International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 5 Issue 11, November 2018

ISSN: 2394-4404

Investigating Factors Impacting Productivity Of Small-Scale Irrigation In Nigeria: A Case Study Of Communities Along The Flood Plains Of Kano River Irrigation Project

Ali Usman Kolomi

Department of Agricultural Education,
Umar Ibn Ibrahim Elkanemi College of Education Science and Technology,
Bama, Borno State, Nigeria

Abstract: ***Agricultural productivity in Nigeria has been in decline in recent years with most crops producing less than their potential. The country has enormous potential for agricultural development, and had tried several sector policies and huge investments since 1970s to transform the agricultural sector especially through irrigation, yet its productivity level is low and dependent on smallholder farms operated by small-scale farmers with 0.5 – 4ha whose yields are far below production potential. The study investigated factors impacting on productivity of small-scale irrigation in Nigeria; with communities along the flood plains of the Kano River Irrigation Project of the Hadejia-Jama'are basin as a case study. The study explored/evaluated agricultural productivity and yields, determinants and effectiveness of irrigation methods used, and constraints faced by small-scale irrigation farmers in the study area. Sixty (60) participants were randomly selected for the study comprising of farmers and staff of the HJRBDA. The study used both qualitative and quantitative methods and the data collected was analyzed using descriptive statistics. The main conclusion drawn from this study is that, small-scale irrigation in the area suffers from inadequate irrigation (purely traditional) practices, lack of necessary skills and knowledge of irrigation such as water requirements and scheduling, small and scattered landholdings, improper plan for production, delay in crop planting, and limitations in accessing government subsidies and support. Some recommendations were also made.***

Keywords: Agricultural productivity, Flood plains, Irrigation, Small-scale farmers, Yields

I. INTRODUCTION

Agriculture in most developing countries of the world is considered key to economic growth and development because of its linkages to other sectors of the economy and provides employment to greater percentage of the populace. In sub-Saharan Africa (SSA), agriculture is regarded as the engine of economic growth and a foremost way out from poverty; it provides employment to 65% of the region's populace and 75% of its domestic trade (Oluwatoyese et al. 2016). Despite these figures, SSA still faces challenges of food security which is attributed to high rates of population growth as compared to the inefficient and low productivity of the agricultural sector. As Burney and Naylor (2012) observed, agricultural productivity in SSA is rainfed dependent and subject to weather driven fluctuations which results in low yields of most staple crops and a food production that is lagging rate of population growth. According to World Bank (2014), for considerable progress in the reduction of hunger and poverty to be achieved in SSA, the region needs to develop and transform its agricultural sector by investing more in irrigation farming. This, therefore, raises the need for African countries to develop their agricultural sector by investing heavily in irrigation technology to reduce poverty, increase income and bridge the lag between food production and population growth.

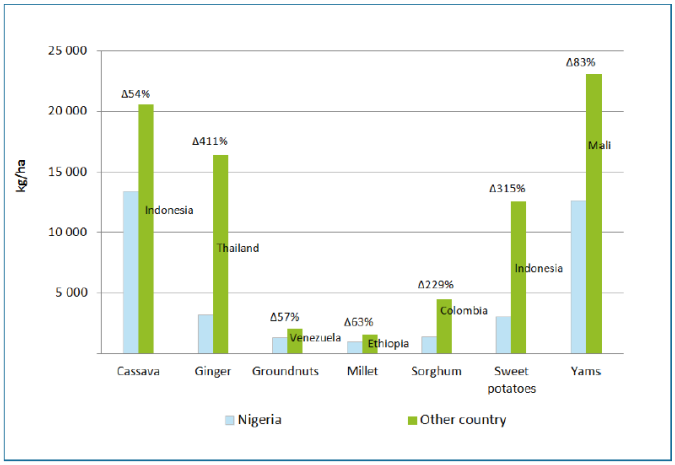
Nigeria is the largest country in SSA in terms of size and rate of population growth. It has an estimated population of

ISSN: 2394-4404

182 million people (NPC 2016). Nigeria's economy is hugely dependent on oil which contributes about 90% of total export and 75% of government revenues (World Bank 2014). Agriculture accounts for over 20% of the country's GDP and employs over 60% of the population (Takeshima et al., 2016). With a cultivated area of 30 million hectares, two-third of Nigeria's rural populations depend on agriculture for their livelihood and income generation yet its agriculture is still characterized with scattered landholdings of 0.5 – 4 hectares, low input technology, and a low-output labour productivity (FMARD 2013 and World Bank 2014).

According to Ugwu & Kanu, (2012), Nigeria is blessed with favorable climatic conditions; well-distributed rainfall and abundant natural resources such as fertile land, water resources (rivers), forests etc. but its agricultural productivity is at subsistence level. There is enormous potential for the country to diversify its crop production activities and be self-sufficient in major staple crops, but the country fails to judiciously utilize its agricultural sector to meet the demand of its growing population, enhance exportation and aid growth. A study on poverty by IFPRI in 2014 indicated that there is elevated level of poverty amongst households whose source of income and livelihood is agriculture (Olomola et al., 2014).

In Nigeria, agricultural productivity has been in decline in recent years with most crops producing less than their potential. Several sector policies and huge investments were initiated since 1970s in both large and small-scale irrigation to transform the agricultural sector, but there are still issues and constraints that are associated with agricultural productivity growth and poverty reduction in the country. Even though the country has enormous potential for agricultural development, its productivity level is low and dependent on smallholder farms. According to IFAD (2014), up to 90% of agricultural output is from small-scale farmers with 0.5 – 4ha under cropping and a yield that is far below production potential. For example, in the 2010 – 2012 periods, yields for important crops such as rice, millet, sorghum, maize, beans, ground nut, cassava, yam, cocoyam, and ginger are far below their potential and farmers productive efficiency was far below 60% (IFAD 2014). When average yields of some of these crops in the same period (2010 – 2012) was compared with other developing countries (figure 1), a yield gap of over 400% can be observed in the case of ginger for which Nigeria is amongst the top producers in the world (FAO 2014). This has also been asserted by World Bank (2014) when it stated that Nigerian agriculture is largely uncompetitive in major staple crops when compared with international markets and the country needs food imports to sustain it. The Nigerian government has in its "Agricultural Promotion Policy" launched in 2016 acknowledged the role of irrigation in closing the yields gap of crops. The program intends to enhance productivity growth by promoting judicious use of water, land and other natural resources (FMARD 2016). This research, therefore, will investigate the key factors that impact on productivity of small-scale irrigation farmers with farmers in Communities along the flood plains of Kano River Irrigation Project as a case study.



Source: FAO (2014)

Figure 1: Yield gaps between Nigeria and other producing countries (2010 - 2012)

II. METHODOLOGY

The study was conducted in communities along the floodplains of one of the largest irrigation projects of the Hadejia-Jama'are River Basin Development Authority (HJRBDA) in Nigeria, namely; the Kano River Irrigation Project (KRIP). In all, the study covered twenty farming communities from Bunkure, Garun Mallam, and Kura local government areas of Kano state.

SAMPLING PROCEDURE AND SAMPLE SIZE

A multi-stage random sampling procedure was used to select sixty (60) participants for the study comprising of farmers and staff of HJRBDA. Three local government areas (LGAs); Bunkure, Garun Malam, and Kura in Kano state were then selected for the study because of the level of both private and public irrigation practice in these LGAs. The next stage was the random selection of fifty (50) respondents from twelve (12) farming communities within the three LGAs. In each LGA, at least four farming communities were selected for the study as shown in table 1. Even though it was a random selection, the communities considered were those situated along the Fadama area and which have been found to be actively involved in both the rainy season and dry season farming.

State	LGA	Community-selected	No. of respondents
Kano	Bunkure	Bunkure	4
		Kode	4
		Lautaye	4
	Garun Malam	Satigal	4
	Kura	Agalawa	4
		Chiromawa	4
		Mudawa	4
		Samawa	4
		Kura	5
		Domawa	5

		Kadani Butalawa	4 4
Total			**50**

Table 1: Sampling Procedure and Sample Size of Farming Communities

The last stage was the random selection of ten (10) respondents comprising of irrigation experts, technical and administrative staff of the HJRBDA. In this stage, five (5) participants each were selected from KRIP and from the Head office of the HJRBDA (see table 2). The selection of all participants (farmers & government staff) for the study was done at random to give equal chance to all staff and farmers in the communities.

HJRBDA	Staff selected	No. of respondents
KRIP	Irrigation experts	3
	Technical staff	2
Head Office	Admin staff	5
Total		**10**

Table 2: Sampling Procedure and Sample Size of respondents from KRIP and HJRBDA Head Office

METHOD OF DATA COLLECTION

Both primary and secondary data sources were used for the study. To obtain the primary data, two different questionnaires; structured for farmers and semi-structured for staff, were administered to sixty (60) respondents in the study area. Fifty (50) questionnaires were administered on active farmers and ten (10) to staff of HJRBDA. The farmer questionnaires were filled in by the farmers with the help of the researcher and a member of water user association (WUA). In most cases, the questions were translated to the farmers in Hausa because it is the major language in the area. The study used semi-structured questionnaires for staff in order not to limit their responses and capture their views on critical issues regarding small-scale irrigation in the study area. The secondary data was obtained from documents, project reports, annual publications and data collected by the HJRBDA. Peer-reviewed journals on similar research were also consulted.

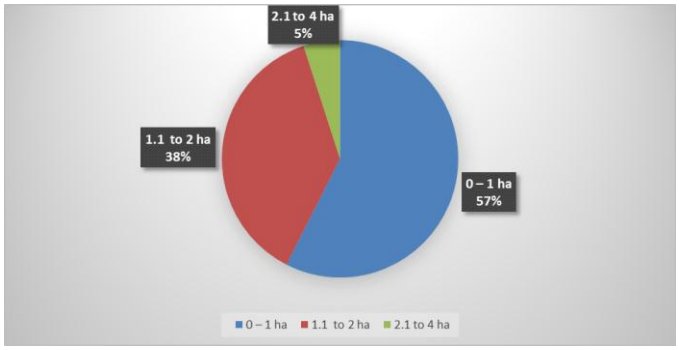
METHOD OF DATA ANALYSIS

The data collected from the study will be analyzed using descriptive statistics, qualitative techniques, and excel package. The descriptive statistics used for this study are parameters such as percentages, means, frequency count, graphs and standard deviation which were used to classify, tabulate and summarize data of respondents in the study.

III. RESULTS AND DISCUSSION

ASSESSING PRODUCTIVITY OF SMALL-SCALE IRRIGATION FARMERS

The study (figure 2 below) reveals that 57% of farmers practice irrigation on relatively very small lands of zero to one (0-1) ha farms lands, another 38% grow crops on farm lands of between 1.1 to 2 hectares (Figure 1). However, even farmers who grow crops on 1.1 – 2 ha in some cases have their land holdings scattered in either one or two places of 0.5 to1 ha. It is also observed that some of these small-scale farmers in most cases do not even own the farms; the land is lease out to them by the RBDA. Furthermore, most of the 2.1 – 4 ha farm lands are cultivated either by politicians, top management staff of the RBDA or by very wealthy members of the community who go into farming either as recreation or as a leisure.



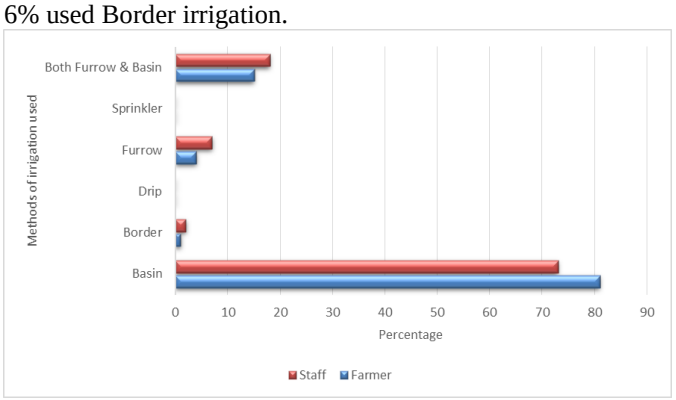
Field Survey; 2017

Figure 2: Percentage farm sizes of respondents

This shows that over 90% (0 – 2ha) of farmers in the area are smallholder irrigation farmers, whose production is at subsistence level because of the small sizes of their farms; hence, production is below their potential. This is in line with what is stated in the literature reviewed that over two-third of Nigeria's rural populations depend on agriculture for their livelihood and income generation, yet its agriculture is still characterized with scattered landholdings of 0.5 – 4 hectares, low input technology, and a low-output labour productivity (FMARD 2013 and World Bank 2014).

IRRIGATION METHODS

The results of the study shown in (figure 3) indicate that basin irrigation is the largest method used by farmers in the study area. About 81% of farmers currently use basin irrigation, 18% use both Basin & Furrow irrigation and only 6% used Border irrigation.



Field Survey; 2017

Figure 3: Comparing farmer and staff responses on methods of irrigation used

Even though staff response was 75% for basin as against 81% response from farmers, the difference is insignificant, because most staff of the HJRBDA response was based on a survey conducted by the authority a couple of years back. Farmer's response on their preference of basin over other

methods of irrigation in the area was because of its suitability to the types of crops they grow such as rice, wheat etc., ease of design structure, its rapid irrigation, guaranteed water supply, cheaper labour, less stressful than other methods, highly profitable and the weather conditions of the area. Other major contributing factor for the use of basin is that KRIP uses gravity irrigation flow to distribute water to fields; hence, farmers find it easier to use basin irrigation. These are factors also asserted by Takeshima, (2013) that; the type of irrigation to adopt is determined by crops/commodities, water source, specific forms of water bodies, length and timing of irrigation practice and the region of the country in which the irrigation is intended. HJRBDA, (2014) also asserted that the type of irrigation methods used in the area are mostly operated by gravity flow of water from dams and they include basin, border and furrow.

SOURCE OF WATER

The KRIP is the major source of water for farmers in the study area. Over 90% of the water used by the farmers is from dams of the project. During rainy season, the RBDA stores and reserve water at the main dams and night reservoirs and from the Tiga, water is discharge when it is due to farmers during the dry season for irrigation purposes. This result is similar to that of Ogunjimi and Adekalu, (2007)'s research on practice of fadama farming in Oyo and Osun states, Nigeria. Their results indicated that over 95% farmers in Osun, and 57% farmers in Oyo states' source of water for irrigation are streams and 40.5% wells in Osun state. This has been the situation in other parts of the world, because as at year 2000, over 30% of the total area irrigated around the world was by dams (Duflo and Pande, 2007 cited in Takeshima et al., 2016). According to Takeshima et al., (2016), because of the importance of dams for irrigation in Nigeria, the World Bank has invested $500 million through the Transforming Irrigation Management in Nigeria (TRIMMING) to improve the utilization of dams for irrigation purposes. Because the HJRBDA distributed water from dams to the fields through canals, 100% of respondents stated that canals are their major source of water abstraction, while about 27.5% of these farmers also use water pumps during the peak of dry season for abstraction.

EQUIPMENT AND MACHINERY USED FOR IRRIGATION

The major equipment used by farmers for irrigation in the study area is Siphon and water pump. The study revealed that 52.5% of farmers use Siphon, 47.5% use water pumps, with 38% of the farmers using both Siphon and water pumps respectively. Even though using water pumps comes with its own problems such high costs of fuel, frequent breakdown & maintenance problems, majority of the respondents pointed out that water pumps are very useful to them during the peak of the dry season when the water level in the rivers and dams has declined. According to Woodhouse et al., (2017), because of the relevance and importance of pumps in irrigation in Nigeria, and the promotion and insistence of the World Bank on the use of pumps and boreholes in extended fadama areas in northern Nigeria, fadama irrigation now accounts for 114,000ha, which is more than halve of the total 220,000ha currently irrigated in Nigeria.

The result also revealed that 75% of the respondents have access and use tractor and its implements for irrigation. 90% use sprayers, 85% use threshing machines to process their produce and only 15% have access to a Combined Harvester. This machinery are usually leased to the farmers by the RBDA at cheap rates while others own sprayers, threshers and even co- own tractor. Even though many northern states governments in Nigeria boast about huge investments in irrigation infrastructure such sprinkler irrigation and drip irrigation to boost agricultural productivity, there were no any sign of such investments throughout the entire area covered by the study, and this area represents the bulk of small-scale irrigation farmers in Nigeria.

ACCESS TO FARM INPUTS

The result in table 3 below show that all respondents in the study area use agrochemicals such as fertilizers, pesticides and herbicides on their farms. All respondents indicated the use NPK, while Nitrogen (N) and organic fertilizers used in the ratio of 50% and 48% respectively. However, even though all respondents indicated the use of agrochemicals, accessibility and affordability of the products is still an issue for most farmers. This is because of the politics/corruption involved in the supply and distribution of fertilizer, where the distribution was untimely and the allocations is given to politicians, prominent people in the society and intermediaries who often times are not even farmers and the product usually ends up in the open market. Hence, farmers' purchase of the product at higher prices in the open market as pointed out by Liverpool-Tasie and Takeshima, (2013).

The corruption in the distribution of fertilizer in Nigeria and the resultant high price of the product in the market has significantly affected its use by farmers in Nigeria. Most small-scale farmers do not apply the right amounts of fertilizer and chemicals to their farms. According to the IFDC (2013), the fertilizer usage in Nigeria is incommensurate with the world's average, while the world average is 100kg/ha, Nigeria's usage is still at 13kg/ha. The study also revealed that 70% of the respondents use improved variety seeds. 66% of which use early maturing variety and 4% use disease/pest resistant varieties.

In terms of labour used on the farm, the study revealed that majority of the respondents uses both family and hired labour respectively. The results indicate that 74% of the respondents use family labour, 66% use hired labour, while 10% use communal labour respectively. Women are only actively involved during harvesting and threshing of farm produce. This result has confirmed Shittu et al., (2014)'s findings on labour use efficiency in Ogun state asserting that family labour is the most widely used labour amongst small-scale farmers, and that over 64% also use hired labour on their farms.

Variables	Access/Usage	Frequency	Percentage (%)
Improved variety	Yes	35	70
	No	15	30

Improved variety used	Early maturity	33	66
	Drought resistant	0	0
	Disease/pest resistant	2	4
	Non-logging	0	0
Fertilizer	Yes	50	100
	No	0	0
Types of fertilizer used	**Single nutrient fertilizer**		
	Nitrogen (N)	25	50
	Phosphate (P)		
	Potassium (K)		
	Multi-nutrient (compound) fertilizer		
	NPK	50	100
	NP		
	NK		
	PK		
	Organic fertilizer	24	48
Labour source	Hired	33	66
	Family	37	74
	Others (communal)	5	10

Field Survey; 2017

Table 3: Distribution of respondents' use of agrochemical and other resources

CROP PRODUCTION AND YIELD

The total area harvested during the 2016/2017 dry season irrigation as covered by the study was 99.86ha (see table 4). The major crops grown and the percentage area dedicated to each crop in the period under review were Wheat (15.3%), Rice (32%), Maize (14.76%), Tomato (14.34%), Onions (10%), Pepper (9.51%) and Okra (4%) of the total area harvested in hectares. About 95% of the cropped area is cultivated by farmers who operated between zero to two (0 – 2) hectares. The output of the given crops provided by the respondents in bags/kg for each hectare; which was converted to metric tons per hectare (MT/Ha) is shown in table 4 below. When the average yield of these crops is compared with that produced and managed by the HJRBDA in previous years (see Appendix E), it can be observed the yields of these crops has increased significantly during 2016/2017 dry season. For instance, in the 2013/2014 and 2014/2015 dry season farming by HJRBDA (see Appendix E), the average yield of rice per hectare was constant at 4.5 MT/ha as against 4.84 MT/ha of the farmers in the 2016/2017 dry season farming. The output (of 4.84MT/Ha) by the small-scale farmers is similar to that achieved by the Bakalori large irrigation scheme in 2014 with 5.4 tons/ha in the dry season and 4.6 tons/ha in the rainy season (IFPRI 2015, cited in FAO, 2016). The difference in yields between farmers and HJRBDA is significant considering the odds against these farmers compared with farms managed by the RBDA that have all resources at their disposal.

Crop type	Area cropped (ha)	Average yield Mt/ha	Production (MT)	Price/Mt (#)	value (#)
Wheat	15.3	2.76	42.18	166,000	7,001,880
Rice	32	4.84	155.04	150,000	23,256,000
Maize	14.74	2.1	30.95	135,000	4,178,250
Tomato	14.32	13.7	196.18	56,600	11,103,788
Onions	10	18.75	187.5	83,000	15,562,500
Pepper	9.5	9.58	91	40,000	3,640,000
Okra	4	1.3	5.2	25,000	130,000
TOTAL	**99.86**		**1070.35**		**64,872,418**

Field Survey; 2017

Table 4: Respondents' crop production and value for 2016/2017 dry season irrigation

Conversely, even though the farmers recorded significant increase in yields during 2016/2017 dry season, it is still below the potential for crop yields in Nigeria. One of the major reasons for this increase in productivity of rice is because of import restrictions by the Nigerian government in 2015; this has tremendously boosted local production with farmers in some states like Niger states producing up to 5.5 MT/ha (Vanguard, 2017). According to Nzeka and Taylor, (2017), despite the challenges of production and the subsequent problems of milling, what encouraged farmers to increase their productivity is the good income made by selling their product to either the government or humanitarian agencies who purchase their goods at favourable prices.

Furthermore, the average yield of wheat (2.76 MT/Ha) has also increased significantly when compared with that of the well-managed HJRBDA farms. In the previous years of 2013/2014 and 2014 /2015, wheat production by the HJRBDA was 2.5 MT/Ha. This significant increase was as result of factors mentioned above. However, the average yields/ha of the other crops – maize (2.1mt/ha), tomato (13.7mt/ha), onions (18.7mt/ha), pepper (9.58mt/ha) and okra (1.3mt/ha) were all slightly below that of the HJRBDA (see Appendix E). Therefore, this prove that if small-scale irrigation farmers are provided with the required support, resources, and favourable growing conditions, agricultural productivity would increase leading to reduction in poverty, improved livelihood, increased income, and overall economic growth.

CONSTRAINTS/LIMITATIONS OF SMALL-SCALE IRRIGATION

The findings of the study as shown in table 5 below revealed that majority (78%) of the respondents have storage problems, while 22 indicated that their storage problem is negligible. The persistent storage problems identified by respondents in order of severity include rodent (38%), insects (28%), lack of storage facility (22%), and moisture (12%). These farmers use traditional storage facilities such as bags, sheds, barns (rumbu), and stores (rooms), the impact of these storage problems and losses at harvest have affected their income negatively. However, even though these farmers

pointed out they use insecticides (such aphicide, rodenticide, fumigant etc.) and cultural methods of pest control during storage, considerable number of their crops especially perishables (vegetables) are lost due to storage problems.

Variables	Grouping	No. of Respondents	Frequency	Percentage (%)
Storage problem	Yes	50	39	78
	No		11	22
	No storage facility		11	22
Problem types	Insects	50	14	28
	Moisture		6	12
	Rodent		19	38
Market and Pricing	Yes	50	22	44
	No		28	56

Field Survey; 2017

Table 5: Distribution of respondents' problems according to storage, market and price

This agrees with Jake, (2011) assertion that over 40% of the crops produced by small-scale farmers in Nigeria are lost due to storage problems. Jake, (2011) further pointed out that the most challenging aspect of storage for small-scale farmers in Nigeria is the storage of perishables such as tomatoes, lettuce, eggplant, pepper, okra, and spinach. Even though some farmers store their perishables by slicing and drying, crops not sold or consumed in the house are usually thrown away (Jake, 2011).

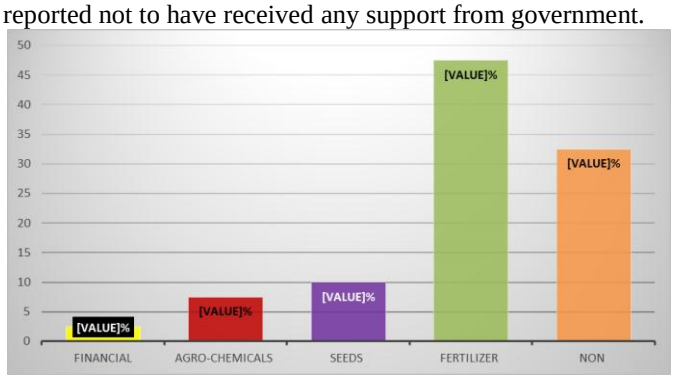
STAFF ACCOUNTS OF CROP MANAGEMENT PROBLEMS

Majority (85%) of the staff sampled for this study indicated that farmers in the area have several problems with crop management practices that affect their productivity. The study revealed that the HJRBDA identify farmers' problems through regular field visits (crop survey), face-to-face contact with farmers, discussions with water user association, report by aquatic service department and channels opened specifically for farmers to report incidents as they occur. The study therefore revealed that the major crop management problems faced by farmers as identified by 85% of staff include the following: Farmers lack necessary skills and knowledge of irrigation such as water requirements and scheduling, lack/inadequate support from government, small and scattered landholdings, poor extension service, lack of adherence to advice, purely traditional practices, lack of finance and proper plan for production, delay in crop planting, growing crops that are not compatible, inadequate storage facility, lack of good markets for their produce, use of local seeds (improved variety unavailable and expensive), inadequate application of fertilizer and chemicals, problems of pest and disease control, shortage of farm implements, problems of pump (breakdown & high maintenance cost); and shortage of irrigation water during peak of dry season.

This result is in line with Girei et al., (2014) who stated that fadama farmers in Adamawa state suffer from problems such as inadequate and high cost of fertilizer, agrochemicals, high labour cost, non-availability of improved seeds, and high cost of pumps and irregular supply of water in some months. This, therefore, is an indication that small-scale irrigation in Nigeria suffers peculiar problems, which, if properly addressed by government could lead to improved productivity.

SUPPORT AND INTERVENTIONS FROM GOVERNMENT

The study as shown in figure 4 below revealed that, respondents reported receive of support from government in the following order: fertilizer (47.5%), seeds (10%), agro-chemicals (7.5%), and financial support (2.5%) while 32.5% reported not to have received any support from government.



Field Survey; 2017

Figure 4: Percentage distribution of respondents based on support from government

This has shown that despite government's different policy interventions and several efforts, small-scale farmers seldom benefit from interventions and subsidies provided by government. Even though government through the Agricultural Transformation Agenda created a new subsidy strategy (voucher programme) to check loop holes in fertilizer distribution and get fertilizer to 94% of the real farmers (FMARD, 2011), farmers still faces challenges in accessing the product. These farmers do travel to long distances to redeem their vouchers/allocations to access the fertilizer, which by implication is an additional cost to the subsidized price.

RESPONDENTS' VIEWS OF WHAT WILL HELP IMPROVE YIELDS OF SMALL-SCALE IRRIGATION IN THE AREA

All respondents (farmers and staff) captured for this study agreed that crop productivity and yields of small-scale irrigation farmers in the area needs to be improved. The study revealed that for yields to be improved, government should take step to provide/implement the key issues brought forth by respondents as listed below:

- ✓ Adequate and timely provision of subsidized farm inputs/resources such fertilizers, seeds, agro-chemicals etc.
- ✓ Provision and access to modern tools and equipment.
- ✓ Extension service to educate farmers on new techniques of irrigation- through training, demonstrations, and seminars for educated farmers.
- ✓ Small-Scale farmer output protectionism.
- ✓ Easy access to loans and credit facilities

- ✓ Right and improved advisory services backed up by actions.
- ✓ Improvement of irrigation facilities, and;
- ✓ Enhancing and extending or reforming land tenure system

IV. CONCLUSION

The study revealed that the country has enormous potential to improve its agricultural productivity beyond what is produced today. Despite its distinct agro-ecological and varied geopolitical zones, to its several types of farming systems and favourable climate, Nigerian farmers, about 90% of which are smallholders, produce less than their potential. The study revealed that irrigation in northern Nigeria is smallholder based and male dominated. This was as result of the drudgery that characterizes agriculture (irrigation), and the constraints female farmers face in terms of culture, access to inputs, information, technology and their less likelihood to have equal land as male farmers. The study also revealed that greater percentage of farmers practice irrigation on 0 - 2ha of farms lands with most of the land holdings scattered in either one or two places of 0.5 to1 ha; and in most cases is leased out to them by the HJRBDA. However, the findings of the study revealed that, because of the inadequacy of their irrigation practices, and non-availability of resources and limitations of accessing government subsidies and support, small-scale irrigation in the area suffers from the following challenges and limitations: Farmers lack necessary skills and knowledge of irrigation such as water requirements and scheduling; Lack/inadequate support from government. Small and scattered landholdings; Poor extension service; Lack of adherence to advice; purely traditional practices; Lack of finance and proper plan for production; Delay in crop planting; Growing crops that are not compatible; Inadequate storage facility; Lack of good markets for their produce; Use of local seeds (improved variety unavailable and expensive); Inadequate application of fertilizer and chemicals; Problems of pest and disease control; shortage of farm implements; Problems of pump (breakdown & high maintenance cost); and shortage of irrigation water during peak of dry season.

V. RECOMMENDATIONS

The level of crop production/output of farmers in the 2016/2017 dry season irrigation has really demonstrated that small-scale irrigation in the study area and indeed in Nigeria at large has a good chance for the crops to produce at their maximum potential. It is therefore the recommendation of this study that if the following measures are taken, production/output of small-scale irrigation in the country would significantly improve:

- ✓ Extension service be adequately used to educate farmers on new techniques of irrigation- through training, demonstrations, and seminars;
- ✓ Adequate and timely provision of subsidized farm inputs/resources such fertilizers, seeds, agro-chemicals, finance and affordable irrigation infrastructure; and
- ✓ Small-Scale farmer output protectionism.

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