LEVEL OF ALLOCATIVE EFFICIENCY ESTIMATION OF IRRIGATED TOMATO PRODUCTION UNDER KANO RIVER IRRIGATION PROJECT (KRIP), NIGERIA.

[*1]Ahmed, Bashir Sa'ad, [2]Ben Ahmed, [2]Oseni Yusuf

[1]Department of Agricultural Education, Kano State College of Education and Preliminary Studies (KASCEPS), Kano
[2]Department of Agricultural Economics, Ahmadu Bello University, Zaria, Kaduna State.

[*]Corresponding author email: baseeru33@yahoo.com

ABSTRACT

The focus of this study is to analyze the Level of Economic Efficiency of Irrigated Tomato Production under Kano River Irrigation Project (KRIP), Nigeria. A combination of purposive and random sampling techniques were used to select 213 irrigated tomato farmers. Primary data were collected through a well-structured questionnaire. Data collected were analyzed using descriptive statistics such as frequency, percentages and data. It was found that the medium and large scale farms emerged as farms with price-efficiency in terms of higher unit profit (0.43) respectively. It can be concluded irrigated tomato farmers in the study area were fairly allocative efficient, suggesting that opportunities for improvement in the allocative efficiency of the respondents. It is recommended that education should be encouraged by extension agents through effective and efficient dissemination of information.

Keywords: Level, Allocative Efficiency, Irrigated Tomato Production, Kano River Irrigation Project

INTRODUCTION

Tomato can be grown anywhere in northern and southern Nigeria, but the best area is the Savannah zone because some diseases of tomatoes are less common in the Savannah (Ogunniyi and Oladejo, 2011). Tomato production requires a high level of management, large capital inputs and close attention to detail. Tomato production is subject to the variations that occur in weather, which may result in severe crop damage and losses. Labour requirements for production, harvesting, grading, packaging and transporting are very intense. Tomato production is labour intensive and the bulk of production is mostly supported by small-scale farmers (Erdogan, 2007).

Nigeria in her quest to be among the world 20 largest economies by the year 2020 has to fight poverty among its citizenry and empower them economically to collectively improve the economy of the nation. Despite the rapid pace of urbanization taking place in Nigeria, half of Nigerians (approximately 70 million individuals) are still in rural areas; most of them engaged in small-holder semi-subsistence agriculture (Lenis e*t al*., 2011). Agriculture remains a crucial sector in the Nigerian economy, being a major source of raw materials, food and foreign exchange; employing over 70% of the Nigerian labour force and serving as a potential vehicle for diversifying the Nigerian economy. However, there are no rigorous studies that explain productivity in this sector. Most small-holder farmers produce significantly below their frontiers. As a result, they produce less than optimal levels of output as revealed by studies (mostly land productivity) while many farming enterprises are profitable, profit margins are generally low (Lenis e*t al*., 2011).

Several studies have been conducted on irrigated tomato production in Nigeria. Olugbire, Aremu, Oke and Kolade, (2020) studied profitability and marketing efficiency in Oyo State Nigeria. Gona, Maikasuwa and Tomo, (2020) Profit Efficiency of irrigated Tomato Farmers in Kebbi State, Nigeria. Usman and Bakari, (2013) Productıvıty Analysıs of Dry Season Tomato Productıon in Adamawa State, Nıgerıa. Despite these studies, a dearth of information and limited empirical findings for policy recommendations. Therefore, this study tried to estimate the level of allocative efficiency of irrigated tomato production under Kano river irrigation project (KRIP), Nigeria.

METHODOLOGY

Description of the Study Area

The study was carried out in Kano State, Nigeria. Kano lies between latitude $12^0 37'$ North and $9^0 33'$ South and longitude $9^0 29'$ and $7^0 43'$ West. It shares boundary with Jigawa State to the North-East, Katsina State to the North-West and Kaduna State to the south. The State comprises of 44 local government areas with population of 9,383,682 (NPC, 2006). The projected a population in 2012 with a national growth rate of 3.2% is 11,710, 553. Agriculture is the major employer of labour in the State with many citizens involved in farming, animal husbandry and fishery (Muhammad and Atte, 2006). The cropping system is mostly undertaken under rain-fed conditions and the majority of the farmers are small-scale holders with less than 2.5 hectares per farming household and either resource are meager (KNARDA, 2002). The predominant ethnic groups are Hausa and Fulani. The KRIP is one of the largest and successful projects, not only in Nigeria but in the West African sub-region. It is unique in its design in that the entire water distribution network operates on gravity. Water is conveyed from Tiga Dam to the project site through 18 km long main canal, which splits into East (Bunkure) and West (Garun Malam and Kura) Branches. These are then further broken into lateral canals, distributaries canals, field channels and finally to the farm for the crops to be irrigated. Crops cultivated include tomato, wheat, onion,

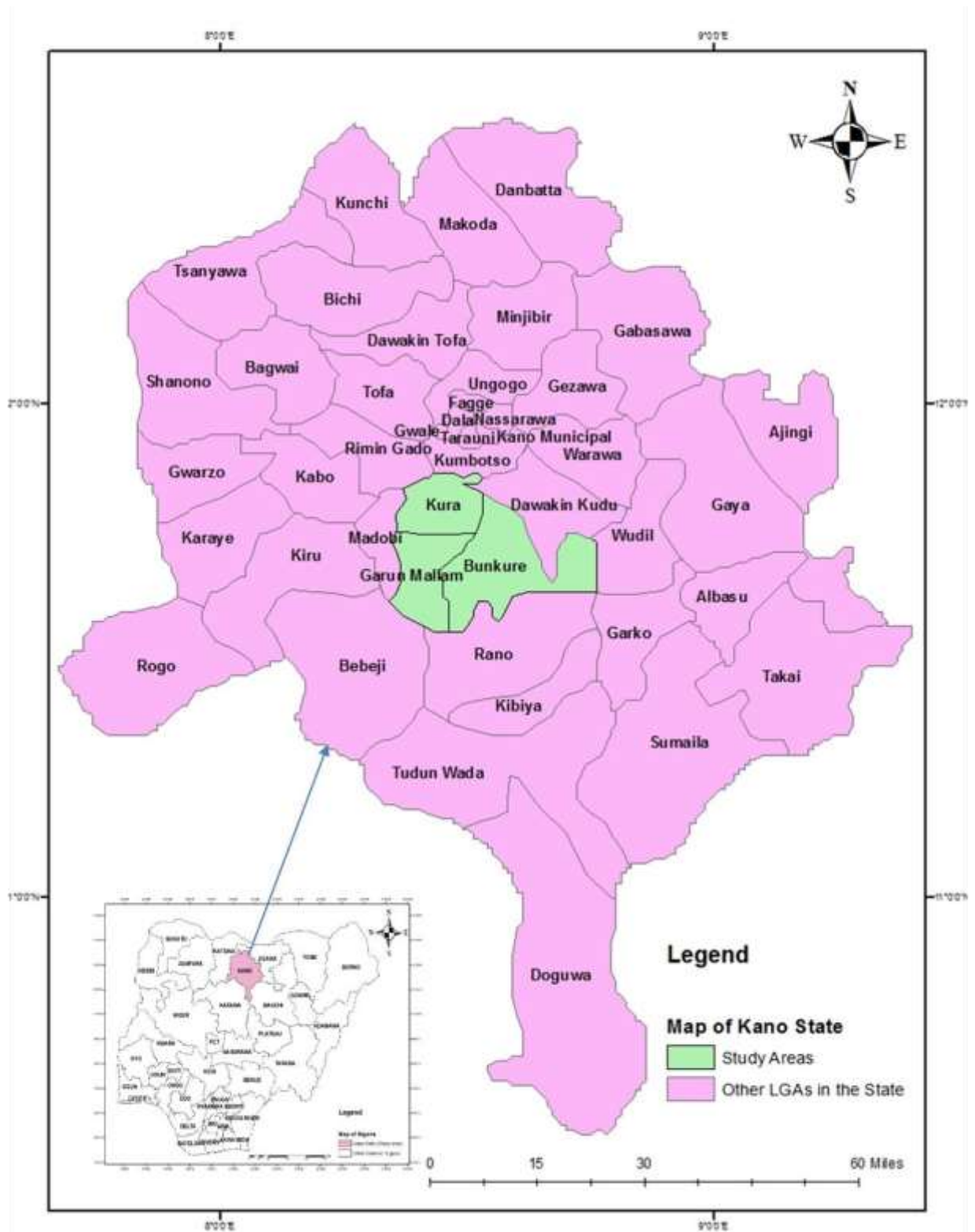maize, rice, garlic, cucumber, potatoes, millet, guinea corn and melon (HJRBDA, 2013).

Figure 1: Map showing the study area

Sampling Procedure and Sample Size

Kano State comprises three agricultural zones, namely Danbatta, Rano and Gaya zones. Rano zone was purposively selected because of its highest number of irrigated tomato farmers. The major irrigated tomato producing local government areas in the zone are Bunkure, Garun-Mallam

and Kura which are covered by Kano River Irrigation Project (KRIP) Phase I, (HJRBDA, 2013). Large-scale tomato-production has been taken up along KRIP (Olanrewaju and Swarup, 1983). Two villages with the highest number of large-scale irrigated tomato farmers from each of the three local government areas were purposively selected. Finally, random number sampling was employed to select 10% of the total population (2122) of the purposively selected villages to give a sample size of 213.

Classification of the sizes

The classification of the three sizes of production was based on the categorizations of Haruna (2004) and Usman and Bakari (2013), it is given as farm size of:

i. less than a hectare are small-scale farmers **(<1.0ha)**

ii. one hectare to less than three hectares are medium-scale farmers **(1.0ha to 2.9ha)**

iii. three hectares and above are large-scale farmers (**3.0ha and above**)

Data Collection

Primary data were used for this study and were collected with the aid of structured questionnaire through the assistant of field enumerators in a manner that allows the collection of relevant data on specific variables that were investigated. Information was collected on the following variables: type and cost of labour (both family and non-family), type and cost of inputs used per hectare, revenue, water rate, produce prices.

Analytical Techniques

Descriptive statistics such as percentage frequency distribution, mean, minimum and maximum were used to achieve the objective. The index of allocative efficiency measure was used to compute the level of allocative efficiency, this is derived from the input-output Data Envelopment Analysis (DEA) model. Furthermore, the allocative efficiency (AE) firm i can be calculated as follows:

$$AE = \frac{EE}{TE}$$

RESULTS AND DISCUSSION

Estimate of allocative efficiency based on the three sizes of production in the study area

The frequency distribution of allocative efficiency estimates for irrigated tomato farmers in the study area as obtained from the Data Envelopment Analysis result presented in Table 1. Results revealed that the majority of the irrigated tomato farmers (35%) of the small farm size operated within an allocative efficiency range of 0.41-0.60. Approximately 39% of the medium farm size operated within an allocative efficiency range of 0.20-0.40, while 64% with large farm size operated within an allocative efficiency range of 0.61-0.80. The implication of this result is that majority of the irrigated tomato farmers are not allocatively efficient in the use of production resources. This can result to the utilization of inputs in the wrong proportions, given input prices, and hence higher costs of input combination and reduced return to capital. The study also suggests that allocative efficiency among the irrigated tomato farmers varied widely ranging between 0.252 and 1.00 for small farms, 0.034 and 1.00 for medium farms and 0.36 and 1.00 for large farms with a mean allocative efficiency of 0.65, 0.54 and 0.77 for small, medium and large farms respectively.

Table 1: Frequency distribution of allocative efficiency estimates based on the sizes of production in the study area

Allocative efficiency	Small farms	Medium farms	Large farms
<0.20	15	9	6
	(10)	(25)	(24)
0.20-0.40	52	14	3
	(34)	(39)	(12)
0.41-0.60	53	10	0
	(35)	(28)	(0)
0.61-0.80	32	3	16
	(21)	(8)	(64)
0.81-1.00	0	0	0
	(0)	(0)	(0)
Mean	0.646	0.543	0.769
Min	0.252	0.034	0.36
Max	1	1	1

Source: Field survey 2015

This result revealed that the farmers are utilizing the inputs in the wrong proportions, given input prices. In other words, about 35% of small farms, 46% of medium farms and 23% of large farms resources are inefficiently allocated relative to the best-practiced farms producing the same output and facing the same technology in the study area. This implies that allocative efficiency among the respondents could be increased by 35% for small farms, 46% for medium farms and 23% for large farms through better utilization of resources in optimal proportions given their respective prices and given the current state of technology. The findings from this study are similar to findings by Usman and Bakari, (2013) who found the mean allocative efficiency of 0.81 with minimum and maximum allocative efficiencies of 0.30 and 0.99 respectively. However, This finding is at variance with (Okoye *et al.,* 2009) who observed that the most allocatively inefficient farmer will have an efficiency gain of 89.6 % in cocoyam production if he or she is to attain the efficiency level of the most allocative efficient farm in the State. It also agrees with the findings of (Asogwa *et al.,* 2011) that

Nigerian rural farmers are not utilizing production inputs in the optimal proportions, given input prices.

CONCLUSION

It can be concluded that 64% and 52% of the large farm size operated within an allocative range of 0.61-0.80. This shows that irrigated tomato farmers in the study area were fairly allocative efficient, suggesting that opportunities exist for improvement in the allocative efficiency of the respondents.

RECOMMENDATION

It is therefore recommended that since the farms were not allocatively efficient, farmer education should be encouraged by extension agents through effective and efficient dissemination of information.

REFERENCES

Asogwa, B. C. Ihemeje, J. C. and Ezihe, J. A. C. (2011). Technical and Allocative Efficiency Analysis of Nigerian Rural Farmers: Implication for Poverty Reduction, *Agricultural Journal.* 6(5): 243-251.

Erdogan, G. (2007). The econometric analysis of tomato production with contracting in Turkey. *Journal of Applied science*, 7(14):1981-1984.

Gona, A., Maikasuwa, M. A. and Tomo, I. K. (2020). Profit Efficiency among Small Holder Irrigated Tomato Farmers in Kebbi State, Nigeria. *Journal of Business management*, 6(6):41-63.

Haruna, U. (2004). Prospects and Problems of Vegetable Production under Irrigation in the Fadama Areas of Bauchi State, Nigeria. Horticultural Society of Nigeria, Proceedings of the 22nd Annual Conference.

Hadejia Jama'are River Basin Development Authority (HJRBDA, 2013). Brief on Kano River Irrigation Project (KRIP), Phase I.

Kano Agricultural and Rural Development Authority (KNARDA). 2002 Kano State Estimated Crop Production. Monitoring and Evaluation Unit.

Lenis, S. L, Oluyemisi, K. and Akeem, A. (2011). A Review of Literature on Agricultural Productivity, Social, Capital and Food Security in Nigeria: National Strategy Support Programme (NSSP), International Food Policy Research Institute (IFPRI), Washington D. C, USA. NSSP *Working Paper* No. 21.

Muhammad, L.A. and Atte, O.A. (2006) Analysis of Agricultural production in Nigeria. African Journal of General Agriculture, Vol.2, No.1. Nigeria.

NPC (2006). National Population Commission. Population Census of the Federal Republic of Nigeria. *2006 Census Report* National Population Commission, Abuja.

Ogunniyi, L.T. and Oladejo, J.A. (2011). Technical efficiency of tomato production in Oyo State, Nigeria. *Agricultural Science Research Journal*, 1(4):84-91.

Okoye, B. C, Asumugha, G. N. and Mbanasor J. A. (2009). *Cost and Return analysis of Cocoyam Production at National Root Crops Research Institute, Umudikwe, Abia State, Nigeria.* Pp 17363. http://mpra.ub.uni-muenchen.de/17363.

Olanrewaju, D. and Swarup, V. (1983).Tomato Cultivation and it's Potential in Nigeria. National Horticultural Research Institute, Idi-Ishin, Ibadan, Nigeria, *Occasional Paper* No. 10 ISSN 0795-4123.

Olugbire, O.O.,Aremu, F.J.,Oke, D.O. and Kolade, R.I. (2020).Analysis Of Profitability And Operational Efficiencies Of Fresh Tomato Marketing: Empirical Evidence From Oyo State Nigeria**.** *Journal of Agriculture and Food Sciences,* 18(2):109-119.

Usman, J. and Bakari, U.M. (2013).Profitability of Small Scale Dry Season Tomato (*Lycopersicon esculentum* Mill.) Production in Adamawa State, Nigeria. *ARPN Journal of Science and Technology*.3 (6):604-612