ALBIT SMART AGRICULTURAL TECHNOLOGY: A STRATEGY FOR REDUCING DRUDGERY, IMPROVING YIELD AND INCOME AMONG SMALL – SCALE MAIZE FARMERS IN NIGERIA; HOW DOES IT WORKS?

***HAMID, M.Y.[1] AND BALLA, Y[2].**

[1]Department of Agricultural Economics and Extension, Adamawa State University, P.M.B. 25, Mubi, Adamawa State, Nigeria.

[2]Albit and Agro Consult Limited, Homes and Savings Buildings, Jimeta, Yola, Adamawa State, Nigeria.

***Corresponding author Email: dawimohammed70@gmail.com**
Mobile: 08101321083

ABSTRACT

The potential of Albit PGR and its complementary components; certified seeds, hand held mini planters, mini wet and dry weeding devices, organic/inorganic fertilizer applicators in promoting agricultural production in Nigeria was reviewed. The reviewed indicated that, Albit PGR and associated smart tools strategically played an important role in reducing drudgery, minimizing cost of production, increasing yield, improving income and alleviating poverty among farmers in Nigeria. A demonstration was conducted on maize farms in Pella districts, Hong Local Government Area of Adamawa State, Nigeria during the 2016 and 2020 wet seasons farming. Three fertilizer application technologies were utilized on 30 hectares maize farms which include 10 hectares for chemical fertilizer only, 10 hectares for Albit PGR only and 10 hectares for mixed (Chemical and Albit). The result reveals an average cost of fertilizing one hectares of maize using the three technologies in 2016 as ₦45,600, ₦20,000 and ₦28,600 respectively while in 2020 as ₦106,400, ₦25,000 and ₦55,600 respectively. It also shows that chemical fertilizer, ranked first in terms of high cost, followed by mixed and Albit only respectively for both the trial periods 2016 and 2020. The result further shows that, in terms of yield, the chemical only ranked lowest, followed by Albit only while the mixed gave the highest yields with averages of 2.26 tons/ha. 2.51 tons/hectare and 2.72 tons/ ha for the 2016 trial period respectively while for the 2020 trial period the averages yields for chemical fertilizer only, Albit only and mixed were 2.19 tons/ha, 2.44 tons/ ha and 2.70 tons/ ha respectively. Its therefore concluded that, Albit can lower cost of fertilizing arable crops among small – scale farmers and the following recommendations were made; Government, Non – Governmental Organizations and Farmer Associations should promote the use of Albit and smart technology among farmers through organizing sensitization workshops, seminar and summit to facilitates mass dissemination of Albit and associated complementary smart technologies by agricultural development actors in Nigeria due to its enormous benefits.

Key words: Albit, Smart, Agricultural, Complementary, Technology and Strategies

1.0. Introduction

Agriculture constitutes one of the most important sectors of Nigerian economy. The sector is particularly, important in terms of generating employment and contributing to Gross Domestic Product (GDP) and export revenue earning (Manyong et. al. 2004). Therefore, it has to be discussed over and over again on how to develop, promote and sustain it.

Any discussion on agriculture that doesn't take cognizance of small- scale agricultural operators in Nigeria, is neglecting about 60 – 70% of the population. This is also same in most West African sub- region.

Small – scale farming produced over 90% of locally food consumed in the sub – region and about 60% of raw materials for agro – industries (Oyekan, 2003). This class of farmers possessed some of the following characteristics in addition to others; cultivation of small piece of land, which is normally scattered and no clear title, utilization of low – level technology (rudimentary technology), lack of tangible and intangible assets (low capital), limited access to health services, little or no education (Hamid, et. al. 2007).

As a result of the above mentioned features of small – scale farmers, their productivity and output is generally low, principally to feed themselves and therefore expected income from farm operations is low, had little or no savings and high poverty incidence (Onucheyo, 1998).

Anyanwu et, al. (1997), reported that, so many programs and policy measures were put in place in the last few decades in Nigeria aimed at strengthening the economic position of the independent farmers, however as observed by Hamid et. al. (2004), most of the program as good as they were, only partially or totally failed to achieve their objectives prominent among which is the attainment of self – sufficiency in food production and supply.

For instance, the state wide World Bank Agricultural Development Program (ADP) which was aimed to improve agricultural productivity, food security and welfare of farmers especially rural farmers based on the concept that ; agricultural education and extension of improved technologies from research stations , supported with technical and infrastructural facilities will play significant role in steady shift of small – scale farming from subsistence form of agriculture to market oriented agriculture has suffered tremendously negatively (Oyekan, 2003). He identified paucity of funds after the withdrawal of the World Bank, poor project management, inadequate and low caliber of extension personnel, poor transportation and communication facilities, lack of basic amenities and infrastructure in the rural areas in addition to poor staff incentives and motivation as factors that contributed to the failures.

Currently, there is a wide gap between agricultural research recommendation and application on the individual farmer's farms which necessitate devising alternative approaches to extension services delivery, application of smart technologies and effective and efficient farm management strategies on sustainable bases.

Perhaps, development/ establishment of effective and efficient private agri-business enterprises and extension outfits such as Albit Agro Consult Limited (AACL) will go a long way in promoting and fostering agricultural entrepreneurship in Nigeria, hence the need to evaluate their activities.

1.1. Agricultural Entrepreneurship in Nigeria. Why?

Agriculture produces the food that feeds the people and the raw materials for industries. It provides most of the jobs and incomes on which the world most vulnerable people depend.

Small – scale agriculture is the basic of survival for most of the poor resources farmers in Nigeria and therefore any attempt at improving their operation from mere subsistence to market – oriented enterprises will constitute a key component in overcoming poverty (Madeley, 2002). Agriculture matters because absence of a viable agricultural sector makes it less attractive for people to stay in the rural areas. It can stem the drift to towns and cities if properly packaged. It also matters because a depressed agricultural sector can give rise to social instability, civic disorders, conflict and war. Agriculture matters, because the continuation of poverty is no body's interest (Manyong et. al., 2004).

Engaging and encouraging youth especially, accepting agriculture as a means of livelihood is highly desirable and needing to be promoted. This however, requires orientation change (change of mind set), change of working tools from primitive/ traditional to appropriate / modern, less stress, more effective and efficient tools.

Therefore, creating an enabling environment for agricultural entrepreneurship to thrive and succeed is worth embarking and paramount. Therefore, individuals, private organization, non – governmental and governmental organizations should put all their hands on deck to pursue and support agricultural entrepreneurship aimed at fostering food security, agro allied industrialization and to guarantee sustainable development.

1.2 Sustainable Agricultural Entrepreneurship Development and Management in Nigeria

Nigeria is rich in agricultural endowments, despite this; however, the agricultural sector has been growing at a very slow rate. It is also recognized that agricultural commercialization and investments are the key strategies for promoting accelerated sustainable growth and development and hence poverty reduction in the country. The question, therefore, remains how fast or how well is our agriculture changing from mere subsistence to market – oriented?

It is also worth noting that, for significant progress to be achieved, Nigeria's agricultural development priorities should be focused and fortified with new cadre of actors (specialists, operators, leaders and institutions), new ideas (innovations), concepts and strategies (smart/

precision), all geared towards supporting/ achieving increased production/ productivity on a sustainable bases.

Agricultural Entrepreneurship development, therefore, could mean any agricultural strategies that contribute to un–locking constraints to commercialization and investment in the Nigerian agricultural sector for sustained economic growth, enhanced food security, poverty alleviation increased competiveness of products in the domestic, regional and international markets (Manyong, 2004).

2.0 Materials and Methods

2.1 Land and Location

Thirty hectares of land located in FAA, Pella district, Hong Local Government Area, Adamawa state, Nigeria (Geographically located coordinates 10^{o} $^{14'}$ 0'' North, 12^{O} 56' 0" East), was used for the experiment. The thirty (30) hectares was divided in to 10 hectares each for the three fertilizer application technologies. The land was sourced from Alkay Global Ventures Limited (AGVL)**.**The land was prepared manually and ploughed using conventional tractor sourced from AGVL. Ridges were not prepared.

2.2 Fertilizers

Chemical (Inorganic – NPK, 20- 10- 10 and Urea 46 %), Organic only (Albit PGR), and Mixed (Inorganic and Organic) constitutes the three different fertilizer technologies utilized. NPK and Urea were applied into the soil using fertilizer applicator (buried method). NPK and Urea were sourced from a genuine input dealer in the area. The NPK was branded TK while the urea IR. Albit**,** A bio – organic fertilizer was used for seed treatment before planting and second (foliar application) at 6 weeks and third (foliar) during tasselling of the plant (70 days). Albit, a plant growth regulator (PGR) consisting of anti-stress and antidote for disease and pesticides was introduced by Albit and Agro Consult Limited (AACL) to Africa and Nigeria. The mother company Albit LLC in Russia has developed a biological stimulators and immunizers for seeds and plants for over 40 years and is performing positively. **How does it works?**

Immunization of seed with Albit accelerates breaking of seed dormancy, stimulate early emergence and growth, formation of healthy root system, provision of essential nutrients required by crop in first stage of vegetation. Giving plant resistance to infection, resistance to drought, resistance to cold and heat. While Foliar in second stage of vegetative growth enhances seed immunization thereby resulting to increase in yield and production of high quality organic produce.

Albit give enormous advantage to growers inform of minimizing costs of fertilizing, increasing yield and producing healthier crops at harvest. The nutritional content of Albit

includes nutrient chargers and broad-spectrum foliar, delivering optimal nutrients for health and strength of the plant. Albit is suitable for seed immunization, foliar and drip irrigation in both raining and dry season farming. Albit has a pH that is neutral and is free from chloride and sulphate. Contains optimum levels and nutrients including NPK, S, Mg, Mn, Zn, Fe, Cu, Cd, Pb, OC, OM (see table 1).

Table 1: Nutritional value of Albit confirmed by institute of agricultural research (IAR) ABU, Zaria

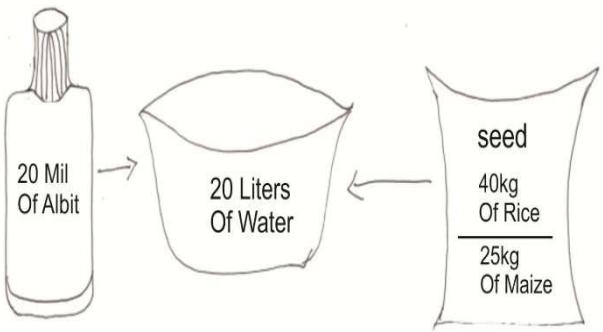
S/N	NUTRIENT	MEASUREMENT	S/N	NUTRIENT	MEASUREMENT
1	Total Nitrogen, % wv	9.29	8	Soluble Magnesium (Mg2O), Mg/L wv	0.9
2	Urea Nitrogen, % w/v	8.3	9	Manganese (Mn), Mg/L wv	2.10
3	Nitrate, %	0.7	10	Zinc (Zn), Mg/L wv	4.05
4	Available Phosphate (P2O5)	6	11	Iron (Fe), Mg/L wv	63.57
5	Soluble Potash (K2O)	6.24	12	Cupper (Cu), Mg/L wv	0.14
6	Sulphur (S)	1	13	Cadmium (Cd)	Trace
7	Magnesium (Mg), Mg/L wv	0.5	14	Lead (Pb)	1.85
	Other parameters				
15	Organic Carbon (OC), %	5.57	16	C:N	0.52
17	Organic Matter (OM), %	9.73	18	Density (g cm^3)	1.33
19	Ph	6.05			

Preparation of Albit solution for seed immunization before planting

Make reference to table 2: Application dosage and rate for crop you intend immunizing.

i. *Take maize for example:* To prepare Albit solution to immunize maize seed for 1 hectare, you need 1 bottle of Albit (20ml), 25 kg of seed and 25 liters of water (water must be without color).

ii. Add 25 liters of colorless water into a bowl (as shown in illustration on the right), shake bottle of Albit for about one minute and pour into bowl of water, stir the solution and add your seed



iii. Remove all floating seed in the solution (dead seeds)
iv. Treat seed for 24hrs. in Albit solution
v. At the end of treatment period, carefully pour out water and return seed into bag
vi. Seeds are ready for planting
vii. Observe spacing during planting.

Preparation of Albit solution for foliar spraying

i. Refer to application table 2 for crop you intend to spray (can be applied together with post emergence herbicide and pesticide).
ii. Knapsack spray – Add water half way into sprayer (water must be without color)
iii. Shake bottle of Albit for 30 seconds. Add 20 drops or 1 ml of Albit into sprayer for plants whose seeds where immunized with Albit before planting, while for seeds not immunized before planting use 40 drops or 2 ml of Albit per knapsack
iv. Albit solution in knapsack is ready for spraying. Concentrate spraying on leaves of plant
v. Foliar spraying allows for leaf to efficiently absorb nutrients immediately available during the spraying. While solution that hit the soil are absorbed by the roots, delivering root mass of greater size and volume.
vi. Immunization is done on seed before planting while foliar on seedlings and cuttings or bud on establishment of nursery, concentration of working solution is presented in table of application for various crops. Spraying is directed on the plants leaves or seedlings or cuttings hitting the buds. Preferably do the application in the morning hours and is done once before transplanting for plants in nursery. Second application is done as captured in application table. By application of Albit the water and nutrient uptake of crop is improved. On heavy soil, concentration of Albit PGR is less due its good retention capacity than on lighter soil.

Table 2: Application method, dosage and rate for some crops

Crop	Seed treatment Albit/hectare	Quantity of water, lit.	Kilogram of seed per/hectare	RS, hours	DS, hours	FSAP, days	FAR, drops (ml)
Maize	20 ml	25	20 – 25	24	24	21-30 / 45-50	20 (1 ml)
Sorghum	20 ml		20	8-10	12	21	20 (1 ml)
Rice	20 ml	40	30 – 35	24 / 48	24	21-25 / 40-45	20 (1 ml)
Wheat	20 ml		40	12/24	12	21-25/40-50	20 (1 ml)
Groundnut	20 ml	40	30	3	-	-	10 (0.5 ml)
Soya beans	20 ml	25	25	5 – 6	-	25/45	10 (0.5 ml)
Sesame	20 ml	20	15	4 – 5	-	30	20 (1 ml)
Cotton	20 ml	-	-	8	-	30 / 50	20 (1 ml)
Vegetables	3 ml	4	-	4 – 8	4 – 8	14 – 20	10 (0.5 ml)
Tuber plants	20 ml	60	10,000 stem	Foliar	Foliar	Nursery	10 (0.5 ml)
	20 ml	40	35	2 – 3	-	Pesticide + Albit	20 (1 ml)
Sugar beats	5ml	2	1 kg	8	8	25-30/60	20 (1ml)
Sugarcane	Seedlings: 5ml	20	-	-	Foliar	Pesticide + Albit 40/80-90	50 (2.5ml)
Orchard	-	-	-	Spraying	-	At flowering	50 (2.5 ml)

Source: Albit and Agroconsult Ltd (AACL), 2020.

Where:

RS =Raining season;

DS = Dry season;

FSAP = Foliar spraying after planting;

FAR =Foliar application rate

Some advantages of Albit PGR organic liquid fertilizer.

- ✓ Concentrated liquid form "gel"
- ✓ Potassium source free from chloride and sulphate
- ✓ Continuous use does not add to soil salinity and soil water stress
- ✓ Helps to sustain soil bacteria activities: Does not harm animal lives in the soil
- ✓ Helps to unlock other trace elements in soil for plants intake
- ✓ Improves growth and establishment of healthy young plants with added protection during delicate transplant phase of irrigated crops
- ✓ Protective qualities that guard against soil nutrients variability and deficiency

- ✓ Accelerates breaking of seed dormancy, germination, emergence & formation of healthy root system
- ✓ Giving resistance to infection, water stress (drought), heat & cold stress

2.3 Seed

Samaz 15, a foundation maize seed was sourced from Institute of Agricultural Research, Ahmadu Bello University (ABU) by ALbit Agro Consult Limited was used for all the three fertilizer application technologies at the rate of 20 kg per hectare and it was planted using hand push mini planter sourced from AACL.

2.4 Weeding and weed control

Weeds were controlled using hand held dry area weeding devices sourced from AACL for all the three fertilizer application technologies plots.

2.5 Instruments

Measuring tapes, ropes and poles were used in measuring and demarcating the plots.

2.6 Personnel

Two students from Adamawa State University, Faculty of Agriculture (ADSU – FAG – CRS-AEX), department of crop science and agricultural economics were engaged for the experiment design, setting and recording of data while some experts from the faculty interpreted the data.

2.7 Climatic requirements for growing maize

Maize is grown over a wide range of climatic conditions because of its many divergent types.

Temperature requirements

The crop requires warmth throughout the period of its active life. The greatest production potential lies in areas where isotherms in the warmest month range between 21 and 27 °C. Maize does not grow well in areas where the growing season temperature is less than 19 °C or where the average night temperature falls below14 °C. For this reason, proper timing of planting is required for dry-season cropping under irrigation.

Although maize can tolerate high temperatures up to 35 °C, yields usually decrease if the high temperature coincides with pollen shedding. Maize responds differently to changes in temperature at different stages of growth. During germination, the optimal temperature appears to be around 18 °C. Germination is low at temperatures below 14 °C, which may occur during the dry harmattan period. Cool, wet weather encourages many pathogens that cause seedling diseases and kernel rots.

Rainfall requirements

The amount and distribution of rainfall are highly important factors in successful production. A minimal range of 480–880 mm of well-distributed rainfall is adequate for maize, depending on the variety. The moisture requirements are small during the early stages of development but increase rapidly up to the flowering stage, before decreasing again as the crop matures. Maize is especially sensitive to moisture stress during flowering when a short spell of stress can reduce the crop yield by up to 30–35%.

The ecological zones in Nigeria have been demarcated, based on rainfall and vegetation cover, and reflect divergence in cropping systems and production constraints. For the savannas, three ecologies have been identified for maize production: the southern and northern Guinea savannas and the Sudan savanna. Annual rainfall is about 1000 mm spread over 170 rainy days, between late May and early October in the southern Guinea savanna. Rainfall is about 800–900 mm spread over 150–160 rainy days.In the northern Guinea savanna. Annual rainfall is rarely up 3 to 700 mm in the Sudan savanna, spread over about 120 rainy days. The potential for production varies remarkably, as well as the varieties adapted to these zones. The potential increases gradually from the Sudan to the southern Guinea savanna zones.

2.8 Problem of Maize production in Nigeria

According to Kamara et al. (2020), maize production constraints in the Nigerian savannas include;

i. *Poor soil fertility* - Soil fertility in the savannas has progressively declined due to increased pressure on land resources arising from rapid population expansion combined with low use of fertilizers. The soil is deficient both in macronutrients, such as N, P, and K, and key micronutrients, such as copper and zinc. Therefore, the soil cannot support meaningful maize yields without proper fertilization. Yields as low as less than 1 t ha-^{1}can be obtained without the addition of fertilizer.

ii. *Striga infestation* - Striga is a major constraint to maize production. The level of infestation in northern Nigeria, in particular, is as high as 60% in the southern Guinea savanna, 68% in the Sudan savanna, and 74% in the northern Guinea savanna. Striga accounts for over 30–60% of the losses in maize grain yield. Hence, measures that minimize the effects of Striga need to be implemented to ensure good yields on farmers' fields.

iii. *Drought* - The amount of rainfall determines the growth and yield of maize, especially where irrigation is not feasible. In most parts of northern Nigeria rainfall is unreliable and frequently less than the amount required for a good crop. In the southern Guinea savanna whererainfalls are higher than in other zones, instability in their establishment frequently occurs and often compels farmers to replant maize. In the northern Guinea savanna, instability or late establishment of rains, and mid - season and terminal drought conditions regularly occur. In the Sudan savanna, early season and terminal drought conditions are almost an annual event. Temperatures are high across the savannas in northern Nigeria, reaching a maximum of 40 °C in April and a minimum of 18 °C between December and January. This variability in annual rainfall/actual rainy days and monthly temperatures dictates the type of maize variety that can be planted in the respective zones. The length of the rainy days in each of the zones

indicates the need to select appropriate varieties and cultural practices, such as the sowing date, that suit the prevailing conditions.

iv. *Pest* - Fall Armyworm (FAW) The most important pest of maize is the Fall Armyworm (FAW), Spodoptera frugiperda (Lepidoptera: Noctuidae), considered a native pest in the tropical and sub-tropical Americas. On the African continent, FAW is among the most destructive invasive pests. The larvae, which are light green to dark brown with longitudinal stripes feed in large numbers on the leaves, stems, and reproductive parts of plants. The pest affects more than 350 plant species causing severe damage to cultivated crops, such as maize, rice, sorghum, sugarcane, etc. The host crop most susceptible to FAW is maize, a high-priority food crop across many sub-Saharan countries. Annual loss from FAW was estimated at up to 17.7 million t of maize from 12 African countries, enough to feed tens of millions of people and representing an economic loss of up to US$4.6 billion (FAO, 2018). In Nigeria, FAW was first reported in Oyo and Ogun states in 2016. Currently, the pest is present in all the states of the country as well as the Federal Capital Territory (FCT). Losses up to 100% have been recorded in some farmers' fields. The pest is very difficult to control, and management in maize fields the frequent application of insecticides and sometimes the use of multiple types and formulations of chemicals. The eggs are 0.4 mm in diameter and 0.3 mm in height; they are pale yellow or creamy at the time of oviposition and becomes light brown prior to exclusion. Eggs maturity takes 2–3 days when the temperature is between 20 and 30 ^{o}C. Eggs are usually laid in masses of approximately 150–200 eggs, which are laid 2–4 layers deep on the surface of the leaf. Egg masses may be laid on the undersides too, or on top of the leaves.

2.9 *Albit Smart Technology for controlling the problems highlighted above*

Albit is a PGR, anti – dote to pest and disease, and anti – stress ant to drought. So, it provides one hand solution (one- stop- shop) to all the highlighted problems and at very low cost, less harmful to environment and farmers who handle it and is very efficient.

For instance, in Nigeria some insecticides are in the market that can control FAW if applied in the first 3weeks after planting. For example, the chemical called Kartodim 315 EC (with a.i. lambda-cyhalothrin plus dimethoate) could be applied once per week for 3 weeks after planting maize. Application of 50–60 ml in 15-L knapsack sprayer or 70-80 ml in 20-L knapsack sprayer can control it effectively but it is very expensive and harm full to both the environment and farmers handling it. The use of alternative control measures such as host plant resistance, biological control (Sterile Insect Technique, parasitoids, predators, entomopathogens). Similarly, some botanical pesticides can be used; however, they are not desirable and more effective than using Albit.

3.0 Results and Discussion

Fertilizer (s) constitutes one of the variable cost components in arable production. The lower the cost of fertilizer the better, since higher costs will results to high cost of production and low profit. Therefore, it is good to go for fertilizer application technology that has less cost. Based on the information provided in table 3 below, Albit fertilizer application technology indicates the lowest cost per hectare in addition to its other benefits apart from fertilizing like anti – dote to pesticides and anti – to drought etc.

Table 3: Per hectare analysis of different fertilizer application technology 2016

Doses	Type of fertilizer	Costs ₦	Type of fertilizer	Cost ₦	Type of fertilizer	Cost ₦
1ST	NPK 50 kg UREA 50 kg	5,000 5,000	ALBIT 20mls	5.000	ALBIT 20mls	5,000
2ND	NPK 75 kg UREA 75 kg	7,500 7,500	ALBIT 20mls	5,000	ALBIT 20mls	5,000
3RD	NPK 50 kg UREA 100 kg	5,000 10,000	ALBIT 20mls	5,000	NPK 50 kg UREA 100 kg	5,000 10,000
Fertilizer **Application** **Transport** **Total**		**40,000** **4,000** **1,600** **45,600**		**15,000** **5,000** **-** **20,000**		**25,000** **3,000** **600** **28,600**

Field Experiment, 2016

Table 4: Per hectare analysis of different fertilizer application technology in 2020

Doses	Typeof fertilizer	Costs ₦	Type of fertilizer	Cost ₦	Type of fertilizer	Cost ₦
1ST	NPK 50 kg UREA 50 kg	12,000 12,000	ALBIT 20mls	6.000	ALBIT 20mls	6,000
2ND	NPK 75 kg	18,000 18,000	ALBIT 20mls	6,000	ALBIT 20mls	6,000
3RD	UREA 75 kg NPK 50 kg UREA 100 kg	12,000 24,000	ALBIT 20mls	6,000	NPK 50 kg UREA 100 kg	12,000 24,000
Fertilizer **Application** **Transport** **Total**		**96,000** **8,000** **2,400** **106,400**		**18,000** **7,000** **-** **25,000**		**48,000** **7,000** **600** **55,600**

Field Experiment, 2020

Going by the FMA 8 bags blanket recommendation per hectare of chemical fertilizer, the chemical fertilizer only, at year 2020 market prices, the total cost was N96, 000 excluding cost of transportation and application in the study area. This cost is considered very high and constitute a serious concern considering the small – scale farmers.

Accordingly, the total cost of 60ml per hectare recommended by Albit Agro and Consult Limited (AACL) for the organic fertilizer only excluding cost of transportation and application at year 2020 market price in the study area is N21, 000. This cost is low/ reasonable and therefore should be promoted and encouraged among the small – scale farmers. Apart from it relatively low cost, it has other advantages e.g less transportation cost, less effect on the environment, less handling risk and health effect, multiple effects (anti – stress and pesticide).

Similarly, the total cost of mixed fertilizers, excluding cost of transportation and application at the year 2020 market price is N48, 000.

Comparatively, the change in cost within five years (2016 to 2020) of applying chemical fertilizer only in terms of price is 96,000 – 45,600 = 63,000 (53%), for applying Albit only is 18,000 – 15,000 = 3,000 (17%), mixed is 48,000 – 25,000 = 23,000 (48%) respectively.

The variation in cost for Albit between year 2016 and 2020 is the lowest, followed by mixed while the chemical is the highest, indicating wide variation.

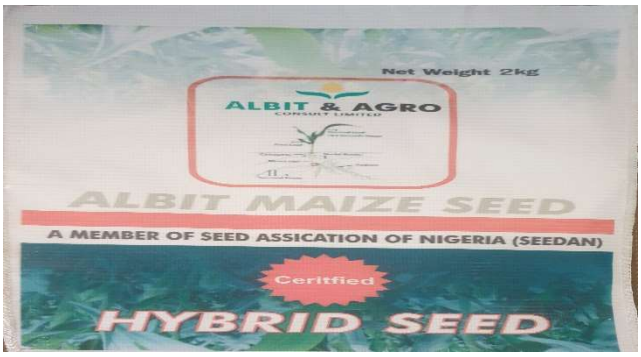
Table 5: Estimated yield, for using the three types of fertilizer technology 2016

Hectares	Yield tons/ha Inorganic	Yield tons/ha Organic	Yields tons/ha Combination	Remark
A. Yield/ha				
1	2.40	2.40	2.20	
2	2.20	3.00	2.80	
3	2.20	2.50	2.80	
4	2.30	2.60	2.90	
5	2.20	2.50	2.60	
6	2.20	2.40	2.50	
7	2.20	2.40	2.70	
8	2.40	2.30	2.80	
9	2.20	2.40	2.90	
10	2.30	2.60	3.00	
Total (tons)	**22.60**	**25.1**	**27.20**	
Average yield/ton	**2.26**	**2.51**	**2.72**	

Table 6: Estimated yield, for using the three types of fertilizer technology 2020

Hectares	Yield tons/ha Inorganic	Yield tons/ha Organic	Yield tons/ha Combination	Remark
A. Yield/ha				
1	2.30	2.60	2.30	
2	2.10	2.70	3.00	
3	2.00	2.50	2.70	
4	2.20	2.40	2.80	
5	2.50	2.20	2.30	
6	2.00	2.30	2.50	
7	2.20	2.30	2.80	
8	2.30	2.50	3.30	
9	2.40	2.40	3.10	
10	2.30	2.50	2.80	
Total (tons)	21.90	24.40	27.60	
Average yield/ton	**2.19**	**2.44**	**2.70**	

ALBITAND RECOMMENDED SMART TOOLS FOR SMALL – SCALE FARMERS



Albit Display Room

2.0 Conclusion

Albit, smart agricultural technology through it activities, are minimizing stress (drudgery) in agricultural production activities in Nigeria, more especially by promoting Albit, organic fertilizer (from biological source) and other cheaper, effective and efficient smart working devices/ tools among small holder farmers such as hand held/driven/push mini planter, mini weeding device, organic fertilizer applicator etc.

It also, promote the use of Albit certified seeds, which are high yielding varieties, drought resistance, striga tolerant etc. the early generation seeds (EGR) of which were sourced from research institutes; Institute of Agricultural Research (IAR), Ahmadu Bello University, Zaria and National Cereals Research Institute (NCRI), Badegi, Bida, Niger state, Nigeria, in addition to offering advisory and capacity building trainings to small- scale farmers.

With Albit, Smart Agricultural Technology (ASAT), it's very easy to go organic food production in Nigeria which has a lot of benefits such as Environment user friendly (EUF), hazard free on users (it's very healthy), less expensive and very efficient.

3.0 Recommendations

1. Widespread dissemination of Albit Smart Agricultural Technology (ASAT) through media and sensitization campaigns (agricultural inputs trade fair, summit) is necessary and highly recommended,
2. Government (at Federal, State and Local) levels should patronize Albit Smart Agricultural products (organic fertilizer and devices) and give it out to small – scale farmers in order to support them in pursue and implementing market – oriented farming and serve as an incentive to boost Albit Agro consul limited to bring more advancement in and facilitate agricultural transformation in Nigeria.
3. Non – Governmental Organizations (NGO.s) and Philanthropists should utilize this type of opportunities to empower the youth to engage in serious and meaningful agricultural transformation and development
4. Small – scale farmers should form co-operative societies or association to pool their resources together, purchase and utilize some of these Albit Smart Agricultural Technologies (fertilizer, seeds device, tools etc) for better yield/output/ income and poverty reduction.

6.0 Acknowledgements

The Authors want to acknowledged the management of Albit Agro Consult Limited, Al-Kay Global Ventures Limited and Faculty of Agriculture, Adamawa State University for all the support rendered at different capacities.

REFERENCES

Anyanwu, J.C., Oyefusi, A., Onikhenan, H., and Dimowon, F.A. (1997): The structure of the Nigerian Economy. Joanee Educational Publishers Ltd, Onitsha Anambara State, Nigeria. Pp10-30

FAOSTAT, FAOSTAT statistics database, (2017). https://search.library.wisc.edu/catalog/999882363002121.

Hamid, M.Y., Muhamman, M.A., and Bello, K. (2005): Revolutionalising Agriculture in Nigeria: A challenge to the youth. Journal of International Children in Science and Technology (JOCIST) Vol. 3 No.1

Kamara, A.Y., Ewansiha, S.U. and Menkir. A. (2014): Assessment of nitrogen Uptake and utilization in drought-tolerant and Striga resistant tropical maize Varieties. Archives of Agronomy and Soil Science 60: 195–207. doi:10.1080/03650340.2013.783204

Kamara, A.Y., Kamai, N. Omoigui, L.O., Togola, A. and Onyibe. J.E. (2020): Guide to Maize Production in Northern Nigeria: Published by the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria.

Madeley, J. (2002): Food for All: The need for a new Agriculture: University Press Ltd. Dhaka Bangladesh

Manyong, V.M., Ikpi, A., and Olayemi, J.K. (2004): Agriculture in Nigeria; identifying opportunities for increases commercialization and investment. International Institute of Tropical Agriculture, Ibadan Nigeria.

Onucheyo, E. (1998): Political Decision in Nigeria Agricultural Industry: Tamaza Publishing Ltd, Zaria-Nigeria

Oyekan, P.O. (2003): Small – Scale Farming in West Africa for improved production and better Family living: A manual for leventis foundation, Heinenman Educational Book, Ibadan, Nigeria

Sani, M.H., Danwanka, H.A., Ma' ule, U.M. (2015): Analysis of factors influencing maize Output of farmers using fertilizers in Bauchi State, Nigeria. In Haruna, U., Izge, A. U., Abdulhamid, A., Iliyasu, Y., Abdurrahman, S.L. and Katanga, Y.N. (editors). Proceedings of the 29th Farm Management Association of Nigeria (FAMAN) conference, held between 23rd – 26th November, 2015 at federal University, Dutse, Jigawa State, Nigeria.