



**ANALYSIS OF TYPES OF CROPS CULTIVATED WITH TOMATO AND
CROPPING INTENSITY OF IRRIGATED UPLAND TOMATO
(*Lycopersicon esculentum*) FARMERS IN GOMBE STATE, NIGERIA**

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ABSTRACT

The study was carried out on analysis of types of crops cultivated with tomato and cropping intensity of irrigated upland tomato (*Lycopersicon esculentum*) farmers in Gombe State, Nigeria. Multi-stage random sampling procedure was used to select 461 farmers as sample size for this study. The results that most (36.4%) of the respondents cultivate lettuce with tomato. Many (32.9%) of the respondents for tomato production acquired their seeds from open markets representing. The results also showed that 45.4% of the respondents used NPK as their fertilizer and that many (37.8%.) farmers acquired their fertilizer from open markets. In Dukku LGA of Gombe State, many of the farmers use seedlings representing 64.3% while those use seeds 35.7%. More than half of the respondents in Nafada LGA use seedlings for dry season tomato farming and others use seeds representing 45.5%. Many of the respondents in Funakaye LGA used seeds representing 52.0% and some seedlings 48.2%. The planting materials in Yamaltu LGA are seedlings and seeds representing 52.5% and 47.5%, respectively. The result obtainable in Kaltungo LGA showed that most of the respondents use seeds for tomato farming representing 63.2% and others use seedlings representing 38.6%. So, by implication the respondents in Dukku, Nafada, and Yamaltu Deba preferred using seedlings while those from Funakaye and Kaltungo use more of seeds for dry season tomato production. in terms of cropping intensity, the results showed that the many (41.4%) farmers had one-off engagement in the dry season tomato. The varieties of tomato grown in Dukku LGA of Gombe State are Cherry (Omo-Okoko), Capari (Gbeske), Grape (Alahusa), Plum (Kerewa) Better boy (UTC), Beef steak (Tyres) representing 15.7%, 15.7%, 17.1%, 22.9% 12.9%, and 15.7% respectively. The study concluded that in Gombe State, have different sources of capital for the production of dry season tomato in a sustainable manner for farm efficiency. In the study area many of the farmers used the irrigation tools because it is easier to use. It was recommended that farmers should formed strong cooperative associations, to be united in one voice to have a bargaining power over labour cost and can also make request to government on their needs.

Keywords: Tomato, Varieties, Cropping intensity, Irrigation, Multi-stage.

INTRODUCTION

Major tomato producers in Gombe State are small scale farmers who could hardly produce enough to meet the demand of consumers. Tomato produced in the State is done mostly during the dry season, that is, October to May. The period between July to September tomato become very scarce because of high incidence of pests of tomatoes which includes whitefly, green aphid, tomato trusslet mite, root-knot nematodes, spider mites, leaf minner (tuba absoluta)



and tomatoes disease such as southern blight, fruit rot, bacterial wilt, fusarium wilt, early blight and tomato late blight that associated with growing tomato; general crop management and shifting of tomato producers to production of grain crops. These critical supply elements drive high demand for fresh tomatoes, causes inflation of fresh tomato price, opens market for unhygienic sun-dried tomato as well as clearance for imported fresh tomatoes from neighboring States.

The resources are considered to be at its highest and best use when it is put into use with highest comparative advantage to other uses. Efficiency of resource use can therefore be assessed from the productivity of the output. This is important issue of the present time, because resource use efficiency issues are core elements of sustainable vegetable crop production of small-scale farming activities. Inefficiency use of inputs can jeopardize food availability and its security. It is therefore imperative to know whether resources are used efficiently in tomato production in the study area (Toluwase *et al.*, 2017).

Tomato (*Lycopersicon esculentum*) is one of the most important vegetables in Nigeria. It is a relatively short duration crop, high yielding, and economically attractive. Tomatoe contribute to a healthy, well-balanced diet (Naika *et al.*, 2013), as they are rich in minerals, vitamins, essential amino acids, sugars, dietary fibres, vitamin B and C, iron and phosphorus. The consumption of tomatoes and tomato-based foods can be linked to reduced incidence of a variety of cancers in general, including pancreatic, lung, stomach, colorectal, oral, bladder, breast and cervical cancers (Giovannucci, 2014). is the most frequently consumed vegetable in many countries, becoming the main supplier of several plant nutrients and providing an important nutritional value to the human diet (Willcox *et al.*, 2011).

Onuk *et al.* (2018) reported that, constraints faced by farmers in the production of Tomatoes are lack some basic equipment and infrastructure such as pumping machines, tube wells and wash bores that will encourage tomatoes production. The next most critical constraint was inadequate extension support service. The implication of this is that tomato farmers may be operating with outdated production technology hence find tomato production unattractive. Similarly, poor access to credit facilities also affects production of dry season tomato production. The implication is that the lack of access to credit by farmers would weaken their ability to expand their production or adopt new technologies. Finally, poor marketing and processing system was also another critical challenge to tomato production in the study area, causing farmers to sell at giveaway prices at harvest time to reduce losses.

The production constraints include, use of poor agricultural practices; unwillingness of communities to give out land to interested investors to go into commercial production; lack of good quality seeds and over application of fertilizer and other insecticides by farmers. Other constraints include: high cost of critical production inputs such as irrigation equipment, greenhouse, machinery, fertilizer and pesticide, lack of experienced technical manpower in tomato production and management infrastructure and basic amenities such as electricity, roads and water. The lack of good quality seeds and non-adoption of Agricultural Practice result in poor yields and low productivity (Mgboh, 2015).

Abebe (2014) expressed that, households that are educated will adopt such novel techniques and technologies and increase their technical efficiency. Also educated households will be more exposed to information and will manage their farm production better. Malinga *et al.* (2015) in their study conducted in Swaziland, reveal that, the coefficient for age was positive and highly significant at the 1% level of probability. This implies that the advancement in age leads to an increase in technical efficiency; that older farmers are more technically efficient than their younger counterparts. This positive relationship can be likely attributed to experience in farming as well as frequent contacts with extension agents. Most of the younger farmers may



be engaged in other part time activities and secure other livelihood options which reduces their technical efficiency.

MATERIALS AND METHODS

The Study Area

Gombe State is located between Longitude $10^{\circ}15' - 10^{\circ}50'N$ and Latitude $11^{\circ}00' - 11^{\circ}45'E$ of the Greenwich meridian. It lies within the North East region of Nigeria and occupies a total land area of about 20,265 km². The number of inhabitants of the area has a projection population of 3,822,081 based on 3.2% annual population growth (NBS, 2021). The major ethnic groups are Tera, Bolewa, Hausa, Fulani, Tangale, Lunguda, Waja, Kamo, Kanuri, Jukun, Peroshonge, Cham, Dadiya, and Tula. The State shares boundary with Yobe State to the North, Adamawa and Taraba State to the South, Borno and Bauchi State to the West. As presented in Figure 1, the State is administratively divided into 11 Local Government Areas, which include: Akko, Balanga, Billiri, Dukku, Funakaye, Gombe, Kaltungo, Kwami, Nafada, Shongom and Yamaltu Deba.

The study area experience dry season from November to April while wet season begins from late April to October. This is characterized by the north easterly wind blowing across the country from Sahara Desert known as Harmattan wind (Dabo, 2017).

The annual rainfall starts in late April and ends in October with mean annual rainfall ranges from 800 mm to over 900 mm with rainfall duration of 4-5 months. The mean minimum daily temperature recorded ranges from 13.6°C – 31.9°C in January and 9.0°C to 28.5°C in August. (Gombe State Agricultural Development Programme [GSADP], 2018). Rainfall intensity and duration is sufficient to permit production of typical rainfall farming in the areas.

The vegetation type in the area is predominantly natural growing trees, such as *afzelia Africana acasia SSP* which are found on heavier soil. The area is characterized by shrubs savannah on fertile soil, short grass and thorny vegetation on cetaceous sediments. All the rivers are seasonal (GSADP, 2018).

The Area is gentle undulating plains both east and west of an escarpment, which is defined by localized sandstone hills. Soil type has an impact on determination of land suitability for suitable crop production. Because all types of soils are not suitable for vegetable production. The soils in Gombe State were classified according to soil classification methods from the FAO-UNESCO classification system. According to National *Fadama* Development Project (*Fadama* III AF II) study on soil fertility Bauchi, Gombe revealed that, Soil has been categorised into six broad groups (Luvisols, Fluvisols, Nitosols, Regosols, Vertisols, and Leptosols) and were spatially distributed across the state based on the prevailing physiographic factors.

Gombe State is mainly an agrarian state, and some of the major crops grown include food crop like sorghum, rice, millet, maize, cowpea, sweet potatoes, cassava and a wide variety of vegetables such as tomato, pepper, onion, melon etc. Also, other crops; groundnut, soya beans, benny seed and cotton are also being produced. Other trades of the peasants include hunting, fishing and carving. Livestock rearing including cattle, sheep, goats and poultry contribute immensely to the economy of the study area.

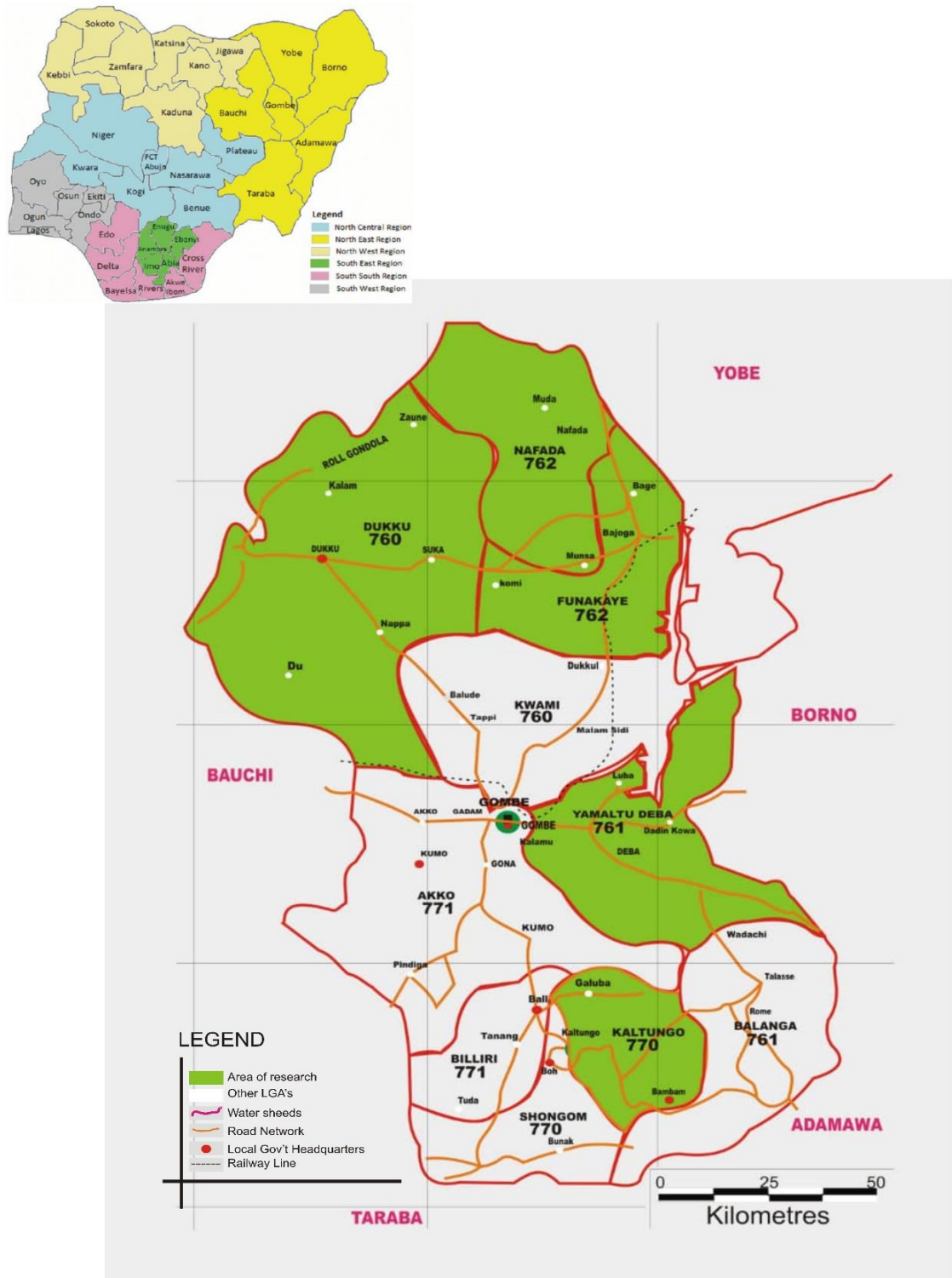


Figure 1: Map of Gombe showing LGAs of intervention

Sampling Procedure and Sample Size

Gombe State Agricultural Development Programme reveals that there are 32,887 farm families in the State, out of which 19,732 engaged in rain-fed while 13,155 engaged in both



irrigated and rain-fed tomato production (GSADP, 2017). Multi-stage random sampling procedure was used to select sample farmers for this study. At first, five LGAs namely Yamaltu Deba, Funakaye, Dukku, Nafada and Kaltungo will be randomly selected on the basis of potential *fadama* areas. In the second stage, three farming communities will be randomly selected from three Local Government Area (Dukku, Kaltungo and Nafada) and four communities were also selected from two LGA (Funakaye and Yamaltu Deba) were selected on the basis of area and production of dry season tomato making a total of 17 farming communities. Thus, an area with high number of tomato producers gets large number of beneficiaries. Lastly, in each LGA, 10% sample size out of 4,606 sample frames were selected using purposive sampling, thus making a total of 461 farmers used in the study area. Finally, the samples will be randomly selected from the complete list of tomato farmers for interview. This is in line with Eboh (2009) who stated that 10% for 2000-5000 sampling frame is appropriate for decision making in case of social science research.

Table 1: Sample size determination and selection plan for the study

LGA	District	Ward	Sample frame (N)	Sample Size (10% of N)
Northern Gombe:				
Dukku	1. Ashidu	Ashidu	187	19.0
	2. Malala	Malala	250	25.0
	3. Zaunne	Zaunne	258	25.8
Sub-total			695	70
Nafada	1. Nafada	Nafada Esat	160	16.0
	2. Barwo Nasawo	Barwo Nasawo	111	11.1
	3. Barwo Winde	Barwo Winde	165	16.5
Sub-total			436	44
Funakaye	1. Ashaka Gari	Ashaka Magaba	308	30.8
	2. Jagabari	Jillahi	216	21.6
	3. Dubbel	Tilde Bodor	191	19.1
	4. Kupto	Kupto	269	26.9
Sub-total			984	98
Central Gombe:				
Yamaltu Deba	1. Kwadon	Kwadon	896	89.6
	2. Dasa	Jagali South	362	36.2
	3. Dadinkowa	Hinna	300	30.0
	4. Difa	Lobo/Difa/Kinafa	253	25.3
Sub-total			1,811	181
Southern Gombe:				
Kaltungo	1. Dogo Ruwa	Awak	284	28.4
	2. Kamo	Kamo	198	19.8
	3. Kaltungo Lakoli	Kaltungo East	198	19.8
Sub-total			680	68
Total			4,606	461

Source: Reconnaissance survey, 2022; GSADP Gombe 2017/2018 CAY



Method of Data Collection

Data were collected from the selected farmers, through the use of pretested structured questionnaire by the researcher with the assistance of GSDAP trained enumerators. The questionnaire was divided into sections and each is aimed at achieving an objective of the study. The sections in the questionnaire cover socio-economic characteristics of the farmers, cost and returns, technical, allocative and economic efficiency, socio-demographic, economic and institutional factors, Income, and constraints associated with the dry season tomato production system in the study area. This approach was adopted to facilitate intensive data collection.

Method of Data Analysis

Data were analyzed using simple descriptive statistics, farm budgeting techniques (net farm income) and regression analysis of the socio-economic characteristics as well constraints associated with dry season tomato production system in the study area. The objectives of the study were analyzed using descriptive statistics.

RESULTS AND DISCUSSION

Types of Crops Cultivated with Tomato

Table 2 revealed the type of crops the respondents cultivated with tomato. Going by the findings on Table 2, most of the respondents cultivate lettuce with tomato representing 27.1% follow by carrot 20.0%, onion 18.6%, and Cucumber 17.1%. That of Nafada LGA most of the farmers cultivate lettuce with tomato represent 36.4%, cabbage 18%, carrot 18.2%, onion 15.9% and cucumber 11.4%. The result of Funakaye revealed that many of the respondents cultivate onion with tomato representing 24.5%, carrot 20.4%, lettuce 19.4%, cucumber 18.4% and cabbage 17.3%. In Yamaltu Deba LGA, the following crops were cultivated with tomato base on their priorities, many of the farmers cultivated carrot representing 23.2% follow by cucumber 21.0%, onion 20.4% lettuce 18.2% and Cabbage 17.1%. The findings in Kaltungo LGA showed that most of the respondents preferred the cultivation of lettuce with tomato representing 26.5% follow by onion 25.0%, cucumber 20.6%, cabbage 19.1% and carrot 8.8%. This finding signifies that the respondents in the study area cultivate tomato with a supporting crop of priority that earn them additional income and enhance farm efficiency. This finding is in agreement with Sani and Haruna (2014a) reporting farm activities under dry season water melon intercropping with other crops (Garden egg, leafy vegetable, peppers, onion and tomatoes) to constitutes majority for *fadama* III beneficiaries (38.9%) and non-beneficiaries (50.0%).



Table 2: Type of crop cultivated with tomato

Locations	Type of crop	Frequency	Percentage
Dukku	Cabbage	12	17.1
	Lettuce	19	27.1
	Carrot	14	20.0
	Onion	13	18.6
	Cucumber	12	17.1
	Total	70	100.0
Nafada	Cabbage	8	18.2
	Lettuce	16	36.4
	Carrot	8	18.2
	Onion	7	15.9
	Cucumber	5	11.4
	Total	44	100.0
Funakaye	Cabbage	17	17.3
	Lettuce	19	19.4
	Carrot	20	20.4
	Onion	24	24.5
	Cucumber	18	18.4
	Total	98	100.0
Yamaltu Deba	Cabbage	31	17.1
	Lettuce	33	18.2
	Carrot	42	23.2
	Onion	37	20.4
	Cucumber	38	21.0
	Total	181	100.0
Kaltungo	Cabbage	13	19.1
	Lettuce	18	26.5
	Carrot	6	8.8
	Onion	17	25.0
	Cucumber	14	20.6
	Total	68	100.0

Sources of Tomato Seeds

Table 3 revealed the sources from where the respondents got their seeds. The findings in Dukku LGA were that, many of the respondents for tomato production acquired their seeds from open markets representing 32.9%, while those recycling seeds from farmers represent 24.3%, Agro-dealers 22.9%, and ADP 20%. In Nafada LGA many of the respondents recycle seeds from farmers representing 31.8% followed by those who acquired from open markets 27.3%, while those who acquired from ADP 20.5% and Agro-dealers 20.5%. The study in Funakaye LGA revealed that many respondents recycle seeds from farmers representing 29.6%, some acquired from agro-dealers representing 27.6%, others from the open markets representing 24.5% while those who got their seeds from ADP representing 18.4%. In Yamaltu Deba LGA many of the respondents recycle seeds from farmers representing 30.4% follow by agro-dealers 26%, ADP 22.7% while in the open markets 21.0%.

As presented in Table 3, the source of seeds in Kaltungo LGA are as follows; ADP 33.8%, open markets 30.9%, agro-dealers 22.1% and recycle seeds from farmers 13.2%. This result shows that the source of tomato in the study area is not just one but, up to four which also signifies that the respondents in Nafada, Funakaye and Yamaltu Deba relays



much on recycle seeds from farmers, while those from Dukku preferred the seeds from open markets and while those from Kaltungo preferred the seeds from the ADP. However, seeds are the fundamental input for efficient production. Having the right quality of certified seeds true to type will yield a good harvest thereby increasing the farmer's income through farm efficiency.

Table 3: Source of tomato seeds

Locations	Source of tomato seeds	Frequency	Percentage
Dukku	Open Market	23	32.9
	ADP	14	20.0
	Recycle seed from farmers	17	24.3
	Agro-dealer	16	22.9
	Total	70	100.0
Nafada	Open Market	12	27.3
	ADP	9	20.5
	Recycle seed from farmers	14	31.8
	Agro-dealer	9	20.5
	Total	44	100.0
Funakaye	Open Market	24	24.5
	ADP	18	18.4
	Recycle seed from farmers	29	29.6
	Agro-dealer	27	27.6
	Total	98	100.0
Yamaltu Deba	Open Market	38	21.0
	ADP	41	22.7
	Recycle seed from farmers	55	30.4
	Agro-dealer	47	26.0
	Total	181	100.0
Kaltungo	Open Market	21	30.9
	ADP	23	33.8
	Recycle seed from farmers	9	13.2
	Agro-dealer	15	22.1
	Total	68	100.0

Types of Fertilizer Use

Table 4 revealed the type of fertilizers use for the production of dry season tomato in the study area. In Dukku LGA most of the respondents use NPK representing 41.4%, urea 34.3% and manure 24.3%. In Nafada LGA NPK was use by 45.4% respondents, urea 27.3% and manure 27.3%. The result in Funakaye LGA showed that the respondents that use NPK were 32.6% while urea 52.1% and manure 15.3%. The respondents in Yamaltu Deba LGA use more of urea representing 38.7% followed by NPK 37.0% and manure 24.3%, while in Kaltungo LGA many of the respondents use NPK representing 48.5% followed by urea 32.4% and manure 19.1%, by implication the respondents in Dukku, Nafada, and Kaltungo LGAs preferred to use NPK for the production of dry season tomato, while Yamaltu Deba and Funakaye LGAs use more of urea for the production. Fertilizer is also a very important ingredient for the production of dry season tomato. This is in consonance with Sani (2000) reports that vegetable *fadama* farming entails increased application of chemical fertilizers because the increase in per hectare fertilizer consumption is due to high yielding varieties of tomato and other vegetable crops.



Table 4: Type of chemical fertilizer use

Locations	Type of chemical fertilizer	Frequency	Percentage
Dukku	NPK	12	17.1
	CAN	17	24.3
	Super Phosphate	11	15.7
	Urea	13	18.6
	Manure	17	24.3
	Total	70	100.0
Nafada	NPK	9	20.5
	CAN	11	25.0
	Super Phosphate	7	15.9
	Urea	5	11.4
	Manure	12	27.3
	Total	44	100.0
Funakaye	NPK	12	12.2
	CAN	20	20.4
	Super Phosphate	28	28.6
	Urea	23	23.5
	Manure	15	15.3
	Total	98	100.0
Yamaltu Deba	NPK	33	18.2
	CAN	34	18.8
	Super Phosphate	36	19.9
	Urea	34	18.8
	Manure	44	24.3
	Total	181	100.0
Kaltungo	NPK	13	19.1
	CAN	20	29.4
	Super Phosphate	7	10.3
	Urea	15	22.1
	Manure	13	19.1
	Total	68	100.0

Sources of Fertilizer

Table 5 revealed the source from where the respondents got their fertilizer for the dry season tomato farming in the study area. The respondents in Dukku LGA acquired their fertilizers from the following sources; Agricultural Development Programme (ADP) 47.1%, open market 38.6%, and agro-dealers 14.3%. From the respondents in Nafada LGA, many of the farmers acquired their fertilizer from open markets 31.8%, agro-dealers 29.5%. The result from Funakaye revealed that many of the farmers acquired their fertilizer from open markets representing 37.8% followed by ADP 31.6% and those acquired from agro-dealers representing 30.6%. The finding from Yamaltu Deba LGA revealed that many of the respondents acquired their fertilizer from the open markets representing 37.6% followed by ADP 33.1% and others acquired from agro-dealers 29.3%. In kaltungo LGA the respondents acquired their fertilizer from the following sources; ADP 38.2%, open markets 30.9% and agro-dealers 30.9%. Many of the respondents from Dukku, Nafada and Kaltungo LGAs, preferred to acquired their fertilizer from ADP. While those from Funakaye and Yamaltu Deba preferred to acquired their fertilizer from open markets. The findings from study could mean that the inputs from the agro-dealers are not true to type or are expensive.



Table 5: Source of fertilizer

Locations	Source of fertilizer	Frequency	Percentage
Dukku	Government sales (ADP)	33	47.1
	Open Market	27	38.6
	Agro-dealers	10	14.3
	Total	70	100.0
Nafada	Government sales (ADP)	17	38.6
	Open Market	14	31.8
	Agro-dealers	13	29.5
	Total	44	100.0
Funakaye	Government sales (ADP)	31	31.6
	Open Market	37	37.8
	Agro-dealers	30	30.6
	Total	98	100.0
Yamaltu Deba	Government sales (ADP)	60	33.1
	Open Market	68	37.6
	Agro-dealers	53	29.3
	Total	181	100.0
Kaltungo	Government sales (ADP)	26	38.2
	Open Market	21	30.9
	Agro-dealers	21	30.9
	Total	68	100.0

Types of Planting Materials for Tomato Production

A good planting material result to good output with efficient management. The respondents in the study area use the following planting material for dry season tomato farming. In Dukku LGA, many of the farmers use seedlings representing 64.3% while those use seeds 35.7%. More than half of the respondents in Nafada LGA use seedlings for dry season tomato farming and others use seeds representing 45.5% (Table 6). Many of the respondents in Funakaye LGA use seeds representing 52.0% and some seedlings 48.2%. The planting materials in Yamaltu LGA are seedlings and seeds representing 52.5% and 47.5%, respectively. The result obtainable in Kaltungo LGA showed that most of the respondents use seeds for tomato farming representing 63.2% and others use seedlings representing 38.6%. So, by implication the respondents in Dukku, Nafada, and Yamaltu Deba preferred using seedlings while those from Funakaye and Kaltungo use more of seeds for dry season tomato production.



Table 6: Type planting material for dry season tomato production

Locations	Type planting material	Frequency	Percentage
Dukku	Seeds	25	35.7
	Seedling	45	64.3
	Total	70	100.0
Nafada	Seeds	20	45.5
	Seedling	24	54.5
	Total	44	100.0
Funakaye	Seeds	51	52.0
	Seedling	47	48.0
	Total	98	100.0
Yamaltu Deba	Seeds	86	47.5
	Seedling	95	52.5
	Total	181	100.0
Kaltungo	Seeds	43	63.2
	Seedling	25	36.8
	Total	68	100.0

Planting Date for Dry Season Tomato

Table 7 revealed the planting date by tomato farmers in Gombe State, Nigeria. The result shows that in Dukku LGA many of the dry season farmers planted their tomato in the months of July– September 28.6% followed by those who plant in April – June representing 27.1%, while few planted in October-December representing 25.7% and others engage in tomato production in January-March. The findings (Table 7) in Nafada LGA also revealed that, most of the tomato farmers in the study area planted their tomato in April-June, July - September 29.5% and 29.5 respectively, and few in October-December. The result from Funakaye showed that, majority of the respondents' plant in October-December, January-March, July –September and April –June representing 27.6%,26.5%,25.5% and 20.4%, respectively. However, in Kaltungo LGA swing into tomato production in October-December and April – June representing 27.9% and 27.9%, respectively.



Table 7: Planting Date for dry season tomato

Locations	Planting Date	Frequency	Percentage
Dukku	January-March	13	18.6
	April -June	19	27.1
	July-Sept	20	28.6
	October-December	18	25.7
	Total	70	100.0
Nafada	January-March	6	13.6
	April -June	13	29.5
	July-Sept	13	29.5
	October-December	12	27.3
	Total	44	100.0
Funakaye	January-March	26	26.5
	April -June	20	20.4
	July-Sept	25	25.5
	October-December	27	27.6
	Total	98	100.0
Yamaltu Deba	January-March	37	20.4
	April -June	41	22.7
	July-Sept	58	32.0
	October-December	45	24.9
	Total	181	100.0
Kaltungo	January-March	15	22.1
	April -June	19	27.9
	July-Sept	15	22.1
	October-December	19	27.9
	Total	68	100.0

Cropping Intensity

Table 8 results in Dukku LGA shows that the respondents engage in the dry season tomato production once 41.4% followed by 31.1% and few go into dry season three time a year representing 27.1%. However, from this study it revealed that majority of the respondents' practices irrigated tomato production thrice, while Funakaye LGA engage into dry season tomato production twice a year. Further to the results presented in Table 8 on cropping intensity, Sani (2000) emphasized that adoption of high yielding varieties of vegetable crops, use of chemicals, expansion of irrigable lands and farm mechanization plays a vital role in increasing the vegetable farming and intensity of productivity; and such improvement in cropping intensity could further be increased and sustained in the long run with adoption of improved vegetable farm cultural practices based on low input sustainable agricultural system.



Table 8: Cropping intensity

Locations (n = 461)	Time	Frequency	Percentage
Dukku	Once	29	41.4
	Twice	22	31.4
	Thrice	19	27.1
	Total	70	100.0
Nafada	Once	18	40.9
	Twice	6	13.6
	Thrice	20	45.5
	Total	44	100.0
Funakaye	Once	33	33.7
	Twice	37	37.8
	Thrice	28	28.6
	Total	98	100.0
Yamaltu Deba	Once	58	32.0
	Twice	52	28.7
	Thrice	71	39.2
	Total	181	100.0
Kaltungo	Once	22	32.4
	Twice	21	30.9
	Thrice	25	36.8
	Total	68	100.0

Varieties of Tomato Grown

Table 9revealed the varieties of tomato grown in the dry season in Gombe State. The varieties of tomato grown in Dukku LGA are Cherry (Omo-Oko), Capari (Gbeske), Grape (Alahusa), Plum (Kerewa) Better boy (UTC), Beef steak (Tyres) representing 15.7%, 15.7%, 17.1%, 22.9% 12.9%, and 15.7% respectively. The respondents in Nafada grow these varieties of tomato; Cherry (Omo-Oko), Capari (Gbeske), Grape (Alahusa), Plum (Kerewa) Better boy (UTC), Beef steak (Tyres) representing 15.9%, 9.1%, 25.0%, 13.6%, 22.7%, and 13.6%, respectively. The study in funakaye reveals that the respondents use the following varieties; Cherry (Omo-Oko), Capari (Gbeske), Grape (Alahusa), Plum (Kerewa) Better boy (UTC), Beef steak (Tyres) which are represented by 18 .4%, 17.3%, 15.3%, 13.3%, 17.3%, 19.4%.



Table 9: Varieties of tomato grow

Locations	Varieties of tomato	Frequency	Percentage
Dukku	Cherry (Omo-oko)	11	15.7
	Campari (Gbeske)	11	15.7
	Grape (Alahusa)	12	17.1
	Plum (Kerewa)	16	22.9
	Better boy (UTC)	9	12.9
	Beefsteak (Tyre)	11	15.7
	Total	70	100.0
Nafada	Cherry (Omo-oko)	7	15.9
	Campari (Gbeske)	4	9.1
	Grape (Alahusa)	11	25.0
	Plum (Kerewa)	6	13.6
	Better boy (UTC)	10	22.7
	Beefsteak (Tyre)	6	13.6
	Total	44	100.0
Funakaye	Cherry (Omo-oko)	18	18.4
	Campari (Gbeske)	17	17.3
	Grape (Alahusa)	15	15.3
	Plum (Kerewa)	13	13.3
	Better boy (UTC)	16	16.3
	Beefsteak (Tyre)	19	19.4
	Total	98	100.0
Yamaltu Deba	Cherry (Omo-oko)	30	16.6
	Campari (Gbeske)	40	22.1
	Grape (Alahusa)	34	18.8
	Plum (Kerewa)	24	13.3
	Better boy (UTC)	19	10.5
	Beefsteak (Tyre)	34	18.8
	Total	181	100.0
Kaltungo	Cherry (Omo-oko)	9	13.2
	Campari (Gbeske)	11	16.2
	Grape (Alahusa)	9	13.2
	Plum (Kerewa)	11	16.2
	Better boy (UTC)	16	23.5
	Beefsteak (Tyre)	12	17.6
	Total	68	100.0

Also, in Table 9, the respondents in Yamaltu Deba grow the following varieties; Cherry (Omo-Okoko), Capari (Gbeske), Grape (Alahusa), Plum (Kerewa) Better boy (UTC), Beef steak (Tyres) which representing 16.6%, 22.1%, 18.8%, 13.3%, 10.5% and 18.8%, respectively. The result from the findings from Kaltungo LGA reveals that, these varieties of tomato were used for production Cherry (Omo-Okoko), Capari (Gbeske), Grape (Alahusa), Plum (Kerewa) Better boy (UTC), Beef steak (Tyres) which represent 13.2%, 16.2%, 13.2%, 16.2%, 23.5%, and 17.6% respectively. Generally, the findings show that each of the study area have its preferred varieties. Dukku LGA preferred Plum while Nafada preferred grape, Funakaye preferred beef steak, Yamaltu Deba preferred capari and while Kaltungo grown more of better (UTC). These result meaning that each study area preferred the varieties that is more marketable and more needed by consumers.



Sources of Water for Irrigation

Table 10 show the sources of water use for the dry season tomato in the study area. The respondents in Dukku LGA use more of well water representing 37.1%, wash bore/tube 34.3% and surface water 28.6%. In Nafada LGA the following sources of surface water that used by the respondents for the production of tomato; wash borehole/tube 40.9%, surface water 31.8, well water 27.3%. The study in Funakaye LGA revealed that many of respondents use wash borehole/tube representing 39.8%, surface water 32.7% while tube well 27.6%. The findings of the sources of water use by respondents in Yamaltu Deba are wash borehole/tube well 36.5%, well 33.7%, surface 29.8%. The dry season tomato farmers in Kaltungo LGA from the study conducted showed that many of them use washborehole representing 38.2%, surface and well water represent 30.9% and 30.9%, respectively. The study signifies that many of the respondents from Nafada, Funakaye, Yamaltu and Kaltungo use wash borehole as source of water for irrigation, while the respondents from Kaltungo use well water for irrigation. However, the *fadama* land that respondents use for dry season tomato production has enough underground water to support production hence increase yield.

Table 10: Sources of water for irrigation

Locations	sources of water	Frequency	Percentage
Dukku	Surface	20	28.6
	Wash bore/Tube	24	34.3
	Well	26	37.1
	Total	70	100.0
Nafada	Surface	14	31.8
	Wash bore/Tube	18	40.9
	Well	12	27.3
	Total	44	100.0
Funakaye	Surface	32	32.7
	Wash bore/Tube	39	39.8
	well	27	27.6
	Total	98	100.0
Yamaltu Deba	Surface	54	29.8
	Wash bore/Tube	66	36.5
	Well	61	33.7
	Total	181	100.0
Kaltungo	Surface	21	30.9
	Wash bore/Tube	26	38.2
	Well	21	30.9
	Total	68	100.0

Types of Irrigation Tools

Table 11 revealed the types of irrigation tools use for dry season tomato farming in Gombe State. The types of irrigation tools use by respondents in Dukku LGA; shadduf, water pump, canal, watering can/others representing 30%, 18.6%, 27.1% and 24.3%, respectively. The findings in Nafada LGA denote that the respondents use various types of irrigation tools as follows; shadduf, water pump, canal, watering can/others representing 18.2%, 20.5%, 43.2%, and 18.2% respectively. The irrigation tools use by respondents in Funakaye LGA are shadduf, 28.6%, water pump 32.7%, canal 21.4%, watering can/others 17.3%. The result from Yamaltu Deba LGA revealed that, the respondents use shadduf 23.8%, water pump 26.0%, canal 25.4%, watering can/others 24.9% were used for dry



season tomato farming. In Kaltungo LGA the respondents also use shadduf 16.2%, water pump 19.1%, canal 27.9% watering can and others 36.8%. From this study the results showed that many of respondents in Dukku use shadduf, those in Nafada, Funakaye, Yamaltu Deba and Kaltungo use canal, water pump, water pump and watering can/others respectively. These irrigation tools facilitate production and promote farm efficiency.

Table 11: Type of irrigation tools

Locations	Type of irrigation tools	Frequency	Percentage
Dukku	Shadduf	21	30.0
	Water pump	13	18.6
	Canal	19	27.1
	Watering Can/Used buckets/hand-pan	17	24.3
	Total	70	100.0
Nafada	Shadduf	8	18.2
	Water pump	9	20.5
	Canal	19	43.2
	Watering Can/Used buckets/hand-pan	8	18.2
	Total	44	100.0
Funakaye	Shadduf	28	28.6
	Water pump	32	32.7
	Canal	21	21.4
	Watering Can/Used buckets/hand-pan	17	17.3
	Total	98	100.0
Yamaltu Deba	Shadduf	43	23.8
	Water pump	47	26.0
	Canal	46	25.4
	Watering Can/Used buckets/hand-pan	45	24.9
	Total	181	100.0
Kaltungo	Shadduf	11	16.2
	Water pump	13	19.1
	Canal	19	27.9
	Watering Can/Used buckets/hand-pan	25	36.8
	Total	68	100.0

Reason for Adoption of Irrigation Tools

Table 12 revealed the reasons for adoption of irrigation tools by the respondents in the study area. In Dukku LGA many of the farmers use the irrigation tools because it is easier to use. This set of respondents represent 38.6% others faster 32.9% and less costly represent 28.6%. The reason for adoption of irrigation tools by respondents in Nafada LGA are; it's easier to use 45.5%, faster 31.8%, less costly 22.7%. The findings in Funakaye showed that the respondents adopt irrigation tools for the following reasons; it is easier to use 35.7%, faster 33.7, less costly 30.6%.

Table 12: Reason for adoption of irrigation tools

Locations	Reason	Frequency	Percentage
Dukku	It is easier to use	27	38.6
	Faster	23	32.9
	Less costly	20	28.6
	Total	70	100.0
Nafada	It is easier to use	20	45.5
	Faster	14	31.8
	Less costly	10	22.7
	Total	44	100.0
Funakaye	It is easier to use	35	35.7
	Faster	33	33.7
	Less costly	30	30.6
	Total	98	100.0
Yamaltu Deba	It is easier to use	67	37.0
	Faster	52	28.7
	Less costly	62	34.3
	Total	181	100.0
Kaltungo	It is easier to use	19	27.9
	Faster	23	33.8
	Less costly	26	38.3
	Total	68	100.0

Table 12 on Yamaltu Deba showed that many of the respondents use irrigation tools for tomato farming capture under it is easier to use 37.0%, faster 28.7% less costly 34.3%. The respondents in Kaltungo LGA have their reasons for adoption of irrigation tools are as follows: - many gave their reasons as less costly representing 38.3% followed by faster 33.8% and it is easier to use representing 27.9%. Generally, this study showed that many respondents in Dukku, Nafada, Funakaye, and Yamaltu Deba gave their reasons as it is easier to use, while many of the farmers in Kaltungo gave their reasons as less costly and they are also easy to maintained.

Frequency of Irrigation Per Week

The findings of Table 13 revealed the frequency of irrigation per week as practice by respondents. The study in Dukku LGA showed that many of the respondents irrigate their tomato twice in week representing 25.7% followed by once in a week 22.9%, while four times 20.0% and three times and five times or more represent 15% each. In Nafada LGA the frequency of irrigation per week has revealed by the respondents is that many of them irrigate four times per week representing 31.8%, once 27.3%, twice 22.7%, three times 11.4% and five times or more 6.8%. The respondents in Funakaye LGA responded that many of them irrigate their tomato five times or more and twice a week representing 23.2% each. Follow by four times a week representing 20.4% follow by three times 19.9% and once 13.3%. The frequency of irrigation in Kaltungo was observed that many of the respondents irrigate once per week representing 29.4% followed by twice 25.0%, three times 17.6%, four times 16.2%, and five times or more 11.8%. From the field result obtain in Gombe State showed that the respondents irrigate their tomato at least once or five times or more in a week for maximum output.



Table 13: Frequency of irrigation per week

Locations	Frequency of irrigation per week	Frequency	Percentage
Dukku	Once	16	22.9
	Twice	18	25.7
	Three times	11	15.7
	Four times	14	20.0
	Five times or more	11	15.7
	Total	70	100.0
Nafada	Once	12	27.3
	Twice	10	22.7
	Three times	5	11.4
	Four times	14	31.8
	Five times or more	3	6.8
	Total	44	100.0
Funakaye	Once	24	24.5
	Twice	20	20.4
	Three times	21	21.4
	Four times	18	18.4
	Five times or more	15	15.3
	Total	98	100.0
Yamaltu Deba	Once	24	13.3
	Twice	42	23.2
	Three times	36	19.9
	Four times	37	20.4
	Five times or more	42	23.2
	Total	181	100.0
Kaltungo	Once	20	29.4
	Twice	17	25.0
	Three times	12	17.6
	Four times	11	16.2
	Five times or more	8	11.8
	Total	68	100.0

Point of Sale of Tomato

Table 14 shows the point of sale or where the respondent's sale their tomato in Gombe State. The choice of village markets by majority of the farmers might be connected with high cost of transportation and bad roads. Going by the result obtained, from the field report of Dukku LGA, many of the respondent's sale their tomato at the market representing 27.1% followed by farm gate and market representing 27.5% and those who sale through associations is 24.3%. In Nafada LGA, the point where the respondent's sale their tomato is at the market 31.8%, through associations 27.3%, at farm gate 22.7% and those who sale at farm gate and market are 18.2%. The field report of Funakaye LGA showed that many of the farmer's sale their tomato at farm gate and market representing 28.6% and the next point of sale is through associations representing 27.6%, those who sales at the market are 23.5% and those at the farm gate 20.4%. The result of Yamaltu Deba revealed that many of the farmers sale their tomato at farm gate and market representing 28.7%, some through association 26.5%, those who sale at the market 24.9%, while those who sale at the farm gate is 19.9%.

Table 27 results however, in Kaltungo LGA revealed that many of the respondent's sale their tomato at the market representing 36.8%, while some sale at farm gate, and farm



gate and market representing 22.1% each, while others sale through associations representing 19.1%. The implication of these study showed that the tomato farmers in Gombe State had their outlets for the sale of tomato. This implies that, the frequency at which tomato farmers disposed their produce either in bulks or retailing could enhance their abilities to purchase other goods and services thereby reducing the incidence of poverty. However, the respondents in Dukku, Nafada, and Kaltungo sales more of their tomato at the market and those from Funakaye and Yamatu LGAs sale more of their tomato at the farmgate.

Table 14: Point of sale of tomato

Locations	Point of sale	Frequency	Percentage
Dukku	At farm gate (on the farm)	16	22.9
	To the market	19	27.1
	Through association	17	24.3
	Farm gate and Market	18	25.7
	Total	70	100.0
Nafada	At farm gate (on the farm)	10	22.7
	To the market	14	31.8
	Through association	12	27.3
	Farm gate and Market	8	18.2
	Total	44	100.0
Funakaye	At farm gate (on the farm)	20	20.4
	To the market	23	23.5
	Through association	27	27.6
	Farm gate and Market	28	28.6
	Total	98	100.0
Yamaltu Deba	At farm gate (on the farm)	36	19.9
	To the market	45	24.9
	Through association	48	26.5
	Farm gate and Market	52	28.7
	Total	181	100.0
Kaltungo	At farm gate (on the farm)	15	22.1
	To the market	25	36.8
	Through association	13	19.1
	Farm gate and Market	15	22.1
	Total	68	100.0

Grading of Tomato

The findings in Table 15 discussed the grading of tomato as handle by the respondents in Gombe State, Nigeria. Base on the result from Dukku LGA more than half of the respondents do not grade their tomato before sale this represent 54.3%, those who do the grading is 45.7%. In Nafada LGA the result showed that those do the grading and those do not are 43.2% and 56.8% respectively. The result of Funakaye in Gombe State also revealed that those who are into tomato farming, some grade their tomato and others do not and are represented as 56.1% and 43.9%, respectively. The tomato farmers from Yamaltu Deba the result showed that those who do the grading have 54.1% while those who do not grade represent 45.9%. The result of Table 28 on grading of tomato in Kaltungo LGA revealed that more than half of the respondents do not grade their tomato 51.5%, those who grade is 48.5%. The general result on grading of tomato in Gombe State revealed that most of farmers do not grade their tomato before sale and that will reduce



economic efficiency. There is need for sanitization and awareness on grading of tomato before sale. This will help to increase income/profit of the farmers on tomato base on grade.

Table 15: Grading of tomato

Locations	Grading	Frequency	Percentage
Dukku	Yes	32	45.7
	No	38	54.3
	Total	70	100.0
Nafada	Yes	19	43.2
	No	25	56.8
	Total	44	100.0
Funakaye	Yes	55	56.1
	No	43	43.9
	Total	98	100.0
Yamaltu Deba	Yes	98	54.1
	No	83	45.9
	Total	181	100.0
Kaltungo	Yes	33	48.5
	No	35	51.5
	Total	68	100.0

Method of Transportation

The findings in Table 16 availed the methods and mode of transporting tomato from farm to point of sales, based on the findings in Dukku, many of respondents use Pickup vans and animal traction these represent 24.3% each, followed by Motorcycle 20.0%, and those who use bicycle, and head carriage represent 15,7%, and 15.7%, respectively.



Table 16: Method of transportation

Locations	Method of transportation	Frequency	Percentage
Dukku	Bicycle	11	15.7
	Head carriage	11	15.7
	Motor cycle	14	20.0
	Pick up van	17	24.3
	Animal traction	17	24.3
	Total	70	100.0
Nafada	Bicycle	12	27.3
	Head carriage	7	15.9
	Motor cycle	6	13.6
	Pick up van	5	11.4
	Animal traction	14	31.8
	Total	44	100.0
Funakaye	Bicycle	18	18.4
	Head carriage	23	23.5
	Motor cycle	19	19.4
	Pick up van	17	17.3
	Animal traction	21	21.4
	Total	98	100.0
Yamaltu Deba	Bicycle	23	12.7
	Head carriage	51	28.2
	Motor cycle	49	27.1
	Pick up van	28	15.5
	Animal traction	30	16.6
	Total	181	100.0
Kaltungo	Bicycle	13	19.1
	Head carriage	10	14.7
	Motor cycle	14	20.6
	Pick up van	12	17.6
	Animal traction	19	27.9
	Total	68	100.0

The findings (Table 16) obtained in Nafada LGA is that, many of the farmers use animal traction to transport tomato from farm to point of sale, some use bicycle 27.3%, head carriage 15.9%, motorcycle 13.6%, and pick-up 11.4%. The field report of Funakaye LGA of Gombe State showed that the respondents use more of the head carriage representing 23.5% followed by animal traction 21.4% some use motorcycle 19.4%, bicycle 18.4% and others use pick-up van 17.3%. The findings from Yamaltu Deba LGA tomato farmers indicate that many of the respondents use head carriage 28.2% to transport their tomato from farm to point of sale in the study area, some use motorcycle representing 27.1%, animal traction 15.6%, pickup van 15.5% and others use bicycle 12.7%. Base on the field result obtained from Kaltungo LGA, more of the respondents use animal traction which is 27.9%, those who use motorcycle were 20.6%, some use bicycle which was 19.6%, some use pick-up van 17.6% and others use head carriage as means of transportation which represent 14.7%. This study signifies that, many of the respondents in Gombe State have various means of transporting their products which is much more adoptable to them.



Cost of Transporting of Tomato Per Basket

Table 17 represent the result of the mean cost of transportation of tomato per basket to the point of sale. This table showed that the mean cost of transportation of tomato per basket in Dukku LGA as ₦215.9000 minimum ₦114, and maximum ₦450, respectively. Meaning that the average cost of transportation of tomato by the farmers is within cost efficiency. The mean of the cost of transportation in Nafada LGA is ₦164.2045, minimum ₦103 and maximum ₦342, respectively. The cost of transporting a basket of tomato in Funakaye LGA showed that the mean is ₦101.2857, minimum ₦101 and maximum ₦390, respectively. The field report of Yamaltu Deba revealed that the mean cost of transporting a basket of tomato is ₦127.5691, minimum ₦100 and maximum ₦299, respectively. Also, in Kaltungo LGA, the mean cost for the transportation a basket of tomato is ₦192.2647, minimum ₦104, and maximum ₦344, respectively. The implication of this study is that, the tomato farmers within the study area do not see the cost of transportation as a hindrance to production.

Table 17: Cost of transportation of tomato per basket

Locations	N	Minimum	Maximum	Mean (₦)	Std. Deviation
Dukku	70	114.00	450.00	215.9000	75.03509
Nafada	44	103.00	342.00	164.2045	72.92353
Funakaye	98	101.00	390.00	101.2857	67.72047
Yamaltu Deba	181	100.00	299.00	127.5691	74.20850
Kaltungo	68	104.00	344.00	192.2647	68.52772

Source of Capital for Tomato Production

Table 18 revealed the field report on how the respondents source funds for tomato production in Gombe State. In Dukku LGA, the field report revealed that the following are the sources from which the respondents get money for farming tomato; personal savings, friends and family, cooperative societies, commercial banks, and bank of agriculture 22.9%, 15.7%, 17.1%, 28.6%, and 15.7%, respectively. The results from Nafada LGA on the source of capital for tomato farming revealed the following; personal savings, friends and family, cooperative societies, commercial banks, and bank of agriculture are represented as 13.6%, 20.5%, 11.4%, 21.5% and 25%, respectively. The finding from Funakaye LGA on source of capital for tomato farming the following were obtained; personal savings, friends and family, cooperative societies, commercial banks, and bank of agriculture are represented as 23.5%, 21.4%, 19.4%, 18.4% and 17.3 % respectively. The respondents in Yamaltu Deba LGA on the process of this study revealed the sources of capital for tomato production which are as presented as personal savings, friends and family, cooperative societies, commercial banks, and bank of agriculture 22.7%, 18.8%, 17.7%, 22.1% and 18.8%, respectively. However, the field report of Kaltungo LGA from where the respondents get capital for tomato production are as follows; personal savings, friends and family, cooperative societies, commercial banks, and bank of agriculture are presented as follows; 23.5%, 22.1%, 25.0%, 8.8%, and 20.6%, respectively. The implication of this study in Gombe State, Nigeria is that, many of the respondent's relayed more on personal savings. This signifies that informal type of credit dominant the source of capital for tomato production in Gombe State and by implication farmers will enhance their capital and credit capacity. Apata *et al.* (2010) says access to farm credit plays significant role in entire farm production cycle and farmers welfare. Agricultural finance comprised of all loans and advances given or granted to farmers and others



in agricultural related activities such as fisheries, forestry, processing, marketing, transportation, storage and distribution of products resulting from these activities (Sani, 2017). Sources of agricultural credits include, government, relatives, landlords, agricultural banks, professional money lenders, traders, cooperatives and commercial or micro-finance banks (Sani, 2017). Improving access to credit and finance for agricultural development, through a lower interest regime which constitute a disincentive to agriculture, and availing agribusinesses the opportunity of leveraging on the special intervention programmes (e.g., anchor borrowing scheme) of the Central Bank of Nigeria in support of agricultural production and agro enterprises (Sani, 2017).

Table 18: Source of capital for tomato production

Locations	Source of capital	Frequency	Percentage
Dukku	Personal saving	16	22.9
	Friends and family	11	15.7
	co-operative society	12	17.1
	commercial banks	20	28.6
	Bank of Agriculture	11	15.7
	Total	70	100.0
Nafada	Personal saving	6	13.6
	friends and family	9	20.5
	co-operative society	5	11.4
	commercial banks	13	29.5
	Bank of Agriculture	11	25.0
	Total	44	100.0
Funakaye	Personal saving	23	23.5
	friends and family	21	21.4
	co-operative society	19	19.4
	commercial banks	18	18.4
	Bank of Agriculture	17	17.3
	Total	98	100.0
Yamaltu Deba	Personal saving	41	22.7
	friends and family	34	18.8
	co-operative society	32	17.7
	commercial banks	40	22.1
	Bank of Agriculture	34	18.8
	Total	181	100.0
Kaltungo	Personal saving	16	23.5
	friends and family	15	22.1
	co-operative society	17	25.0
	commercial banks	6	8.8
	Bank of Agriculture	14	20.6
	Total	68	100.0

Capital for Dry Season Tomato Production

Table 19 showed the amount of funds use for dry season production of tomato in Gombe State. The mean result from Dukku LGA is ₦212,747.36 with minimum ₦120,822 and maximum ₦432,982, respectively. The field result of Nafada LGA revealed that, the mean is ₦183,662.55, minimum ₦153,862 and maximum ₦325,692 naira respectively. From the respondents in Funakaye LGA it was obtained that, the mean was ₦261,540.30, minimum ₦132,881 and maximum ₦529,079, respectively. The mean obtained from



Yamaltu Deba field report on capital for tomato dry season production was ₦204,785.956, minimum ₦142,262 and maximum ₦434,958, respectively. The mean capital obtained from Kaltungo field report for dry season tomato production was ₦191,815.90, minimum ₦165,572 and maximum ₦333,272, respectively. This study revealed that the respondents in Gombe State have different sources of capital for the production of dry season tomato in a sustainable manner for farm efficiency.

Table 19: Capital for tomato dry season production

LGAs	N	Minimum	Maximum	Mean (₦)	Std. Deviation
Dukku	70	120,822.00	432,982.00	212,747.36	11.51344
Nafada	44	153,832.00	325,692.00	183,662.55	23.87728
Funakaye	98	132,881.00	529,079.00	261,540.30	31.02483
Yamaltu Deba	181	142,262.00	434,958.00	204,785.96	12.77956
Kaltungo	68	165,572.00	333,272.00	191,815.90	10.12106

CONCLUSION AND RECOMMENDATIONS

The study concluded that the respondents in Gombe State have different sources of capital for the production of dry season tomato in a sustainable manner for farm efficiency. In the study area many of the farmers used the irrigation tools because it is easier to use. This set of respondents represent 38.6% others faster 32.9% and less costly represent 28.6%. The reason for adoption of irrigation tools by respondents in Nafada LGA are; it's easier to use 45.5%, faster 31.8%, less costly 22.7%. The findings in Funakaye showed that the respondents adopt irrigation tools for the following reasons; it is easier to use 35.7%, faster 33.7, less costly 30.6%. The farmers should form strong cooperative associations, to be united in one voice to have a bargaining power over labour cost and can also make request to government on their needs. Farmers should also adopt high yielding varieties tomato so as to gain high yield for high returns on investment

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