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Perceived Potentials of Agritech Innovation on the Improvement of Maize (*Zea Mays*) Production in Southern Taraba, Nigeria

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ABSTRACT
This study examined the perceived potentials of Agritech innovation on the improvement of maize (Zea mays) production in Southern Taraba, Nigeria. Eight objectives were achieved and 8 hypotheses were tested. The study adopted comparative research design. Population for this study was 850 comprising 830 registered maize farmers; 15 lecturers in the department of crop production and protection, Federal University Wukari and 5 extension agents from Southern Taraba Agricultural Zone Wukari. The sample size for the study was 272 respondents. Data was collected using interview and questionnaire. Data was analysed using percentage, mean, standard deviation and analysis of variance. Finding revealed that traditional methods of maize production is predominantly used by farmers in the study area. Finding also revealed that use of innovative technologies for planting; weeds control; fertilizer application; pests and diseases control; harvesting; and storage of maize significantly improve maize production. The study concluded that adoption of innovative technologies would help to improve maize production. It was recommended that traditional methods which affects high yield of maize should be discouraged; higher institutions of learning should intensify effort towards teaching innovative techniques of agriculture to students who would also become agricultural extension agents responsible for creation of proper awareness and intensive training to farmers for improved maize production.
Keywords: Perceived, Potentials, Agritech Innovation, Improvement and Production

INTRODUCTION

Agriculture plays a chiefly role in economy as well as it is considered to be the backbone of economic system for developing countries. Agriculture is an art and science that prudent endeavour to reshape a part of Earth's crust through cultivation of plants and other crops as well as raising livestock for sustenance or other necessities for human being and economic gain (Ismail, 2021). For decades, agriculture has been related with the production of vital food crops. According to Ismail (2021), many people depend on the agriculture, about 70% population of directly rely with agriculture for livelihood. This gigantic ratio in this sector is as a result of none development of non-agricultural activities to absorb the fast-growing population. Nevertheless, mostly populations of developed countries do not rely on agriculture. Mostly developing counties depends on agriculture for their source of national income. While for developed

countries it contributes as smallest ration to their national income. Agriculture provides provide proteins as people's food requirements which is also found in maize.
Maize, also scientifically known as *Zea mays* is one of the most crucial crops worldwide, playing a vital role in global food security. Its versatility and adaptability have made it a staple in many diets and an essential component in various industries (Sergeyeva, Evgrafova, Vasilchenko, Chukhacheva and Fandina, 2023). In recent years, the development of innovative seed technology has revolutionized the cultivation of sweetcorn, a popular variety of maize. The large hectares of land been devoted to maize production indicate the potentials of the crop in fighting global food shortages. Report by IITA in Adiaha (2017) indicated maize production at 8 million tons in Nigeria. Annual production of maize in Nigeria accounts to a value of 5.6 million tons. Hartmans in Adiaha (20217) revealed that maize is cultivation to 1 million hectares in Nigeria, out of the 9 million hectares cultivated in Africa, presenting Nigeria as one of the exporter of maize and the largest African producer of maize, contributing to increase production of crops to feed the fast-growing human population, especially in developing countries like Nigeria
According to Adiaha (20217), maize is utilized in multitude of ways which vary according to what the user intends. Nowadays maize grain is being used, as novelty food product, poultry/animal feed and pet birds. Maize grains are prepared either by boiling or roasting as paste or as popcorn, eaten all over Africa, especially West Africa. Maize grain can be processed into traditional Nigerian meal like pap, 'tuwo', 'donkunnu', 'massa', 'cous cous' and 'akple'. Medicinally, Abdulrahaman in Adiaha (20217) asserted that the silk can be used to treat gonorrhea, infusion from stigma of maize inflorescence can be used for treatment of urinary tract disorder. 80% carbohydrate, 10% protein, 3.5% fibre, 2% mineral has been reported to be among the nutritional benefit derived from maize consumption. Industrial utilization of maize including wet-milling has been surveyed by Watson as cited in Adiaha (20217). Maize grain is the second most nutritious grain after the spiked crops grain (wheat, oats). Around 60% of maize grain is used in poultry/animal feed industry, 30% in wet milling, 6% as food and 4% as seed / other purposes. The wet milling produces an array of products, by products and value additions (Ayub Agricultural Research Institute, 2024).
There are different varieties of maize grown in Nigeria. These include AMANA 2, SAMAZ 49, SC612. Recently, the Federal government of Nigeria has approved the release of maize varieties which are transgenic insect-resistant and drought-tolerant known as TELA maize.four varieties approved by the NVRC are, SAMMAZ 72T, SAMMAZ 73T, SAMMAZ 74T, and SAMMAZ 75T. Other varieties of maize are Oba Super 8 Maize hybrid VSL 2201, PAC 740, SAMMAZ 69, SC 423 and SC 555. These varieties released based on earliness of maturity, good standability, stay green characteristics, high pro-vitamin A content; tolerance to low nitrogen, Striga, fall armyworm, multiple stresses, major foliar diseases and drought (National Centre for Genetic Research and Biotechnology (2023). The varieties are suitable for Rain Forest, Guinea, and Sudan Savannas. Stem borers reduce maize production in several countries in Africa, while fall armyworms can destroy up to 20 million metric tons of maize in Africa each year, enough to feed 100 million people (African Agricultural Technology Foundation, 2024). To enrich the agriculture through the introduction of innovation, technology plays effective role in crop production. The use of innovative technology in agriculture which causes more and high-quality production of crops is called agritechnology.
Agritechnology is the use of technology in agriculture, horticulture and aquaculture with the aim of improving yield, efficiency, and profitability. It is also called agricultural technology, agrotechnology, or abbreviated as agritech or agrotech. Agricultural technology can be products, services or applications derived from agriculture that improve various input and output processes (National Institute for Food and Agriculture (2020). Technology is also used for production of maize in land preparation, planting, weed control, pests and diseases control, fertilizer application, harvesting and storage. In view of Awe and Abegunrin (2017), there are three innovative land preparation methods; namely ploughing once (PL1), ploughing twice (PL2) and ploughing once followed by harrowing (PL+H). Awe and Abegunrin (2017) identified three innovative land preparation methods required for maize production, namely ploughing once (PL1), ploughing twice (PL2) and ploughing once followed by harrowing. Kamara, Kamai,

Omoigui, Togola, Ekeleme and Onyibe (2020) posited that land preparation during maize production where vegetation cover is fairly dense, land clearing is carried out well ahead of the rains. They stressed that suitable ridges are constructed as soon as the rains start. Animal-drawn implements, hand, hoe, or tractor mounted tillage equipment are used for preparing ridges,

Similarly, Parihar, Jat, Singh, Kumar, Hooda, Chikkappa and Singh (2011) assert that technological practices are used in maize production for raising of beds (ridges) planting**,** zero-till planting**, c**onventional till flat planting, furrow planting and transplanting. Melander and Roma-Burgos, Rouse, Singh, Salas-Perez and Bagavathiannan (2023) noted that breaking the yield ceiling, developing resilient varieties, efficient management of large farms, and improving the sustainability of crop production require a higher level of technological innovations such as herbicide trait stacking, developing crops resistant to parasitic weeds, RNA interference (RNAi) technology, gene and genome editing, genomics, bioinformatics tools, remote sensing, robotics and drones, nanotechnology, herbicide formulations and herbicide sensors and tracers. McCollough (2021) reported that mechanical weeder, thermal weeder, laser weeder, flame weeder, electrical weeder, full width cultivation, inter-row cultivation and intra-row cultivation are technologies for weed control.

For fertilizer application, Petrov, Kanaev, Kirov, Kuznetsov and Petrov (2019) asserted that modern technologies of precise farming cover a wide range of agricultural operations; the main aim of these technologies is to reduce the cost of crop cultivation. One of the most promising and rapidly developing areas is precise farming technologies. These technologies cover a wide range of technological operations of crop production. Precision farming technologies are navigation systems, parallel driving systems and multi-layer electronic maps. As noted by Raj, Bezbaruah and Dawar (2023), modern approaches to fertilizer application and management aim to increase efficiency, reduce waste, and improve crop yields while minimizing the environmental impact of fertilizer use. These approaches include Precision Agriculture, Controlled release fertilizer (CRF), Fertigation, and Integrated Nutrient Management (INM). According to Aravind (2022), technical and scientific advances have made the application of fertilizers more efficient in recent years and have helped farmers maximize fertilizer's benefits while reducing risks of their over, under or misuse. Use of digital tools like International Plant Nutrition Institute (IPNI) tool box which is designed to assist in interpreting results from on-farm trials; specifically, trials involving multiple rates of any added nutrient. Its main goal is to provide the best possible estimate of "optimum rate" or "most economic rate of N" (MERN) from limited data.

Stressing further, Fu, Liu, Zhao, Chen, Qjao and Li (2022) explained that technologies are used for maize plant disease detection is based on the maize spectral recovery network and advanced hyperspectral recovery convolutional neural network (HSCNN+) and the maize disease detection network based on the convolutional neural network (CNN). Taking raw RGB data as input of the framework, the output reconstructed HSIs are used as input of disease detection network to achieve disease detection task. Albahli and Masood (2022) noted that use efficient attention-based CNN network (EANet) is a g good innovation for maize crop disease detection. Kreuze, Adewopo, Selvaraj, Mwanzia, Kumar, Lava, Cuellar, James, Legg, Hughes, and Blomme (2022) revealed that digital tools and technologies available for pests and diseases control are systems based on identification keys, human and artificial intelligence based, identification based on smart applications, web interfaces, short messages services (SMS), or combinations thereof and the use of image recognition from smartphones or unmanned aerial vehicles (UAVs) for pest and disease monitoring preparatory for harvesting of maize.

Also, Drahniev (2019) opined that the technologies for harvesting corn residues in bales includes pressing into rolls using a roll baler instead of rectangular bales' collecting in a crushed form in a mixture of different fractions of plant residues and a crushed form in a separate fraction of plant residues, such a rod. Kamara, et al., (2020) explained that maize is harvested traditional where the cobs can be broken by hand from the plant or the whole plant can be cut with a cutlass. In a situation where the entire maize plants are harvested, they are usually stacked in the field to allow the grain to dry further. The process is different in the humid areas where the crop is dried in a ventilated granary.

Technology innovation is used for storage of maize. Abass, Fischler, Schneider, Daudi, Gasper, Rüst, Madulu, Kabula (2017) noted that storage methods of maize include the use of different hermetic storage containers (metal silos and plastic barrels with and without fumigation with phostoxin, PICS bags) and non-hermetic polypropylene (PP) bags combined with insecticide treatment bags with yarn treated with Deltamethrin and maize grain treated with Actellic Super). Zhao, Ly and Li (2023) noted that carbon dioxide gas-controlled grain storage systems include a carbon dioxide gas supply system, a detection system, gas circulation facilities, pressure regulation equipment, an oxygen respirator, a grain monitoring and control system, and a mechanical ventilation system.

Despite the conducive climatic factors and fertile soil suitable for optimum maize production in Taraba state, it has been observed that the level of maize yield is very low. This is attributed to the fact that farmers do not use technological equipment. They still depend on use of primitive methods of maize production. Interaction by the researcher with farmers has revealed that most of the farmers are not aware of technological tools used for maize production. It was also gathered that many of them are not aware of the innovative techniques of maize production. As such, the quantity of maize produced is always low. As evidenced by Abdulrahaman and Kolawole (2006), the traditional methods dominate maize production in Nigeria. The methods used by farmers involve manual land preparation, hand planting, use of locally adopted maize varieties, relying on rainfall water supply, manual harvesting usually with sticks and post-harvest drying done by spreading the cobs directly on the ground under the sun.

In every household, maize has been cultivated in Taraba state. Many farmers cultivate maize consumption purposes. Over the years, maize production in the state does not meet the demand by the masses due to inappropriate methods of production. This scenario calls for a search for maize production technologies, replacing primitive means which is more advanced with high yield expectations in maize production.

Objectives

1. Identify the traditional methods of maize production affecting high yield among farmers
2. Examine the maize production technologies in land preparation
3. Determine how technology is used for maize planting
4. Ascertain the use of technology to control weeds in maize farm
5. Examine the technologies used for fertilizer application on maize
6. Identify the innovative technologies used for maize pests and diseases control
7. Find out the technologies used for harvesting
8. Examine the technologies used for storage of maize

Hypotheses

1. There is no significant relationship between the traditional methods of farming and high yield of maize
2. There is no significant difference in the mean ratings of extension agents, lecturers and farmers on maize production technologies in land preparation
3. There is no significant difference in the mean ratings of extension agents, lecturers and farmers on the use of technology for maize planting;
4. There is no significant difference in the mean ratings of extension agents, lecturers and farmers on the use of technology to control weeds and improvement in maize production
5. There is no significant difference in the mean ratings of extension agents, lecturers and farmers on the use of technologies for fertilizer application and improvement in maize production
6. There is no significant difference in the mean ratings of extension agents, lecturers and farmers on the use of technologies for control of pests and diseases and improvement in maize production
7. There is no significant difference in the mean ratings of extension agents, lecturers and farmers on the use of technologies for harvesting and improvement in maize
8. There is no significant difference in the mean ratings of extension agents, lecturers and farmers on the use of the technologies to improve maize storage

METHODOLOGY

This study was conducted in Southern Taraba is a Senatorial District in Taraba State, Nigeria comprising five Local Government Areas, namely; Takum, Donga, Wukari, Ibi and Ussa. The area is naturally blessed with vast and fertile land suitable for crop production. Farming is the predominant economic activities of the inhabitants of the zone. They produce varieties of crops including maize. The study employed the use of comparative research design. Population for this study was 850 comprising 830 registered maize farmers; 15 lecturers in the department of crop production and protection, Federal University Wukari and 5 extension agents from Southern Taraba Agricultural Zone Wukari. The sample size of 272 respondents was selected for the study using Taro Yamane formula. Proportionate stratified random sampling technique was used to select 252 maize famers in each of the 5 local government areas in Southern Taraba. The 15 lecturers in the department of crop production and protection, Federal University Wukari and 5 extension agents from Agricultural) Zone Wukari were all used making a total of 272 respondents for the study. Data was collected using interview and questionnaire. Descriptive statistical tools such as percentage, mean and standard deviation were used to answer research question while analysis of variance (ANOVA) was used to test the null hypotheses.

RESULTS AND DISCUSSION

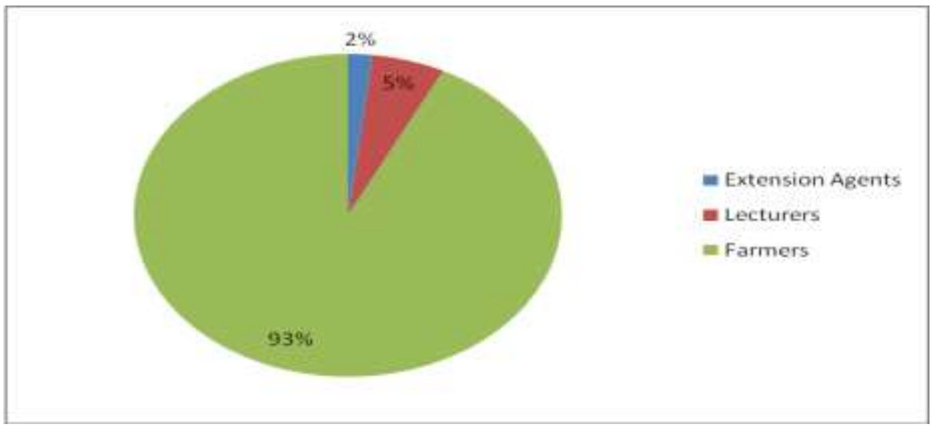

Fig. 1: Categories of Respondents
Source: Field Survey, 2025

Figure 1 shows categories of respondents. Extension agents were 2% while lecturers were 5and maize farmers were 93% respectively.

Table 1: Mean and Standard Deviation of Respondents on the Traditional Methods of Maize Production

S/N	Traditional Method	Mean	Std. Dev.	Remarks
A	**Land preparation**			
1	Use of cutlass to clear the bush	3.4559	.96712	Agree
2	Use of hands to remove stumps	3.5074	.87606	Agree
3	Burning the bush with fire	3.4007	.95144	Agree
4	Ridging by use of hoes and animals	3.1765	.97483	Agree
B	**Planting**			
5	Use of legs to open holes and plant	3.2868	.94816	Agree
6	Use of hoes	3.4007	.84022	Agree
7	Use of wooden digger	3.2868	.87531	Agree
8	Use of cutlass	3.3787	.90100	Agree
C	**Weeds control**			
9	Hand picking of weeds	3.1985	.78095	Agree
10	Use of hoes to remove the weeds	3.2426	.73897	Agree
11	Use of hoes to bury the weeds inside soil	3.3676	.76654	Agree
D	**Pests and diseases control**			

12	Use of nets to control pests	3.1471	.96070	Agree
13	Use of hands to pick insects	3.0331	.98457	Agree
14	Use of local guns to scare birds	3.3419	.67426	Agree
15	Use of human images to scare birds	3.3750	.82790	Agree
16	Use of fire to clear the field after harvesting	3.4228	.69892	Agree
E	**Fertilizer application**			
17	Use of hands to broadcast	3.4007	.90370	Agree
18	Use of hands to side-place fertilizer	3.1103	.83884	Agree
19	Use of hand operated sprayer for foliage application	3.2426	.86333	Agree
F	**Harvesting**			
20	Use of cutlass to cut down the maize stem	3.1985	.76665	Agree
21	Use of hands to remove the cobs	3.2426	.86333	Agree
G	**Storage**			Agree
22	Use of silos	3.1103	.97324	Agree
23	Use of jute bags to store maize grains	3.4449	.77596	Agree
24	Use of cribs	3.0110	.86542	Agree
25	Use of silos	3.3529	.70872	Agree
	Grand Mean	**3.2854**	**.85305**	

Source: Field Survey, 2025

The result in Table 1 shows that all the 25 items had their mean values ranged from 3.0110 to 3.4559 and is above the benchmark of 2.50. This implies that the 25 items are **t**he traditional methods of maize production in Southern Taraba State.

Table 2: Mean and Standard Deviation of Respondents on the Land Preparation Technologies for Improvement Maize Production

S/N	Technologies	Mean	Std. Dev.	Remarks
1	Asses the soil type and soil moisture	3.5993	.75706	Agree
2	Conduct soil pH testing	3.5404	.73789	Agree
3	Do soil nutrients requirement test	3.8750	.33133	Agree
4	Amend the Soil with organic or inorganic material to enhance it fertility, structure, water retention and balancing soil pH	3.1324	1.09887	Agree
5	Plough the land to create a loose and aerated seedbed soil	3.1765	1.05132	Agree
6	Use of disk harrow to break up and smooth the surface of the soil	3.1765	1.10271	Agree
7	Use of a power tiller to break up and turn over the soil	3.0551	1.15923	Agree
	Grand Mean	**3.3650**	**0.89120**	

Source: Field Survey, 2025

The result in Table 2 shows that app the 7 items had their mean values ranged from 3.0551 to 3.5993 and is above the benchmark of 2.50. This means that the 7 items are land preparation technologies to improve maize production.

Table 3: Mean and Standard Deviation of Respondents on the Planting Technologies to Improve Maize Production

S/N	Technologies	Mean	Std. Dev.	Remarks
1	Raise a bed (ridge)	3.3125	1.02809	Agree
2	Use of Carboxin fungicides to treat seeds and stimulate growth	3.1103	1.13106	Agree
3	Determine the plant population and spacing zero-till planting	3.3162	.99595	Agree
4	Use of conventional till flat planting	3.1324	1.05780	Agree
5	Do furrow planting technique	3.3199	.56062	Agree
6	Consider the soil temperatures and corn planting time	3.5368	.52829	Agree
7	Use of hands to remove the cobs	3.2426	.86333	Agree
	Grand Mean	**3.2815**	**.88073**	

Source: Field Survey, 2025

The result in Table shows that all the 7 items had their mean values ranged from 3.1103 to 3.5368 and is above the benchmark of 2.50. This means that the 7 are the technologies of planting to improve maize production.

Table 4: Mean and Standard Deviation of Respondents on the Weed Control Technologies to Improve Maize Production

S/N	Technologies	Mean	Std. Dev.	Remarks
1	Use of mechanical weeder	3.3235	.79558	Agree
2	Use of thermal weeder technique	3.3640	.83945	Agree
3	Laser weeder	3.0662	1.02156	Agree
4	Flame weeder	3.0257	1.26085	Agree
5	Electrical weeder	2.7684	1.24848	Agree
6	Full width cultivation	3.0331	1.26068	Agree
7	Inter-row cultivation	2.8603	1.32070	Agree
8	Intra-row cultivation	2.9779	1.04487	Agree
9	Use herbicide trait stacking to reduce the rate of weed resistance efficacy of herbicides	3.1434	1.02983	Agree
10	Develop crops resistant to parasitic weeds	3.3309	0.97991	Agree
11	Use RNA interference (RNAi) Technology to improve plant physiology to better adapt to abiotic and biotic stressors	3.3456	0.94403	Agree
12	Use of genomics, bioinformatics tools for stress adaptation and herbicide resistance	2.9706	0.99029	Agree
13	Use of remote sensing, robotics and drones for weed detection, spatial distribution, and herbicide injury evaluations	3.0331	1.11133	Agree
14	Use of nanotechnology to extend systemically, avoiding phytotoxicity problems and/or detoxification	3.0441	0.99717	Agree
15	Use of herbicide formulations to increase herbicide efficacy by improved absorption and translocation of herbicide in the maize	3.0331	1.03571	Agree
16	Use of herbicide sensors and tracers to locate the organelle and molecular target of herbicides or destination metabolites	3.0478	.97644	Agree
	Grand Mean	**3.0855**	**1.05356**	

Source: Field Survey, 2025

The result in Table 4 shows that all the 16 items had their mean values ranged from 2.7668 to 3.3640 and is above the benchmark of 2.50. This means that the 16 are the technologies of weed control to improve maize production.

Table 5: Mean and Standard Deviation of Respondents on the Technologies of Fertilizer Application to Improve Maize Production

S/N	Technologies	Mean	Std. Dev.	Remarks
1	Use of multispectral images from drones and satellites that reflect nutrient levels in the plant canopy to quickly identify and respond to fertilizer deficiencies	3.0919	0.98082	Agree
2	Use of organic and microbial fertilizers	3.1654	1.04785	Agree
3	Use of CRFs to release nutrients over time, reducing application frequency and over-fertilization risk	2.7353	1.14444	Agree
4	Use of fertigation technology to sprinkle fertilizers into the precision irrigation system	2.6287	1.32740	Agree
5	Integrated nutrient management (INM) practices to optimize fertilizer	2.5147	1.19646	Agree
6	Use of controlled release fertilizer (CRF) that releases fertilizing nutrients in a controlled and delayed manner in synchrony with the sequential needs of plants for nutrients	2.9228	1.14836	Agree
	Grand Mean	**2.8431**	**1.14089**	

Source: Field Survey, 2025

The result in Table 5 shows that all the 16 items had their mean values ranged from 2.5147 to 3.1654 and is above the benchmark of 2.50. This means that the 6 are the technologies of fertilizer application to improve maize production.

Table 6: Mean and Standard Deviation of Respondents on the Technologies of Pests and Diseases Control to Improve Maize Production

S/N	Technologies	Mean	Std. Dev.	Remarks
A	**Detection**			
1	Stress detection glasses	2.7132	1.01580	Agree
2	Integrated pest management (IPM) scope	3.0331	0.92665	Agree
3	Use of YOLO real-time object detection algorithms	3.1434	1.06159	Agree
4	Use of red/blue/green (RGB) and hyperspectral image (HIS) to detect diseases	3.1801	0.83770	Agree
5	Use of KPSNet-50 convolutional neural network model	3.1324	1.01508	Agree
6	Use of PRF-SVM model	3.6654	0.71503	Agree
7	Use of efficient attention-based CNN network (EANet)	2.9779	1.04487	Agree
B	**Control**			
8	Prophylaxis techniques such as exclusion protection	2.5478	1.01534	Agree
9	Immunization through genetic resistance	2.6250	1.15217	Agree
10	Avoidance of pathogen by planting at times when or where inoculum is absent or ineffective due to unfavorable environment conditions	3.2022	1.04489	Agree
11	Preventing infection by creating a chemical toxic barrier between the plant and the pathogen is comes under protection measures.	3.1728	1.01443	Agree
12	Use of Carboxin fungicides to treat seeds and stimulate growth	3.1103	1.13106	Agree
	Grand Mean	**3.0420**	**0.99789**	

Source: Field Survey, 2025

The result in Table 6 shows that all the 12 items had their mean values ranged from 2.4078 to 3.6654 and is above the benchmark of 2.50. This means that the 6 are the technologies of pests and diseases Control to improve maize production.

Table 7: Mean and Standard Deviation of Respondents on the Harvesting Technologies to Improve Maize Production

S/N	Technologies	N	Mean	Std. Dev.	Remarks
1	Use of combine harvester in which the husking mechanism, consisting of closely spaced, counter-rotating rollers, tears the husks away	272	3.1765	0.95185	Agree
2	Use of mechanical picker that snaps the ears from the stalk so that only the grain and cobs are harvested	272	3.5221	0.84580	Agree
3	Use of husked corn harvesting machines	272	2.9669	1.14083	Agree
4	Use of clusters bract chopping devices	272	3.1103	1.07073	Agree
5	Use of bending type maize harvesting machine headers	272	3.0331	1.17900	Agree
6	Use of bract smashing devices	272	2.9449	1.12038	Agree
7	Use of lodged maize harvesting devices	272	3.1213	1.15416	Agree
	Grand Mean		**3.1250**	**1.06611**	

Source: Field Survey, 2025

The result in Table 6 shows that all the 12 items had their mean values ranged from 2.9449 to 3.5221 and is above the benchmark of 2.50. This means that the 12 items are the harvesting technologies to improve maize production**.**

Table 8: Mean and Standard Deviation of Respondents on the Storage Technologies to Improve Maize Production

S/N	Technologies	Mean	Std. Dev.	Remarks
1	Use of mechanical refrigeration cooling that often used to reduce the temperature of grain piles	3.6765	0.51376	Agree
2	Use detection system	3.4853	0.91309	Agree
3	Use of gas circulation facilities	3.4669	0.81883	Agree
4	Pressure regulation equipment	3.3199	0.83107	Agree
5	Grain monitoring and control system	3.1544	0.88346	Agree
6	Mechanical ventilation system	3.0882	1.04136	Agree
7	Use of metal galvanized steel silos with barrier properties against moisture and air exchange between the grains and surrounding	3.4559	0.96712	Agree
8	Use of flexible HSS (bags, cocoons)	3.4081	0.87123	Agree
9	Use recycled rigid containers to provide low capacity hermetic containment of grains	3.5000	0.76356	Agree
10	Use super grain bag from flexible plastic films of extremely low oxygen permeability	3.2757	0.82022	Agree
11	Use of mechanical refrigeration cooling that often used to reduce the temperature of grain piles	3.2426	0.78262	Agree
	Grand Mean	**3.3703**	**0.83694**	

Source: Field Survey, 2025

The result in Table 6 shows that all the 11 items had their mean values ranged from 3.0882 to 3.54853 and is above the benchmark of 2.50. This means that the 11 items are the storage technologies to improve maize production.

Table 9: ANOVA Result on the Traditional Methods of Maize Production used by Farmers

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	5.153	2	2.577	10.679	0.000
Within Groups	64.901	269	.241		
Total	**70.054**	**271**			

Source: Field Survey, 2024

Result in Table 8 shows result of ANOVA analysis on the traditional methods of maize production used by farmers with a significant with value of 0.000 and is below the alpha value of 0.05. This result is a statistically significant. This means that the traditional methods of farming affect maize production.

Table 10: ANOVA Result on the Land Preparation Technologies in Maize Production

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	6.115	2	3.058	7.695	.001
Within Groups	106.889	269	.397		
Total	**113.004**	**271**			

Source: Field Survey, 2025

Result in Table 10 shows ANOVA analysis on the land preparation technologies of maize production with a significant with value of 0.001 and is below the alpha value of 0.05. This result is a statistically significant. This means that land preparation technologies in enhance maize production.

Table 11: ANOVA Result on the Planting Technologies of Maize Production

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	2.185	2	1.093	2.396	.003
Within Groups	122.667	269	.456		
Total	**124.852**	**271**			

Source: Field Survey, 2025

Result in Table 10 shows result of ANOVA analysis on the planting technologies of maize production used by farmers with a significant with value of 0.003 and is below the alpha value of 0.05. This result is a statistically significant. This means that planting technologies in enhance maize production.

Table 12: ANOVA Result on the Weeds Control Technologies of Maize Production

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	3.941	2	1.970	4.296	.015
Within Groups	123.385	269	.459		
Total	**127.325**	**271**			

Source: Field Survey, 2025

Result in Table 10 shows result of ANOVA analysis on the weeds control technologies of maize production used by farmers with a significant with value of 0.015 and is below the alpha value of 0.05. This result is a statistically significant. This means that technologies used for weed control enhance maize production.

Table 13: ANOVA Result on the Fertilizer Application Technologies of Maize Production

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4.218	2	2.109	5.185	.006
Within Groups	109.423	269	.407		
Total	**113.641**	**271**			

Source: Field Survey, 2025

Result in Table 12 shows result of ANOVA analysis on the fertilizer application technologies of with a significant with value of 0.006 and is below the alpha value of 0.05. This result is a statistically significant. This means that technologies used for fertilizer application enhance maize production.

Table 14: ANOVA Result on the Pests Control Technologies of Maize Production

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.064	2	4.532	7.659	.001
Within Groups	159.176	269	.592		
Total	**168.240**	**271**			

Source: Field Survey, 2025

Result in Table 13 shows result of ANOVA analysis on the fertilizer application technologies of with a significant with value of 0.001 and is below the alpha value of 0.05. This result is a statistically significant. This means that technologies used for pest control enhance maize production.

Table 15: ANOVA Result on the Harvesting Technologies of Maize Production

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.870	2	3.435	10.787	.000
Within Groups	85.663	269	.318		
Total	**92.533**	**271**			

Source: Field Survey, 2025

Result in Table 14 shows result of ANOVA analysis on the harvesting technologies of with a significant with value of 0.000 and is below the alpha value of 0.05. This result is a statistically significant. This means that technologies used for harvesting improves maize production.

Table 16: ANOVA Result on the Storage Technologies of Maize Production

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6.870	2	3.435	10.787	.000
Within Groups	85.663	269	.318		
Total	**92.533**	**271**			

Source: Field Survey, 2025

Result in Table 14 shows result of ANOVA analysis on the storage technologies of with a significant with value of 0.000 and is below the alpha value of 0.05. This result is a statistically significant. This means that technologies used for storage improve maize production.

DISCUSSION OF FINDINGS

Findings of this study revealed that farmers practice traditional methods of maize production in Southern Taraba. This affects the yield of maize drastically. Finding agrees with Abdulrahaman and Kolawole (2006) who noted that the traditional methods of maize production in Nigeria involve manual land preparation, hand planting, use of locally adopted maize varieties, relying on rainfall water supply, manual harvesting usually with sticks and post-harvest drying done by spreading the cobs directly on the ground under the sun.

Findings of the study also revealed that technologies land preparation improve maize production. The finding agrees with a report by Parihar, Jat, Singh, Kumar, Hooda, Chikkappa and Singh (2011) who found out that technological practices are used in maize production for raising of beds (ridges).

The finding of study revealed that the technologies for planting could improve maize production. The finding corroborates with Parihar, Jat, Singh, Kumar, Hooda, Chikkappa and Singh (2011) assert that technological practices are used for improved maize production are zero-till planting**, c**onventional till flat planting, furrow planting and transplanting.

Findings on the weed control revealed that technologies significantly enhance weed control for improved maize production. This finding affirms that of Melander and McCollough (2021) who reported that mechanical weeder, thermal weeder, laser weeder, flame weeder, electrical weeder, full width cultivation, inter-row cultivation and intra-row cultivation are technologies for weed control that brings improvement in maize production.

This result of finding on the use of technologies for fertilizer application revealed a statistical significant improvement in maize production. The finding agrees with Raj, Bezbaruah and Dawar (2023) who reported that modern approaches to fertilizer application and management aim to increase efficiency, reduce waste, and improve crop yields while minimizing the environmental impact of fertilizer use. These approaches include precision agriculture, controlled release fertilizer (CRF), Fertigation, and Integrated Nutrient Management (INM). The finding also agrees with Aravind (2022) who reported that technical and scientific advances have made the application of fertilizers more efficient in recent years and have helped farmers maximize fertilizer’s benefits while reducing risks of their over, under or misuse.

The study found that use of technologies for pest control would significantly improve maize production. The finding is not different from Kreuze, Adewopo, Selvaraj, Mwanzia, Kumar, Lava, Cuellar, James, Legg, Hughes, and Blomme (2022) who revealed that digital tools and technologies available for pests and diseases control are systems based on identification keys, human and artificial intelligence based, identification based on smart applications, web interfaces, short messages services (SMS).

The finding revealed a statistically significant impact of the use of technologies on improve maize harvesting practices. The finding is similar with the report of Drahniev (2019) who opined that the technologies for harvesting corn residues in bales includes pressing into rolls using a roll baler instead of rectangular bales’ collecting in a crushed form in a mixture of different fractions of plant residues and a crushed form in a separate fraction of plant residues, such a rod. This enhance improvement in maize production.

Finally, the study revealed that technologies used for storage improve maize production. The finding collaborates that of Abass, Fischler, Schneider, Daudi, Gasper, Rüst, Madulu, Kabula (2017) who noted that storage methods of maize include the use of different hermetic storage containers (metal silos and plastic barrels with and without fumigation with phostoxin, PICS bags) and non-hermetic polypropylene (PP) bags combined with insecticide treatment bags with yarn treated with Deltamethrin and maize grain treated with Actellic Super.

CONCLUSION

Maize is one of the food products wide used over the world today. However, the level of production has been generally low in Southern Taraba area. This study has established that innovative technologies enhances increase in the yield of maize in modern days. The study concluded that adoption of innovative technologies will help to improve maize production in Southern Taraba.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made:

1. The traditional methods of maize production which affects high yield among farmers in Southern Taraba should be discouraged
2. Higher institutions of learning should intensify effort towards teaching of innovative techniques of agriculture to students who would also serve as agricultural extension agents
3. Agricultural extension agents should create awareness on innovative technologies of maize production through adequate dissemination of information to farmers in the rural areas
4. Agricultural extension agents should also carry out intensive training to farmers on innovative technologies maize as a necessity for improved maize production.

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