Application of Ancient Indian Agricultural Practices in Cloud Computing Environment

Abhishek Pandey[1], V. Ramesh[2]
[1] Research Scholar, SCSVMV University, Kanchipuram (Tamil Nadu)
[2] Assistant Professor, SCSVMV University, Kanchipuram (Tamil Nadu)
Email: apandey.net@gmail.com, rameshvpothy@gmail.com

Abstract - About 70% people of India are living in rural areas and are still dependent on Agriculture. Therefore transformation of the Agriculture through technology is quite important in today India's Agriculture system. In olden days formers in India used to depend on clouds for rains, but today they are looking towards Cloud Computing where they are getting knowledge for cultivation of better crops, Expert advice for crop diseases and causes, Interactive learning service, Dynamic storage service, real time question answering service and many more in a nominal cost. With the evolution of cloud computing and its subsequent popularity, the service providers are coming up with very easy and affordable solution for our farmers. Just our farmers need to register with service provider like CloudCow and to pay for the agri services they got from service provider. In this study we proposed an Agri cloud model for rural Indian farmers, so that they can opt digital farming through cloud computing for better productivity of their agriculture products and to improve their lifes.

Keywords - Cloud Computing, CloudCow, Digital India, Ubiquitous Agriculture, Vedic Agriculture

I. INTRODUCTION

India is a unique combination of ancient knowledge and modern technology. The true India resides in its Villages and Village resides in its farmer. Agriculture plays a major role in a source of employment as well as India's GDP. In the country, over 70% people depend on agriculture business as the major source of income. India is third largest economy in Asia after China and Japan. India is the world's second largest producer of Rice, Wheat and other cereals. According to the Central Statistics Office, National Statistical Organization, India, the agriculture and allied sector contributed 13.90% to GDP during 2013-2014 (at 2004-2005 constant prices). According to the Australian Department of Agriculture, real value of agri-food demand in India is likely to rise between 2009 and 2050. To fulfill this unprecedented demand we must need modernization of Indian Agriculture. Therefore our agriculture scientists and researchers have to think how science and technology can be used as tool to empower Indian Agriculture and to develop India. Today when world is talking about holistic health care, Environmental sustainability, Yoga, Green Energy, Environmental friendly computing and to go back to basic. It is right time for them to think Agriculture with ancient Indian prospective i.e. Vedic Agriculture so that India can play the role of Vishwa Guru (Universal leader) in the 21st century.

With growing population and ever growing demand for food, the scientist and researchers across the globe are busy to find innovative ways to meet this ever surging demand. With the evolution of cloud computing and its subsequent popularity the service providers are coming up with very easy and affordable solutions for the end users. In this research work we put our emphasis on how cloud computing technology can be applied in the field of agriculture to empower rural farmers.

A. Research Questions
A Research Question is a statement that identifies the phenomenon to be studied. Here we are going to raise some research question that will guide the research process.
1. Are rural Indian farmers are digitally literate?
2. How you will provide digital literacy among rural Indian farmers.
3. Are farmers aware of agriculture schemes provide by central and state government?
4. Are rural Indian farmers are ready to accept organic farming?
5. Are farmers aware of Vedic Agriculture?
6. Are farmers know about agriculture through cloud computing?

B. Research Objectives
The research objective provides tentative answer to the research question. Objectives must always be set after having formulated a good research question. After all, they are to explain the way in which such question is going to be answered. It guides the activities of research. Following are the objectives of our research work.
1. To digitally empower rural Indian farmers.
2. To develop a Village Innovation Centre (VIC) model for rural Indian farmer to empower them digitally.
3. To provide knowledge of various schemes provided by state and central government to facilitate our farmers.
4. To create awareness about ancient Indian Vedic agriculture.
5. To create awareness about natural pesticides and fertilizers for better crop yield.
6. To provide benefits of Cloud Computing in the field of Agriculture in rural India.
7. To create a platform to provide better understanding of ancient Indian Agriculture and modern technological practices.
8. To develop a Agri cloud model that facilitate Indian farming Industry.

II. CLOUD COMPUTING

Cloud computing refers to applications and services that run on a distributed network using virtualized resources and accessed by common Internet protocols and networking standards. It is distinguished by the notion that resources are virtual and limitless and that details of the physical systems on which software runs are abstracted from the user.

A. Services of cloud computing

IaaS (Infrastructure as a service): It involves offering hardware related services using principles of cloud computing. Leading vendors that provides Iaas are Amazon EC2, Amazone S3, Rackspace, cloud servers and Gogrid etc.

PaaS   (Platform as service): It involves offering a development platform on the cloud. The vendors which provide PaaS are Microsoft Azure, Salesforce.com, AT&T etc.

SaaS (Software as service): It includes complete software offering on the cloud. A user can access a software application hosted by the cloud vender on pay per use basis. The vender which provides SaaS are Salesforce.com, Gmail, Hotmail, Google docs and office 65 etc.

B. Agriculture through Technology

Recently Government of India has taken an initiative of Digital India and 100 Smart cities mission in India to ensure that government services are made available to citizens electronically by improving online infrastructure and by increasing internet facilities. For digitalization of villages government has taken several initiatives to facilitate our farmers that includes National Digital Literacy Mission (NDLM), Internet Saathi**,** e SMS Service for Farmers on Extreme Weather Conditions, National Project on Organic Farming, National Horticulture Mission, National Food Security Mission, Promoting the use of Biofertilizer, ICAR Contribution in Promoting Organic Farming, Rashtriya Krishi Vikas Yojana, Jute Technology Mission, Technology Mission on Cotton, National Scheme on Welfare of Fishermen, Gramin Bhandaran Yojna, Kisan Credit Card Scheme, AgriMarket app, Mobile App for Dairy Farmers, Project Loon in India etc.

III. REVIEW OF LITERATURE

Bagherinia & Sohrab (2012) proposed a model to execute long computational and other service in cloud computing that couldn't be executing in single computer system alone. While in all other existing cloud computing model users must pay cost for using cloud services this model is based on collaborative between each using system with other systems that they need to other services. Showole (2008) has taken a sample of 60 agriculture worker for study by using questionnaire. Data analysis was through the use of descriptive statistics and linear regression model. The finding shown that the mean score of .33 are agreeing to the use of statistical packages in computer for research purpose. Nautiyal (2014) spoke on plants mentioned in Epics and correlated these with paleo botanical remains of plants which have been found in India, for thousands of years in an International conference on 'Determining Cultural Continuity since Vedic and Epic Eras' at I-SERVE Delhi Chapter. Prasad S & Sateesh (2013) proposed a framework for Agro Mobile System. The proposed framework Agro Mobile Cloud for Indian Farmers to assist them for their various Agriculture needs. They proposed various ways in which farmer can utilize MCC on their handsets using application called AgroMobile, to assist them for relatively better cultivation and marketing. The main attention of their work is focused on crop image analysis.

This framework uses MCC, Which in effect, authors believed that puts cloud into farmers pocket. The agexperimental setup uses tool like Open Nebula 2.0, and MATLAB 2012b.Major & Kaur (2015) introduces the primary applications of cloud computing in agriculture sector. The collaboration of cloud computing with agriculture processes has provided the necessary impetus to agro production, marketing and sales around the globe. Venkataramana & Padmavathamma (2012) designed agriculture system framework AGRI CLOUD which provide assistance to the farmers in analyzing crop diseases, getting required suggestions and finding appropriate fertilizers during cultivation. This cloud model benefits various stake holders in agriculture field to provide precise and accurate information along with various security related concepts for providing integrity, security and authentication for agriculture data shared or stored in cloud data center along with agri expert service. Ji Chu Zaho(2013) has elicited IOT Technology in the field of agriculture. He proposed IOT of agriculture, green house production environment measurement and control system which allows customers (farmers) to monitor remotely.

IV. RESEARCH FINDINGS

In this section we will discuss the results and findings of our study. Earlier we discussed limitations and benefits of cloud computing; now we shall see the current cloud scenario in India and abroad. In Japan Fujitsu, a leading company in cloud services, provide SaaS based solution for agriculture production management, which is designed to support management in both agriculture and food related industries. In USA The united states department of agriculture has moves its email and productivity application to the cloud in order to consolidate disparate messaging environments onto a single unified platform, which will reduce costs, boost workforce productivity and improve communication and collaboration across the agency. In South Africa Farmers use a cloud based trading system that disseminates information about planting schedules, crop status, harvesting times, and market prices through mobile phones.

In Nigeria Agrivi aims to help Nigerian farmers in improving their farming productivity by bringing them knowledge and tools for making smart decisions through its cloud platform. In Taiwan the Council of Agriculture, Taiwan has launched a scheme named Agriculture Cloud Service Project that focuses on the improvement of agriculture through Cloud based GIS system.

Agri cloud computing is used mainly in South Africa, Japan, USA, China. In India Agri cloud computing is in the phase of theoretical Research only. Presently there is no agriculture specific cloud exists in India. The well-known existing cloud initiatives in India are Meghdoot, Baadal, E-Sikshak, MANTRA: MAchiNe Assisted Translation system over cloud, Meghraj: Technically called GI Cloud. The major problem in implementation of agriculture cloud is digital literacy among Indian farmers. Here we proposed a model VIC (Village Innovation Center) to digitally empower rural Indian farmer.

A.Village innovation Centre (VIC):

Our model has a vision to construct a Village innovation Centre in each Indian village panchayat. The village innovation Centre provides various programs to digitally empower Indian farmers. These empowerment programs include Digital Agri Marketing, Cloud awareness Programme, Mobile Library, Agriculture Fair, E Village friend, Yoga training, Farming through social media, Farmers Success Stories, Agriculture quizzes, CCTV Surveillance Systems, Green house cultivation Training, Bank account for each farmer etc. After providing basic internet skills among village farmers, VIC will motivate them to join Vedic Digital Farming through cloud computing platform. For that purpose we constructed a Vedic agriculture cloud model for rural Indian farmers. So that they can increase the productivity of their yields through digital farming.

B. Proposed Model

Here we are going to build a Agri Cloud model to facilitate Indian farming, In which farmer can access various agri services ubiquitously through Agri cloud. Using the application of cloud the farmers have nothing to worry about hardware and software investment and also technical knowledge required to learn them. First the farmer need to register with agri cloud provider to get access with Agri cloud, Then farmer will send the request to agri cloud provider using user friendly devices like mobile phones, Laptops, Desktops etc. with internet connectivity. The agri cloud provider will process the request and provide various on demand agri services to farmer on rental basis.
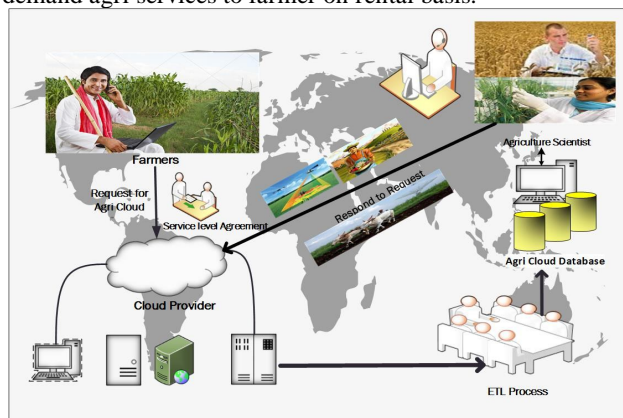

Figure 4: Farmer cloud interaction

C. The process flow

The figure 3.10 shows process flow of agri cloud in detail. First cloud provider receives a call from farmer for agri cloud

services. Then cloud provides various on demand services to farmer. If farmer is satisfied the cloud provider will get feedback from the farmer. Otherwise farmer will request for field survey and cloud provider will provide the final counselling at the field. The cloud provider will provide various online and onsite training to the farmers. That includes Vedic Agriculture Training, Fruit cultivation Technique, Poultry Farming, Duckery, Aquaculture, Agro Forestry, Bee Keeping, Mushroom Cultivation (Fungiculture).

Figure 5: Agri Cloud Process Flow

D. Agri cloud Architecture

In our proposed agri cloud architecture various variable of agriculture like farmer, supplier, farming industries, transport and consumer will upload their data to cloud provider and get get access to various cloud services. Agri cloud provider will provide crop related decision making, weather information, soil information, Growth processing, Expert services to Indian farmer as per the data uploaded by the farmer. Similarly other agri variables can also access the cloud services. In this agri cloud architecture farmer farmer first register to agriculture cloud provider for agri cloud services with the help of mobile phone, laptop, desktop etc. with internet connectivity. Then farmer request for various agri services provided by cloud provider. The cloud provider consists of following data bases.
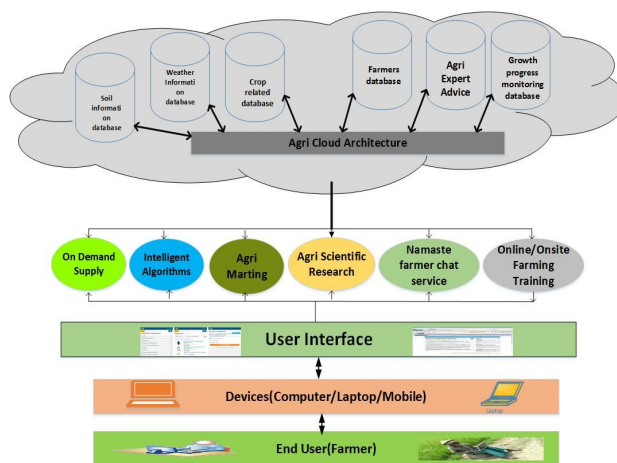

Figure 8: Agriculture cloud Mechanism

- **Weather information database:** It stores weather related information of various parts of the country and it also

provide weather forecasting for particular time period in different parts of country. This will guide the farmer in decision making related to crop selection.

- **Soil information database:** This module consists of data on nature of soil in different parts of the India. It will provide historical soil data of a particular geographical location that helps to predict future soil behavior in that region.
- **Growth processing database:** It captures crop data growth information in different regions of India in a specific time period.
- **Farmers Database:** It consists of farmer's data information of different regions of India. This module provides help to policy makers to build policies to empower our farmers.
- **Crop information related database:** It consists information of crops growth in different parts of India. This will provide benefit to Indian farmers regarding crop related decision making.
- **Expert Service database:** This module provides solution to various agriculture related problems of Indian farmers by best agriculture Experts in the world.

E. Agri Cloud Services
Agriculture cloud provider provides various services to farmers with respect to their request on rental basis. These services includes FaaS(Food as a service), DaaS(Dairy as a service), CaaS(Consultation as a service), TaaS(Training as a service), MaaS(Marketing as a service), (Namaste farmer chat service).
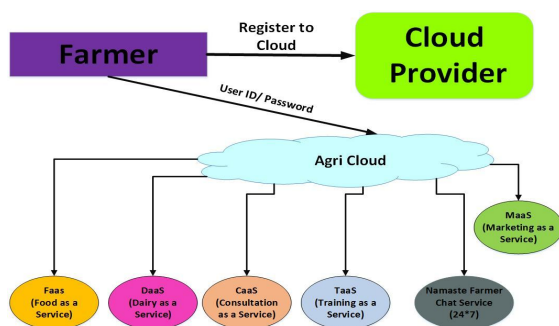

Figure 9: Agri cloud services

- **FaaS (Food as a service):** It provides high capacity to store agriculture relate data. This system monitor the overall information related to agriculture.
- **DaaS (Dairy as a service):** This system provides facility to farmers to run their online dairy.
- **CaaS (Consultation as a service):** It provides easy solution to the problems faced by Indian farmer at different stage of farming. They can get best online expert advices in their farming related problems 24*7 from any part of India in Various Indian languages.
- **TaaS (Training as a Service):** It provide various online and onsite Vedic farming training to empower Indian farmers and to increase the agriculture productivity.
- **MaaS(Marketing as a service):** Through this service farmer market their agri products online across India.

- **Namaste Farmer Chat Service:** It provide 24*7 online chat services to Indian
- farmer, where farmer can ask his agriculture related droughts with the Agriculture expert.

Thus we can clearly see that these two systems VIC and Agri Cloud helps us to modernize Indian farming industry.

V. CONCLUSION

In this research paper we discussed the several benefits of Vedic Agriculture through cloud computing and its implementation challenges. To answer the basic research question and to achieve the research objective, this study developed a basic conceptual model VIC(Village Innovation Center) and Agri cloud for rural agriculture development. Our Village Innovation Center is a visionary idea to digitally empowering rural Indian Agriculture system. In VIC model we put our emphasis how basic internet skills will reach to each doors and every corners of village to fulfill the dream of e‑India. This model includes various features like Digital Agri Marketing, Cloud awareness Programme, Mobile Library, Agriculture Fair, E Village friend, Yoga training, Farming through social media, Agriculture quizzes, CCTV Surveillance Systems, Green house cultivation Training, Bank account for each farmer etc. to digitally empower rural Indian farmers. We suggested an Agri cloud model for rural Indian farmers. So that they can opt digital farming through cloud computing for better productivity of their agriculture products and to improve their life's. This model shows how science and information technology can be used as tool to improve the livelihood of common Indian Villagers. Agri cloud provides services like FaaS(Food as a service), DaaS(Dairy as a service), CaaS(Consultation as a service), TaaS(Training as a service), MaaS(Marketing as a service), Namaste farmer chat service on rental basis. The stakeholders of this study are Rural Indian farmer, Farming enterprises, Suppliers, Consumers, Transport etc., who can upload their data and information on Agri Cloud and can access various agri services at anytime from anywhere.

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