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Agricultural Productivity and Processes Enhancement through the use of Software Applications: A Review of Agriculture Based Software

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Abstract: Food insecurity is a major issue the world over as it is one of the problems bedeviling the human race. The Food and Agricultural Organization, (FAO) predicts that by 2050, there will be 9.6 billion people on the planet and this will require an increase in food production to about 70%. The use of application software resulting to e-agriculture can contribute to solving these problems to a large extent since technology has tremendous impact on the agricultural sector. But the concept and knowledge about the use of these software to enhance agricultural activities remain relatively poor among farmers, especially the smallholder farmers which produces more than 80% of the food consumed. This has resulted to many problems like poverty, health issues, insurgency, and many others. This work reviews some existing software applications that can be applied to enhance agricultural processes for improved food production.

Key words: Agriculture, Enhancement, Farmer, Software Applications, Productivity, Smallholder Farmer and Crop Yield.

I. INTRODUCTION

Nearly every area of human effort finds applicability for computer science as a field of study. This is due to the fact that it enhances value and has a significant impact on the activities and procedures involved in all disciplines. Agriculture as a field cannot be an exception in this regard. In order to improve agricultural production services and procedures, a variety of software programs that have been built employing computing methodologies have been used.

According to [1], computer applications software aids in carrying out any tasks that may be employed by people and computers to improve their operations. They could be either user-defined or all-purpose.

Ref [2] claims that application software are capable of handling user inputs and assisting the user in finishing a task. Also known as an end-user program. It is located immediately above the system software in the computer's architecture.

In terms of their application to agriculture, they make a variety of contributions, but in general, they aid in increasing productivity by giving farmers the essential guidance to help them with things like farm planning and operation, marketing, and others.

According to [3], farming is still the primary source of food, hence it needs to be improved in order to enhance production and feed everyone on earth. A key component of smart farming is the usage of numerous mobile and online apps in the agricultural sector.

Mobile applications provide cutting-edge, dynamic, and transdisciplinary services for agricultural and rural development. She went on to say that these new services might boost farmers' income and present them with more opportunities.

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According to [3], adopting these farm planning and processes will result in benefits such as access to better information, finance, control over farms, a distribution network, farm information, market information, climate information, and others that will help the farmer command higher prices for his products. These benefits also include disaster and risk management strategies, financial management, live updates about their farms and fields, and the ability to gather and analyze farm data.

These programs make use of technology to guarantee efficient communication and the necessary farm output. The main computational infrastructure and communication network are present. Because these technologies and applications cover all agricultural processes, including planning, cultivation, harvesting, and sales or storage, they enable the efficient operation of the entire agricultural value chain.

Other advantages include:

(i) They aid in connecting and recommending services to persons in the agricultural industry

(ii) (They aid in bridging the gap between buyers and sellers of agricultural items

Most lately, the digital farming technique is creating ripples in the agriculture market. This is achieved by leveraging online platforms to subscribe for farming operations with a possible return on investment in a specific time frame. Since no physical presence is necessary for members to get the outcomes of farm procedures, this form of farming system is better referred to as virtual farming.

Planning a farm, cultivating a crop, harvesting, storing, and, most importantly, marketing it are all examples of agricultural processes. It encompasses more than just agronomic procedures. In animal husbandry too, software are also used to improve production procedures and systems.

According to [4], software is occasionally used in animal husbandry to prepare for efficient growth and monitoring of farm animals. Among these are the preparation of animal feeds and the intake of feed. In other cases, animals are implanted with electronic chips that serve as trackers in the event that the animal goes missing or comes under attack from a wild animal.

By examining the software, describing how it is used to address issues in the agricultural sector, and evaluating its benefits to the sector, this work aims to analyze various computer application software used in the agricultural sector and how they have impacted the industry.

This study is beneficial to major stakeholders in the agricultural sector. They include the smallholder farmers, agricultural produce off takers, financial institutions, government, researchers and others who have business with the agro sector as the knowledge of these applications will enhance agricultural productivity.

According to Rishaj [5], the primary goal of farming applications is to optimize the entire agricultural process. Since the majority of the features are accessible via a smart device, such as a computer or mobile phone, they aid farmers in planning their farming operations appropriately. The study identified a number of applications for agricultural software, including expert advice with farm management software, increasing fertility with farm management system solutions, weather forecasting, drone use with customized agriculture software, using GPS tracker, showcasing the agricultural products, and maintaining calendars.

According to [6], farming involves more than just growing crops; instead, farmers and landowners must deal with difficulties including viability, productivity, maintenance, and taxes, to name a few. Being an excellent producer is no longer sufficient to stay in business. She continued by saying that being a competent producer as well as a good farm manager are essential traits for today's successful farmers. She reiterated that farm management is one of the most crucial aspects of running farms and that it determines how farm life will be structured, resources will be distributed, and activities will be carried out. It also discusses numerous strategies and techniques to keep a farm productive, workable, unaffected, and profitable, all of which can be accomplished by using software applications without difficulty.

As the human population grows daily, the agriculture sector must be scaled-up to technology to meet all the demands, according to ref [7], who also listed some of the benefits, including the use of GPS tracking, using drones with agricultural app development, video calls and chats, weather forecasting, diseases and their treatment.

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In a nutshell, there are several ways that computers are used in agriculture, including

(i) software that aids in weather forecasting and productivity estimation.
(ii) Computers are used to estimate and calculate profit and/or loss, as well as to keep track of information on the costs associated with production, transportation, and agricultural processes.
(iii) Farmers and agricultural specialists can communicate more easily; thanks to the internet. This promotes knowledge sharing and gives farmers direction on how to increase productivity and make money.
(iv) Farming practices have improved to those demanding less work and producing more thanks to the application of software technology. Mechanization has boosted production speed and quality while reducing labor required from humans and animals.

II. REVIEW OF SOME AGRICULTURAL MANAGEMENT APPLICATION SOFTWARE

So many software are being used to enhance agricultural productivity. Below are some of the software and how they are used in agriculture.

A. TraxView

This program was created by AgTrax, a company that offers agricultural software to grain elevators, fertilizer firms, full-service cooperatives, ethanol production facilities, feed stores, and other businesses. It can be applied to farm receivables, commodities accounting, general ledger, order point, customer entry, staff payroll, perpetual inventory, product manufacture, etc.

B. Granular

It is a comprehensive farm management tool that also serves as a crop and farm accounting tool. Granular increases teamwork efficiency, uses data-driven crop models to help farms increase yield, calculates profit down to the field level, and analyzes a lot of data to estimate the value of individual fields. Granular then provides farmers with real-time analytics reports to assist them in making timely and accurate decisions. Basically, it works by giving farmers information about the crop for the previous five years and advising ideal crop rotation techniques with an expected yield to be attained. There are versions of this software available for Windows, Android, the web, and other platforms.

C. FarmLogic

A web-based farm accounting system, called FarmLogic. The program delivers GPS field mapping reports and keeps track of service records, farm records, scouting, and soil sample. FarmLogic is designed to empower farmers to make better informed decisions on their properties, boosting productivity and efficiency. Its two main basic components are FarmPAD and Web Headquarters. FarmPAD gathers information about the farm and provides it to Web Headquarters, while Web Headquarters handles the record keeping part of farm operations. It can work offline, plans farming strategies for the following season, monitors daily farming activities, incorporates GPS, generates reports, has a database of pesticides and their uses and applications, and conducts field scouting among other tasks.

D. Crop Audit

This program helps farmers understand the costs and efficiencies of production. Only this crop management software integrates field data and accounting technologies. Crop Audit is a full crop management system that increases agricultural profitability through crop management, satellite image analysis for crop activities, farm accounting activities, and can be used for plant breeding and research among other things that improve farming operations.

E. Farmer Core

Famer Core, developed from Trimble Ag, is an all-inclusive farm cost management system that maintains your records on both an accrual and cash basis. This enables you to determine the precise profitability of any enterprise on your farm. It can project the most likely outcome from the farm activity by planning, carrying out, monitoring, and recording farm information.

Tracking equipment locations, status, and utilization, viewing historical positions, capturing time spent idle, moving, and traveling, as well as monitoring delay causes, are some of the other main advantages associated with this program. For real-time machine health, it can also interact with the engine diagnostics.

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F. AGRIVI

It is a farm management program used to schedule, keep track of, and evaluate every activity on the farm. Tillage, planting, spraying, fertilizing, irrigation, harvesting, and other processes are among them. It also oversees crops, fruits, and vegetables.

G. FarmLogs

FarmLogs is a software solution that combines farm management and grain marketing. You can use FarmLogs to make agronomic plans, compute field-level profit and loss, manage daily activities, and perform field labor in real time, among other things.

H. Farmbrite

Farmbrite is a program for managing records on farms and with livestock. The ranch management software aids in keeping you organized, maintaining better records, managing your resources, monitoring production, spotting production drifts, learning new things, and boosting revenues.

III. DISCUSSIONS ABOUT THE REVIEWED SOFTWARE

From the agricultural application software reviewed so far, it is clear that no simple software offers the combined services of crop management, farm management and farmers operations. The software above manages farmers finances and do little of farmer's workflow coordination. In most instances, the implementation is done on computing devices that requires the use of internet. This is a great disadvantage to the farmers as most farmers operate in a remote location that lacks internet access.

There is a need for an application that will combine farm processes workflow and crops management activities coupled with after cultivation activities like sales, storage and processing. These post cultivation activities if performed under the direct control of the farmer and eliminating middle men add more value and income to the farmer, therefore, a unified software application that can achieve these events at a stretch will go a long way in helping the farmers achieve great success.

Nevertheless, most farmers have limited knowledge as regards computer operations. Agricultural applications can as well be fashioned to use fewer complex ways of operation like the Unstructured Supplementary Service Data (USSD), for easy operations. This will add more value and encourage more farmers to use the applications themselves and provide solutions to their farming problems real time. In the same vein, cost of deployment and use should be within the reach of smallholder farmers since software that are expensive no matter how good may not be acquired for use by smallholder farmers because of their low-income nature.

Most importantly, these software should be conceived and developed bearing in mind the locality within which their operations will mostly be domiciled. These will enhance effectiveness and efficiency in their operations and more gain in their utilization.

IV. CONCLUSION

Agricultural activities and operations are enhanced by the use of software and have positively impacted on the lives of farmers, leading to an improved gross domestic product from agricultural produce. Nevertheless, the knowledge about their usage still remains low among many farmers especially in Nigeria. Efforts towards encouraging their usage and bringing to bare their activities will continue to be advanced by researchers and scholars to make better agricultural activities.

In this regard, researches that bring forth cutting edge technologies and procedures to advance agronomic practices cannot be left unattended to. More researches should consider evolving systems with state-of-the-art technologies and models that will enhance agricultural productivity and fast track agronomic activities that farmers can perform in real time which are portable, easy to operate and not expensive. The gain expectedly from the use of these software should be highly quantifiable to users such that they can easily see and tell the advantage of using such methods in advancing their farm work operations.

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