



A framework for Development of Agricultural Automated Information System

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ABSTRACT

Information dissemination in the Agricultural sector is usually done through broadcast media (Television and Radio), newspapers, magazines, pamphlet, individuals, gatherings, and seminars. Also records of farmer are collected manually using printable forms and complaints are tabled through extension workers. The main objective of this paper is to design a framework for Development of Agricultural Automated Information System for Computer Based Information system in Agricultural sector in Nigeria. The framework can be used for the design of algorithm that describes how to solve the problem of a lack of appropriate and easily accessible agricultural information and provide proper means of interaction between the farmers and government.

Keywords: Information System; broadcast media; Agricultural sector; framework; farmers; government

1.0 INTRODUCTION

1.1 Background of the study

Agricultural information is an important factor that interacts with other production factors, such as land, capital, labour and other managerial ability, can be improved by relevant, reliable and useful information supplied by extension, research, education and agricultural organizations helps farmers make better decisions. Therefore, there is a need to understand the functioning of a particular agricultural information system in order to manage and improve it (Demiryurek, Erdem, Ceyhan, Atasever & Uysal, 2008).

Every organization requires information to survive in this modern world. Information has great influence on decision making. Its values cannot be over emphasized and achievable for those who use it. Information is important resource needed to grow and develop any sector of the organization. Change in the environments and way things are carried out, make it necessary for the need to have access to vital information for efficient and effective decision making in each level of management in an organization. Information creates awareness for better understanding that can improve the means of livelihood of individual and communities at large (Adedokun and Gbaje, 2014).

Accordingly, an Agricultural Information System (AIS) consists of subsystems, information related

processes, interfaces, networks, control and management. Agricultural information is considered as an essential input to agricultural education, research and development and extension activities. There is a strong need for AIS to influence agricultural activity in several ways. It can bring about the needed information which farmers would make decisions regarding farming activities and management. Agricultural activities can be improved upon through efficient, consistent, and useful information and knowledge dissemination in the sector. AIS help in disseminating information to farmers so that farmers can make decision in order to take advantage of their productivities.

A work that aims at reviewing the state-of-the art of smart agriculture security, particularly in open-field agriculture, discussing its architecture, describing security issues, presenting the major challenges and future directions was proposed (de Araujo, da Silva & Albini (2020). Strang, Vajjhala & Bitrus (2019) examined what factors impacted the Agricultural Information System (AIS) electronic software adoption by rural farmers in central Nigeria. They collected a moderately large sample of responses from rural farmers and examined the generally accepted factors that were found in the literature. The results should generalize to other rural farm decision makers in Nigeria and the paper should be of interest to other researchers in this field.

Tegegne and Alemu, (2019) present a design and evaluation of an SMS-based agricultural information system that serves as a platform where rural farmers and extension officers can share agricultural information. Development of the system followed a Rapid Application Development (RAD) methodology. The system was evaluated for usability, accuracy, performance, and significance. The performance of the system was analyzed by gathering data for the amount of time it took to process the messages and send responses based on a user's request. Based on feedback from 20 participants using the SUS, the system, with the score ranging from 0 to 100, scored 87.63. The mean average response system time was 3.34 seconds. These results show that the problem of a lack of appropriate and easily accessible agricultural information can be solved using a system.

Information dissemination in the Agricultural sector is done through broadcast media (Television and Radio), newspapers, magazines, pamphlet, individuals, gatherings, and seminars. Also records of farmer are collected manually using printable forms and complaints are tabled through extension workers. Various agricultural information systems were developed to provide crop information to farmer (Adeyemo, 2013) developed national e-agriculture that provides relevant information about varieties of crops and other requirement such as temperature soil type, rain fall, temperature, type and quantity of fertilizer, time of planting, time of maturity, market price etc. all this agricultural information system provide pre- farming and post farming information to the Farming to take decision about his farming activities.

The various agricultural information system highlighted does not have functionality for storing information of the farmers, farmer cannot interact with the institution concerned, whenever in difficulties. Information dissemination in the Agricultural sector is usually done through broadcast media (Television and Radio), newspapers, magazines, pamphlet, individuals, gatherings, and seminars. Also records of farmer are collected manually using printable forms and complaints are tabled through extension workers. The challenges with the current system are irrelevant of information deliver, the system does not capture all farmers, and communication is one way.

The main objective of this study is to design a framework for the system that collects, stores, manages, and disseminates information in the Agricultural sector.

1.2 Related Works

In this section various related studies were reviewed to provide an overview of the current knowledge, method and gaps identify in the existing research. Attempt are being made to see that agricultural productions and activities are improved upon by make possible the advancement in agricultural technologies get to farmers through broadcast media (Radio and Television), newspapers, magazines, individuals, gatherings, and seminars. These are the methods used.

Application of Information and Communication Technology (ICT) in agriculture is increasingly important (Saha, Sakib, Saquib & Hussain, 2010). Agricultural information involves the conceptualization, design, development, evaluation and application of innovative ways to use ICT in rural domain, with a primary focus on agriculture. ICT can play a significant role in maintaining properties of information as it consists of three main technologies (Mahant, Shukla, Dixit, & Patel, 2012).

The developments in ICT and the Internet in particular have revolutionized the entire agriculture field. It has generated new markets, changed the structure of the Agriculture distribution channels and re-engineered all processes. Different technology used from the perspective of agricultural research, extension, product processing and marketing. The findings reveal potential growth of the agriculture sector (Sohoo, 2008). The impact of information and communication technology (ICT) on access for rural farmers on agricultural information was analyzed by (Armstrong, Gandhi, & Lanjekar, 2012) reveal that farmers were most interested in obtaining market price information without putting into consideration the need to have modern knowledge about farming and farming related activities. Examining of the relationship between use of ICT tools and co factors such as age, qualifications and income indicated that only income was a determining factor of using ICT tools. Armstrong, Diepeveen and Gandhi (2011) explain the grains value chains in agriculture, and identify the importance in developing strategies which could better secure food production. The study integrates ICTs in agricultural supply and value chains. The

development of strategies to integrate these ICTs into the supply chain was proposed.

Saidu, Clarkson, Adamu, Mohammed & Jibo (2017) reviewed the influence of Information and Communication Technology in agriculture in respect of opportunities and trials. It was found that improvement of market activities, exchange of relevant information, profit gain, networking agricultural sector globally, conducting research and strategizing economic growth for self-reliance are among the possible benefits of ICT in agricultural sector. Likewise, the review identified inadequate ICT facilities, lack of personnel, insufficient infrastructure, harmonization of knowledge and language, power supply and farmers' perception are some of the challenges and issues that obstruct successful implementation of ICT in agricultural growth. Saidu et al, (2017) concluded that more research need be conducted in order to draw relevant ideas and suggestions that will enhance fruitful implementation of ICT to develop agriculture. Islam, Haque, Afrad, Abdullah and Hoque (2017) conducted a study on 110 SAAOs (Sub

Assistant Agriculture Officer) of Manikganj district to investigate the use of different ICT tools for official purpose and found that about 94% of the respondents highly used mobile phone followed by smart phone (8%) and digital camera (6%). Rest of the tools had very limited use. It was a major concern that only 3% and 1% respondents (Fig. 6) highly used internet and computer respectively. There is no alternative to increase and apply the use of GIS in the coming years to sustain agricultural production. A GIS based soil mapping system at the union level can analyze data and provide information relating to crop suitability, land zoning, nutrient status and fertilizer dosage. Satellite based data will help to define flooding by its characteristics (river flood, flash flood, tidal flood, rain fed flood) and duration of inundation. This system can also be applied to assess drought, salinity and cold stresses for each soil map unit.

Birke (2021) presented a work that aims to provide evidence on the implementation process of ICT initiatives in agriculture extension organizations and their use. The researcher provides empirical evidence on the complex interaction of social and technical actors and their assemblage to set up an ICT-based initiatives called Agricultural Knowledge Centers (AKCs); to provide empirical evidence on experts' perceptions and their use of ICTs in agriculture extension offices; and to bring

insights on organizational characteristics that facilitate or hinder the learning of an organization for successfully applying ICTs in agriculture extension services. The work analyzes the innovation process of ICT-based initiatives in agriculture extension by building on the definition of innovation as an alignment of hardware (technical devices, bodily skills), software (mode of thinking, discourse, perceptions).

Chowhan & Ghosh (2020) performed a thorough review of secondary data sources; i.e. overlook of literatures from web, online published articles, reports, news etc. on some selective districts of Bangladesh to study the current features of ICT, its exercise and future prospects in the context of agriculture information and communication. The results showed that the majority of the farming group and thereby involved extension workers (SAAO) have limited access, usage, knowledge and capacity on the use of ICT tools and media. But the researchers do not consider collecting, storing, managing, and disseminating information in the Agricultural sector.

Information system is an integrated set of components for collecting, storing, and processing data and for providing information, knowledge, and digital products. Agricultural firms and other organizations rely on information systems to carry out and manage their operations, interact with their customers and suppliers, and compete in the marketplace. Information systems are used to run inter organizational supply chains and electronic markets. Information systems are used to process agricultural information, to manage human resources, and to reach their potential customers with online platforms. (Zwass, 2020).

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2.0 RESEARCH METHODOLOGY

Process Flowchart of the Proposed System

The flowchart that describes the proposed system (Agricultural information system) is described in different section according to the interface and the operations each user of the system can perform. The

user of the system start be login with his access details if successful the displays menu options, the user then selects from the list menu and perform required operations, else if failed to login successful the user has to login again with the correct login details as shown in Figure 2.1.

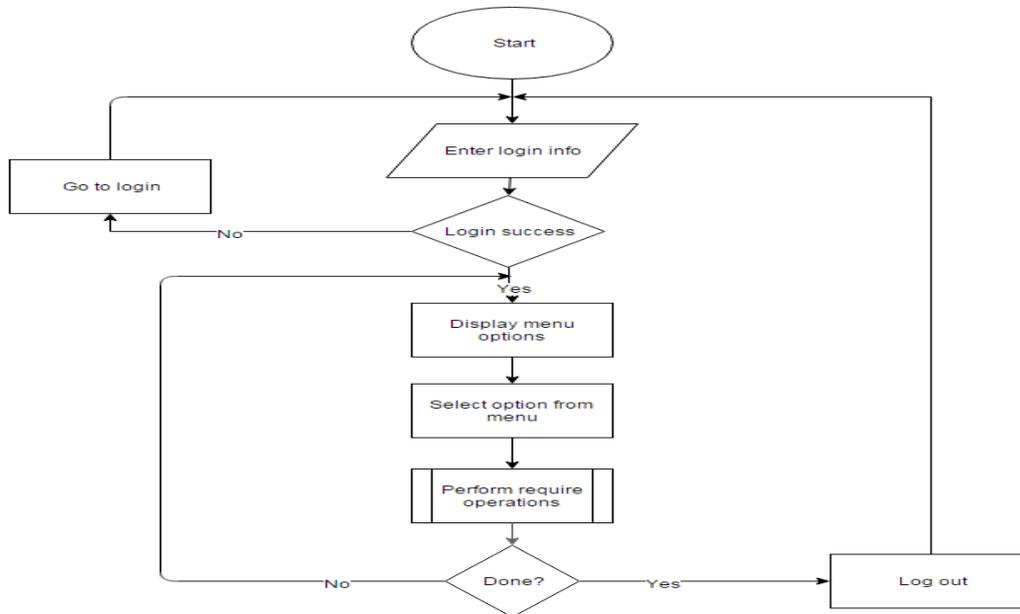


Figure 2. 1: Process Flowchart of the Proposed System Design

The proposed system aims to improve the efficiency of information management and the general order of operation of the system, and the main function is managing and maintaining information. The researcher, government and farmer are the major functional requirements in the system. The Administrator (government) will be given more powers (enable/disable/ update) than other users. It will be ensured that the information entered is of the correct format.

The Farmer: is the center focus in the system aimed at providing better services to the Agricultural sector, farmer play important role, farmer can upload his information, access the information regarding new method, advanced technology, and government programs and policies, can also make complaints where he or she have difficulties in implementing new method which is one of the functions of the system also for more inquiring, as shown in Figure 2.2

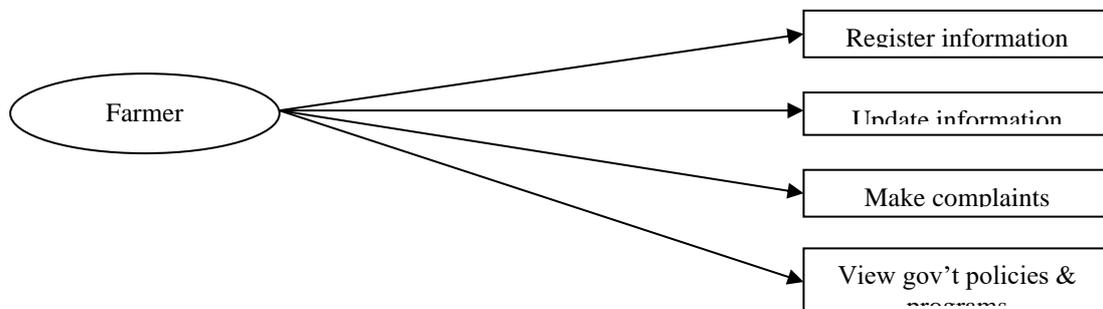


Figure 2.2. Detailed Functions of the Farmer activities

The Research Institution: is responsible for various kind of research it also receives complaints from farmers on various issues; they view farmer

information and act on the complaints and profound solution as shows in Figure 2.3.

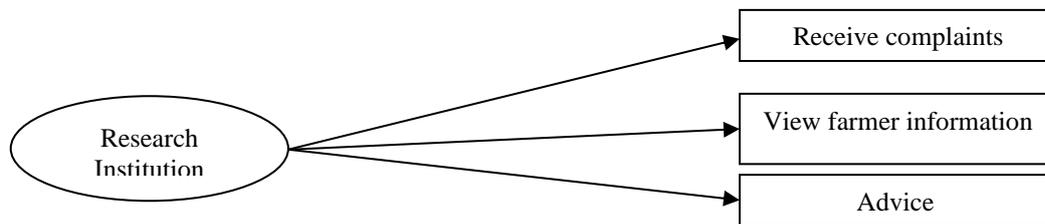


Figure 2.3. Detailed Functions of the Research Institution

The Ministry's Coordinator: is to be in-charge of registering the research institution, publish

government programs and view farmer's information as shown in Figure 2.4.

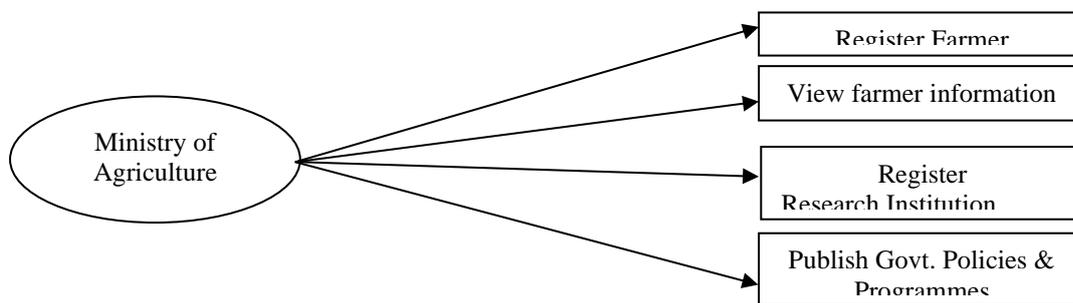


Figure 2.4. Detailed Functions of the Government Agencies

Firstly, the performance requirements of the system dictates that the developed system was should be used as the chief performance system for helping the agricultural sector in managing the whole database of the farmers in the country. Therefore, it is expected that the database would perform functionally all the requirements that are specified. Secondly, the safety requirements of the system take into consideration that the database may get crashed at any certain time due to virus or operating system failure. Therefore, it is required to take the database backup.

Lastly, the security measures require that a secured database should be developed for the system since the it will run as distributed system. The system has various categories of users namely: Administrator, farmer who will be viewing either all or some specific information from the database. Depending upon the category of user the access rights are decided. It means if the user is an administrator, then he can be able to modify the data that is at the level of his access right. All other users', the Research and Institution only has the rights to retrieve the information about database

4.0 CONCLUSION

Based on the research work carried out at the course of the study, the work comes out with framework that can be used for storing and disseminating information in the Agricultural sector. The framework for automated agricultural information system if adopted will help in having a system that contains precise and accurate information concerning each and individual farmer, his location, state of residence, and the type of farming he/she is into. Accurate information can be disseminated in due course reaching the targeted audience which is the farmer at the right time.

Based on the advantages to be derived from the ICT in this modern age, this research is recommended to various Ministry of agricultural and rural development in the country, so as to have a system that contains all farmers' information and provide a platform that would provide seamless access to improved information and communication dissemination system in order to take advantage of ICT. The framework can be used for the development of algorithm to implement the agricultural information systems.

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