Ministry of Foreign Affairs

S4C Baseline Report Horticulture Kano Nigeria

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BASELINE STUDY OF HORTICULTURAL PRODUCTION IN KANO STATE

May, 2020
Technical Report
Baseline Study on Vegetables in Kano State, Nigeria.
Seeds for Change (2019-2021)

NABC
Confidence in African Business

S4C

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Abbreviations and Acronyms

ADP:	Agricultural Development Programme
AVG:	Average
BSS:	Baseline Survey
CPP:	Crop Protection Products
FGD:	Focus Group Discussion
FMARD:	Federal Ministry of Agriculture and Rural Development
GAP:	Good Agricultural Practices
HJRBDA:	Hadejia Jama'are River Basin Development Authority
KII:	Key Informant Interview
KNARDA:	Kano State Agricultural and Rural Development Authority
LGA:	Local Government Area
NBS:	National Bureau of Statistics
SHFs	Smallholder Farmers
S4C:	Seeds for Change
SE:	Standard Error

Executive Summary

The main objective of the baseline study serves as a zero-setting for crop yield and farmer skills level to measure progress and impact of the Seeds For Change (S4C) impact cluster.It will also underline the most important gaps in knowledge and farmer cultivation practices enabling the companies to adapt the training programme to the local context. Addressing those gaps if necessary, maximizing the impact of the training program and utilization of improved seeds.

600

vegetable producers comprising of tomato, onion,pepper, cabbage and watermelon producers were interviewed using structured questionnaires.

28,000 Hectares

estimated land utilized and divided amongst small-holder farmers in the irrigation clusters around Kano.

60%

annual income of the vegetable produced,

The survey was conducted in the largest vegetable production clusters of Kano State comprising 21 villages in Bunkure, Garun Malam and Kura Local Governments Areas. A total of 600 vegetable producers comprising of tomato, onion, pepper, cabbage and watermelon producers were interviewed using structured questionnaires. In addition, Focus Group Discussions (FGDs) were conducted to obtain qualitative information to augment information collected during the enumerator conducted survey. Thereafter, data collected was analyzed with both SPSS and Microsoft Excel and the results were presented in tables, illustrated graphically and discussed.

Findings of this survey revealed that most of the tomato, onion, pepper, cabbage and watermelon production enterprises in Kano State are dominated by males within productive age. However, both male and female, adults and children participate in vegetables production activities in the State. Much like the rest of the North, the horticultural production in Kano is dominated by small scale farming activities of about an acre in large production clusters.

Currently, there are an estimated 28,000 hectares of land utilized and divided amongst small-holder farmers in the irrigation clusters around Kano.The production methods used are labour intensive, utilizing flooding and furrow irrigation. Furthermore, currently, the majority of the vegetable farmers use OPV and farmer saved seeds with varying seeding rates for the same crop on an acre of land which connotes a lack of standard seeding protocol. In addition, producers use both in organic and organic fertilizers and have a high usage of herbicides and insecticides. With respect to farm labour, the farmers combine paid (hired) and unpaid (household) labour to produce tomato, onion, pepper, cabbage, and watermelon. A substantial amount of labour used for production of the vegetables is for weeding and harvesting.In terms of labour intensity, tomato and pepper production are more labour intensive compared to the production of the other 3 vegetables.

When looking at the production volumes, the volumes produced and sold vary significantly among farmers per unit land area. It can be concluded that, in general, productivity for the various crops is below the yield potential.

With respect to the production costs, labour accounts for up to 50% of the total production costs for tomato, onion, pepper, cabbage and watermelon. It was concluded that the farmers currently make a profit, but the margin could be improved by managing labour cost and using higher quality inputs. For the specific vegetable crops, total production costs for tomato and pepper were higher compared to the costs incurred in onion, cabbage and watermelon production. When looking at the annual income of the vegetable producers, the income from vegetable production constitutes 60% of total annual income.

One of the challenges encountered by farmers is the marketing of vegetables. Marketing in the Kano area is grossly under developed and characterized with high risk of losses due to post-harvest handling and low prices during glut periods. The majority of sales and transactions in the fresh market is still informally organised. In addition, the knowledge of Good Agricultural Practises (GAP) needs to be developed within the sector to help farmers increase their profitability index. Furthermore, there is a presence of counterfeit and low- quality inputs, particularly seeds and fertilizers on the market which needs to be addressed.

While the adoption of hybrid seeds is still quite low amongst farmers, the awareness of the benefits they offer are often known among producers. The higher price of hybrid seeds and the above mentioned market uncertainty limit the willingness to invest in hybrid seeds. Therefore, the study recommends interventions to promote high-quality seeds for the production of quality tomato, onion, pepper, cabbage and watermelon and raise further awareness on the financial benefits these seeds can bring. Inview of the foregoing, the S4C activities in Kano State, promoting high quality inputs, creating awareness on the benefits of improved seeds and biological crop protection by way of demonstrations and knowledge transfer to farmers on improved cultivation practices would contribute to the above.

1.0 INTRODUCTION

1.1 Background of the Study

Seeds for Change (S4C) is a three-year project coordinated and implemented by NABC and six Dutch companies, seed breeders and experts in biological crop protection, partly funded by the Dutch Government. The S4C aims for the development of the vegetable sector in Kano, Nigeria by provision of high-quality input materials such as hybrid seeds and biological crop protection. In addition, training of farmers on GAPs and access to improved inputs and knowledge transfer will be facilitated through trials, demonstrations; capacity building activities focused on crop management, basic and improved cultivation techniques and good agricultural practices. The targeted vegetables are tomato, onion, pepper (hot & sweet), cabbage and watermelon. This baseline study provides information for planning of interventions focused on the five vegetable crops and one area, namely Kano vegetable production and market clusters.

1.2 Objective of the Baseline Study on Vegetables

The key objective of the study is to gather baseline data for the five target vegetables in order to establish baseline values. The baseline study will serve as a zero-setting for crop yield and farmer skills level to measure progress and impact. It will also underline the most important gaps in knowledge and farmer cultivation practices enabling the companies to adapt the training programme to the local context. Addressing those gaps if necessary, maximizing the impact of the training program and utilization of improved seeds.

1.2.1 Specific objectives of the baseline study on Vegetables

The specific objectives of the baseline study are:

i. describe the socio-economic characteristics of the targeted vegetables (tomato,onion, pepper, cabbage and watermelon) producers in the clusters under study,
ii. estimate volume of the vegetables produced by farmers,
iii. estimate volume of vegetables sold by the targeted farmers,
iv. estimate proportion (%) of farmers' total income that represents income from sale of vegetables (tomato, onion, pepper, cabbage and watermelon),
v. estimate vegetables (tomato, onion, pepper, cabbage and watermelon) productivity at farm level among the farmers,
vi. estimate cashout lays (seeds, labor, other inputs) on vegetables (tomato,onion, pepper, cabbage and watermelon) production among the farmers,
vii. assess the level of awareness and adoption of improved varieties of vegetables (tomato, onion, pepper, cabbage and watermelon) among the targeted farmers,
viii. assess the level of awareness and adoption of Good Agricultural Practices among the vegetables (tomato, onion, pepper, cabbage and watermelon) farmers,
ix. identify the preferred vegetables varieties by farmers and the reasons,

1.3 Deliverables/Outputs

Output 1: Baseline report making use of existing studies on the 5 crops and value chains in Kano State.

Output 2: Kano vegetable sector Stakeholder map (& matrix).

1.4 Methodology

The study covered the major vegetable production clusters within Kano River Irrigation Project (KRIP) in Kano State, Northern Nigeria. KRIP lies between 80°.30'to 90°.40'E and 11°.30 to 12°.03N within the Sudan Savannah zone of Nigeria (Figure 1). The project is one of the largest and most successful irrigation schemes in Nigeria. It is located within Bunkure, Kura and Garum Malam Local Government Areas of Kano State. The schemes' source of water is the Tiga Dam, which provides a perfect setting for gravity irrigation.

The total irrigable area is 22,000 hectares. With respect to the data, the 2018 dry season production was the reference point for the data collected. In addition, data was collected from 2nd to 20th September 2019, covering a total of 21 villages across the three (3) LGAs in KRIP (Table 1, Figure 1). Within each LGA, villages with highest population of the targeted vegetable producers were purposively selected. Furthermore, farmers were drawn randomly from a prepared list in each village. The sample size drawn per village was proportionate to the estimated size of producers in the respective villages (sample frame).

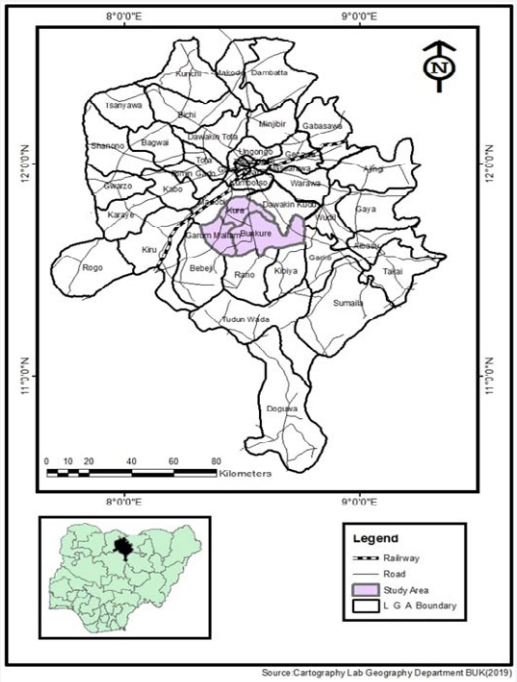
In total, 600 vegetable producers were interviewed by enumerators and data were collected using structured questionnaires. Also, a checklist was used to guide Focus Group Discussion(FGD)/Key Informant interviews (KII) with selected stakeholders to obtain in depth qualitative information on the vegetables production, processing, marketing and consumption in the study area.Thereafter, the data was analyzed using descriptive statistics and graphical illustrations and tables are used to present the study results.

Table 1: Sample Size Distribution and Locations Surveyed

LGA	Onion	Tomato	Pepper	Cabbage	Watermelon	Total
Sample Size Distribution:						
Bunkure	30	30	40	30	60	190
Garun Malam	42	60	36	60	30	230
Kura	48	30	44	30	30	180
Total	120	120	120	120	120	600

Figure 1: Kano State showing the 44 Local Government Areas (important vegetable crops production LGAs are colored).

Source: Kano State Survey Division (1999).



2.0 VEGETABLE PRODUCTION, PROCESSING AND MARKETING IN KANO STATE

2.1 Vegetable Crops production in Nigeria

The major vegetables produced in Nigeria include onion, tomato, okra, pepper, Amaranthus, carrot, melon, ewedu (Corchorus olitorus), sobo (Hibiscus sabdariffa) and baobab leaves (Adansoniadigtata). In Nigeria, enormous quantities of vegetables are produced, and staggering figures are sometimes given as estimated annual production. For example, figures like 3.8 million tonnes of onions, 6 million tonnes of tomatoes have been quoted as annual production levels (Oyeniran, 1988; Erinle 1989). Vegetables grow in most parts of Nigeria and tomato is the leading vegetable produced in many parts of the country. The tomato producing areas are mainly in Northern Nigerian States namely, Kano, Kaduna, Jigawa Bauchi, Benue, Plateau, Kwara and some Southern States like Delta, and Oyo. Despite the enormous potential of most vegetables for industrial growth and development, very few large-scale vegetable processing industries abound in Nigeria.

Globally, the country is the 14th largest tomato producer with 2.3 million tons in 2016 (FAO, 2017).

Nigeria is currently the 2nd largest tomato producer in the region, producing 11% of fresh tomatoes (Taofiq, 2017)

Nigeria is currently the second largest (Taofiq, 2017) producer of fresh tomatoes in Africa, producing 11% of fresh tomatoes in the region. Globally, the country is the 14th largest tomato producer with 2.3 million tons in 2016 (FAO, 2017) which accounts for 1.2% of the world's output in 2016. Over the last decade, the production of fresh tomatoes in Nigeria has grown by 25% from 1.8 million tons to an estimated 2.3 million tons. This growth has been primarily facilitated by continuous increase in the harvested area for tomatoes from 265,000 hectares to 668,292 hectares during that same period. However, tomato yields have remained very low to an average of 5 tons/ha compared to the world average yield of 38 tons/ha. The use of old seed varieties, pest and weed invasion and low soil fertility have contributed to this low productivity (Sahel Research, 2017).

2.2 Vegetable Crop Production in Kano State

Vegetables are produced in Kano State under two conditions, rainfed and irrigated. Available water resources in Kano State allow for the irrigation of over 160,000 hectares per annum producing nearly two million tons of crops that include tomato, onion, pepper, wheat, maize, rice and so on (Kano State Guide, 2004). The most important irrigation project is the Kano River Irrigation Project (KRIP) which depends on the Tiga Dam for water supply.

The Dam supplies water used for the irrigated production of crops especially rice, wheat and vegetables (tomato, onion, pepper, cabbage, watermelon, carrot, green beans, green maize, etc.). Estimates of quantities produced per location are not available. However, tomato is the most prominent vegetable produced in Garun Malam, Kura and Bunkure production clusters.

Infact, tomato is the most popular vegetable crop produced across Kano State followed by onion and pepper. Qualitative 1 information shows that tomato constitutes 60%, 45% and 60% of vegetables produced in Garun Malam, Kura and Bunkure LGAs, respectively. Onion accounts for 15%, 20% and 10%; while pepper accounts for 15%, 15% and 10% of the vegetables in the respective locations.

Results of qualitative interview withstakeholders revealed the important vegetable crops and production locations in Kano State (Appendix1).

2.3 Vegetable Crop Marketing in Kano State

Marketing arrangement for vegetables in Kano State are predominantly informal with 60% of producers selling at farm gate within production clusters. Less than 10% of the producers are able to sell in urban markets with the rest of the produce lost as a result of post-harvest losses during harvest, storage and transportation. Within Kano metropolis, Yankaba market is a popular urban vegetable market. After Yankaba, rural markets around the vegetable production clusters provide the next option for the producers to sell their vegetables. Within the marketing phase, aggregators play important roles in linking producers to buyers.

The aggregators operate at rural markets and also at farmgate (See Appendix 2 for a list of aggregators). Involvement of Companies /supermarkets is very limited. However, Dangote Tomato Processing Company purchases tomato at Kwanar Gafan International vegetables market from February to April (irrigation production season). Also, some supermarkets and hotels purchase vegetables from Yan'kaba vegetables market (urban market).

Table 2: Relative production of vegetables 1

Vegetable	Tomato	Onion	Pepper	Cabbage	Watermelon	Others
Percentage of production	37%	30%	21%	3%	7%	2%

1 Information on quantities of vegetables produced is scarce and different sources can contradict each other.

2.4 Vegetable Crop Processing in Kano State

Nigeria is the 14th largest producer of tomato in the World; and 2nd largest producer in Africa. Despite the large amount of tomato produced, Nigeria still imports significant amounts of tomato paste.

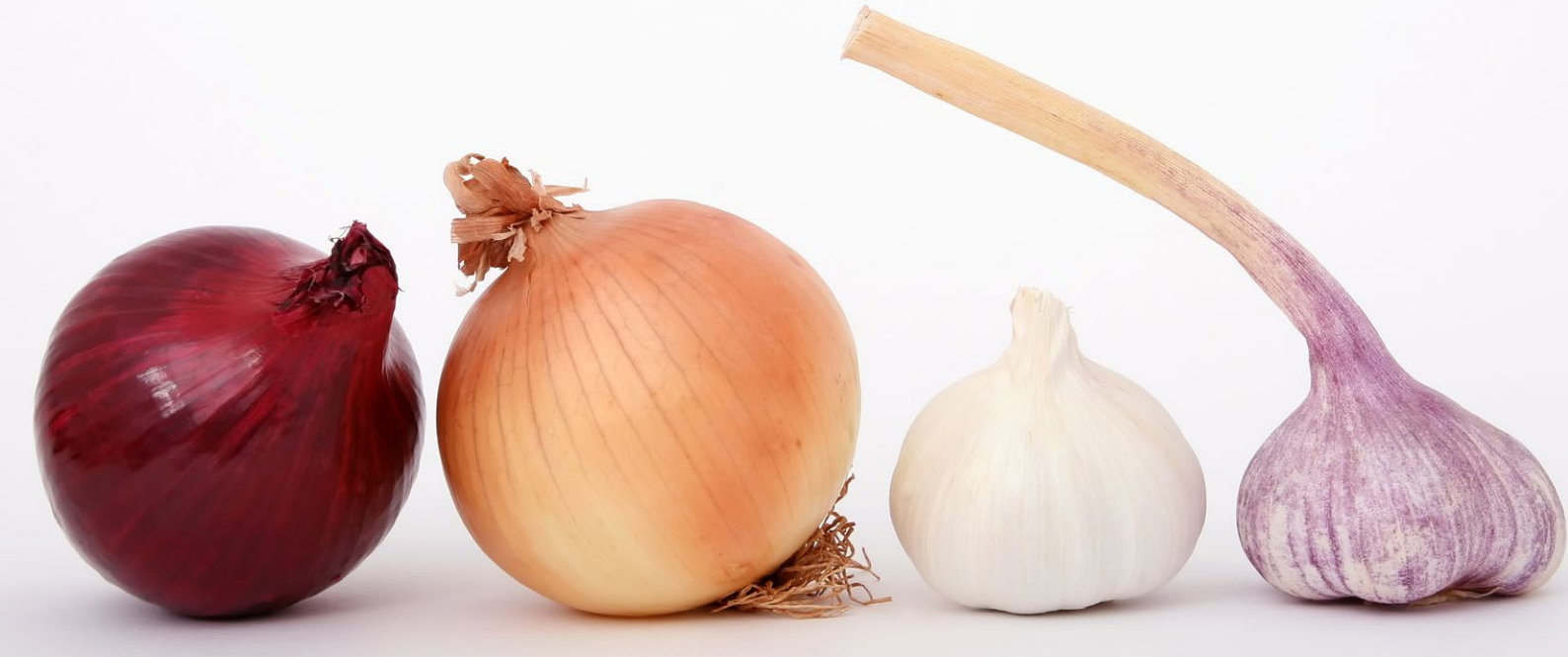
This indicates a large market gap for the processing of vegetables, particularly processing tomatoes. Currently, processing occurs with local/traditional small scale methods, mainly occurring during the glut period. This includes sun drying of tomatoes, peppers and also dried/powdered okra and involves the cutting of tomato and sun drying on the floor. There is only one large scale processing plant in Kano State, namely Dangote Tomato Processing Company located within Garun Malam Production cluster along the Kano-Kaduna expressway. This is the only large scale processing plant in the state with 140 ton capacity per day. With regards to small-scale processing, NGOs such as Pyxera and Techno Serve have trained tomato processors and disseminated improved processing technologies in Kura-Garun Malam- Bunkure production cluster of Kano State.

3.0 CHARACTERISTICS OF THE VEGETABLE PRODUCERS

This sub-section provides information on socio economic characteristics of vegetable producers in the study area. Generally, vegetable production in Kano is dominated by young men below the age of 38 years. Only an estimated 7% of growers in the area are female. In addition, 40% of the vegetable growers in Kano were found to have secondary school education while the rest of the vast majority were informally trained in the Qur anic education. The producers are also characterized by high years of experience in vegetable production. The results revealed that tomato and onion producers had the most experience, 17 and 13 years of experience respectively. Farmers growing pepper, cabbage and watermelon producers had 9, 6- and 8 years' experience respectively.

In addition, results revealed that average household sizes of vegetable farmers were between 8 10 people. The size of the family is an important factor for the producers as larger families have more capacity to do farm work without hiring extra labour.

Farming skills and knowledge are transferred from generation to generation. It is reported that this sometimes comes at a cost for the level of education of the children working on the farm. Furthermore, the majority of the producers are members of cooperatives and other economic interest groups. These cooperatives provide trainings for their members and provide access to different kinds of agro dealers. Usually these agro dealers only have contact with the cooperatives, this way farmers only have access to agro inputs via the cooperatives.



4.0 VEGETABLE CROP PRODUCTION

4.1 Sources of Agricultural Land

Vegetable producers in the study area have diverse sources of land. Land inheritance and rented plots appear to be the common sources of land among the producers. Rent value for farmlands varies from the dry to the wet season with the rental value being approximately N50,000 per hectare during the dry season; and between N70,000 to N100,000 per hectare during the wet season. During the wet season, land rent is more expensive as there is more competition with rice, maize and sorghum production. The use of rented land increases the cost of production and reduces the profit margin for the producers. In table3 below, an overview is provided of the various sources of agricultural land.

Table 3: Sources of Agricultural Land among Vegetable Crops Producers

Land Ownership:	Tomato	Onion	Pepper	Cabbage	Watermelon
Inherited	23%	25%	32%	30%	26%
Leased from Government	1%	-			3%
Communal Plot	4%	3%	3%	2%	3%
Rented	28%	19%	18%	33%	33%
Borrowed	16%	15%	13%	15%	12%
Purchase	10%	18%	15%	13%	6%
Family owned	18%	20%	19%	7%	17%

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
Source: S4C Baseline Survey, 2019

4.2 Methods of Vegetable Production

Vegetable production in Kano State is mainly semi-mechanized, where tractors and work-bulls drawn implements are used for ploughing and harrowing during land preparation. Local/manual tools are used for other operations. The use of only locally fabricated hand tools is very limited as demonstrated below in table 4, which provides an overview of production methods among vegetable producers (manual, semi-mechanized and mechanized).

With regards to the semi-mechanized production methods, most vegetable producers operate their farms individually and rely on commercial tractor service providers for ploughing and harrowing operations.These service providers are usually farming cooperatives that own tractors to lease them to their members while others are privately owned businesses.

The Government's agricultural departmental so provides tractors and other mechanization tools for lease at subsidized prices through Kano State Agricultural & Rural Development Agency. With respect to the costing of semi-mechanized land operations, the average cost of land operations ranges from N9,706/ha to N10,915/ha for ploughing and N10,677/ha to N13,550/ha for harrowing.

However, the location of the farmland and the demand for services influences the cost of operations. Farmers located within the irrigation clusters that can pool resources with other farmers will lower the (per farmer) price of leasing and rental of semi-mechanized equipment. Therefore, extension agents, development workers and researchers encourage producers to purchase production inputs and rent or lease tractor services as a group.

Table 4: Method of Production among Vegetable Crops Producers

Method of Production	Tomato	Onion	Pepper	Cabbage	Watermelon
Manual	2%	7%	3%	3%	1%
Semi-mechanized	98%	93%	95%	97%	99%
Mechanized	-		2%		-

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
Source: S4C Baseline Survey, 2019

4.3 Cropping System and Major Crop Combinations

The majority of the target vegetable producers practice sole cropping. Those engaged in mixed cropping combine tomato with either onion, maize and or cowpea. Onion farmers combine onion with either tomato, pepper, cabbage, maize and or cowpea. Similar crop combinations were reported among pepper, cabbage and watermelon producers. Below, an overview of the cropping systems and crop combinations is provided.

Table 5: Cropping System and Crop Combinations among Vegetable Crop Producers

Cropping System and Crop Combinations	Tomato	Onion	Pepper	Cabbage	Watermelon
Cropping System:					
Sole Cropping	67%	79%	58%	79%	88%
Mixed Cropping	33%	21%	42%	21%	12%
Crop Combinations:					
Tomato		14%	12%	8%	25%
Onion	1%		38%	28%	8%
Pepper		9%		4%	8%
Cabbage		5%			
Maize	97%	68%	27%	64%	43%
Rice					8%
Cowpea	1%	5%	9%		
Sugarcane	1%		3%		
Green Beans		5%	12%		
Milo					8%

Sample size (n): Tomato = 40, Onion = 22, Pepper = 51, Cabbage = 25, Watermelon = 12) for producers engaged in mixed cropping.
Source: S4C Baseline Survey, 2019

Furthermore, when looking at vegetable production seasons in Kano State, vegetables are produced during both wet and dry season periods. However, the bulk of the production takes place in the dry season (November- April) as yields are higher under the dry season production arrangement. The bulk production starts end of October, early November. For tomato, onion, pepper and cabbage, the bulk is harvested from January to April and early May.

The bulk of watermelon is harvested in September. Figure 2a below provides a graphical description of seasons in Kano State.

Figure 2.a: Graphical description of seasons in Kano State. Computed from narrations by Olofin (1987, 2008)

Season	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Dry and cool season (Kaka)												
Dry and hot season (Bazara)												
Wet and warm season (Damina)												
Dry and warm season (Rani)												

Dry and cool season (Kaka)	Morning and night temperatures as low as 10^{0}C and afternoon temperatures as high as 35^{0}C
Dry and hot season (Bazara)	Mean monthly temperature between 30 and 320C; Daily minimum = 240 C; Daily maximum = 400 C
Wet and warm season (Damina)	Monthly average temperature 25 to 260 C; Daily minimum of 200C
Dry and warm season (Rani)	Average daytime temperature 35 400C Night temperature 190C

In Kano State, both rain-fed production and production under flood and furrow irrigation is taking place. Some more advanced farmers are using drip irrigation, but the majority is farming under flood and furrow irrigation. The farmers that have access to the possibility of flood (furrow and drip) irrigation are capable of farming in different seasons in comparison to the farmers depending of rain fed irrigation.

Furrow production is used for tomato and pepper. For onion, cabbage and watermelon, flood irrigation is used. Figure 2b provides an overview of the crops that can be farmed per season and watering/ irrigation method. Most farmers choose to do produce several (vegetable) crops inorder to reduce the risk of glut. In addition, as can be seen, some of the vegetable seasons are overlapping which entails that there is the risk of competition of resources producing different products.

Figure 2.b: Production seasons

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Tomato rainfed												
Tomato irrigation*												
Onion rainfed												
Onion irrigation												
Pepper rainfed												
Pepper irrigation												
Cabbage rainfed												
Cabbage irrigation												
Watermelon rainfed												
Watermelon irrigation												

*Flood/furrow irrigation

4.4 Inputs in Vegetable Crop Production

4.2.4.a Types and amount of seeds used for vegetable production

Vegetable producers in the region mainly use three types of seeds; hybrid, open pollinated and farmer saved seeds. The result from our survey shows that the majority of the farmers currently use farmer saved seeds and OPVs. Only a fraction of the farmers is using hybrid seeds. The knowledge of different kinds of hybrid varieties is quite low amongst producers as varieties are mainly identified by the company's names, indicating that differences between various seeds of the same supplier are unclear.

The main sources of information on crop varieties for farmers are village extension agents, agro-dealers and other farmers which sell the hybrid seeds. OPVs are usually obtained by channels more close to the farmers such as fellow farmers and agro-dealers (table6). Most producers in the study area use seeds from different varieties for the same crop. Some varieties are popular but farmers make a combination to spread risks or experiment with other varieties.

When looking at the division of the types of vegetable seeds used by producers (table 7) it can be concluded that tomato and watermelon production are dominated by OPVs. When looking at tomatoin specific, tomato producers adopted several Open Pollinated Varieties. In particular, and firstly, UC82B, which is produced during dry season and adopted by 92% of farmersin the dry season. During the wet season, this variety is adopted by the remaining farmers in the study area.

The adoption rate is high since the variety has a number of desirable characteristics (firm and large fruits, squareshape, highyield, resistance topest, longer shelf-life and good market value). Secondly, the Roma VF tomato variety is produced during the wet season by less than 50% of farmers in the study area.It has resistance to blight, but its shape is not desirable by farmers because it is not round (less market value compared to UC82B). When looking at the use of hybrid seeds, in table 7 it can be found that less than 15% of the tomato producers use hybrid seeds. For cabbage, however, the uptake of hybrid seeds is a lot higher, it is the crop with the highest users of hybrid varieties in the region. GloriaF1, a hybrid, is the most preferred among 72% of producers due to its high yield, resistance to pests and environmental conditions.

Secondly, red onion (Africa RedF1) is a hybrid seed preferred by 33% of the producers because of its high yield, market value and resistance to environmental conditions.However, 67% (the remainder) of the onion producers use farmer saved seeds. Therefore, onion (together with pepper) are the crops with the highest use of farmer saved seeds.

As mentioned above, many of the pepper producers patronize localized varieties/farmer saved seeds. The most preferred among them was the Dan-Damaso produced by 80% of pepper farmers in the study area.This variety is high yielding, has resistance to pest and a high market value. Dan-Damaso is produced during the dry season.

Lastly, for watermelon, Kaolack is an OPV preferred by 90% of watermelon producers because it has high yield, resistance to environmental condition and pests (Table7). Although the adoption rate is still low; the utilization of hybrid seeds amongst vegetable growers in the region can be attributed to the impact of project works of extension agents, demonstration projects championed by NGOs and out-grower schemes by processors. In there cent past, the Rockefeller Foundation, Dangote Tomato Processing Company, Bakker Brothers and NGOs in the study area have made progress in introducing hybrid seeds of various vegetable crops to the growers. There cent (3 to 6years) dissemination and diffusion of hybrid vegetable seeds through farmer trainings and demonstrations by NGOs has proven to be effective in providing producers with viable production options among which are shorter production cycles, increase in yields, reduction in post-harvest losses etc.

Table 6: Market channels for seeds

Sources	Tomato	Onion	Pepper	Cabbage	Watermelon
Main Source of Hybrid Seeds:					
Retailers in Local Market	47%	60%	48%	57%	41%
Seed companies	1%	-		7%	3%
NGOs	1%	-	3%		-
Agro-dealer	46%	40%	48%	33%	55%
Fellow Farmer	5%	-		3%	1%
Main Source of Open pollinated Seeds:					
Local Market	18%	7%	32%	63%	5%
Saved Seeds	-	14%	27%		-
On-Farm Trials	-	-	3%		-
Seed companies	18%	-	4%	13%	
Agro-dealer	35%	9%	5%	19%	45%
Fellow Farmer	29%	65%	20%	6%	-
Neighbor/Relative	5%	10%	8%		-

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
Source: S4C Baseline Survey, 2019

Table 7: Types of Vegetable Seeds Used by Producers in 2018 Production Season

Crop/Variety	Type*	% Producers	Producers Reasons for Preference/ Attributes	Seed Company
Tomato:				
UC82B	OPV	100%	High yield, Resistance to pest, Longer shelf life, good market Value	Technisem & Techniseeds
Roma VF	OPV	49%	Resistance to pest	Technisem
Rio Grande	OPV	19%	High yield, Resistance to pest	Technisem
Kilele F1	HYBRID	1%	High yield, Resistance to pest	Syngenta
Tylka F1	HYBRID	3%	High yield, Resistance to pest	Syngenta
Red Star F1	HYBRID	11%	High yield, Resistance to pest, Longer shelf life	Apollo Seeds
Onion:				
Africa Red F1	HYBRID	62%	High yield, Good market value, Resistance to Environmental Condition	Syngenta
kwallingiwa	FFS*	38%		
Pepper:				
Jupiter	OPV	34%	High yield, good market value	Technisem
Lafayette	HYBRID	1%	Resistant to environmental conditions (heat), High yield, Resistance to pests	Syngenta
Cayenne	HYBRID	1%	Resistant to environmental conditions (heat), High yield, Resistance to pests	Syngenta
Farinlri	FFS	50%	Wet season sweet pepper variety	Previous Harvest & Local Markets
Dan Damaso	FFS	80%	Dry season Sweet pepper variety: High yield, Large fruit size, Good Post Harvest Quality, Good market Value	Previous Harvest & Local Markets
Dan Izala	FFS	20%	Dry season sweet pepper variety: Small fruits	Previous Harvest & Local Markets
Dan Hunkuyi	FFS	21%	Dry season sweet pepper variety: High yield, Resistance to pests, Good market Value	Previous Harvest & Local Markets
Dan Boko	FFS	3%	High yield	Previous Harvest & Local Markets
Dan Zagade	FFS	3%	High yield	Previous Harvest & Local Markets
Kahon Barewa	FFS	4%	High yield, Resistance to pests	Previous Harvest & Local Markets
Dan Chela	FFS	80%	Dry season chilies: Larger fruits	Previous Harvest & Local Markets
Dan Makarfi	FFS	8%	Wet season chilies: Small fruits, Resistant to environmental conditions (heat)	Previous Harvest & Local Markets
Dan Gombe	FFS	80%	Dry season hot pepper variety: High market value	Previous Harvest & Local Markets

Cabbage:				
Copenhagen	OPV	28%	High yield, Early maturing, Uniform-globe-shaped heads, Resistance to pests, Resistance to environmental conditions	Technisem , Techniseeds, Danish Agroconnect
Gloria F1	HYBRID	72%	High yield, Resistance to pests, Resistance to environmental conditions	Syngenta
Watermelon				
Sugar Pack	OPV	4%	Good Market Value	Seminis
Kaolack	OPV	90%	Resistance to environmental condition	Technisem & Techniseeds
Mai Yashi	FFS	100%	Good market Value	Previous Harvest & Local Markets

*FFS: Farmer saved seeds; Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600. Multiple answers cause the percentage to increase above 100%

As mentioned above, the usage and adoption rate of improved varieties is still limited. A number of constraints associated with this low rate were enumerated by the producers which are presented in table 8 below. The main constraint towards adoption was the (higher) price of the hybrid varieties, compared to the other varieties.

Table 8: Constraints with Adopting Improved Varieties

Constraints with Adopting Improved Varieties:	Tomato	Onion	Pepper	Cabbage	Watermelon
Seed not available in locality	25%	56%	49%	42%	32%
Seed too expensive	57%	67%	54%	73%	69%
Low yielding variety	6%	23%	13%	14%	12%
Variety sensitive to diseases	31%	30%	35%	31%	35%
Low Market Value	30%	31%	27%	25%	35%
Not good in intercropping	1%	15%	9%	8%	14%
Variety sensitive to environmental conditions	20%	17%	19%	20%	15%
Requires much fertilizer	39%	40%	33%	35%	30%
Late maturity of variety	8%	13%	17%	6%	8%
Small size	22%	24%	24%	27%	29%
High Attack by insects	33%	34%	37%	28%	28%
Inadequate knowledge about the variety	13%	18%	18%	17%	23%

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600. Figures will not add-up to 100% because of multiple response. Source: S4C Baseline Survey, 2019

Furthermore, when looking at the amount of seeds purchased and quantities used for production, there seems to be a little difference between the purchases and used quantity. Generally, the differences in quantities purchased and applied in the field were less among hybrid seed users and highest among local seed (FFS) users (Table 9).

In addition, in table 9, differences in the amount of seeds planted per hectare by vegetable producers are shown. These differences could be attributed to none adherence to recommended seed rates and can lead to wastage (over use) of seeds and seedling and increase the amount of labourneeded and used for production. The reason for the deviation from recommended seed rates is the farmers' experience with poor germination rates when using low quality seeds. Therefore, theyareused to requiringahigher seeding rate to start production in a bid to get the right plant population on the field. Since deviating from the optimal seeding rate can lead to lower production or higher cost it is important that farmers are made aware of this issue. This is a critical knowledge gap that needs to be addressed by training farmers in calculating the right seeding rates that are required per plot when using high quality seeds (hybrids or OPVs.)

Table 9: Types and Quantity of Seeds Used by Vegetable Crop Producers

Type of Seeds	Tomato		Onion		Pepper		Cabbage		Watermelon	
AVG: Average	AVG	SE	AVG	SE	AVG	SE	AVG	SE	AVG	SE
Average quantity of Hybrid seed purchased (grm/farmer)	591	53	600	158	292	56	243	19	722	83
Quantity of Hybrid seed Used (grm/farmer)	550	52	600	158	274	54	243	19	682	81
% Difference	7.50		0		7		0		6	8
Unit Price of Hybrid Seed Purchased (N/grm)	195		80		320		164		86	
Quantity of Open Pollinated seed purchased (grm/farmer)	1239	162	887	92	393	50	350	53	1209	395
Quantity of Open Pollinated seed Used (grm/farmer)	1144	151	807	78	364	49	347	54	1164	395
% Difference	8		10		8		1		4	8
Unit Price of Open Pollinated Seed Purchased (N/grm)	38		45		48		53		25	
Quantity of Saved seed purchased (grm/farmer)	283	95	737	80	588	151	567	92	480	80
Quantity of Saved seed Used (grm/farmer)	267	99	608	60	448	102	350	206	480	80
% Difference	6		21		31		62		0	6
Unit Price of Saved Seed Purchased (N/grm)	25		14		23		45		18	

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
Source: S4C Baseline Survey, 2019, SE: Standard Error, AVG: Average

"...the medium scale vegetable farmers, a small population of farms, less than 1% of vegetable growers in Kano, currently use horticultural grade soluble fertilizers"

4.2.4.b Types and amount of fertilizer and other agro-chemicals used for vegetables production

Next to the study results on the use of seed varieties, the study also researched the types and amounts of fertilizers and agro-chemicals used by farmers in Kano State. The table below (table 10) provides insight in the various fertilizers and product sources. It was found that fertilizer inputs for vegetable crop production in Kano State rely heavily on the use of granular NPK (15-15-15) and Urea fertilizers for production. There is currently no evidence of the usage of horticultural grade fertilizers or soluble fertilizers amongst small holder growers.

Among the medium scale vegetable farmers, a small population of farms, less than 1% of vegetable growers in Kano, currently use horticultural grade soluble fertilizers which they purchase from two main vendors; Jubaili Agrotec and Afri Agri Products. With respect to soil testing and analysis, small scale farmers do not conduct soil analysis. However, they recognize alkaline and acidic soils based on experience.

Soil amendments are routinely implemented by the application of manure and compost which are a combination of animal droppings, rice hulls/bran and ash on the affected farm lands before harrowing. This treatment is used by the small-scale vegetable producers to ensure the can keep using the land.

In terms of the fertilizer brands, different brands of NPK are used by vegetable producers. These include Agro-TAK, Dan-Buhari, Golden, KASCO, etc. The NPK fertilizer from Golden is the most popular brand and the proportion of target vegetable producers that use Golden NPK fertilizer were the highest compared to users of other brands. For urea fertilizers, only two brands were mentioned almostequally.

These are from INDORAMA and NOTORE of which the second became popular among crop farmers in Northern Nigeria as a result of the "PropCom Mai-karfi Notore fertilizer intervention". The intervention supported the promotion of Notore's fertilizer and Good Agricultural Practices (GAPs) in farming communities of Northern Nigeria.

This was done through the establishment of Village Promoters (VPs) and supply of quality and affordable products including small pack size fertilizers produced by Notore. Farmers generally adhere to the use of a brand for quality and affordability reasons. The abovementioned intervention could be studied to assist in promotion of other agro-inputs such as improved seeds across Northern Nigeria. The main sources for NPK and Urea fertilizers among the vegetables producers in the production cluster are local markets and agro-dealers (Table 10).

Table 10: Types and Sources of Fertilizer among Vegetable Crops Producers

Types and Sources of Fertilizer	Tomato	Onion	Pepper	Cabbage	Watermelon
NPK Used:					
Agro-TAK	5%	12%	10%		
Dan Buhari	4%		2%		
Golden	81%	83%	79%	89%	89%
KASCO				2%	
Mai-Glass		5%		8%	
Nagari	3%		3%	2%	5%
OCP			2%		1%
WACOT	1%		4%		
Magic	6%				5%
Urea Fertilizer Used					
INDORAMA	56%	49%	47%	48%	57%
NOTORE	44%	51%	53%	52%	43%
Main Source of NPK:					
Local Market	53%	57%	58%	64%	51%
Agro-dealer	47%	43%	42%	36%	49%
SSP Fertilizer Used					
Agro-TAK				33%	
KASCO			33%		
Super	100%	100%	67%	67%	100%
Main Source of SSP:					
Local Market	100%	50%	100%	100%	100%
Agro-dealer	-	50%	-	-	-
Main Source of Urea:					
Local Market	48%	60%	50%	61%	48%
Agro-dealer	51%	38%	47%	38%	50%
Fellow Farmer	1%	2%	2%	-	2%
NGOs	-	-	1%	1%	-

Main Source of Cow-dung:					
Fellow Farmer	62%	73%	56%	57%	76%
Neighbour/Relative	38%	27%	44%	43%	24%
Main Source of Compost Manure:					
Fellow Farmer	50%	61%	67%	67%	71%
Neighbour/Relative	50%	39%	33%	33%	29%
Main Source of Poultry Droppings:					
Fellow Farmer	50%	20%	75%		75%
NeighbourlRelative	50%	80%	25%	100%	25%

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, WM.);Total sample size = 600.
Source: S4C Baseline Survey, 2019

The third type of fertilizer used, is SSP fertilizer. However, the use of this type of fertilizers is negligible as farmers claimed that SSP fertilizer is not commonly available in the markets. Fourthly, non-chemical alternatives are used by the vegetable crop producers. These non-chemical fertilizers (cow-dung, compost manure and poultry droppings) are sourced from other fellow farmers and or neighbors and relative. This means that the non-chemical fertilizers, by-products of livestock production and domestic waste, are obtained locally from livestock activities of the farmers in the production clusters. The results also revealed that all vegetable producers utilize non-chemical fertilizers for vegetable production (Table 10).

When looking at the table below, providing insight in the quantity of fertilizers purchases and used, there is little or no difference between the amounts of NPK and Urea fertilizers purchased and applied to the field. However, the differences that are reflected are those between the quantities used per crop. Tomato, pepper and watermelon producers use higher amounts of NPK fertilizer while the amount of NPK fertilizer used by onion and cabbage producers per hectare of land were significantly lower.In the case of the use of Urea and SSP fertilizers, a similar scenario was observed, although for SSP, it was reported by very few producers.

The average quantities of urea used by tomato, pepper and watermelon producers per hectare of land were higher, with tomato being the highest, compared to the use of onion and cabbage producers.

This is caused by the higher nutrient demand for tomato and pepper and the higher planting density of watermelon. In general, prices paid by the producers were similar across the fertilizers (Table 11). The amount of manure used to fertilize farmlands varies across the vegetable producers, but again, tomato, pepper, watermelon (and also cabbage) farmers take the lead in the volume of manure (cow-dung) used per hectare of farmland (Table 11). For the use of compost, cabbage and watermelon farmers are, relatively, the biggest users and for poultry droppings, tomato, cabbage and watermelon farmers are using most of this type of organic fertilizer.

Table 11 also shows the amount of organic and chemical fertilizers used. The farmers can obtain the organic fertilizers which usually consist of manure for free or at very low cost compared to the chemical fertilizers. Most farmers therefore choose to only use the minimum of chemical fertilizer needed to ensure a good production. The remainder of the demand is filled up with organic fertilizers for cost saving purposes.

Table 11: Quantity of Chemical and Non-Chemical Fertilizer Used among Vegetable Crop Producers

Type of Fertilizer	Tomato		Onion		Pepper		Cabbage		Watermelon	
	Average	SE	Average	SE	Average	SE	Average	SE	Average	SE
FERTILIZER:										
Quantity of NPK purchased (Kg)	382	27	193	9	262	20	188	10	260	17
Quantity of NPK Used (Kg)	375	27	191	11	253	20	186	10	255	16
Unit Price of NPK Purchased (₦/Kg)	155	1	155	1	157	1	157	1	156	2
Quantity of Urea purchased (Kg)	236	21	117	7	145	11	116	10	148	10
Quantity of Urea Used (Kg)	230	20	115	7	140	10	116	10	141	9
Unit Price of Urea Purchased ₦/Kg)	141	1	139	1	138	1	140	1	139	1
*Quantity of SSP purchased (Kg)	225	101	86	18	133	60	75	14	117	51
*Quantity of SSP Used (Kg)	225	101	86	18	133	60	75	14	117	51
*Unit Price of SSP Purchased (₦/Kg)	125	10	140	7	124	9	120	7	137	3
ORGANIC MANURE:										
Quantity of Cow-dung purchased (Kg)	1281	518	273	19	555	84	387	45	386	60
Quantity of Cow-dung Used (Kg)	801	109	273	19	550	84	384	46	386	60
Unit Price of Cow-dung Purchased (₦/Kg)	14	1	19	1	14	1	13	1	11	1
Quantity of Compost purchased (Kg)	204	58	282	21	297	49	392	94	400	72
Quantity of Compost Used (Kg)	204	58	280	21	297	49	392	94	386	76
Unit Price of Compost Purchased (₦/Kg)	13	1	13	1	14	1	13	1	8	1
Quantity of Poultry Droppings purchased (Kg)	1303	1100	204	40	325	103	1000	.	758	183
Quantity of Poultry Droppings Used (Kg)	1303	1100	204	40	325	103	1000	.	758	183
Unit Price of Poultry Droppings Purchased (₦/Kg)	16	2	16	2	20	0	18	.	18	2

Estimate from few users (Tomato = 2 users, Onion = 6 users, pepper = 3 users, cabbage = 4 users, watermelon = 3 users)
SE: Standard Error, AVG: Average

4.2.4.c. Types and amounts of Herbicides and Pesticides used for vegetables production

In addition to organic or chemical fertilizer, vegetable farmers in Kano also apply herbicides and pesticides to protect their crop. Table 12 below provides an overview of the agro-chemicals used. It can be concluded that the producers use similar or same types of herbicides and pesticides in the production of tomato, onion, pepper, cabbage and watermelon.

They use contact and systemic herbicides and other pesticides and they have several options from which they select a range of varieties of the agro-chemicals. However, asystemic herbicide locally known as Glysate was the most reported in use among the producers.

Agro-dealers operating in the production clusters followed by retail in local markets were identified as the major sources of herbicides, insecticides, fungicides and other agro-chemicals used by farmers for weeds control and other crop protection (Table 12). It is common practice that farmers buy more product than they need inorder to resell it to their friends and fellow farmers.

Table 12: Types and Sources of Herbicides and Pesticides among Vegetable Crop Producers

Types and Sources of Agro-Chemicals		% of Tomato Producers	% of Onion Producers	% of Pepper Producers	% of Cabbage Producers	% of Watermelon Producers
Local Name of Herbicides:						
Paraquat	Contact Herbicide	4%				
Grammazone	Contact Herbicide	13%	3%	14%		5%
Touch down	Systemic Herbicide	4%				8%
Bush Clear	Systemic Herbicide	4%	6%	4%	14%	16%
Clear Weeds	Systemic Herbicide	4%	3%			
D-D Force	Systemic Insecticide		6%			3%
Glysate	Systemic Herbicide	67%	80%	72%	86%	68%
Pandoline	Pre-Emergence Herbicide	4%	3%	10%		
Local Name of Pesticides:						
Gamalin A	Pesticide	6%				
Rocket	Contact Insecticide		5%		10%	4%
Best	Contact Insecticide			5%		
Butaforce	Contact Insecticide	12%				4%
Dragon	Contact Insecticide					4%
Combat	Insecticide	2%				2%
Crush	Insecticide					
Imiforce	Insecticide	14%	22%	62%	33%	47%
Magic	Insecticide		9%	4%		
Marshall	Insecticide	8%	13%	4%	4%	
Rocket	Insecticide	12%	30%	7%	29%	9%

Types and Sources of Agro-Chemicals		% of Tomato Producers	% of Onion Producers	% of Pepper Producers	% of Cabbage Producers	% of Watermelon Producers
Sharpshooter	Systemic Insecticide	32%		16%	6%	18%
Zee Force	Fungicide				3%	7%
Lara Force	Wormicide	15%	22%	4%	15%	5%
Main Source of Herbicide:						
Local Market		43%	34%	38%	27%	38%
Agro-dealer		57%	66%	50%	65%	54%
On-Farm Trials		-		6%	-	-
Fellow Farmer		-		6%	8%	8%
Neighbour/Relative		-			-	-
Main Source of Pesticides:						
Local Market		46%	33%	44%	60%	42%
Agro-dealer		53%	67%	53%	38%	56%
On-Farm Trials				2%	1%	0%
Fellow Farmer		1%	0%	1%	1%	2%

Estimate from few users (Tomato = 2 users, Onion = 6 users, pepper = 3 users, cabbage = 4 users, watermelon = 3 users)

Use of herbicides to control weeds is common among vegetable producers. This is in addition to the use of labour to control weeds manually. The quantities of herbicides and pesticides purchased, and the amounts used per hectare of farmland are similar. Producers use both liquid and powder. The herbicides are only used at planting and not afterwards. Since the quantities of herbicides are not enough to control weeds, the extra amount of labour needed causes increased costs for the farmers.

Table 13a: Quantity of Pesticides and Herbicides Used among Vegetable Crop Producers

Type of Pesticides and Herbicides	Tomato		Onion		Pepper		Cabbage		Watermel-on	
***Average= AVG**	AVG	SE	AVG	SE	AVG	SE	AVG	SE	AVG	SE
HERBICIDES:										
Quantity of Herbicide purchased (Ltr/Ha)	2	0	2	0	4	1	2	0	4	0
Quantity of Herbicide Used (Ltr/Ha)	2	0	2	0	4	1	1	0	3	0
Unit Price of Herbicide Purchased (₦/L)	1636	36	1612	102	1725	211	905	49	1439	33
PESTICIDES:										
Quantity of Pesticide-1 purchased (Ltrs/Ha)	4	0	2	0	9	3	3	0	5	1
Quantity of Pesticide-1-Used (Ltrs/Ha)	4	0	2	0	9	3	3	0	5	1
Unit Price of Pesticide-1 Purchased (₦/Ltrs)	1699	97	1631	73	1909	102	1920	124	1993	97

Quantity of Pesticide-3 purchased (grm/Ha)	490	60	1100	634	814	238	231	50	639	241
Quantity of Pesticide-3 Used (grm/Ha)	479	59	975	509	814	238	231	50	639	241
Unit Price of Pesticide-3 Purchased (₦/grm)	11	1	8	1	10	1	15	2	8	1

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
Source: S4C Baseline Survey, 2019. SE: Standard Error, AVG: Average

4.2.4.d Labour for vegetable crops production

Appendix 5 provides detailed information on the amount and type of labour (paid vs unpaid) used for vegetable crops production in the 2018 dry season. The labour use in vegetable production found amongst the study target group is comparable to the labour use in other Northern Nigeria States 1. Generally, the use of manual labour is more prominent in agricultural production in northern Nigeria Paid workers are often found in close vicinity to the farms.

The workers can include family members, neighbours and people living closeby. Although the vegetable producers use herbicides to control weeds, they also use a lot of manual labour for weeding purposes as farms are under continuous weeding during production periods. The doses of herbicides used by most producers are not sufficient to provide effective weeds control which increases the need for manual weeding. Other production activities such as planting and transplanting, land clearing, harvesting, are mainly done manually using either paid or unpaid labour sources. As can be seen in appendix 5, across the five crops, the amount of paid labour used is higher than the amount of unpaid labour and in general, weeding and harvesting draws more labour than other farm operations in vegetable production. However, the amount of labour used per farm activity or in total, differs across the crops. Tomato production needs the highest amount of total labour (702 Man-day/ha) followed by pepper (603 Man-day/ha) and cabbage (455 Man-day/ha). Watermelon (262 Man-day/ha) and onion (273Man-day/ha) production draw the least amount of the labour. Differences among the crops are mostly caused by their sensitivity to theft and the need for theft control. Also irrigation can be labour intensive, plants that need more irrigation therefore need more labour

1 Source: based on several baselines studies, please see chapter "references for an complete list

4.5 Vegetable crop production outputs and Utilization

The land areas devoted for vegetable crop production are generally below one hectare which means that the producers are small-scale operators. The production data can be found in table 14 below. These farmer yields are below the potential yields of the vegetable crop varieties produced in the study location (Appendix 4). This has serious implications on profitability of the farm enterprises.The bulk of vegetable crops produced by farmers in the study area were supplied to market. From the total quantity produced, tomato, pepper and onion producers sold 91%, 93% and 92%, respectively.

The situation was similar in the case of cabbage and watermelon where, 95% and 93% of the respective volume of outputs were sold. The rest of the outputs were consumed, gifted and some reserved to serve as a source of farmer saved seed. Sales occur for the most through middle man. Small amounts are sold at farm gate for the surrounding area. It can be concluded that vegetable production in Kano State is market oriented and that tomato, onion, pepper, cabbage and watermelon are cash crops.In table 14 the current and potential yields can be seen.

For onion and water melon no maximum potential yields under local circumstances were found. The production of tomato, pepper and cabbage is low and under potential. Most likely several factors are contributing to the low yields. Hybrid seeds, fertilizers, herbicides and pesticides irrigation and general management all could improve the production under the current circumstances

Table 14: Land area and Output among Vegetable Crop Producers

Major Pests and Diseases *Average= AVG	Tomato		Onion		Pepper		Cabbage		Watermelon	
	AVG	SE	AVG	SE	AVG	SE	AVG	SE	AVG	SE
Land use for the crop production (Ha)	0.8	0.05	0.7	0.04	0.6	0.04	0.6	0.04	1.0	0.06
Farm Size holdings (Ha)	1.7	0.12	1.7	0.10	2.22	0.31	1.5	0.11	2.0	0.22
Land Available for vegetable crops (Ha)	1.1	0.09	0.9	0.05	1.00	0.12	0.9	0.1	1.4	0.18
Quantity Produced (Kg)	16,648	1749	11,122	734	3,092	194	7,401	470	32,773	2649
Quantity Consumed (Kg)	402	44	277	24	80	6	149	10	670	43
Quantity Sold (Kg)	15,297	1350	10,393	844	2,859	280	7,058	460	30,561	2651
Quantity Gifted (Kg)	501	101	276	21	82	7	194	11	977	81
Quantity Reserved as Seeds (Kg)	**447**	**209**	**177**	**46**	**71**	**11**	**-**	**-**	**565**	**81**
Yield (Kg/Ha)	20,302	-	15,665	-	4,831	-	12,134	-	34,138	-
Maximum potential yield (Kg/Ha)	50,950	-	-	-	29,000	-	42,000	-	-	-
Unit Price Sold at Harvest (N/Kg)	31	2	28	1	135	5	34	1	29	1
Revenue from Sales (N/Ha)	467,792	-	286,232	-	385,544	-	241,469	-	885,039	-
Estimated Revenue from Production (N/Ha)	509,088	-	306,306	-	416,851	-	253,213	-	949,095	-
% Difference in Revenue	**9**	**-**	**7**	**-**	**8**	**-**	**5**	**-**	**7**	**-**

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
Source: S4C Baseline Survey, 2019
SE: Standard Error
AVG: Average

4.6 Costs and Return of Vegetable Crops Production

When looking at table 15, which is displaying the costs and revenue of vegetable production, the costs of production of the various crops have similar variations. Crop Protection Products (CPP) mainly herbicides and pesticides (insecticides, fungicides etc.) takes the lowest proportion of the total production costs. For watermelon, pepper and onion production, the cost of CPP accounts for only 6%, 7% and 4%, respectively.

Cost of CPP in Cabbage and tomato production account for 3% for both vegetables. This could explain the high use of manual labour to control weeds among the vegetable crop producers. Producers do however use herbicides at land preparation stage, but these products often consist of low doses of active ingredients which leads to poor weeds control. During the production phase, weeds control is achieved manually using local tools which increases the use of manual labour.

The success to obtaining high yield has a lot to do with the quality of agro-inputs, especially the quality of seeds. High quality seeds usually attract a premium price. As demonstrated in table 15, the cost of seeds constitute 11% of total production cost among onion producers. For watermelon, tomato, cabbage and onion seeds, the cost constituted 9%, 7%,5% and 4% respectively.

The proportion of funds allocated to cover fertilizer costs varies from 11% (cabbage) to 14% (tomato). Results of the Gross Margin analysis presented in Table 15 revealed the dominance of labour cost in vegetable crop production.

Labour alone accounts for 55% of production cost in tomato, 55% for pepper and 51%for onion. In cabbage and watermelon production, labour accounted for 51% and 42%, respectively. Obviously, production of these vegetables is labour intensive (Figure 13).

As mentioned above, most of the labour used for vegetable production in the study area is paid (hired labour). Farmers could reduce the amount of labour used and labour costs by increasing the use of CPP to control weeds and adopting labour saving devices during planting and harvesting. This would free resources for farmers to acquire quality seeds which would enable them to increase their yield, product market value and finally, their revenue.

It can be concluded that the high costs of labour and poor market prices push down the profit margin for vegetable producers. In fact, the gross margins, though positive, are very low (cabbage and tomato)especially when the value of unpaid labour is included in the analysis. Smallholder agricultural crop production in Nigeria has been known to be labour intensive with low productivity compared to potential yields. This is negatively affecting farmer revenues and incomes. Table 15 shows the costs and revenues from each of the vegetables. Table 16 shows the extra income that van be obtained through crop diversification.

For watermelon, pepper and onion production, the cost of CPP accounts for only 6%, 7% and 4%, respectively.

Table 15 Costs and Revenue of Vegetable Crops Production

	Tomato		Onion		Pepper		Cabbage		Watermelon	
	Cost (N/Ha)	% of Total	Cost (N/Ha)	% of Total	Cost (N/Ha)	% of Total	Cost (N/Ha)	% of Total	Cost (₦/Ha)	% of Total
Seeds										
Costs (₦/Ha)	**43,489**	**8%**	**36,314**	**13%**	**17,472**	**5%**	**18,385**	**5%**	**29,091**	**10%**
Fertilizer:										
NPK	58,338	11%	29,566	10%	39,663	11%	29,123	9%	39,760	14%
Urea	32,481	6%	16,053	6%	19,358	5%	16,318	5%	19,558	7%
Sub-total Cost of Fertilizer (N/Ha)	90,819	16%	45,619	16%	59,021	16%	45,441	14%	59,318	21%
Cow-dung manure	10,830	2%	5,247	2%	7,499	2%	5,129	2%	4,390	2%
Compost manure	2,587	0%	3,742	1%	4,128	1%	5,167	2%	2,974	1%
Poultry Droppings	20,423	4%	3,264	1%	6,500	2%	18,000	6%	13,779	5%
Sub-total Cost of Manure (N/Ha)	**33,840**	**6%**	**12,253**	**4%**	**18,127**	**5%**	**28,296**	**9%**	**21,143**	**8%**
Crop Protection Products (CPP):										
Herbicide	3,780	1%	3,627	1%	6,382	2%	1,348	0%	4,935	2%
Pesticide	12,371	5%	11,146	4%	24,468	7%	9,861	3%	15,023	5%
Sub-total Cost of CPP (N/Ha)	**16,151**	**6%**	**14,773**	**5%**	**30,850**	**8%**	**11,209**	**3%**	**19,958**	**7%**
Labour:										
Costs (NHa)	270,602	43%	123,398	43%	165,471	45%	125,111	39%	88,480	32%
Other Costs (N/Ha)										
Packaging Costs (N/Ha)	19,748	3%	5,638	2%	13,697	4%	15,423	5%	0 *	0%
Other Costs (N/Ha)	77,160	12%	50846	18%	61,566	17%	78191	24%	59,371	21%
Sub total Other Costs (N/Ha)	**96,908**	**15%**	**56,484**	**20%**	**75,263**	**21%**	**93,614**	**29%**	**59,371**	**21%**
Total Cost (N/Ha)	551,809	100%	288,841	100%	366,204	100%	322,056	100%	277,361	100%
Market value of Vegetable Produced (N /Ha)	620,839		431,417		651,330		415,103		988,641	
Profit (N)	69,030		142,576		285,126		93,047		711,280	
Unpaid Farmers wage	79,167		52,009		77,444		80,530		46,163	
Entrepreneurs benefit (N)	**-10,137**		**90,567**		**207,682**		**12,517**		**665,117**	

Source: S4C Baseline Survey, 2019 *No packaging material is used for watermelon

4.7 Income diversification among vegetable crop producers

Like other crop farmers in Northern Nigeria, vegetable farmers have diverse sources of income. Apart from income generated from vegetable crop production, they get additional income from production of other crops such as maize, rice, sugarcane, cowpea and greenbeans. Some of the producers engage in fishing, livestock rearing; while others are artisans (tailoring, repairs and maintenance of bicycles, motorcycles, electric generators, water pumps) among others.

The income obtained from other engagements varies by types and across the different crops. Table 16 below provides an overview of non-vegetable crop production activities. Many tomato (95%), onion (65%), and cabbage (60%) producers as well as some pepper (23%) and watermelon (42%) producers engage in maize production along with the target vegetables during dry season.

In the wet season however, most farmers in the study area (70-80%) produce rice. Income diversification is a common strategy among smallholder farmers in Northern Nigeria. It reduces the effects of crop failure, glut and low prices of agricultural commodities especially the perishable ones like tomato, pepper, cabbage, onion and watermelon.

Table 16: Income from Crop and Non-Crop Production Activities (N/Annum)

ID	Engagement	Tomato Producer	Onion Producer	Pepper Producer	Cabbage Producer	Watermelon Producer
a.	Crop Production except the target crop	305,433	296,282	500,500	317,298	466,667
b.	Fishing/Aquaculture	100,000	11,500	100,000		185,125
c.	Wage employment	151,667	165,000	57,143	205,000	49,667
d.	Artisan	194,619	171,746	543,034	178,943	264,841
e.	Salaried Employment	195,900	598,182	364,889	246,682	484,923
f.	Livestock Rearing	64,550	82,574	125,513	165,281	82,453
g.	Vegetable Crop Production	620,839	431,417	651,330	415,103	988,641

Source: S4C Baseline Survey, 2019

Results of the survey revealed that the proportion of income from vegetable production is higher than that of other sources of income among the producers. For tomato producers, income from the crop constitute 67% to 91% of their total annual income. The corresponding proportions among onion producers were 42% to 97%.

Similar proportions are obtainable among pepper, cabbage and watermelon producers. This scenario could encourage the vegetable producers to continue with the trade of producing tomato,onion, pepper, cabbage and watermelon despite participation in other income generating activities. This shows that for some formers other vegetables can have a significant contribution to their income. This diversification can provide them with more security as it reduces the risk to lose all of the crops and therefore the income of thefarmer.

4.8 Marketing of Vegetable Crops

Table 17 below is providing an overview of the major market outlets and buyers of vegetable crops.For smallholder vegetable producers in Kano State, the marketing arrangement is predominantly rural with about 60% of producers selling at farm gate within production clusters. Few (less than 10%) producers patronizes urban markets. Most of the tomato (74%), onion (40%), pepper (50%), cabbage (57%) and watermelon(78%) producers sell their outputs at farmgate. Some tomato (17%), onion (46%), pepper (46%), cabbage (33%) and watermelon (5%) producers sell at rural markets within the production clusters.

Middlemen play significant role in purchase of the commodities. Most of the middlemen/aggregators operate as bulking agents buying for wholesalers they usually play a crucial role in determining the market price for the products. It can be concluded that the middlemen and aggregators are buying most of the vegetable crops (table 17). Only few of the producers sell directly to consumers, to company agents or to local processors who dry tomato and pepper.

Table 17: Major Market Outlets and Buyers of Vegetable Crop

Major Market Outlets and Buyers	Tomato	Onion	Pepper	Cabbage	Watermelon
Major Market Outlet:					
Home	3%	10%	2%	5%	3%
Farm Gate	73%	40%	50%	57%	78%
Rural Market	17%	46%	46%	33%	5%
Urban Market	7%	4%	22%	5%	14%
Major Buyer:					
Consumer	3%	2%	8%	5%	2%
Middlemen/Aggregators	87%	90%	90%	89%	90%
Local Processor	6%	6%	2%	4%	8%
Company/Firm Representative	4%	2%		1%	
Farmers' Cooperative				1%	

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
Source: S4C Baseline Survey, 2019

Vegetable markets are spread across Kano State serving diverse production clusters. The most popular urban vegetable market is Yankaba market located within Kano metropolis (Nasarawa Local Government Area). However, as mentioned above, most producers sell at farm gate (60%) or at rural markets around production clusters (29%).

These rural markets are seasonal and therefore operate mainly during harvest periods. One example in Garun Malamis Kwanar Gafan International vegetable market which is situated along the Kano-Kaduna express road in Garun Malam Local Government Area. It is rural based, and it serves as a focal point for vegetable aggregation along the Garun Malam production cluster comprising of Garun Malam,

Kura and Bunkure LGAs. Other major rural markets are Liberia vegetables market situated at the tip-end of Thomas Dam along Kano–Danbatta road (in Danbatta LGA); Unguwar Mani vegetables market inKaraye Local Government Area, Kaleku vegetables market situated along Karaye-Rogoroad in Rogo Local Government Area and Dan Dabino vegetable market situated along Kiyawa-Bagwai road in Bagwai Local Government Area.

Aggregators and middlemen converge in the rural markets for market aggregation (vegetables are aggregated in the market for potential buyers) and farm aggregation (the aggregators lead potential buyers to various farms for the purchase of vegetables). Furthermore, involvement of companies/ supermarkets is limited. However, Dangote Tomato Processing Company purchases tomato at Kwanar Gafan International vegetables market between the months of February to April (irrigation production season). Also, some supermarkets and hotels purchase vegetables from Yan'kaba vegetables market (urban market).

In terms of quality standards and consumer preferences, each of the five vegetables has its own quality standards. Products that meet these standards are easier to sell and can be sold for a higher price than products that do not meet these standards. Although standards can differ among consumers, local exports (transports to different states in Nigeria) have been able to establish the general demands for the local market. These can be found in table 18 below.

Table 18: Quality standards

Crop	Quality standards
Tomatoes	Deep red colour, round shaped and firm structure. Het market in Abuja demands an average weight of 130-250g while the market in Kano expects an average weight of 80-180g per tomato
Cabbage	Shape should be round, and leaves should be packed tightly together, it is accepted if the cabbage is a bit flat as well. Average weight should be 3kg.
Sweet pepper	There is a demand for different colours, green is the most popular one. All peppers should have thick walls.
Hot pepper	Colour should be deep red and there should be a strong pungent smell.
Onion	Red colour, large size and filled properly.
Watermelon	Light green from the outside and deep red from the inside. Shape should be round or long and the product should have an average weight of 7kg. The taste should be sweet.

Despite the quality of vegetable crops, prices of vegetables fluctuate and serve as disincentive to vegetable producers especially during glut (dry season harvest period). The prices of both tomato and onion increases as from January, reach maximum in June (wet season) and there after declines to reach minimum value during the dry season in between the months of October to December before it steadily rises again (Table 19 and figure 3). The months of May (part), June, July, August and part of September are wet periods in North-west, Nigeria.

Prices of tomato and onion fluctuate and are generally higher during these (the wet season) months. On the other hand, the months of October to January (cold-dry) and February to April (hot-dry) constitute dry season. Prices of are lowest during the cold-dry season (Table 19 and Figure 3). During the cold-dry season, there is a glut in the market which means that the market is usually over satisfied with vegetables, leading to lower prices. Generally, prices of vegetables in North-west and specifically in Kano State, exhibit significant seasonal variations.

These variations in prices and supply periods could provide opportunities for introduction of new vegetable varieties and planning of production calendars to ensure steady supply and prices, as well as stabilize and enhance the producer's income. This could also encourage participation of entrepreneurs to establish large scale vegetable (tomato) processing companies could reduce glut and losses incurred by producers.

Table 19: Average Monthly Prices of Tomato and Onion in North West, Nigeria (2016 – 2018)

State	2016			2017			2018		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
Kano	102	187	142	141	215	171	203	299	253
Jigawa	101	199	148	120	202	143	124	172	154
Katsina	125	204	166	154	214	181	210	296	249
Kaduna	103	260	168	135	216	162	165	275	203
Kebbi	109	270	179	160	244	198	204	331	268
Zamfara	158	293	195	140	264	199	155	209	186
Sokoto	113	273	198	140	264	186	215	323	270
Mean	116	241	171	141	231	177	182	272	226

Source: Computed from NBS Commodity Prices (2016 – 2018) Prices in N/Kg

Figure 3.a: Seasonal Price Variation in Abuja

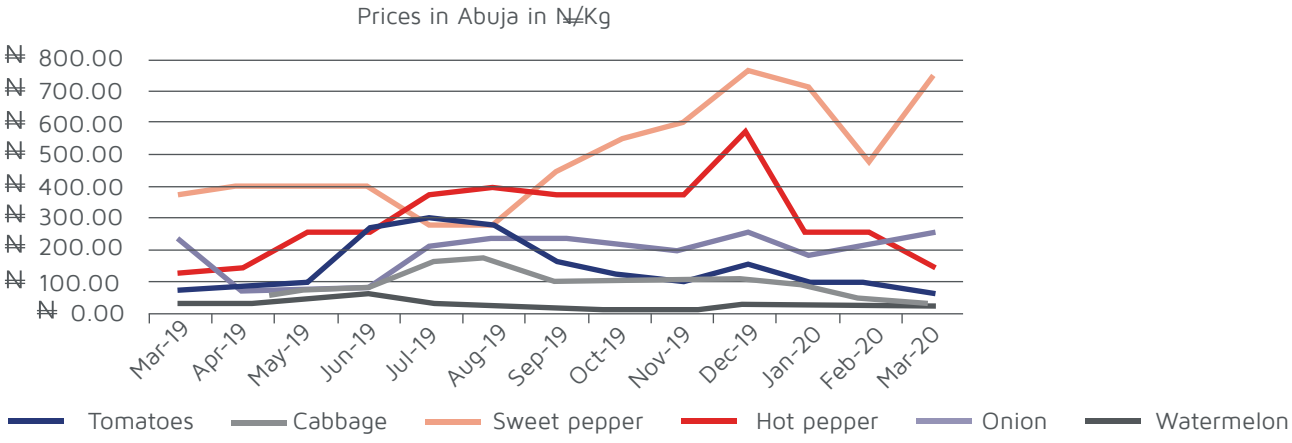
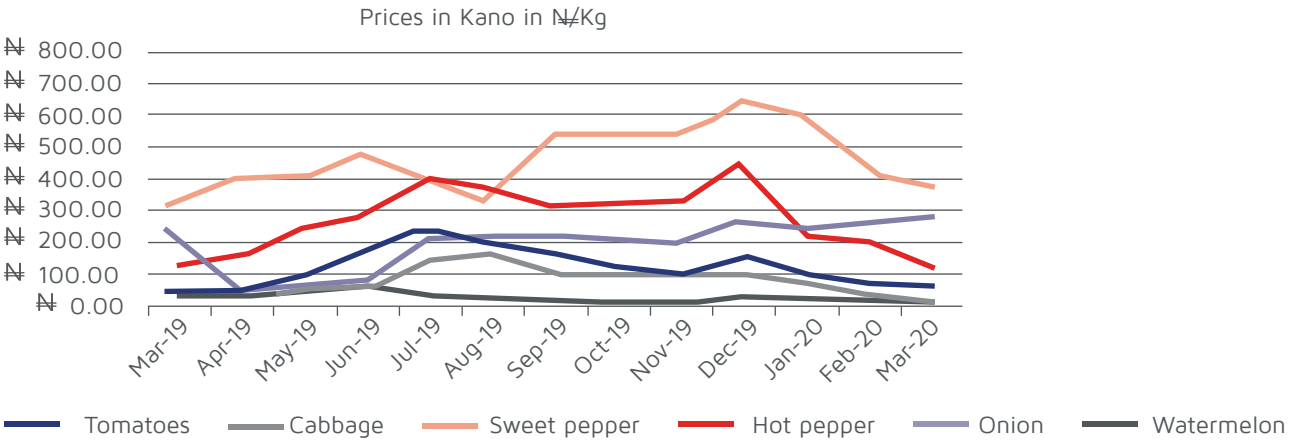


Figure 3.b: Seasonal Price Variation in Kano



4.9 Vegetable Crop Processing in Kano State

Except for the presence of the Dangote Tomato Processing Company located within Garun Malam Production cluster along Kano- Kaduna express way; there is no participation of a modern vegetable crop processing firm in the study area. Local drying of tomato and pepper is common especially in the rural markets operating in the production clusters. Local processing (sun-drying) is more pronounced during glut periods. The drying process involves cutting tomato and sun drying on the floor ground. The Kwanar Gafan market located in Garun Malam production cluster is a popular tomato and pepper drying spot in Kano State. In addition, marketers in Yankaba vegetable market (urban market) are exploring the possibilities of acquiring vegetable dryers to reduce vegetables post harvest loses.

Furthermore, the Nigerian Stored Products Research Institute and the NGOs Pyxera and Technoserve promoted technology for packaging, solar drying of vegetables, storage and processing tomato fruits into paste. However, the use of these technologies is yet to be common among tomato value chain actors in the study area. The quantities of packing material purchased can be found in table.

Table 20: Quantity of Packaging Materials Used among Vegetable Crop Producers

Packaging Materials	Tomato		Onion		Pepper		Cabbage		WaterMelon*	
	AVG	SE	AVG	SE	AVG	SE	AVG	SE	AVG	SE
BASKETS/BAGS										
Quantity of Bag/Basket purchased (Kg)	146	36	49	6	161	22	163	20	.	.
Quantity of Bag/Basket Used (Kg)	145	36	45	6	140	19	150	18	.	.
Unit Price of Bag/Basket Purchased (₦/ Kg)	136	12	125	8	98	5	103	7	.	.

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
No packaging material is used for watermelon.
SE: Standard Error, AVG: Average

4.10 Major Production Constraints and Marketing Challenges among Vegetable Crop Producers

The constraints to production and marketing of vegetable produce are many. The major constraints to production were incidences of pest (tuta absoluta) and diseases (bacterial blight,and fungal infection). More incidences of tutaabsoluta have been reported by 62% of tomato producers in the study area (Table 21 a).

This implies that the disease manifests on 74 out of every 120 tomato fields in the study area. Close to 50% of pepper producers in the study area reported the incidence of bacterial blight and fungal infections. In addition, high glut accompanied by low prices often reduce producer incomes and hence the capital base required for continued and expansion of production. This is part of the reason why producers often report of inadequate capital for production and increases the outcry for credit facilities among them. Furthermore, the producers indicated they would need a higher availability of certified improved seeds. Lastly, the labour intensive nature of vegetable production is increasing the need for better farm tools and production methods (Table 21b).

Table 21.a: Major Pest and Diseases of Vegetable Crops observed by Producers

Major Pests and Diseases	Tomato	Onion	Pepper	Cabbage	Watermelon
Pest:					
Ttaabsoluta	62%	11%	17%	19%	20%
Diseases:					
Bacterial blight, and fungal infection	8%	19%	49%	21%	31%
Anthracnose	-	29%			-

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
Source: S4C Baseline Survey, 2019

Table 21.b: Major Production Constraints and Marketing Challenges among Vegetable Crop Producers

Issues	Tomato	Onion	Pepper	Cabbage	Watermelon
Production Constraints in 2018					
Lack of Certified Improved seeds	22%	43%	31%	38%	27%
Unfavorable Climatic Conditions	29%	26%	35%	36%	44%
Pest and Diseases	90%	72%	81%	89%	79%
Large post-harvest loss	36%	38%	25%	27%	32%
Inadequate farm tools & equipment	18%	31%	22%	22%	20%
Inadequate capital	43%	50%	46%	42%	48%
Inadequate/Lack of credit facilities	35%	35%	34%	43%	28%
Inadequate extension services.	19%	30%	23%	23%	17%
Marketing Challenges in 2018:					
Distance to market is very far	18%	17%	26%	38%	23%
Lack of ready market	68%	60%	52%	58%	54%
Very few buyers	46%	35%	46%	54%	53%
High Cost of Transportation/Unreliable transport	11%	16%	11%	15%	13%
Prices offered is low	72%	68%	59%	67%	63%
Impassable roads	9%	9%	22%	10%	19%
There is oversupply of the commodity in the market	62%	53%	46%	39%	38%
Quality not acceptable to buyers	10%	12%	10%	8%	11%

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600. Figures will not add-up to 100% because of multiple response. Source: S4C Baseline Survey, 2019

With regards to the main marketing constraints as demonstrated above in table 20b, poor market outlet, few buyers, glut and low prices in addition to poor road networks linking production and market places has often given the impression of oversupply of the products. These constitute serious marketing challenges among producers of vegetables.

4.11 Capacity building for Vegetable Crops Producers

Capacity building is a necessary component for the development of vegetable crop sub-sector. Generally, successful vegetable crops production,harvest and post-harvest activities requires knowledge, skills and use of appropriate improved technologies. Farmers need to (continuously) update their technical production knowledge and skills in order to improve productivity and quality of outputs. Depending on the crop, between 23 and 51% of the vegetable crop producers in the study area have participated in a technical training (Table 21a).

This low figure can becaused by the fact that farmers are scattered across many locations in Kano State. Also, farmer organizations in the study area are quite weak, impairing their capacity to organize farmer step-down trainings. The targeted producer organizations in the study area require intensive re-organization and strengthening.

The training activities of Federal Ministry of Agriculture and Rural Development, Kano State Agricultural and Rural Development Authority, Research Institutes, Pyxera, Bakker Brothers, Rockefeller Projects and Dangote Tomato Processing Company and the previous efforts of other projects carried out by National Agricultural Extension and Research Liaison Services provide the needed platform for capacity building among vegetable producers in the area. Recent efforts by Nigerian Stored Products Research Institute and the NGOs mentioned above are all positive indications for feasibility to establish innovation and knowledge transfer platforms in the vegetable production clusters. Other important sources of innovations and information to farmers include agro-dealers, radio and co-farmers operating in the clusters.

As explained above, capacity building of farmers is key, specifically relating to the knowledge of good and improved agricultural practices and importance of improved inputs. In table 21b below, and overview of the awareness of vegetable farmers in the study location on improved varieties and GAP is presented. It can be found that farmers are, in general, aware of both GAP and improved varieties.

However, there is large difference between their awareness and adoption level. Generally, the differences are apparent between the awareness and adoption level of seed selection techniques and hybrid seeds (Table 22a and table 22b). Therefore, there is a need to build vegetable farmers' capacity to adopt hybrid seeds and related GAPs which will have a positive future effecton yields, income and livelihoods of various actors along the vegetable crops value chains.

Table 22.a: Capacity building on Vegetable Crops Production

Capacity building	Percentage of Tomato Producers	Percentage of Onion Producers	Percentage of Pepper Producers	Percentage of Cabbage Producers	Percentage of Watermelon Producers	Average of all producers
Received Training	42%	23%	26%	48%	51%	38%

Trainer:						
FMARD/ADP	12%	20%	15%	36%	26%	22%
NGO	25%	30%	8%	24%	9%	19%
Research Institutions	4%					4%
Public Information (radio, magazines)	18%	40%	58%	25%	43%	37%
Fellow Farmers	18%	70%	75%	50%	70%	56%
Buyers/Aggregators	16%	50%	46%	46%	43%	40%
Agro-dealers	6%	60%	50%	59%	74%	50%
Participate in Farm Demonstration	12%	25%	33%	27%	12%	22%

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
Source: S4C Baseline Survey, 2019

Table 22b: Level of Awareness and Adoption of Improved Seeds and Good Agricultural Practice among Vegetable crop Producers

Good Agricultural Practices on Seeds (GAP)	% of Tomato Producers	% of Onion Producers	% of Pepper Producers	% of Cabbage Producers	% of Watermelon Producers	AVG
Aware of Hybrid Seeds	83%	49%	61%	93%	97%	77%
Adopted Hybrid Seeds	14%	33%	2%	90%	0%	28%
Aware of OPV Seeds	54%	81%	88%	63%	83%	74%
Adopted OPV Seeds	52%	76%	86%	39%	72%	65%
Aware of Seeds Selection Techniques	55%	61%	58%	51%	79%	61%
adopted Seeds Selection Techniques	41%	37%	30%	34%	32%	35%
Aware of Seed Dressing Techniques	61%	74%	68%	62%	88%	70%
Adopted Seed Dressing Techniques	5%	67%	58%	58%	88%	65%
Aware of Recommended Seed Rate	66%	69%	72%	80%	88%	75%
Adopted Recommended Seed Rate	60%	69%	65%	61%	86%	68%
Aware of Nursery Preparation and Management Techniques	76%	83%	61%	84%		76%
Adopted Nursery Preparation and Management Techniques	70%	81%	53%	84%		72%

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
Source: S4C Baseline Survey, 2019. SE: Standard Error, AVG: Average

Similarly, most vegetable producers are aware of GPAs related to Crop Protection Practices (table 22c). These include checking label instructions for use of CPP (dosage/rate, precautions to use, etc.) and CPP expiry dates among others.

Table 21c demonstrates that there is a huge difference between the awareness and the use of the respective knowledge in vegetable production. Bridging the difference will require training involving practical demonstrations to achieve a number of desirable objectives which includes improvement in the proper and safe utilization of CPPs (food and human safety) increase yield and efficient use of CCP and decrease production costs (both CPP and labour costs). Appendix6 provides more details on GAPs awareness and adoption among vegetable farmers in the study area.

Table 22.c: Level of Awareness and Adoption of Improved Seeds and Good Agricultural Practice among Vegetable crop Producers

Good Agricultural Practices (GAP)	% of Tomato Producers	% of Onion Producers	% of Pepper Producers	% of Cabbage Producers	% of Watermelon Producers
Aware of Need to Ensure CPP has not Expired	85.45	79%	100%	91%	90%
Adopted checking on CPP Expiration Status	45.83	43%	23%	58%	40%
Adopted CPP Handling and Transportation Techniques	77.78	82%	97%	85%	88%
Adopted CPP Handling and Transportation Techniques	45.00	41%	32%	49%	35%
Aware of Need to Follow Label Instructions for Use of CPP	77.61	86%	92%	86%	83%
Adopted checking Label Instructions for Use of CPP	55.83	43%	54%	59%	39%
Aware of CPP Maximum Spray Solutions	79.37	78%	95%	86%	82%
Adopted GAP on CPP Maximum Spray Solutions	74.60	76%	93%	86%	76%
Aware of need to Avoid Spay in windy condition	83.33	74%	91%	88%	86%
Adopted spray in non-windy condition	80.30	72%	89%	88%	78%

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.
Source: S4C Baseline Survey, 2019

5.0 CONCLUSION AND RECOMMENDATIONS

Kano state offers large opportunities for vegetable production. Currently 160.000 hectares are used for vegetable production and new irrigation options have increased the productive months for vegetable production. Agricultural inputs are available, and farmers are aware of the various options. Although farmers can make a profit the margins can be quite low. Tomato farmers have to diversify their products in order to earn more than a normal wage for their effort.

The improving low yields make that there is room for improvements that can lead to a higher production and more income. High quality fertilizers, hybrid seeds, pesticides and herbicides are already available. Although farmers are aware of the existence of these products the exact benefits and instructions are not always clear leading to suboptimal performance. More training and knowledge transfer could change the attitude of the farmers towards these products and make clear that the higher investments needed for these products can lead to more profit aswell.

Increased income could be obtained by the increased yield meaning that more product could be sold. A the same time, production costs could be reduced. Currently labour is one of the biggest costs for the farmers. By applying herbicides and pesticides in the proper way labour could be reduced, leading to lower production costs. Besides increasing income for the farmers an increase in production will contribute to Nigeria's food security.

In view of the foregoing, the S4C activities in Kano State is hereby, recommended. The activities of the project should be centered on provision of quality seeds, creating awareness, strengthening the position of vegetable producers, improving production systems, productivity, and income of the vegetable producers. It is important that during these activities it will become clear for producers on how the initial investments can increase their profit margin overall. This will require dissemination and adoption of improved inputs (seeds, fertilizer), Good Agricultural Practices (GAPs) and labour saving devices.

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Appendix 1: Major Vegetable Crops Production and Market Locations in Kano State

Local Government Area	Name of Production Cluster	Production Cluster Coordinates	Name of Vegetable Markets	Vegetable Markets Coordinates
	DorawarSallau	N 11°39.742 E008°25.009	KwanarGafan International Vegetable Market	A. 11°40.504' N & 008°25.358E
Garun Malam LGA:	Dangote Tomato Processing Company	N 11°39.193 E008°24.875		
Kura LGA:	Kura	N 11°45.573 E008°25.369		B. 11°40.739 N & 008°25.371E
Bunkure LGA:	Bunkure	N 11°41.097 E008°32.640		
Madobi LGA:	Dan Marina	N 11°50.080 E008°18.351		C. 11°40.700N & 008°25.252E
Kibiya LGA:	Ginduwa	N 11°32.457 E008°38.678		D. 11°40.492N & 008°25.197E
	Makoda	12°19.129 E008°31.601	Liberia Vegetable Market	A. N 12°19.038 E008°31.406
	Thomas Dam Irrigation site			B. 12°19.131 E008°31.478
Danbatta LGA:	Shiddar	N12°22.793 E008°34.595		C. 12°19.178 E008°31.408
Kunchi LGA:	Dankwai/ Kasuwarkuka	N12°25.635 E008°22.184		D. 12°19.182 E008°31.476
Karaye LGA:	Karaye	N11°46.434 E008°17.097	Unguwar Mani Vegetable Market	N11°46.434 E008°17.097
Rogo LGA:	Kaleku	N11°40.563 E007°54.410	Kaleku Vegetable Market	N11°36.557 E007°52.292
Kiru LGA:	Kiru	N11°42.583 E008°75.571		
Gwarzo LGA:	Nassarawan- Mainika	N11°55.651' E007°55.546'		
Bagwai LGA:	Bagwai	N12°08.705' E008°10.532'		
	Bakin Rafin Kanye Dam	N11°59.651' E008°08.263'		

RiminGado LGA:	Gulu	N11°49.751 E008°17.154		
Shanono LGA:	Faruruwa	N12°11.073 E007°55.447		
Kabo LGA:	Masanawa	N11°49.643 E008°17.155		
Warawa LGA:	Larabar Gadon Sarki	N11°53.628 E008°51.295		
Dawakin Kudu LGA:	HausawaKaba	N11°52.101 E008°30.970		
	Tassa	N11°52.047 E008°30.155		
Kumbotso LGA:	TudunKaba	N11°52.045' E008°30.155		
Garko LGA:	Garko	N11°36.491		
	KafinChiri	E008°51.455		
Wudil LGA:	GarinDau	N11°47.983 E008°49.463		
Ajingi LGA:	Unguwar Bai	N12°02.803 E008°58.648		
Minjibir LGA:	Wase	N12°08.794 E008°41.499		
Albasu LGA:	Hamdallahi	N11°37.988 E009°03.499		
Nasarawa			Yan' Kaba General Vegetable Market	A. N12°00.648' E008°34.878' B. N12°00.493' E008°34.835' C. N12°00.464' E008°34.927' D. N12°00.525'

Source: S4C Vegetable Crops Baseline Survey in Kano State, Nigeria (2019)

Appendix 2: List of Vegetable Crops Aggregators in Kano State

Local Government Area	Name of Production Cluster	Name of Vegetable Market
	Garun Malam	
	DorawarSallau	
Garun Malam LGA:	Kadawa **Dangote Tomato Processing Company**	KwanarGafan International Vegetable Market
Tomato Aggregators	(1) Alh. Hamisu S/Dallalai (08035221474), (2) Alh. ZailaniDorawarSallau (08066949697), (3) Sama'ilaRabi'u (07062925251), (4) Nasiru S. Tijjani (08109289626)	
Onion Aggregators	(1) IsyakuBasiru (08032696442), (2) AdamuSojaDakasoye (07034311354)	
Pepper Aggregators	(1) HamisuGarba (08133065898)	
Cabbage & Green Beans Aggregators	(1) Iliya Dan Wada (08064137028)	
Watermelon Aggregators	(1) Alh. Zailani D/sallau (08066949697), (2) Alh. Yakubu Hassan (08036069218)	

Kura LGA:	**Kura**	**Kwanar Gafan International Vegetable Market**
Tomato Aggregators	(1) Alh. Hassan (08038929984)	
Onion Aggregators	(1) Aminu Butalawa (08066355260)	
Pepper Aggregators	(1) Mahmud Abubakar (07034311354)	
Cabbage Aggregators	None Identified	
Watermelon Aggregators	None Identified	

Bunkure LGA:	**Bunkure**	**KwanarGafan International Vegetable Market**
Tomato Aggregators	(1) Dan uwaBuja (07062034791), (2) Alh. Nafi uBunkure (07034486249)	
Onion Aggregators	(1) SulaimanBunkure (07067686253)	
Pepper Aggregators	(1) MuhdRabi u (09067470717)	
Cabbage Aggregators	None Identified	
Watermelon Aggregators	None Identified	

Madobi LGA:	**Dan Marina**	**KwanarGafan International Vegetable Market**
Tomato Aggregators	None Identified	
Onion Aggregators	None Identified	
Pepper Aggregators	None Identified	
Cabbage Aggregators	None Identified	
Watermelon Aggregators	None Identified	

Local Government Area	Name of Production Cluster	Name of Vegetable Market
Kibiya LGA:	**Ginduwa**	**KwanarGafan International Vegetable Market**
Tomato Aggregators Onion Aggregators Pepper Aggregators Cabbage Aggregators Watermelon Aggregators	(1) Halliru Sani (08029239829), (2) Idris Uba (08100417336)	
Makoda LGA &Danbatta LGA	Makoda	**Liberia Vegetable Market**
Tomato Aggregators Onion Aggregators Pepper Aggregators Cabbage Aggregators Watermelon Aggregators	(1) Alh. Mati (08063555076), (2) Sa aduAlh. Sule (09038026864), (3) Yusuf Hassan Satame (08106791806), (4) Adamu Ahmad Chidari (08036569996)	
Danbatta LGA	**Thomas Dam Irrigation site** **Shiddar**	**Liberia Vegetable Market**
Tomato Aggregators Onion Aggregators Pepper Aggregators Cabbage Aggregators Watermelon Aggregators	(1) Alh. Babanliya (08071618641), (2) Sani Mai laya (08164666949), (3) Alh. Sa'idu Ali Shiddar (07068265920)	
Kunchi LGA:	**Dankwai/ Kasuwarkuka**	**Liberia Vegetable Market**
Tomato Aggregators Onion Aggregators Pepper Aggregators Cabbage Aggregators Watermelon Aggregators	(1) Alh. Maami/ ZulyadainiNasiru (08086850838)	
Karaye LGA:	**Karaye**	**Unguwar Mani Vegetable Market**
Tomato Aggregators	(1) Alh.DanJinjiri Abdo (08069173823), (2) Alh. Iliya 07043410770	
Onion Aggregators	(1) Mustapha Zakiru (08036163091)	
Pepper Aggregators	(1) Alh. Sani Mai Doya (08068979493)	
Cabbage Aggregators	(1) Alh. Bala Mai KayanGwari (08038860603)	

Local Government Area	Name of Production Cluster	Name of Vegetable Market
Watermelon Aggregators	(1) Alh. Bala Mai KayanGwari (08038860603)	

Rogo LGA:	**Kaleku**	**Kaleku Vegetable Market**
Tomato Aggregators	(1) Shu'aibu Umar (09037413171)	
Onion Aggregators	Not Identified	
Pepper Aggregators	Not Identified	
Cabbage Aggregators	Not Identified	
Watermelon Aggregators	(1) Alh. Abdu A.K. (07069457969)	

Kiru LGA:	**Kiru**	**Farm Aggregation and Dispersed Marketing**
Tomato Aggregators	(1) Yakubu Muhd (07060484388), (2) Umar Tukur (08036146981), (3) Iliya Amadu (08146166864)	
Onion Aggregators		
Pepper Aggregators		
Cabbage Aggregators		
Watermelon Aggregators		

Gwarzo LGA:	**Nassarawan Mainika**	**Local aggregators from others states**
Tomato Aggregators	(1) Iliya Amadu (08137475946), (2) Yunusa Hali (08032240341	
Onion Aggregators		
Pepper Aggregators		
Cabbage Aggregators		
Watermelon Aggregators		

Bagwai LGA:	**A). Bagwai**	**Dan Dabino Vegetable Market**
	B). BakinRafin Kanye Dam	
Tomato Aggregators	A: (1) Ahmed Salisu (08064461049), (2) Rafi'ulnuwa (08135640808), (3) Sa'idu Abba Bagwai (08086516068), (4) Bashir Sulaiman Yusuf (08032589929); B: (1) LabiruBakin Rafi (08152142380), (2) Abbas Bala 09026485870	
Onion Aggregators		
Pepper Aggregators		
Cabbage Aggregators		
Watermelon Aggregators		

Local Government Area	Name of Production Cluster	Name of Vegetable Market
RiminGado LGA:	**Gulu**	**Farm Aggregation and Dispersed Marketing**
Tomato Aggregators Onion Aggregators Pepper Aggregators Cabbage Aggregators Watermelon Aggregators	(1) Alh. Dan Ummai (08144962316), (2) Ali Usman (08073349490)	
Shanono LGA:	**Faruruwa**	**Farm Aggregation and Dispersed Marketing**
Tomato Aggregators Onion Aggregators Pepper Aggregators Cabbage Aggregators Watermelon Aggregators	(1) Alh. Haruna Faruruwa (08189598518), (2) Inusa Ibrahim	
Kabo LGA:	**Masanawa**	**Farm Aggregation and Dispersed Marketing**
Tomato Aggregators Onion Aggregators Pepper Aggregators Cabbage Aggregators Watermelon Aggregators	(1) Jamilu Nuhu Masanawa (08103481150), (2) Ibrahim Nuhu Masanawa c/o (1)	
Warawa LGA:	**Larabar Gadon Sarki**	**Farm Aggregation and Dispersed Marketing**
Tomato Aggregators Onion Aggregators Pepper Aggregators Cabbage Aggregators Watermelon Aggregators	(1) Alh. Sabo Haruna (08032871208), (2) Alh. Kabiru Amadu (07067339206)	
Dawakin Kudu LGA:	HausawaKaba	Farm Aggregation and Dispersed Marketing
	Tassa	

Local Government Area	Name of Production Cluster	Name of Vegetable Market
Tomato Aggregators Onion Aggregators Pepper Aggregators Cabbage Aggregators Watermelon Aggregators	(1) AbdusSalamMuhd (09033437652), (2) Nazifilnusa (08167503677), (3) SaminuSule (09030078977)	

Kumbotso LGA:	**TudunKaba**	**Farm Aggregation and Dispersed Marketing**
Tomato Aggregators Onion Aggregators Pepper Aggregators Cabbage Aggregators Watermelon Aggregators	Sani Musa (09078032742)	

Garko LGA:	**Garko**	**Farm Aggregation and Dispersed Marketing**
	KafinChiri	
Tomato Aggregators Onion Aggregators Pepper Aggregators Cabbage Aggregators Watermelon Aggregators	(1) Usman Shu aibu (09026382130), (2)Alh. Murtala Ali (08088754899), (3) Alh. YahuzaTakai (08038857146)	

Wudil LGA:	**GarinDau**	**Farm Aggregation and Dispersed Marketing**
Tomato Aggregators	AbdurRahim Dan Maida (08101058247)	
Onion Aggregators		
Pepper Aggregators		
Cabbage Aggregators		
Watermelon Aggregators		
Ajingi LGA:	Unguwar Bai	**Farm Aggregation and Dispersed Marketing**
Tomato Aggregators	Mal. Basiru Liman (08092239230)	
Onion Aggregators		
Pepper Aggregators	Alh. Haruna Na Halima (09093667919)	
Cabbage Aggregators		
Watermelon Aggregators		

Local Government Area	Name of Production Cluster	Name of Vegetable Market
Minjibir LGA:	**Wase**	**Farm Aggregation and Dispersed Marketing**
Tomato Aggregators	(1) Dayyabu Usman (08037171163), (2) HuduNafi'u (08039321176)	
Onion Aggregators		
Pepper Aggregators		
Cabbage Aggregators		
Watermelon Aggregators		
Albasu LGA:	**Hamdallahi**	**Farm Aggregation and Dispersed Marketing**
Tomato Aggregators	(1) Alh. Abdu Abdullahi (09070506285), (2) Adamu Idris (07011555460)	
Onion Aggregators		
Pepper Aggregators		
Cabbage Aggregators		
Watermelon Aggregators		
Nasarawa	**Yankaba**	**Yan Kaba General Vegetable Market**
Tomato Aggregators	Alh. Dabo Sani (08065426888)	
Onion Aggregators	Alh. Umar Irahim Chairman (08036986802)	
Pepper Aggregators	(1) Abdulhamid Yellow (08039216026), (2) Rabi uAbdulJalaah (08023570229)	
Cabbage Aggregators	Alh. Malami c/o (08036986802)	
Watermelon Aggregators	Tasi u Chairman (08022761559)	

Appendix 3: Socio-Economic Characteristics of Vegetable Producers in Kano State

Demographic/Socio-Economic Variables	Tomato	Onion	Pepper	Cabbage	Watermelon
Producer's Age:					
<20	0	1%	1%	0%	1%
20-29	19%	14%	26%	20%	28%
30-39	40%	38%	36%	37%	38%
40-49	22%	17%	22%	22%	20%
50-59	10.83	23%	14%	19%	11%
≥60	6.67	67%	2%	3%	3%
Minimum	18	18	19	20	19
Maximum	67	85	62	70	65
Average	38	40	36	38	36
Standard Error (SE)	1	1	1	1	1
Marital Status:					
Married Monogamous	39%	44%	50%	49%	43%
Married Polygamous	47%	43%	33%	38%	38%
Single	14%	13%	17%	13%	20%
Divorced	-	-			-
Widowed	-	-			-
Separated	-	-	83%		-
Producer's Religion:					
Islam	100%	100%	99%	99%	100%
Christianity	-	-	1%	1%	-
Traditional	-	-			-
Position of the respondent in the household:					
Husband	79%	80%	66%	82%	68%
Wife	1%	7%	13%	1%	8%
Daughter	0%	0%	8%	1%	1%
Son	20%	13%	12%	15%	23%
Blood relative	0%	0%	1%	1%	0%
Non-blood relative	-	-			-

Status of the respondent:					
Household Head	77%	79%	62%	79%	63%
Not Household Head	23%	21%	38%	21%	37%
Years of Experience in Vegetable Production:					
01-May	19	28	42	63	40
06-Oct	31	30	38	21	36
Nov-15	13	15	8	9	13
16-20	25	14	4	4	7
>20	13	13	8	3	4
Minimum	1	1	1	1	1
Maximum	44	52	40	25	25
Average	17	13	9	6	8
Standard Error (SE)	1	1	1	0	1
Producer's Educational Status:					
None	-	2%	1%	1%	1%
Primary school	13%	19%	19%	23%	18%
Secondary school	37%	26%	38%	39%	45%
Tertiary	18%	14%	8%	10%	12%
Adult Education	2%	2%	3%	4%	3%
Quranic Education	30%	37%	31%	23%	21%

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.

Socio-economic Characteristics of Vegetable Producers (Continued)

Demographic/Socio-Economic Variables	Tomato	Onion	Pepper	Cabbage	Watermelon
Membership of Cooperative/Economic or Interest Group:					
Official	28%	43%	33%	28%	24%
Member	42%	23%	25%	21%	28%
Not Member	58%	76%	75%	79%	73%
Registration Status of Cooperative:					
Registered	80%	86%	80%	92%	76%
Not Registered	20%	14%	20%	8%	24%

Benefits Derived from the Group:					
Agricultural productivity/Other Training	60%	62%	33%	83%	50%
Access to credit/loans	35%	42%	68%	64%	27%
Access to inputs at subsidized rate	45%	23%	61%	64%	36%
Buy Back services	8%		21%	5%	5%
Negotiated Product Prices	10%		21%	0%	9%
Social Belonging	52%	46%	55%	91%	95%
Leadership/group dynamics training	20%	15%	6%	9%	9%
Just joined the group this year	13%	4%	13%	-	9%

Organizational Best Practices Adopted by the Cooperative/Group					
Business Planning	40%	12%	40%	65%	40%
Group Registration	49%	8%	25%	63%	30%
Group Decision Making	66%	19%	38%	76%	55%
Bulk Procurement	31%	8%	7%	44%	20%
Bulk Selling	22%	8%	13%	13%	10%
Technical support in production techniques	17%	15%	20%	13%	-
Quality Control and marketing	3%	8%	13%	-	-
Enterprise Loans	3%			-	5%
Market Access	19%	4%	44%	25%	22%
Input Supply	24%	12%	24%	29%	18%
Intra-group Training and Technical Assistance	9%	4%	29%	-	10%
Finance Access	18%			-	5%
Infrastructure Development	3%		25%	6%	-
Policy/Advocacy	21%	8%	31%	19%	5%
Record Keeping	29%		18%	6%	5%

Bulk Procurement of Seeds:					
Agro-dealer/company/research institute/ADP	69%	100%	25%	45%	100%
Open Market	31%		75%	55%	-
Bulk Procurement of Fertilizer:					
Agro-dealer/Company/Research institute/ADP	64%	100%	20%	50%	100%
Open Market	36%		80%	50%	-
Bulk Procurement of Pesticides:					
Agro-dealer/Company/Research institute/ADP	63%	100%	38%	40%	100%
Open Market	37%	0%	62%	60%	0%

Contact with Extension Agent:					
Have Contact	45%	39%	38%	63%	38%
No Contact	55%	61%	62%	37%	62%

Number of Contact with Extension Worker:					
1 to 5	81%	94%	89%	92%	80%
6 to 10	13%	6%	11%	7%	9%
11 to 15	2%			1%	7%
16 to 20	4%			-	4%
Minimum Number of Contact	1	1	1	1	1
Maximum Number of Contact	10	8	10	12	20
Average Number of Contact	3	3	3	3	3
Standard Error (SE)	0	0	0	0	0

Sample size (n) = 120 per crop (Tomato, Onion, Pepper, Cabbage, Watermelon); Total sample size = 600.

Appendix 4.a: Varieties of Tomato Released in Nigeria (1980 – 2015)

NC*	Variety Name	Original Name	Outstanding Characteristics	Agroecological Zones	Origin/Source			Max. Yield (t/ha)	YOR*	YORE
NGLE -91-12	SAMTOM -12	Ronita	High yielding and good paste qualities		Station and Arnwlioration des plates maraicheris, Monfavent France	IAR, Samaru Zaria			1980	1991
NGLE -91-11	SAMTOM -11	Enterpriser	Produces very large and attractive skin for salad. (46-53.7t/ha)		USDA, Beltsville, Maryland U.S.A.	IAR, Samaru Zaria	46	53.7	1980	1991
NGLE -91-10	SAMTOM -10	Ife -1	Medium size, round and attractive fruit with their skin, good for salad. (49- 53.9t/ha)		Faculty of Agriculture, O.A.U. Ile Ife.	Faculty of Agriculture, O.A.U. Ile Ife.	49	53.9	1980	1991
NGLE -91-9	SAMTOM -9	Gemed - F	Similar to SAMTOM -8, but also resistant to Fusarium, yield 42, 100- 45, 600kg/ha. (42.1-45.6t/ha)		Hazara Seeds Ltd., Haltalsreal, Dizing of W.A. (Nig) Ltd., Apapa Lagos	IAR, Samaru Zaria	42.1	45.6	1980	1991
NGLE -91-8	SAMTOM -8	Gamad	High yield and good paste color, reported to have some drought tolerance. (48.3-62.4t/ha)		Hazer seed Ltd, Italfa, Isreal	IAR, Samaru Zaria	48.3	62.4	1980	1991
NGLE -91-7	SAMTOM -7	Roma -VF	Combines high yield with good paste qualities, good processing tomato		Royal Sluis, Enkhuizen, Holland	IAR, Samaru Zaria			1980	1991
NGLE -91-6	SAMTOM -6	La Bonita	Uniform size, round and attractive fruit with skin suitable for salad		Texas-A&M Weslaco, U.S.A	IAR, Samaru Zaria			1980	1991

NC*	Variety Name	Original Name	Outstanding Characteristics	Agroecological Zones	Origin/Source			Max. Yield (t/ha)	YOR*	YORE
NGLE -91-5	SAMTOM -5	Chico	High yield and some heat tolerance. Good paste qualities.		Texas-A&M Weslaco, U.S.A	IAR, Samaru Zaria			1980	1991
NGLE -91-4	SAMTOM -4	Har-vester	High yield and good paste qualities. (49.5-59.1t/ha)		FMG Corp, California U.S.A. Peto, Italian, parwa, Italy USDA, Beltsville, Maryland, U.S.A.	IAR, Samaru Zaria	49.5	59.1	1980	1991
NGLE -91-3	SAMTOM -3	Piacenza 0164	High yield under heavy leaf spot disease pressure, good paste qualities		Institute Nazionale Gertica Rome, Italy	IAR, Samaru Zaria			1980	1991
NGLE -91-2	SAMTOM - 2	MARZANINO	High yielding, good paste qualties, field tolerance to leaf diseases and moderately resistant to Fusarium race 1. (51.7- 64.1t/ha)		Stazoine Sperimantele Parma, Italy	IAR, Samaru Zaria	51.7	64.1	1980	1991
NGLE -91-1	SAMTOM -1	CIRIO -56	High yielding, good paste qualities, field tolerance to leaf diseases and moderately resistant to Fusarium race 1. (47.5- 55.3t/ha)		Introduction from stezione Agraria Sperimentale, Bari, Italy	IAR, Samaru Zaria	47.5	55.3	1980	1991

NC*	Variety Name	Original Name	Outstanding Characteristics	Agroecological Zones	Origin/Source			Max. Yield (t/ha)	YOR*	YORE
NGLE -00 -14	Onityre	NGLE -158-3	Pinkish red puffy (ridged) fruits high fruit setting under wet humid condition. Tolerant to foliage diseases and rootknot nematode.		Ogbo-mosho	NIHORT			1985	2000
NGLE -00-13	Tomato	NHLE 30	Big pink fruits when ripe, high fruit setting under wet humid condition. Tolerant to rootknot nematode		Ibadan	NIHORT			1985	2000
NGLE -15 -17	Tylka	Tylka	High yielding, tolerant to Verticillium and fusarium wilt, Grey leaf spot, with firm fruits. (53.5t/ha)	Adapted to Derived, Southern guinea, Northern guinea and Sudan savannah.	Syngenta Nig. Ltd.	Syngenta Nig. Ltd.	53.5	53.5	2015	2015
NGLE -15 -16	Chibli	Chibli	High yielding, tolerant to fusarium wilt, late blight, with firm fruits and high brix good for processing. (56.7t/ha)	Adapted to Derived, Southern guinea, Northern guinea and Sudan savannah.	Syngenta Nig. Ltd.	Syngenta Nig. Ltd.	56.7	56.7	2015	2015
NGLE -15 -15	Kilele	Kilele	High yielding, tolerance to fusarium wilt and late blight with firm fruits. (59.8t/ha)	Adapted to Derived, Southern guinea, Northern guinea and Sudan savannah.	Syngenta Nig. Ltd.	Syngenta Nig. Ltd.	59.8	59.8	2015	2015

NC: National Code; *YOR: Year of registration; YORE: Year of release

Appendix 4.b: Varieties of Pepper Released in Nigeria (1981 – 2016)

NC*	Variety Name	Original Name	Outstanding Characteristics	Agroecological Zones	Origin/Source	Developing Institute	Min. Yield (t/ha)	Max. Yield (t/ha)	YOR*	YORE
NGCF-00-2	Ata Sombo	NHCf 387	Profuse fruit setting with an upright plants shape.		Kano	NIHORT			1981	2000
NGCF-00-1	Ata Sombo	NHCf 371	Upright fruit bearing profile.		Ogbomoso	NIHORT			1982	2000
NGCF-00-5	Ata Rodo	NACa(R) 429	Prolific flowering and fruiting, disease tolerant.		Ibadan	NIHORT			1982	2000
NGCF-00-3	Ata Wewe	NHCf 378	Erect with profuse fruiting and an upright fruit carriage.		Zaria	NIHORT			1983	2000
NGCF-00-4	Ata Rodo	NACa(R) 142B	Erect, green stem colour, fruit declining, low pungency.		Oyo	NIHORT			1984	2000
NGCF-16-6	Lafayette	Lafayette	High yield; large, firm, blocky and smooth- skinned fruits. (26t/ha)	Derived, Southern Guinea, Northern Guinea and Sudan Savannah	Syngenta Holland	Syngenta Holland	26	26	2016	2016
NGCF-16-7	Jupiter	Jupiter	High yield; resistance to TMV, CMV and PVY. (32t/ha)	Derived, Southern Guinea, Northern Guinea and Sudan Savannah	Syngenta Holland	Syngenta Holland	32	32	2016	2016

Appendix 4c:Varieties of Cabbage Released in Nigeria (2016)

NC*	Variety Name	Original Name	Outstanding Characteristics	Agroecological Zones	Origin/ Source	Developing Institute	Min. Yield (t/ha)	Max. Yield (t/ha)	YOR*	YORE
NGBO-16-01	Gloria	Gloria	High yield, tolerant to blight, rot and wilt. (45t/ha)	Humid Forest, Derived, Southern Guinea, Northern Guinea and Sudan Savannah agro-ecologies	Syngenta Holland	Syngenta Holland	45	45	2016	2016
NGBO-16-02	Pruktor	Pruktor	High yield, tolerant to wilt, blight and rot. (39t/ha)	Humid Forest, Derived, Southern Guinea, Northern Guinea and Sudan Savannah agro-ecologies	Syngenta Holland	Syngenta Holland	39	39	2016	2016

*YOR: Year of registration; YORE: Year of release

Appendix 5: Labour use

Operations	Tomato	Onion	Pepper	Cabbage	Watermelon
Land Clearing:					
Land Clearing (Unpaid) in Man-day	25	8	28	18	11
Land Clearing (Paid) in Man-day	36	13	48	22	21
Amount Paid (N/Man-day)	400	500	350	450	450
Cost of Paid Labour (N/Ha)	14349	6265	16927	10062	9312
Cost of Unpaid Labour (N/Ha)	9972	4245	9973	7979	5096
Total Cost (Paid + Unpaid) (N/Ha)	24321	10510	26900	18041	14408
*Ploughing (N/Ha)	10628	9706	10914	9860	10510
*Harrowing (N/Ha)	13543	10676	10817	15111	13100
*Basin preparation (N/Ha)	9600	9600	9600	9600	9600
Total Cost of Land Preparation (N/Ha)	58092	40493	58231	52612	47618
Planting:					
Planting (Unpaid) in Man-day	13	13	16	15	5
Planting (Paid) in Man-day	71	33	26	39	14
Amount Paid (N/Man-day)	600	600	500	450	600
Cost of Paid Labour (N/Ha)	42720	19619	12978	17514	8194
Cost of Unpaid Labour (N/Ha)	7831	7926	7890	6908	3150
Total Cost of Planting (Paid + Unpaid) (N /Ha)	50551	27545	20868	24422	11344
Fertilizer Application:					
Fertilizer Application (Unpaid) in Man-day	30	14	29	38	17
Fertilizer Application (Paid) in Man-day	29	22	49	44	23
Amount Paid (N/Man-day)	950	700	450	600	500
Cost of Paid Labour (N/Ha)	27696	15433	22072	26224	11462
Cost of Unpaid Labour (N/Ha)	28334	10133	13136	22660	8595
Total Cost Fertilizer Application (Paid + Unpaid) (N /Ha)	56030	25567	35209	48884	20057
Weeding:					
Weeding (Unpaid) in Man-day	30	26	37	41	28

Weeding (Paid) in Man-day	163	80	82	73	58
Amount Paid (N/Man-day)	600	700	500	550	650
Cost of Paid Labour (N/Ha)	97844	55946	40984	39924	37918
Cost of Unpaid Labour (N/Ha)	17846	17850	18292	22492	18482
Total Cost Weeding (Paid + Unpaid) (N /Ha)	115690	73796	59276	62417	56400
Spraying:					
Spraying (Unpaid) in Man-day	13	6	27	15	12
Spraying (Paid) in Man-day	26	7	44	27	18
Amount Paid (N/Man-day)	600	550	350	350	450
Cost of Paid Labour (N/Ha)	15339	4011	15553	9389	8052
Cost of Unpaid Labour (N/Ha)	7976	3163	9446	5109	5181
Total Cost of Spraying (Paid + Unpaid) (N /Ha)	23314	7174	24999	14498	13233
Harvesting:					
Harvesting (Unpaid) in Man-day	24	14	53	51	16
Harvesting (Paid) in Man-day	242	37	163	73	39
Amount Paid (N/Man-day)	300	600	350	300	350
Cost of Paid Labour (N/Ha)	72655	22123	56957	21997	13542
Cost of Unpaid Labour (N/Ha)	7208	8691	18706	15382	5659
Total Cost of Harvesting (Paid + Unpaid) (N /Ha)	79863	30815	75663	37379	19201

Total Unpaid Labour used for Production (Man-day)	135	82	190	178	90
Total Paid Labour used for Production (Man-day)	567	191	413	278	172
Total Labour used for Production (Unpaid + Paid) in Man-day	702	273	603	455	262
Total Cost of Unpaid Labour used for Production (N/Ha)	79167	52009	77444	80530	46163
Total Cost of Paid Labour used for Production (N/Ha)	270602	123398	165471	125111	88480
Total Cost of Labour used for Production (Unpaid + Paid) in N/Ha	349770	175407	242915	205641	134642

Appendix 6: Adoption of Improved Seeds and Good Agricultural Practice among Vegetable Farmers

Good Agricultural Practices (GAP)	Tomato	Onion	Pepper	Cabbage	Watermelon
SEEDS:					
Aware of Hybrid Seeds	83%	49%		93%	97%
Used Hybrid Seeds in 2017	72%	22%	51%	88%	90%
Used Hybrid Seeds in 2018	80%	27%	63%	89%	93%
Source of GAP on Hybrid Seeds:					
VEA	49%	27%	51%	47%	40%
Agro-dealer	25%	34%	11%	52%	37%
Fellow farmer	26%	39%	38%	1%	23%
Aware of Open Pollinated Seeds	54%	81%	88%	63%	83%
Used Open Pollinated Seeds in 2017	53%	62%	58%	42%	48%
Used Open Pollinated Seeds in 2018	52%	76%	86%	39%	72%
Source of GAP on OPV:					
VEA	37%	32%	45%	57%	41%
Agro-dealer	43%	38%	25%	34%	29%
Fellow farmer	20%	30%	30%	9%	29%
Seed Selection:					
Aware Seeds Selection Techniques	55%	61%	58%	51%	79%
Used Seeds Selection Techniques in 2017	51%	48%	44%	46%	76%
Used Seeds Selection Techniques in 2018	40%	37%	30%	34%	32%
Source of GAP on Seeds Selection:					
VEA	47%	43%	28%	54%	47%
Agro-dealer	43%	30%	56%	41%	35%
Fellow farmer	10%	27%	16%	5%	18%
Seed Dressing Techniques:					
Aware of Seed Dressing Techniques	61%	74%	67%	62%	88%
Used Seed Dressing Techniques 2017	45%	35%	46%	43%	36%
Used Seed Dressing Techniques 2018	54%	67%	58%	58%	88%
Source of GAP Seed Dressing Techniques:					
VEA	63%	60%	33%	65%	40%
Agro-dealer	24%	19%	47%	29%	30%
Fellow farmer	13%	21%	20%	6%	30%

Aware of Recommended Seed Rate	66%	69%	72%	80%	
Used Recommended Seed Rate in 2017	42%	29%	45%	47%	41%
Used Recommended Seed Rate in 2018	60%	69%	65%	61%	86%
Source of GAP on Recommended Seed Rate:					
VEA	64%	71%	35%	55%	45%
Agro-dealer	12%	17%	48%	25%	27%
Fellow farmer	24%	11%	17%	20%	29%

Aware of Nursery Preparation and Management Techniques	76%	83%	61%	84%	
Used Nursery Preparation and Management Techniques in 2017	45%	30%	32%	52%	
Used Nursery Preparation and Management Techniques in 2018	70%	81%	53%	84%	
Source of GAP on Nursery Preparation and Management Techniques:					
VEA	61%	64%	47%	71%	
Agro-dealer	17%	22%	39%	32%	
Fellow farmer	22%	14%	13%	3%	

Adoption of Fertilizer Good Agricultural Practice among Vegetable Farmers

Good Agricultural Practices (GAP)	Tomato	Onion	Pepper	Cabbage	Watermelon
Aware of Appropriate Fertilizer Dosage	77%	79%	97%	82%	53%
Used Appropriate Fertilizer Dosage in 2017	67%	70%	89%	80%	47%
Used Appropriate Fertilizer Dosage in 2018	51%	39%	29%	41%	38%
Source of GAP on Appropriate Fertilizer Dosage:					
VEA	49%	57%	63%	82%	51%
Agro-dealer	18%	26%	29%	6%	42%
Fellow farmer	33%	17%	11%	12%	7%

Aware of undesirability to mix NPK and Urea During Application	75%	67%	86%	76%	78%
Used proper fertilizer Application Techniques in 2017	64%	65%	82%	46%	63%
Used proper fertilizer Application Techniques in 2018	37%	38%	55%	42%	41%

Source of GAP on Fertilizer Application Techniques:					
VEA	57%	54%	35%	64%	37%
Agro-dealer	25%	28%	37%	34%	43%
Fellow farmer	18%	17%	29%	2%	20%

Adoption of Farmers Crop Protection Products and GAP among Vegetable

Good Agricultural Practices (GAP)	Tomato	Onion	Pepper	Cabbage	Watermelon
Aware of Need to Ensure CPP has not Expired	85%	79%	100%	91%	90%
Used Knowledge on CPP Expiration Status in 2017	46%	43%	23%	58%	40%
Used Knowledge on CPP Expiration Status in 2018	46%	43%	23%	58%	40%
Source of GAP on CPP:					
VEA	33%	79%	18%	46%	35%
Agro-dealer	47%	21%	71%	53%	46%
Fellow farmer	20%	15%	11%	1%	19%
Aware of CPP Handling and Transportation Techniques	78%	82%	97%	85%	88%
Used CPP Handling and Transportation Techniques in 2017	45%	41%	32%	49%	35%
Used CPP Handling and Transportation Techniques in 2018	45%	41%	32%	49%	35%
Source of GAP on CPP Handling and Transportation Techniques:					
VEA	35%	82%	18%	37%	36%
Agro-dealer	44%	18%	66%	61%	50%
Fellow farmer	20%	100%	16%	2%	14%
Aware of Need to Follow Label Instructions for Use of CPP	78%	86%	92%	86%	83%
Used Label Instructions for Use of CPP in 2017	56%	43%	54%	59%	39%
Used Label Instructions for Use of CPP in 2018	56%	43%	54%	59%	39%
Source of GAP on Label Instructions:					

VEA	37%	45%	58%	28%	45%
Agro-dealer	43%	41%	35%	66%	45%
Fellow farmer	19%	14%	6%	7%	10%

Good Agricultural Practices (GAP)	Tomato	Onion	Pepper	Cabbage	Watermelon
Aware of CPP Maximum Spray Solutions	79%	78%	95%	86%	82%
Used of GAP on CPP Maximum Spray Solutions in 2017	53%	38%	49%	59%	41%
Used of GAP on CPP Maximum Spray Solutions in 2018	75%	76%	93%	86%	76%
Source of GAP on CPP Maximum Spray Solutions:					
VEA	35%	41%	69%	30%	27%
Agro-dealer	46%	46%	12%	62%	67%
Fellow farmer	19%	13%	19%	10%	6%
Aware of Operator-Exposure Protection Techniques	83%	69%	96%	90%	89%
Operator-Exposure Protection Techniques in 2017	53%	52%	59%	56%	47%
Operator-Exposure Protection Techniques in 2018	73%	69%	92%	87%	86%
Source of GAP:					
VEA	35%	39%	63%	46%	29%
Agro-dealer	49%	36%	10%	54%	54%
Fellow farmer	16%	26%	27%		18%
Do not Spray in windy conditions:					
Aware	83%	74%	91%	88%	86%
Used in 2017	55%	58%	45%	56%	49%
Used in 2018	80%	72%	89%	88%	78%
Source of GAP:					
VEA	33%	38%	74%	46%	19%
Agro-dealer	42%	35%	15%	51%	51%
Fellow farmer	24%	28%	11%	3%	31%

Do not discard Empty Containers in the field:					
Aware	80%	86%	91%	71%	78%
Used in 2017	51%	48%	53%	54%	45%
Used in 2018	75%	88%	95%	77%	80%
Source of GAP:					
VEA	31%	53%	66%	25%	26%
Agro-dealer	51%	36%	5%	62%	37%
Fellow farmer	18%	10%	38%	14%	37%
Do not eat, smoke or drink while handling or working with CPP:					
Aware	89%	86%	94%	84%	93%
Used in 2017	59%	60%	66%	75%	51%
Used in 2018	86%	85%	85%	83%	84%
Source of GAP:					
VEA	39%	86%	56%	42%	38%
Agro-dealer	41%	14%	14%	51%	41%
Fellow farmer	20%	13%	30%	7%	21%
Wash Yourself and Clothes after working with CPP:					
Aware	86%	87%	95%	93%	96%
Used in 2017	54%	56%	61%	63%	56%
Used in 2018	83%	87%	85%	91%	91%
Source of GAP:					
VEA	35%	55%	60%	45%	30%
Agro-dealer	43%	33%	12%	44%	37%
Fellow farmer	22%	12%	27%	11%	33%
Wash Spray Clothes Separately from Domestic Clothes:					
Aware	89%	86%	97%	95%	91%
Used in 2017	53%	54%	61%	64%	56%
Used in 2018	82%	83%	90%	88%	85%
Source of GAP:					
VEA	36%	52%	55%	45%	28%
Agro-dealer	45%	40%	12%	43%	42%
Fellow farmer	19%	8%	33%	12%	30%

Wash Before Drinking and or Eating:					
Aware	86%	88%	97%	91%	95%
Used in 2017	60%	60%	58%	68%	65%
Used in 2018	82%	86%	94%	91%	94%
Source of GAP:					
VEA	33%	51%	59%	40%	42%
Agro-dealer	47%	42%	26%	51%	36%
Fellow farmer	6%	7%	16%	10%	22%
Do not work with CPP if you feel unwell before you start:					
Aware	92%	74%	92%	92%	
Used in 2017	52%	60%	61%	63%	53%
Used in 2018	87%	74%	85%	89%	92%
Source of GAP:					
VEA	35%	49%	62%	38%	
Agro-dealer	48%	32%	10%	50%	48%
Fellow farmer	16%	19%	29%	12%	31%

Adoption of Land Management Good Agricultural Practice among Vegetable Farmers

Good Agricultural Practices (GAP)	Tomato	Onion	Pepper	Cabbage	Watermelon
Pre-harvest Practices (Field Sanitation)					
Aware	88%	90%	99%	90%	83%
Used in 2017	49%	56%	58%	61%	45%
Used in 2018	81%	88%	88%	89%	85%
Source of GAP:					
VEA	46%	64%	57%	68%	28%
Agro-dealer	20%	15%	13%	32%	31%
Fellow farmer	34%	21%	30%		41%
Timely Operations (plant/harvest)					
Aware	91%	95%	98%	93%	85%
Used in 2017	62%	66%	54%	68%	51%
Used in 2018	84%	92%	98%	93%	77%
Source of GAP:					
VEA	39%	65%	62%	62%	25%
Agro-dealer	24%	23%	12%	35%	38%
Fellow farmer	36%	13%	26%	2%	38%

Pests and Diseases Management:					
Aware	87%	95%	89%	89%	90%
Used in 2017	71%	68%	66%	83%	68%
Used in 2018	79%	93%	85%	85%	80%
Source of GAP:					
VEA	48%	68%	66%	61%	30%
Agro-dealer	24%	17%	23%	36%	37%
Fellow farmer	28%	15%	11%	3%	33%
Mono cropping:					
Aware	78%	89%	78%	88%	88%
Used in 2017	65%	61%	69%	82%	62%
Used in 2018	63%	84%	69%	82%	72%
Source of GAP:					
VEA	40%	66%	73%	65%	43%
Agro-dealer	21%	21%	18%	26%	23%
Fellow farmer	40%	14%	10%	9%	34%
Crop Rotation:					
Aware	63%	67%	93%	86%	90%
Used in 2017	50%	55%	59%	76%	53%
Used in 2018	47%	62%	86%	75%	79%
Source of GAP:					
VEA	43%	66%	69%	41%	30%
Agro-dealer	18%	33%	18%	49%	25%
Fellow farmer	38%	1%	13%	10%	44%
Agricultural Mechanization:					
Aware	80%	77%	96%	78%	93%
Used in 2017	59%	53%	59%	78%	70%
Used in 2018	75%	72%	94%	78%	76%
Source of GAP:					
VEA	41%	58%	68%	42%	40%
Agro-dealer	27%	30%	21%	55%	35%
Fellow farmer	32%	13%	11%	3%	25%
Sustainable Land Management:					
Aware	70%	73%	96%	71%	77%

Used in 2017	33%	34%	40%	61%	36%
Used in 2018	45%	34%	8%	32%	23%
Source of GAP:					
VEA	45%	66%	83%	21%	42%
Agro-dealer	30%	24%	13%	77%	30%
Fellow farmer	25%	10%	4%	3%	28%
Farm planning and record keeping:					
Aware	37%	57%	50%	71%	69%
Used in 2017	34%	27%	42%	63%	38%
Used in 2018	32%	78%	52%	71%	84%
Source of GAP:					
VEA	46%	78%	46%	27%	36%
Agro-dealer	22%	22%	40%	67%	42%
Fellow farmer	32%	100%	14%	7%	22%
Water Management:					
Aware	91%	90%	95%	68%	82%
Used in 2017	44%	24%	33%	54%	52%
Used in 2018	85%	79%	83%	68%	79%
Source of GAP:					
VEA	43%	52%	50%	51%	35%
Agro-dealer	15%	38%	15%	40%	24%
Fellow farmer	42%	10%	35%	9%	40%
Post-harvest Management:					
Aware	83%	82%	90%	85%	87%
Used in 2017	35%	23%	24%	45%	45%
Used in 2018	76%	75%	86%	85%	81%
Source of GAP:					
VEA	48%	82%	48%	56%	39%
Agro-dealer	21%	18%	34%	37%	31%
Fellow farmer	31%	100%	17%	11%	30%

Involvement in Contract Farming:	Tomato	Onion	Pepper	Cabbage	Watermelon
Involved	-				-
Not involved	100%	100%	100%	100%	100%
Total	100%	100%	100%	100%	100%

Appendix 7: List of Stakeholders in Kano Vegetable Sector

STAKEHOLDER NAME	ADDRESS	FUNCTION
GOVERNMENT AGENCIES		
Kano State Ministry of Agriculture and Natural Resources	www.manrkano.gov.ng	Policy/Regulatory Roles
Kano State Agricultural and Rural Development Authority (KNARDA)	Km 9, Hadejia Road, Yankaba, PMB 3130, Kano Email: knarda@yahoo.com	Public Extension Services
HadejiaJama'are River Basin Development Authority (HJRBDA)	HadejiaJama are River Basin Development Authority (HJRBDA) Federal Ministry of Water Resources P.M.B. 3168 Maiduguri Road, Hotoro, Kano. www.hjrbda.kn.gov.ng	Responsible for surface and Underground Water Resources Development for Multipurpose Uses in Kano, Jigawa and Bauchi States.
Faculty of Agriculture, Bayero University, Kano	Faculty of Agriculture, Bayero University, Kano	Teaching, Research and Community Development
Faculty of Agriculture and Agricultural Technology, Kano University of Science and Technology	Kano University of Science and Technology, Wudil, P.M.B 3244 Kano - Nigeria. Phone: +234 810 996 6111 Website: kustwudil.edu.ng	Teaching, Research and Community Development
Audu Bako College of Agriculture Kano	Audu Bako College of Agriculture Kano P.M.B. 3159, Danbatta, Kano State, Nigeria Website: abcoa.edu.ng	Training of Middle Cadre Manpower for Agriculture
Kano Agricultural Supply Company (KASCO)	KASCO House, Maiduguri Road Kano. Website: kasconigeria.org	Agricultural Inputs Supply
HadejiaJama'are River Basin Development Authority (HJRBDA)	HadejiaJama are River Basin Development Authority (HJRBDA) Federal Ministry of Water Resources P.M.B. 3168 Maiduguri Road, Hotoro, Kano. www.hjrbda.kn.gov.ng	Responsible for surface and Underground Water Resources Development for Multipurpose Uses in Kano, Jigawa and Bauchi States.

STAKEHOLDER NAME	ADDRESS	FUNCTION
Nigerian Stored Products Research Institute (NISPRI)	Nigerian Stored Products Research Institute (NISPRI) NSPRI Kano 2 Batwa Close, Off Hadejia Road, P.M.B. 3032, Kano, Kano State. Tel: 08034228620 Email: nsprikano@gmail.com, nsprikano@nspri.org.ng	Research to Reduce Postharvest losses by ensuring the quality, safety and availability of Agricultural Produce
National Horticultural Research Institute, Kano Office	National Horticultural Research Institute P.M.B. 5432, Jericho Reservation Area, Idi Ishin, Ibadan, Nigeria. www.nihort.gov.ng	Research and Development of Sustainable Horticultural Crops
National Agricultural Extension and Research Liaison Services	National Agricultural Extension and Research Liaison Services, Ahmadu Bello University, Zaria Nigera.	Research in the area of Agricultural Extension; Dissemination of Proven Agricultural Innovations.
SEED COMPANIES/SUPPLIERS		
Agrico Integrated Seeds Company Ltd.	Agrico Integrated Seeds Company Ltd. No 21 23, Hotoro NNPC Commercial Layout, Kano State.	Seeds Supply
Agritropic Limited Nigeria - Kano	Agritropic Limited Nigeria Kano No. 129 M. Mohammed Road, Gasham Building, Kano, Kano State	Seeds Supply
Atafi Agro Merchandise Services Ltd.	Atafi Agro Merchandise Services Ltd. **No.** 3, Mallam Madori Rd, Opposite Police Barrack, Hadejia Road, Kano State	Seeds Supply
Babmus Seeds Ltd.	Babmus Seeds Ltd. ZS 15, Zoo Road, Kano, Kano State	Seeds Supply
Bagauda Agro Inputs Limited	Bagauda Agro Inputs Limited Plot 269, Tawakali House, Maiduguri Road, Kano, Kano State	Seeds Supply
Benonee Nig. Ltd.	Benonee Nig. Ltd. No. 13a Airport Road Opp. St Thomas Catholic Church, Kano, Nigeria.	Seeds Supply

STAKEHOLDER NAME	ADDRESS	FUNCTION
Chimande Nig. Ltd.	Chimande Nig. Ltd. Plot No 17, Katsina Rd, Kano, Kano State	Seeds Supply
Ella Agro Company	Ella Agro Company **No.** 1, Ibadan Road, Sabon Gari, Kano, Kano State	Seeds Supply
Farm Best Agro Nig. Ltd.	Farm Best Agro Nig. Ltd. **No.** 8a Zoo Road, Kano, Kano State	Seeds Supply
Farm link Agro Allied & Seeds Company Limited	Farm link Agro Allied & Seeds Company Limited **Address:** 42 Jaoji by Zaria Road, Kano, Kano State	Seeds Supply
Galawaki Seeds Ltd.	Galawaki Seeds Ltd. **No.** 5, Mallam Madori Rd, Hadejia, Kano, Kano State	Seeds Supply
Green Spore Nig. Ltd.	Green Spore Nig. Ltd. **Address:** No 110, by ITF Hadejia Rd, Yankabo, Kano, Kano State	Seeds Supply
Guarantee Farm Seed Ltd.	Guarantee Farm Seed Ltd. No. 2330, Hadejia Road, Kano, Kano State	Seeds Supply
Happy Seeds & Agro Allied Company Ltd.	Happy Seeds & Agro Allied Company Ltd. No. 5, Green and White Shopping Complex, Zoo Road, Kano, Kano Stat	Seeds Supply
Inspire Agric Genetics Ltd.	Inspire Agric Genetics Ltd. No. 2, Dan Amarya Plaza, Maiduguri Road, Kano, Kano State	Seeds Supply
Inter Product Seeds Ltd	Inter Product Seeds Ltd. No 22, Niger Street, Kano, Kano State	Seeds Supply
Joy Seeds	Joy Seeds No. 2/3 Gidan Buhari, Zoo Road, Kano, Kano State	Seeds Supply
Madaka Integrated Farms	Madaka Integrated Farms No. 100, Amalsco Plaza, Zoo Road, Kano, Kano State	Seeds Supply
Lasam Seeds Nig. Ltd.	Lasam Seeds Nig. Ltd. No 51, Unity Road, Kano, Kano State	Seeds Supply

STAKEHOLDER NAME	ADDRESS	FUNCTION
Madudan Agro Company Limited	Madudan Agro Company Limited No. 3 Ilaro Road, Sabon Gari, Kano, Kano State	Seeds Supply
Maina Seed - Kano	Maina Seed - Kano No. 1 Kano Road, Ungogo LGA, Kano States.	Seeds Supply
Marsa Seeds Nig. Ltd.	Marsa Seeds Nig. Ltd. No. 3, BUK Road, Kano, Kano State	Seeds Supply
Masrotun Global Agro-Allied Ltd.	Masrotun Global Agro Allied Ltd. No. 1546, N Gabas 'A' Naibawa, Kano State.	Seeds Supply
Math Seed and Allied Company Ltd.	Math Seed and Allied Company Ltd. Plot No. 48, Kabuga Road, Opp FCE, Kano State.	Seeds Supply
Melt Down	Melt Down No 4, GidanMaitangaran, Zoo Road, Kano, Kano State	Seeds Supply
Popular Farms and Mills Ltd.	Popular Farms and Mills Ltd. No. 54, Challawa Industrial Estate, Kano, Kano State	Seeds Supply
Q for Q Farm Enterprises	Q for Q Farm Enterprises Plot No. 5 Kududdufawa Bayan Gidan Bako, Lamido, Ungogo LGA, Kano.	Seeds Supply
Rahama Integrated Farms Ltd.	Rahama Integrated Farms Ltd. No 1, Gidado Idris Road, Tauruni, Kano, Kano State	Seeds Supply
Raudah International Agro Allied Ltd.	Raudah International Agro Allied Ltd. No. 10, Hotoro Maiduguri road, Opp NNPC deport, Kano State.	Seeds Supply
	SAGAD Farms No. 13A Muritala Mohammed Way, Kano, Kano State	Seeds Supply
Sahib Nig. Ltd.	Sahib Nig. Ltd. No. 7/8 IBB Road, Kano, Kano State	Seeds Supply
Seed Project Company Limited - Kano	Seed Project Company Limited - Kano No. 44/77 Gidan Buhari Shopping Complex, Kano, Kano State.	Seeds Supply

STAKEHOLDER NAME	ADDRESS	FUNCTION
Semence Agricole Consult Ltd.	Semence Agricole Consult Ltd. No. 209, Line Dan Hassan, Unguwan Fulani, Naibawa, Kano, Kano State	Seeds Supply
Soft Seeds & Seedling Ltd.	Soft Seeds & Seedling Ltd. Lukat House, 8 Sani Abacha Way, First Bank, Kano, Kano State	Seeds Supply
Tecni Seeds Ltd.	Tecni Seeds Ltd. No. 19, Buhari Shopping Complex Hadejia, Road, Kano, Kano State	Seeds Supply
Terratiga Seed Limited	Terratiga Seed Limited No. 105, Maganda Road, Kano, Kano State.	Seeds Supply
Value Seed limited	Value Seed limited No. 28/30 Niger Street, Kano, Kano State.	Seeds Supply
Ventol International Services	Ventol International Services No. 24, Tarauni by Maiduguri Road, Kano State.	Seeds Supply
Ventol Seeds Ltd.	Ventol Seeds Ltd. NO. 21, Lagos Street, Kano, Kano State	Seeds Supply
Yabanya Seeds Ltd.	Yabanya Seeds Ltd. No. 56, Sky Memorial Complex, Zoo Road, Kano, Kano State	Seeds Supply
VEGETABLE PRODUCERS		
Gurjiya Agric Farmers and Multipurpose Cooperative	Contact: Muhammad Safianu (Chairman) 08061209795	Tomato Production
GurjiyaDankoroFadama Association	Contact: Alhaji Auwalu (Chairman) 07036181021	Tomato Production
DorawarSallau Commercial Rice	Contact: BalaMamuda (Chairman) 08137359391	Tomato Production
MuftahulKhair	Umar Shuaibu (PRO) 08023223076	Tomato Production
Zangon Buhari Water Users Cooperative	Saleh Ahmed (Secretary) 07035943358	Tomato Production
Kango Fadama Farmers Association	Abdulrazak Usaini (Secretary) 07079639222	Tomato Production

STAKEHOLDER NAME	ADDRESS	FUNCTION
Chiromawa Youth Tomato Farmers	Suraja Abdu (Secretary) 08067421580	Tomato Production
F.B.S RIFAN	Shehu Uba Yahaya (Secretary) 7035893485	Tomato Production
ChiromawaGaladimaFadama Farmers Association	SaiduShuaibu (Treasurer) 08039179847	Tomato Production
Youth Tomato Farmers Association	Malam Salihu Mahmoud (Treasurer) 08068289247	Tomato Production
Bono Young Farmers	Contact: Ado Umar (Chairman) 08034594150	Onion Production
Dorawa Rice Producers Association	Contact: Mikaila Hassan Abdullahi (Chairman) 07036876512	Onion Production
Gurjiya Agric Farmers and Multipurpose Cooperative	Contact: Muhammad Safiyanu (Chairman) 08061209795	Onion Production
DorawaSallau Farmers Association	Contact: Sale Ado (Secretary) 08035585715	Onion Production
ManomaMatasa	Contact: YauShuaibu (Treasurer) 07067626930	Onion Production
DorawaFadama III Rice Farmers Assocaition	Contact: Armaya ulsyaku (Treasurer) 08060151385	Onion Production
Fadama Farmers Association Kuruma	Contact: Sani A Ado (Chairman) 07031859990	Pepper Production
Turba irrigation waterwing Society	Contact: Rabiu A. Alasan (Chairman) 08161792728	Pepper Production
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Chiromawa Bakin Kasuwa Women Farmers	Contact: Hajiya Mari Madugu (Vice Chairman)	Pepper Production
Rahma Agricultural Multipurpose G/ Malam	Contact: Salsiu Tukur (Chairman) 08130840577	Cabbage Production

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Rice Farmers Association of Nigeria (RIFAN)	Contact: Lawan Ado Butalawa (PRO) 08065856407	Cabbage Production
Butalawa Fadama III	Contact: Sama ila (Secretary) 08095153867	Cabbage Production
Dangote Farmers and Supplies Multipurpose Cooperative	Contact: Halilu Sani Tukur (Secretary) 07039622228	Cabbage Production
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Kowa Yayi da Kyau Youth Farmers Mudawa	Contact: Abdurrahim I. Muhammad (Chairman) 08080838560	Watermelon Production
Kadawa Forum Association	Contact: Nasiru Muhammad (Secretary) 07089454684	Watermelon Production
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This is a publication of
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This publication was commissioned by the ministry of Foreign Affairs.

Publication number: RVO-183-2020/RP-INT

NL Enterprise Agency is a department of the Dutch ministry of Economic Affairs and Climate Policy that implements government policy for Agricultural, sustainability, innovation, and international business and cooperation. NL Enterprise Agency is the contact point for businesses, educational institutions and government bodies for information and advice, financing, networking and regulatory matters.

Netherlands Enterprise Agency is part of the ministry of Economic Affairs and Climate Policy.