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Smart Agripreneurship: A Panacea for Food Security In Nigeria

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Abstract: *The high rate of hunger in today's world has made attention to be given to agriculture. Smart farming has been identified as a practice to help advance zero hunger in Africa. The study investigated smart agripreneurship and food security in Nigeria. The study employed cross-sectional research design as well as multi-stage sampling method. Primary data was used through a structured questionnaire administered to agribusiness farmers in Southwest, Nigeria. The study employed multiple regression as the data analytical technique for the study. The findings revealed that smart agripreneurship dimensions (greenhouse farming, hydroponics, geo-mapping, drone agriculture, nutrient cycling and soil analysis) have a significant effect on farm productivity, food affordability, farm yield and food accessibility in Southwest Nigeria. The study concluded that smart agripreneurship is a determinant factor for food security in Nigeria. The study suggested that agribusinesses should continue to practice smart agripreneurship and the government should formulate policies that will encourage the practice of smart agripreneurship in Nigeria.*

Keywords: *Farm Yield,Food Accessibility, Food Security, Farm Productivity, Smart Agripreneurship.*
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I. Introduction

Achieving food security is the desire of every nation. Food security output around the world continues to be responsible for the insecurity, insufficiency, poverty and hunger and the best-fit model to alleviate starvation seems elusive to agri-preneurs especially in Nigeria. This challenge has devalued the living standard in many homes as a majority of Nigerians cannot afford basic three meals a day. The technological methods of dealing with the aforementioned remain vague, particularly in Nigeria. This is perceived to be arising from the continuous growth in population and traditional farming methods which produce low nutritious food output. This seems to stanch from a food-insecure environment, with low entrepreneurial investment in agribusiness due to erratic and volatile business environments that make long term invests insecure.

The need to grow more nutritious food is pressing and smart agripreneurship is a key potential in addressing growing food insecurity (Achim, Robert, Robert & Nina, 2017). The modern pattern of farming has to be anchored on knowledge and technological advancements as farmers' most important tools (Bell, & Scott, 2011). Emami, Almassi and Bakhoda (2018) stated that smart agriculture involves technology and if well domesticated can reduce reliance on foreign food importation and promote food security. They opined that agribusiness in developing nations do not approach food security with fairness, due to the prevalent unjust sharing of benefits of income and burdens among smallholders, which has led to declined interest by potential entrants. Saiz-Rubio and Rovira-Más (2020) viewed smart agripreneurship as beyond increasing profitability and gaining competitive advantage but value creation, which is a vital factor in meeting the food need of the rising population. Ruttan, Bell and Clark (1996) corroborated that the environment begins to deteriorate and health undermined due to hunger and poverty, hence value creation along food security is important.

Uche and Familusi (2018), held the view that smart agri-preneurship and its dimensions will help the attainment of food security in Nigeria if smallholders are educated to embrace it. According to Saiz-Rubio & Rovira-Más, (2020); Myklevy, Doherty & Makower (2016), food production needs to be increased globally in 2050 by 60% due to the continuous increase in population growth as there is an impending crisis. On the same line, greenhouse farming, hydroponics, geo-mapping, drone agriculture, soil analysis and nutrient cycling are productive larger-scale smart agri-preneurship dimensions that add value to addressing extreme hunger and food security in the population (Verma, Sahoo & Rakshit, 2018).

The exasperating demand for starvation reduction and food security have been met with failure mostly in developing countries. Mellor (2017; Regan, Stuart and Paul (2018) have centred on smart agri-preneurship as a pro-economic tool to address food security in developing nations. Evidence revealed by the International Institute of Tropical Agriculture [IITA] synthesis report (2017) showed that the per capita food supply per day dropped steadily from 2,720kcal (2007), 2706kcal (2011) and further down to 2690kcal (2015), which exposed that Nigeria is experiencing food insecurity. Awojide, Simon, and Akintelu (2018) opined that new studies especially from the Nigerian perspective, have partially investigated the effect of smart agri-preneurship technologies (such as greenhouse farming, hydroponics, geo-mapping, drone agriculture, soil analysis) on farm productivity. Several studies (Rehman & Young, 2018; Kropff, Pilgrim & Neate, 2019; Labya, Megha, & Kamlesh, 2018) have investigated the link between smart agripreneurship, soil analysis and greenhouse farming on reduced cost of food in the attempt to achieve food security on an individual basis in developed economies, leaving an existing gap in knowledge about the link between smart agri-preneurship dimensions (hydroponics, geo-mapping, greenhouse farming, drone agriculture, nutrient cycling and soil analysis) and its effect on food affordability in developing economies from the Nigerian context. This gap as suggested by Solomon, Mungai, and Radeny (2017) and Wekesa, Ayuya, and Lagat (2018), to be considered from the purview of a developing nation.

Objectives of the Study

The broad objective of the study is to investigate smart agri-preneurship (greenhouse farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) and food security in South-West, Nigeria. Other specific objectives are to:

i. evaluate the effect of smart agri-preneurship dimensions (greenhouse farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) on farm productivity;
ii. determine the effect of smart agri-preneurship dimensions (greenhouse farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) on food affordability;
iii. investigate the effect of smart agri-preneurship dimensions (greenhouse farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) on farm yield;
iv. examine the effect of smart agri-preneurship dimensions (greenhouse farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) on food accessibility

II. Literature Review

Food Security

Food security is a means to secure adequate and suitable supply of food for everyone (FAO, 2001). World Food Conference emphasized food security as the availability of sufficient basic foodstuff supplies at all times, irrespective of fluctuations in price and production as well as food consumption expansion. Sen (1981) however widened the definition of food security as he perceived it from the viewpoint of starvation, stating that food insecurity is more tied to food accessibility denial, rather than its insufficiency, scarcity or unavailability. The FAO further referred to food security as a situation that exists when everyone has economic, physical and social access to enough, non-toxic and nutritious balanced food and preferences required for healthy and active life (FAO, 2018). Abiodun, Onafowora, and Ayo-Adeyekun, (2019) referred to food security as a notion encompassing peoples' safety from hunger, disease, and repression, which include people having access to sufficient, safe and nutritious food at all time.

Farm Productivity: According to Alston, Beddow and Pardey (2009), farm productivity is the dimension of the number of farm products produced from a particular quantity and quality of input. Sheng and Chancellor (2019) opined that the productivity of a farm can be measured by how long it takes to produce specific produce. In Africa, productivity in agriculture lags when compared globally, and is below the required standards of achieving food security, poverty goals and food sufficiency (Masipa, 2017). Agricultural production in terms of productivity and sustainability can be attained through smart agriculture (Lytos, Lagkas, Sarigiannidis, Zervakis, & Livanos, 2020) Dethier and Effenberger (2011) stated that there are two measures for productivity. Partial factor productivity measure which focuses on the quantity of output per unit of input while the second is total factor productivity which measures the total outputs of all inputs (Zepeda, 2001). Malik, Rahman, Qayyum, and Ravana (2020) asserted that agricultural productivity in recent time is being achieved through smart farming.

Food Affordability: The notion of affordability refers to the ability of a household or a country to pay for its food needs and preferences (Wright, Gupta & Yoshihara, 2018). Food affordability can be defined as the cost of the diet of a household relative to the household's income (Achim et al., 2017). Food affordability refers to allocation mechanisms and preferences that enable people to effectively translate their hunger into satisfying demand. The index for food affordability gives information that is useful to access to food within a country and outside a country. It is pointed change in real income affect food consumption pattern especially in the developing economies (Gasparatos, Takeuchi, Elmqvist, Fukushi, Nagao, Swanepoel, Swilling, Trotter & Blottnitz, 2017). Thus, rood affordability is a function of disposable income (Kuyrah, Obare, Herrero & Waishaka, 2006).

Food Yield: Farm yield can be defined as what is produced from the farm as harvest (Dinesh, 2015). Liao, Vander and Salmon-Monviola (2015) define farm yield as the ratio of the quantity of farm produces. Farm yield is usually presented in kilograms (kg) or metric tonnes (t) in terms of product per hectare (ha). Therefore, in getting the farm yield, farm product area and amount of farm produces will be estimated. Social-economic factors have effects on-farm yield, which is; increased population, access to land, access to inputs such as seeds and fertilizers, labour and diseases affecting labour, age, income, education (Tom, Rajab & Wamalwa, 2013).

Food Accessibility: According to the United States Department for International Development (1992), food access is seen as the adequate financial resources of an individual to obtain exact and nutritious foods needed for consumption. According to Sakyi (2012), food accessibility is the physical and economic ability of an individual to acquire food always through many acceptable means which land ownership for farming and regular income are included (Sakyi 2012).

Smart Agriculture

The term smart agri-preneurship is a combination of three concepts – smart technology, agribusiness and entrepreneurship. Agribusiness is defined according to Pricewaterhouse Coopers [PwC] (2016) as a large scale agribusiness activity, encompassing the cultivation, processing and distribution of agricultural outcome and the manufacture of farm machinery, equipment and supplies. Entrepreneurship in agriculture as the creation of an innovative economic organization for growth or gain under conditions of risk and uncertainty. Smart technology, on its own, refers to the scientific approaches, systems and gadgets that aid data tracking, efficiency improvement and are environmentally friendly. Smart farming technologies have the potential to improve farming in response to economical, ecological and societal challenge and develop agriculture continuously (Kernecker, Knierim, Wurbs, Kraus, & Borges, 2020). Smart agri-preneurship also entails biotechnology and applies its technique in nutrient cycling, greenhouse farming, geo-mapping, soil analysis and hydroponics by using living organisms or substances from these organisms to make or modify a product for a practical purpose (Fasiha, Kaleem, Aleem, & Shujjah, 2017).

Dimensions of Smart Agriculture

Greenhouse farming, hydroponics, geo-mapping, drone agriculture, nutrient cycling and soil analysis are smart agriculture dimensions adopted in this study. Wekesa et al. (2018) defined greenhouses as the framed erections enclosed with a large clear material to plant seed under partial or fully controlled environmental situations. Drone agriculture can be defined as a technological instrument that observes plants from the air to show the patterns and identify a related problem to irrigation, fungal infestations, as well as soil variation (Alimuzzaman, 2015). Hydroponics is referred to as the plant cultivation in water to support the survival and growth of the plant with soil. Capolupo, Pindozzi, Okello, and Boccia (2014) opined that a hydroponic system is a new farming system that requires nutrient solutions without the soil substrates, but with the presence of an artificial supporting medium.

According to Romero-Olivares, Allison, and Treseder (2017), soil analysis is the service which delivers an analysis of soil texture, pH, organic substance on three major plant nutrients (potassium, phosphorus and magnesium) for varied purposes. y. Soil analysis also involves the study of micro-organisms in the soil to have knowledge on the functions or roles of microbes in soil health and plant productivity and also to understand and manipulate ecosystem processes such as nutrient cycling, organic matter turnover and the development and inhibition of soil pathogens. Soil analysis also helps in providing the basis for calculating the required quantity of fertilizer to be applied for each crop. Estimation of soil PH is vital in soil analysis because plants have their PH preferences.

The concept of geo-mapping is defined as a practice of data imaging from diverse coordinates within specific geographic locations which capture the cultural characteristics of inhabitants with specifics by Pothuganti, Jariso, and Kale (2017). This definition specifies that geographical identification metadata and codes from information gathered are carried out in the process. Jekel, Sanchez, Gryl, Juneau-Sion, and Lyon (2014) referred to geo-mapping as geographic mapping and defined it as the specified geographic mapping of farm, land or space location and the designing of a system for capture, stockpiling, deploying, analyzing, managing, and presenting all types of geographical data for future reference or research.

HYPOTHESES DEVELOPMENT

Smart Agriculture Dimensions (greenhouse farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) and Farm Productivity

The studies of Carrer, Souza and Batalha (2019), Aatif, Kaiser, Showket, Prasanto and Negi

(2018) and Yi-Hsuan, Ssu-Pei and Ting (2019) have established that smart agri-preneurship has a positive and significant effect on farm productivity, enhanced food security and revenue generation for the farmers. The studies of Gasparatos et al., (2017), and Tripathi and Agarwal, (2015) revealed that greenhouse and drone agriculture farming is designed to create optimal agricultural productivity and value-adding to the agripreneur's output. On the contrary, few studies, like Verma et al. (2018) found that there is an insignificant relationship between smart agri-preneurship and farm productivity in some Indian agribusinesses. Laud (2018) also revealed a negative relationship between smart agripreneurship and farm productivity, especially in developing countries. Thus, there exist mixed results on the association between smart agriculture and its dimensions and farm productivity. Based on this premise, this study hypothesized that: H01: Smart agri-preneurship dimensions do not significantly affect farm productivity in South-West, Nigeria.

Smart Agriculture Dimensions (greenhouse farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) and Farm Affordability.

Hubeau, Marchand, Coteur, Mondelaers, Debruyne, and Van-Huylenbroeck, (2017), Benavidez, Jackson, Maxwell and Norton (2018), and Velde and Nisini (2019) found that modern agricultural systems like smart agri-preneurship measures have a positive and significant effect on food availability, thus enhancing food affordability. Conversely, Dauphin, Lubroth and Jobre (2016) found that Geo-Mapping does not significantly improve food affordability. According to Hsieh, Hung, Chiu, and Wu (2020) Agricultural drones minimize the amount of human labour required and also reduces production costs. Also, Masrin, Nurul, Fakhrulisham and Sharil (2018) empirically found that agricultural drones may help surveys and geo-mapping but does not significantly enhance farm product affordability. Studies such as Ariani, Hervani and Setyanto (2018); Brück, Naudé, and Verwimp (2011) have identified a gap concerning the employment of smart agri-preneurship, especially in developing countries. Based on the foregoing mixed arguments on research findings, this study hypothesized H01: There is no significant effect of smart agri-preneurship dimensions on food affordability in South-West, Nigeria.

Smart Agriculture Dimensions (greenhouse farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) and Farm Yield.

The studies of Benavidez, Jackson, Maxwell and Norton (2018) and Corwin and Yemoto (2015) found that innovative and simplest Alternative Analytical Technology (AAT) for testing soil nutrients by smart agri-preneurs have a positive and significant effect on types of crops that best fit, best fertilizers to be applied and eventually high farm yield. Solomon, Mungai and Radeny (2017); Zaccardelli, Pane, Villecco, Palese and Celano (2018) and Nwibo and Okorie (2013); Asrat and Simane (2018) revealed that smart agri-preneurship measures significantly improve farm yield. However, Praveen and Sharma (2019); Ingram, (2011) and Wieczorek, (2018) established that smart agriculture is either very expensive for local growers to afford, or even not available in numerous occasions, which in turn will create an imbalance in cost of farm crop product, food affordability and decline in farm yield. It was hypothesized that H03: Smart agripreneurship dimensions do not significantly affect farm yield in South-West, Nigeria.

Smart Agriculture Dimensions (greenhouse farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) and Farm Accessibility.

Kropff, Pilgrim and Neate (2019); Branca, McCarthy, Lipper and Jolejole (2011) and Suberi, Tiwari, Gurung, Bajracharya and Sitaula (2018) found that smart agri-preneurship positively attempts to use scientific research and technology to improve the agribusiness space and farmland management, thus increasing food accessibility and farm productivity. Wekesa et al. (2018), found that drone agriculture, nutrient cycling, geo-mapping and soil analysis have significantly increased food accessibility. On the contrary, Cai and Leung (2006) and Dauphin, Lubroth and Jobre (2016) showed that geo-mapping and drone agriculture analysis does not significantly increase food accessibility. Also, Kira and Sumari (2019) revealed that a geospatial approach insignificantly affects food accessibility. Based on these premises, this study hypothesized that: H04: There is no significant effect of smart agripreneurship Dimensions on food accessibility in South-West, Nigeria.

Theoretical Underpinning

This study adopted Lewis model theory; as the theory focused on how traditional farmer can employ innovation and become a modern farmer which enhance farmer creativity, creation of wealth and increase in productivity. Lewis model theory is selected to guide this study because their assumptions are keen on how agri-preneurs become modernized and creative to gain an increase in agribusiness profitability, farm productivity and food security. The justification for this theory employed in this study is based on their theoretical explanation related to the variables in this research. The Lewis theory was propounded by W. Arthur Lewis in 1954. The Lewis theory focused on subsistence economy two-sector model-a traditional and subsistence sector.

III. Methodology

This study adopts a cross-sectional survey research design. This research design captures one-time observation of both the dependent and independent variables and will be used as a base for this study. The study is limited to Southwest, Nigeria thus, the population of the study comprises of targeted registered agribusiness firms (Agricultural Farming Organizations) across all the states-Lagos, Ogun, Oyo, Osun, Ondo and Ekiti in South-West, Nigeria. The population is thus presented in the table below.

Table 1: Population of Agribusiness Firms in South-West Nigeria

S/N	Name of the State	Agribusiness Firms
1	Lagos State	438
2	Ogun State	578
3	Oyo State	212
4	Osun State	321
5	Ondo State	621
6	Ekiti State	387
	Total	2557

Source: Ministry of Agriculture of Each State (2018)

The study employs multi-stage sampling techniques which comprise stratified random sampling and simple random sampling. The study will focus on only the agri-preneurs who own or manage the agricultural firms and this could be the agri-preneur who may be the founder or senior management. The study employs Raosoft table for sample size determination to determine the sample size for the study using 0.05& confidence level, 333. In order ensure that minimum samples are met, the sample size is increased by 50% to cover for non-response rate, Hence the sample size of 333 will become 333 + (333 * 50%) that is now 333 + 167 = 500. The main sample size to be adopted for this study is five hundred (500). In order to ascertain the sample size for each state, proportionate formular is adopted and presented below:

$$\frac{\text{Number of agribusiness companies}}{\text{Total Population}} \times \text{Sample size}$$

Table 2: Proportional Distribution of Selected Sample Size

S/N	State	Computation	Proportion per State
	Lagos State	$\frac{438}{2557}*500$	86
	Ogun State	$\frac{578}{2557}*500$	113
	Oyo State	$\frac{621}{2557}*500$	121
	Osun State	$\frac{321}{2557}*500$	63
	Ondo State	$\frac{387}{2557}*500$	76
	Ekiti State	$\frac{212}{2557}*500$	41
		Total	500

Source: Researcher's Computation

Primary data sources will be used to gather data from respondents for this study. This is because it allows for the collection of data showing current happenings in line with respondents' perception. The structured questionnaire instrument will be administered to the target agripreneurs within the South-west of Nigeria.Each variable question in the independent and dependent are designed to elicit responses with selection options from within the 6point-type ranging from very high, to very low. Multiple regression are used as data analytical technique for the study.

IV. Data Analysis and Interpretation

Table 3: Reliability and Validity Table

Variable	**No of Items**	**AVE**	**KMO**	**Cronbach Alpha**
Greenhouse Farming	6	0.672	559	0.731
Hydroponics	6	0.619	0.698	0.821
Geo-Mapping	6	0.532	0.636	0.861
Drone Agriculture	6	0.763	0.791	0.773
Soil Analysis	6	0.781	0.688	0.658
Food Productivity	6	0.653	0.614	0.681
Food Affordability	6	0.792	0.750	0.805
Farm Yield	6	0.693	0.630	0.755
Food Accessibility	6	0.762	0.512	0.679

Source: Researcher's Computation

The reliability and validity of the instrument was tested using Cronbach Alpha and Kaiser-Meyer-Oklin's (KMO) through statistical package for social science (SPSS). Cronbach Alpha was used to ascertain the internal consistency of the data while KMO was done to ascertain if the instrument measures what it is intended to measure. According to Serbetar and Sedlar (2016), Cronbach Alpha value that is greater than 0.70 is considered to be good to conduct a study. Thus, all the variables employed in this study have Cronbach Alpha values that are greater than 0.70

TEST OF HYPOTHESES

H_{01}: - Smart agri-preneurship dimensions do not significantly affect farm productivity in South-West, Nigeria.

Table 4: Smart agri-preneurship Dimensions do not significantly affect Farm Productivity

	β	Std Error	t	P-value
Green House Farming	0.128	0.045	2.870	0.004
Hydrophonics	0.100	0.044	2.276	0.023
Geo-Mapping	0.225	0.035	6.344	0.000
Drone Agriculture	0.033	0.017	1.956	0.051
Soil Analysis	0.284	.0.037	7.671	0.000

R^2 = 0.675 Adj. R^2 = 0.671
F (6, 551) = 190.420 (p=0.000)

Table 4 shows the result of the analysis on smart agri-preneurship dimensions (green house farming, hydrophonics, geo-mapping, drone agriculture, and soil analysis) on farm productivity. From table 4, the result of the analysis revealed that green house farming (β = 0.128, t = 2.870, p<0.05), hydrophonics (β = 0.100, t = 2.276, p<0.05), geo-mapping (β = 0.225, t = 6.344, p<0.05), drone agriculture (β = 0.033, t = 1.956, p=0.05), and soil analysis (β = 0.284, t = 7.671, p<0.05) all have positive and significant effect on farm productivity in South-West, Nigeria. This finding indicated that all the dimensions of smart agri-preneurship have positive and significant effect on farm productivity in South-West, Nigeria.The coefficient of determination (R^2) value in the analysis is 0.675 which indicates variations in farm productivity is caused by smart agri-preneurship dimensions. Also, the F-statistics (df = 5, 551) = 190.420 at p = 0.000 (p<0.05) demonstrates that the model for the hypothesis is significant in predicting effect of smart agr-preneurship dimensions on farm productivity. Therefore, null hypothesis (H_{01}) is rejected.

H_{02}: - There is no significant effect of smart agri-preneurship dimensions on food affordability in South-West, Nigeria.

Table 5: Smart agri-preneurship Dimensions do not significantly affect Food Affordability

	β	Std Error	t	P-value
Green House Farming	0.126	0.049	2.540	0.011
Hydrophonics	0.204	0.049	4.174	0.000
Geo-Mapping	0.134	0.039	3.413	0.129
Drone Agriculture	0.029	0.019	1.519	0.000
Soil Analysis	0.216	.0.041	5.261	0.000

R^2 = 0.606 Adj. R^2 = 0.602
F (6, 551) = 141.319 (p=0.000)

Table 5 showed the result of the analysis on smart agri-preneurship dimensions (green house farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) on food affordability. The result revealed that green-house farming (β = 0.126, t = 2.540, p<0.05), hydrophonics (β = 0.204, t = 4.174, p<0.05), geo-mapping (β = 0.134, t = 3.413, p<0.05), and soil analysis (β = 0.216, t = 5.261, p<0.05) have positive and significant effect on food affordability in South-West, Nigeria. Also, the result of the analysis revealed that drone agriculture (β = 0.029, t = 1.519, p>0.05) has a positive and insignificant effect on food affordability in South-West, Nigeria. This finding indicated that farmers should focus on green-house farming, hydrophonics, geo-mapping, nutrient cycling and soil analysis to improve food affordability in South-West, Nigeria.The coefficient of multiple determination, adjusted R^2 is 0.602 revealed that smart agri-preneurship explained 60.2% of the changes in food affordability in South-West, Nigeria. Also, the F-statistics (df = 5, 551) = 141.319 at p = 0.000 (p<0.05) implies that model for the hypothesis is significant. Thus, the null hypothesis is rejected.

H_{03}: - Smart agri-preneurship dimensions do not significantly affect farm yield in South-West, Nigeria.

Table 6: Smart Agri-preneurship Dimensions do not significantly affect Food Yield

	β	Std Error	t	P-value
Green House Farming	0.121	0.049	2.476	0.014
Hydrophonics	0.190	0.049	3.953	0.000
Geo-Mapping	0.161	0.039	4.154	0.000
Drone Agriculture	0.033	0.019	1.762	0.078
Soil Analysis	0.248	.0.041	6.118	0.000
R^2 = 0.623 Adj. R^2 = 0.619				
F (6, 551) = 151.798 (p=0.000)				

Table 6 showed the result of the analysis on smart agri-preneurship dimensions (green house farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) on farm yield. The result revealed that green-house farming (β = 0.122, t = 2.476, p<0.05), hydrophonics (β = 0.190, t = 3.953, p<0.05), geo-mapping (β = 0.161, t = 4.154, p<0.05), and soil analysis (β = 0.248, t = 6.118, p<0.05) have positive and significant effect on farm yield in South-West, Nigeria. Also, the result of the analysis revealed that drone agriculture (β = 0.033, t = 1.762, p>0.05) has a positive and insignificant effect on farm yield in South-West, Nigeria. This finding indicated that farmers should focus on green-house farming, hydrophonics, geo-mapping, nutrient cycling and soil analysis to improve farm yield in South-West, Nigeria.The coefficient of multiple determination, adjusted R^2 is 0.619 revealed that smart agri-preneurship explained 61.9% of the changes in farm yield in South-West, Nigeria. The F-statistics (df = 5, 551) = 151.798 at p = 0.000 (p<0.05) means that the model for the hypothesis 3 of the study is significant. Thus, the null hypothesis (H_{03}) is rejected.

H_{04}: - There is no significant effect of smart agri-preneurship dimensions on food accessibility in South-West, Nigeria.

Table 7: Smart agri-preneurship Dimensions do not significantly affect Food Affordability

	β	Std Error	t	P-value
Green House Farming	0.197	0.045	4.389	0.000
Hydrophonics	0.134	0.044	3.019	0.003
Geo-Mapping	0.106	0.036	2.965	0.004
Drone Agriculture	0.050	0.017	2.922	0.000
Soil Analysis	0.256	.0.037	6.846	0.000
R^2 = 0.646 Adj. R^2 = 0.642				
F (6, 551) = 167.442 (p=0.000)				

Table 7 showed the result of the analysis on smart agri-preneurship dimensions (green house farming, hydroponics, geo-mapping, drone agriculture, and soil analysis) on food accessibility. The result revealed that green-house farming (β = 0.197, t = 4.386, p<0.05), hydrophonics (β = 0.134, t = 3.019, p<0.05), geo-mapping (β = 0.106, t = 2.965, p<0.05), drone agriculture (β = 0.050, t = 2.922, p<0.05), and soil analysis (β = 0.256, t = 6.846, p<0.05) have positive and significant effect on food accessibility in South-West, Nigeria. This finding indicated all dimensions of smart agri-preneurship are significant in improving food accessibility in South-West, Nigeria.The coefficient of multiple determination, adjusted R^2 is 0.642 ($F_{(6, 551)}$ = 167.442, p=0.000) revealed that smart agri-preneurship explained 64.2% of the changes in food accessibility in South-West, Nigeria while the remaining 35.8% could be attributed to other factors not included in this model. Also, the F-statistics (df = 5, 551) = 167.442 at p = 0.000 (p<0.05) means that the model for the last hypothesis is significant. Hence, the null hypothesis (H_{04}) is rejected

V. Discussion Of Findings

The importance of agriculture cannot be overemphasized in a developing economy like Nigeria. Thus, practices of smart agripreneurship will surely enhance the growth of agriculture in Nigeria and this goes will the findings of the study. It is evidenced that smart agripreneurship plays an important role in food security. The results of the hypotheses intensified that smart agripreneurship influence the productivity of farmers as well as the farm produce. It should be noted that green-house farming, hydroponics, geo-mapping, drone agriculture and soil analysis are fundamental agripreneurship that improve farm productivity, farm yield, food affordability and food accessibility. It is also indicated that food accessibility and food affordability is being enhanced by smart agripreneurship. The more of smart agripreneurship practices, the more the hunger rate will reduce in Nigeria. This is because there will be food security which implies that there will be adequate food for the people to eat. Past studies have also confirmed that smart agripreneurship dimensions aid agribusiness to achieve agricultural purposes (Rogers, Lassiter, & Easton, 2014; Gasparatos et al., 2017; Tripathi & Agarwal 2015; Tom, 2016; Nwibo & Okorie, 2013) established that smart agripreneurship dimensions enhance food security. However, the findings of the study disagree with the results of Verma et al., (2018); Laud (2018); Masrin et al (2018) who established a negative relationship between smart agri-preneurship and food security.

VI. Conclusion And Recommendation

The objective of the study which is to investigate the role of smart agripreneurship on food security in Nigeria has been achieved. The study revealed that smart agripreneurship dimensions have a significant effect on farm productivity; food affordability; farm yield; food accessibility. Thus, it is concluded that there is a significant effect of smart agripreneurship on food security in Southwest Nigeria. The study also concluded that smart agri-preneurship affects food security output in Nigeria and climate change and government policy exerted no effect on food security output.

The study recommended that agribusinesses seeking to engineer growth should engage and adopt technology to improve food security output. Smart agripreneurship should continue to be practised by farmers in southwest Nigeria and Nigeria as a whole. This will improve farm productivity, farm yield and make food affordable. In other words, smart agripreneurship practices will make food to be accessible. Also, the government should formulate policies that will encourage the smart agripreneur in Nigeria who is attempting to reduce the rate of hunger as well as poverty in Nigeria.

References

[1]. Aatif, H., Kaiser, I., Showket, A., Prasanto, M., & Negi A. K. (2018). A review on the science of growing crops without soil (Soilless Culture) – A aovel alternative for growing crops.*International Journal of Agriculture and CropSciences, 7*(11), 833-842

[2]. Abiodun, T. F., Onafowora, O., & Ayo-Adeyekun, I. (2019). Alarming rate of child poverty in Northern Nigeria: Implications for national security. *American Research Journal ofHumanities Social Science,2*(1), 1-10.

[3]. Achim, W., Robert, F., Robert, H., & Nina B. (2017). Smart farming is key to developing sustainable agriculture. *PNAS, 114*(24), 6148-6150.

[4]. Adelowokan, O. A., Maku, O. E., Babasanya, A. O., & Adesoye, A. B. (2019). Unemployment, poverty and economic growth in Nigeria. *Journal of Economics & Management*, *35*, 5-17.

[5]. Alexandra, A., & Akaakar, A. (2019). *Oil dependency and national food security: A case for Nigeria*. Southern Illinois University Carbondale

[6]. Alimuzzaman, M. D. (2015). Agricultural drone. *Journal of Food Security*, *3*(5), 12-27.

[7]. Alston, J. M., Beddow, J. M., & Pardey, P. G. (2009). Agricultural research, productivity, and food prices in the long run. A recent summary of the evidence. *Journal of Agriculture Science,325*(4), 1209–1210

[8]. Ariani, M., Hervani, A., & Setyanto, P. (2018). Climate smart agriculture to increase productivity and reduce greenhouse gas emission– a preliminary study. *Earth andEnvironmental Science, 200*(8), 12-24.

[9]. Ashe, M. O. (2019). International agencies and the quest for food security in Nigeria. *Journal of Conflict Transformation*, *8*(1),251-274

[10]. Asrat, P., & Simane, B. (2018). *Adaptation benefits of climate-smart agricultural practices in the Blue Nile Basin: empirical evidence from North-West Ethiopia*. London: Springer; p. 45–59

[11]. Awojide, L., Simon, J., & Akintelu, S. (2018). Empirical investigation of factors affecting information and communication technologies (ICTs) in agric-business among small scale farmers in Esan Community, Edo State, Nigeria. *Journal of Research in Marketing 9*(1), 34-51

[12]. Belay, A., Recha, J.W., Woldeamanuel, T., & Morton, J.F. (2018) Smallholder farmers' adaptation to climate change and determinants of their adaptation decisions in the Central Rift Valley of Ethiopia. *Journal of Agric Food Security, 6*(24), 1–12.

[13]. Bell, D. E., & Scott, C. (2011). Los Grobo: Farming's Future?. *Harvard Business School General Management Unit Case*, (511-088).

[14]. Benavidez, R., Jackson, B., Maxwell, D., & Norton, K. (2018). A review of the universal soil loss equation ((RUSLE): With a view to increasing its global applicability and improving soil loss estimates. *Hydro Earth System Science, 22*, 6059- 6086

[15]. Branca, G., McCarthy, N., Lipper, L., & Jolejole, M. C. (2011). Climate smart agriculture: A synthesis of empirical evidence of food security and mitigation benefits from improved cropland management. *Italian Agricultural Review*, *4*, 121-138

[16]. Brück, T., Naudé, W., & Verwimp, P. (2011). Small business, entrepreneurship and violent conflict in developing countries. *Journal of Small Business and Entrepreneurship*, *24*(2), 161-178

[17]. Cai, J., & Leung, P. S. (2006). Growth and stability of agricultural production in Hawaii: A portfolio analysis. *Journal of Agricultural Productivity, 1*, 57-64

[18]. Capolupo, A., Pindozzi, S., Okello, C., & Boccia, L. (2014). Indirect field technology for detecting areas object of illegals. *Technology angle, 1*, 1-12

[19]. Capone, R., Bilali, H. E., Debs, P., Cardone, G., & Driouech, N. (2014). Food economic accessibility and affordability in the Mediterranean region: An exploratory assessment atmicro and macro levels. *Geospatial Health, 11*, 29- 35

[20]. Carfagna, E., & Gallego F. J. (2005). The use of remote sensing in agricultural statistics,*International Statistical Review, 73*(3), 389-404.

[21]. Carrer, M.J., Souza Filho, H.M., & Batalha, M.O. (2019). Factors influencing the adoption of farm management information systems (FMIS) by Brazilian citrus farmers. *Computers andElectronics in Agriculture* 138, 11-19.

[22]. Corwin, D. L., & Yemoto, K. (2015). Methods of soil analysis. *Soil Science Society of America, 10*, 21-36.

[23]. Dauphin, G., Lubroth, J. and Jobre, Y.M (2016). Predominance and geo-mapping of avian influenza H5N1 In poultry sectors in Egypt. *Geospatial Health, 11*, 492- 503

[24]. Dethier, J. J., & Effenberger, A. (2011). *Agriculture and development policy*. World Bank: Research Support Unit, Development Economics.

[25]. Dinesh, D., Frid-Nielsen, S., Norman, J., Mutamba, M., Loboguerrero Rodriguez A.M., & Campbell,B.M. (2015). *Is climate-smart agriculture effective? A review of selected cases*. CCAFSWorking Paper no. 129. Copenhagen, Denmark

[26]. Emami, M., Almassi, M., & Bakhoda, H. (2018). Agricultural mechanization, a key to food security in developing countries: strategy formulating for Iran. *Agriculture & FoodSecurity*, *7*(1), 24-37

[27]. FAO (2012). *Greening the economy with climate-smart agriculture* .Food and Agriculture Organization of the United Nations.

[28]. FAO (2018). *Climate-smart agriculture*. Food and Agriculture Organization of the United Nations.

[29]. FAO. (2010). *FAO/WFP crop and food security assessment mission to Ethiopia (Phase 2*). Food and Agriculture Organization: Rome.

[30]. Fasiha, F. K., Kaleem, A., Aleem, A., & Shujjah, H. (2017). Applications of biotechnology in agriculture. *World Journal of Biology and Biotechnology, 1*, 139-142.

[31]. Fouilleux E, Bricas N, Alpha A (2017) Feeding 9 billion people: Global food security debates and the productionist trap. *Journal European Public Policy 24*, 1658–1677.

[32]. Gasparatos, A., Takeuchi, K., Elmqvist, T., Fukushi, K., Nagao, M., Swanepoel, F., Swilling, M., Trotter, D., & VonBlottnitz, H. (2017). Sustainability science for meeting Africa's challenges: setting the stage. *Sustainable Science 12*, 635–640

[33]. Gates, B. (2019). *Examining inequality. Goalkeepers report from Bills and Melinda GatesFoundation survey*. Retrieved from https://www.gatesfoundation.org/goalkeepers/report/2019-report

[34]. Godrich, S. L., Payet, J., Brealey, D., Edmunds, M., Stoneham, M., & Devine, A. (2019). South West food community: A place-based pilot study to understand the food security system. *Nutrients*, *11*(4), 738.

[35]. Hsieh, T. C., Hung, M. C., Chiu, M. L., & Wu, P. J. (2020). Challenges of UAVs Adoption for Agricultural Pesticide Spraying: A Social Cognitive Perspective.

[36]. Hubeau M, Marchand F, Coteur I, Mondelaers K, Debruyne L, Van Huylenbroeck G (2017). A new Agri food systems sustainability approach to identify shared transformation pathways towards sustainability. *Ecological Economics 131*, 52–63.

[37]. Ingram, J.S, (2011). *From food production to food security: Developing interdisciplinary, regional-level research*. PhD Thesis, Wageningen University.

[38]. Jekel, T., Sanchez, E., Gryl, I., Juneau-Sion, C., Lyon, J. (2014). *Learning and teaching with geomedia*. Newcastle upon Tyne: Cambridge Scholars.

[39]. Kernecker, M., Knierim, A., Wurbs, A., Kraus, T., & Borges, F. (2020). Experience versus expectation: farmers' perceptions of smart farming technologies for cropping systems across Europe. *Precision Agriculture*, *21*(1), 34-50

[40]. Kira, E. S., & Sumari, N. S. (2019). Analysis of geospatial data of Morogoro Urban: lessons for educationists and researcher.. *Indian Journal of Traditional Knowledge 18*(2), 65-795

[41]. Kropff, W., Pilgrim, V., & Neate, P. (2019). *Overcoming challenges to digital agribusiness startup in ACP countries*. Wageningen: CTA Press.

[42]. Kuyrah, J. N., Obare, G., Herrero, M., & Waishaka, M. (2006). *Agricultural income risk and rural poverty dynamics strategies of smallholder producers in Kenya*. A paper presented at the International Association of Agricultural Economics Conference, Gold Coast, Australia, August, pp.12–16.

[43]. Labya P., Megha A., & Kamlesh S., (2018). Hydroponics emerging technique of plant cultivation. *International Journal of Engineering Technology Science and Research, 1,* 2394 –3386

[44]. Laud, K. (2018). Factors influencing agri-preneurship and their role in agri-preneurship performance among young graduate agri-preneurs. *International Journal of Environment,Agriculture and Biotechnology*, *3*(6), 1878-2456

[45]. Liao, W., Vander, M. G., & Salmon-Monviola, J. (2015). Improved environmental life cycle assessment of crop production at the catchment scale via a process-based nitrogensimulation model. *Environment Science and Technology, 49,* 10790–10796.

[46]. Lytos, A., Lagkas, T., Sarigiannidis, P., Zervakis, M., & Livanos, G. (2020). Towards Smart Farming: Systems, Frameworks and Exploitation of Multiple Sources. *Computer Networks*, 107147.

[47]. Malik, A. W., Rahman, A. U., Qayyum, T., & Ravana, S. D. (2020). Leveraging fog computing for sustainable smart farming using distributed simulation. *IEEE Internet of Things Journal*.

[48]. Masipa, T. S. (2017). The impact of climate change on food security in South Africa: Current realities and challenges ahead. *Journal of Disaster Risk Studies, 9*, 411-436.

[49]. Masrin, A., Nurul F.A., Fakhrulisham, R., & Sharil, M.Z. (2018). Geographical mapping on seropositive status of melioidosis among livestock in Malaysia from 2012 to 2016. *Malaysian Journal of Veterinary Research, 9*(2), 44-52.

[50]. Mellor, J. W. (2017). *Agricultural development and economic transformation. Promoting growth with poverty reduction. Palgrave studies in agricultural economics and food policy*. New York: Palgrave MacMillan

[51]. Modirwa, S., & Oladele, O.I. (2012). Food security among male and female-headed households in Eden District Municipality of the Western Cape, South Africa. *Journal of HumanEcology, 37*(1), 29-35.

[52]. Motsara, M. R., & Roy, R. N. (2008). *Guide to laboratory establishment for plant nutrient analysis*. Rome: Food and Agricultural Organization of the United Nation.

[53]. Myklevy, M.; Doherty, P.; Makower, J. The New Grand Strategy; St. Martin's Press: New York, NY, USA, 2016; p. 271.

[54]. Nisha, S., Somen, A., Kaushal, K., Narendra, S., & Chaurasia, O. (2018). Hydroponics as an advanced technique for vegetable production: An overview. *Journal of Soil and WaterConservation, 17*(4), 364-371

[55]. Nwibo, S. U., & Okorie, A. (2013). Constraints to entrepreneurship and investment decisions among agribusiness investors in southeast, Nigeria. *International Journal of SmallBusiness and Entrepreneurship Research, 1*(4), 30-42

[56]. Obiero, E. O. (2013). Social economic factors affecting farm yield in Siaya District, Siaya County, Kenya. *Italian Agricultural Review, 8*, 13-21

[57]. Onyibe, J. E. (2019). Re-thinking Ag-Sector development strategies towards zero hunger in Nigeria by 2030. *Journal of Emerging Trends in Economics and ManagementSciences*, *10*(1), 12-23.

[58]. Paul, R. (2013). *Drones can be positive and negative for the AG industry*. The OHIO StateUniversity, College of Food, Agriculture and Environmental Sciences.

[59]. Ponisio, L. C., & Ehrlich, P. R. (2018). Diversification, yield and a new agricultural revolution: Problems and prospects. *European Scientific Journal, 1*,140-157

[60]. Praveen, B., & Sharma, P. (2019). A review: The role of precision technology in agriculture. *Journal of Public Affairs, 3,* 25-33

[61]. Price Water House Coopers LLP (2016). *PwC Agribusiness report*. African PressOrganization.

[62]. Rajaram, S., & VanGinkel, M. (2019). *Achieving global food security for all: focus on sub-Saharan Africa and Asia*. In Le Déméter (pp. 297-309).

[63]. Regan, Á., Stuart, G., & Paul, M. (2018). *Smart farming in Ireland: Anticipating positive and negative impacts through a qualitative study of risk and benefit perceptions amongst expert actors in the Irish agri-food sector*. Conference proceedings of 13th European International FarmSystemsAssociation Symposium.

[64]. Rehman, T.U., & Chang, Y.K. (2018). Current and future applications of cost effective smart cameras in agriculture." *RoboticsandMechatronics for Agriculture*, *1*,83-128.

[65]. Remondino, F., Barazzetti, L., Nex, F., Scaioni, M., & Sarazzi, D. (2011). UAV potogrammetry for mapping and 3D modeling – Current status and future perspectives. *InternationalArchives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 38*(1), 281-296

[66]. Rogers, M., Lassiter, E., & Easton, Z. M. (2014). Mitigation of greenhouse gas emissions in Agriculture. *Agricultural Review, 4*, 17-26

[67]. Romanus, O, Evans, O., & Ese, U. (2018). Food security, institutional framework and technology: Examining the Nexus in Nigeria Using ARDL Approach. *Journal of Science and Technology, 4,* 32-47

[68]. Romeo, D.; Vea, E.B.; Thomsen, M. (2018) Environmental Impacts of Urban Hydroponics inEurope: A Case Study in Lyon. *Urbanisation Process*, *69*, 540–545.

[69]. Ruttan, V. W., Bell, D. E., & Clark, W. C. (1996). Climate change and food security: agriculture, health and environmental research. In *Climate Change and World Food Security* (pp. 625-649). Springer, Berlin, Heidelberg.

[70]. Saiz-Rubio, V., & Rovira-Más, F. (2020). From Smart Farming towards Agriculture 5.0: A Review on Crop Data Management. *Agronomy*, *10*(2), 207.

[71]. Sakyi, P. (2012). *Determinants of food accessibility of the rural households in the LimpopoProvince, South Africa.* (Unpublished Masters Thesis) Ghent University

[72]. Sen, A. (1981). *Poverty and famines: An essay on entitlement and deprivation.* Oxford: Clarendon Press.

[73]. Serbetar, I., & Sedlar, I. (2016). Assessing reliability of a multi-dimensional scale by coefficient alpha. *Journal of Elementary Education*, *9*(1/2), 189-195.

[74]. Solomon, D., Mungai, C., & Radeny, M. (2017). Climate-smart agriculture (CSA) for resilient agriculture, food security and inclusive business growth in East Africa. *Journal of Agronomy, 12*, 55-71

[75]. Suberi B, Tiwari, K, Gurung, D., Bajracharya, R., & Sitaula, B. (2018) People's perception of climate change impacts and their adaptation practices in Khotokha valley, Wangdue Bhutan. *Indian Journal of Traditional Knowledge 17*(1), 97–105

[76]. Tom, N., Rajab, O., & Wamalwa, I. (2013). Bungoma food security assessment report, ministry of agriculture, livestock and fisheris, Kenya. *Agricultural Review*, *1*, 4-18

[77]. Tripathi, R., & Agarwal, S. (2015). Rural development through agri-preneurship: A study of farmers in Uttar Pradesh. *Global Journal of Advanced Research*, 2(2), 534-542.

[78]. Uche, C., & Familusi, L. (2018). The adoption of agri-preneurship as a mitigating measure to unemployment in Nigeria: A topical review. *Global Journal of Business and ManagementResearch,18*(2), 46-59

[79]. United States Department for International Development (1992). *USAID policy determination:Definition for food security*. PD No.19.USAID

[80]. Velde, M. V. D., & Nisini, L. (2019). *Performance of the MARS-crop yield forecasting system for the European Union: Assessing accuracy, in-season, and year-to-year improvementsfrom 1993 to 2015*. European Commission, Joint Research Centre (JRC), Ispra 21027,Italy

[81]. Verma, R. K., Sahoo, A. K., & Rakshit, S. (2018). Opportunities in Agri-preneurship in India:Need, challenges and future prospects. *Indian Agricultural Statistical Research Institute. 13*(1), 69-72.

[82]. Vox, H., Teitel, Y., Pardossi, F., Minuto, A., Tinivella, E., & Schettini, K. (2010). *Household food security in rural areas of Nepal - Relationship between socio-economic characteristic and food security status.* A Paper Presented at the International Association of AgriculturalEconomist Conference, Gold Coast, Australia.

[83]. Wekesa, B. M., Ayuya, O. I., & Lagat, J. K. (2018). Effect of climate-smart agricultural practices on household food security in smallholder production systems: Micro-level evidence from Kenya. *Agriculture and Food Security, 7*(1), 86-97

[84]. Wieczorek AJ (2018) Sustainability transitions in developing countries: Major insights and their implications for research and policy. *Environmental Sciences, 84*, 204–216.

[85]. Wright, P. M., Dunford, B. B., & Snell, S. A. (2001). Human resources and the resource based view of the firm. *Journal of management*, *27*(6), 701-721

[86]. Yi-Hsuan, H., Ssu-Pei, L. & Ting-I, L. (2019). *The application of organic hydroponics on homegrown urban agriculture in Taiwan comma company.* M.Sc Thesis, National Chiayi University, Taiwan.

[87]. Zaccardelli, M., Pane, C., Villecco, D., Palese, A. M., & Celano, G. (2018) Compost tea spraying increases yield performance of pepper (Capsicum annuum L.) grown in greenhouse underorganic farming system. *Italian Journal of Agronomy*, *13*, 91- 106

[88]. Zepeda, L. (2001). *Agricultural investment, production capacity and productivity*. FAO Economicand Social Development Paper, 148.

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