A REVIEW ON REQUIREMENT OF SELF SUSTAINABLE NATURAL FARMING AND APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGY (AGRO INFORMATICS) FOR AGRICULTURE IN INDIA

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Abstract

Agriculture with its associated divisions is undeniably the biggest occupation in all the regions of India and contributes a critical figure in Indian Gross Domestic Product. There are various types of farming in India. Agriculture in India is running towards a downtrend due to various reasons. Sustainable Natural Farming is the best eco-friendly and an essential idea in characteristic cultivating to keep up wellbeing of soil, products and different living life forms. It has diminishes reliance on constrained non-renewable assets, for example, petroleum based items and importation of natural materials.

The technology advancement in Information and Communication is engineering is massive. Agro Informatics is an emerging research area, where various tools are research areas of Information and Communication Technology can be applied to enhance the various aspects of agriculture. This research article reviews the current challenges of Agriculture in India, the need for sustainable natural farming and the analysis on possible segments in Agriculture where Information and Communication Technology can concentrate.

Key Words: Sustainable Natural Farming, Agro Informatics, Information and Communication Technology in Agriculture.

Introduction

Agriculture is the backbone of India, around 70 percentages of the total population lives based on it. Agriculture satisfies the fundamental needs of individuals and creature. Various classifications of farming in India are listed below,

1. Sustainable Farming
2. Commercial Farming
3. Intensive Farming

4. Extensive Farming

5. Plantation Farming

6. Mixed Farming

**Sustainable Farming**

Subsistence or sustainable farming is the traditional method, farmers usually follows. This type of farming refers the cultivation of crops by the farmer for own utilisation. In this type of cultivation land holdings are little and divided. Development procedures are primitive and straightforward. There will not be any usage of modern farming methods such as tractors usage and ranch inputs like synthetic composts, bug sprays and pesticides. In this farming farm will concentrate on developing almost all type of vegetables, oil seeds, pulses, cereals and other family requirement crops.

**Commercial Farming**

Majority of farmers in India in the modern days for shifted to this type of farming. The land is utilised to produce the crops which is sold in the market for earning money. In this framework the farmer uses inputs like insecticides, pesticides, chemical fertilizers and high yield variety seeds. Cotton, jute, sugar cane, rice, groundnut are some of the crops grown in various zones of India for commercial purpose.

**Extensive Farming**

In extensive farming the large portion of area is used for cultivation. The production output per unit will be low but the total production will be high as the farming area is huge. Extensive farming is not practice in India.

**Intensive Farming**

When the farmer uses their limited land for higher production then it is called as intensive farming. Production per unit will be high.

**Plantation Farming**

Plantation farming refers to the process of developing a crop which can yield huge cash in an estate. Banana, spices, coffee, tea and rubber are the examples of plantation farming.

**Mixed Farming**

The best economical farming is mixed farming. In mixed farming the farmers will develop crops and breeding animals together which both racing games and racing creators are carried on at the same time. This is the most economical farming.
Challenges towards Agriculture in India

As per National crime records Bureau the farmer suicide is increased drastically in last decade. Cash crop farmers appear to be significantly affected in last decade due to the major challenges.

The challenges on agriculture in India are listed below,

1. Natural energy loss in the soil
2. Decrease in fresh ground water
3. Non systematic approach in agriculture marketing
4. Cost involved in inputs
5. Global climate change

Natural energy loss in the soil

The natural nutrients in the soil have decreased a lot in the agricultural lands. Usage of chemical fertilizers, insecticides and pesticides leads to the loss of energy in the soil. Rotational crop cultivation will normally increase or maintains the nutrients in the soil. In last decade farmers concentrated only on same type of cash crops.

Measurements

Main indicator:

- Areas with a certain level of erosion (aggregated to NUTS 3 regions)

Supporting indicator:

- Estimated soil loss by water erosion (tonnes per hectare per year)

Data used and methodology

Two soil disintegration pointers have been delivered on the premise of experimental PC model. The principle pointer speaks to evaluated soil disintegration levels for NUTS Level 3 regulatory territories that range from low values (under 1 ton for every hectare every year) to high values (more than 20 tons for each hectare every year) for the EU.

The second marker is a cell-based guide that gauges the rate of soil disintegration by water in tons per hectare every year for cells of 100 m x 100 m for the EU. The pointers are anticipated gauges and not real values. They are gotten from an upgraded adaptation of the Revised Universal Soil Loss Equation (RUSLE) model which was created to assess soil disintegration by water at a provincial scale. This propelled form is named RUSLE2015 and depends on high caliber and associate checked on distributed data layers (soil erodibility, precipitation erosivity, geography, land spread, protection rehearse) (Figure 4). Also, the latest and accessible container European datasets have been utilized.
to show the info layers. The model structure has been adjusted keeping in mind the end goal to consider protection arranging, stock disintegration rates and gauge dregs conveyance on the premise of acknowledged experimental information and specialized judgment. In this evaluation, the fundamental RUSLE model has been adjusted through the enhanced nature of the information elements.

Decrease in fresh ground water

The continuous usage of chemical fertilizers in structure side and pesticides in agriculture land leads to lack of fresh ground water. Wastewaters from various industries are settled with water banks like lakes and rivers. Industry wastewater also the reason for the cause of depletion in groundwater.

Acquiring all the data important for demonstrating is not a simple assignment. Indeed, a modeler may need to give impressive exertion and time in information obtaining, particularly when the database for the study zone is non-existent. A few information might be gotten from existing reports of different organizations/divisions; yet by and large extra field work is required. Besides, the information is not promptly accessible in the configuration required by the model, and requires extra work to process it. The watched crude information acquired from the field may likewise contain irregularities and mistakes. Before continuing with information preparing, it is vital to do information acceptance to right mistakes in recorded information and evaluate the unwavering quality of a record. Also, as the
demonstrating exercise advances, certain crevices in the database get recognized. In such cases, the field checking system may experience some modification including establishment of new piezometers/observing wells.

The destinations of the groundwater level checking are to:

- Detect effect of groundwater revive and deliberations,
- Monitor the groundwater level changes,
- Assess profundity to water level,
- Detect long haul patterns,
- Compute the groundwater asset accessibility,
- Assess the phase of improvement,
- Design administration systems at provincial level.

**Agricultural marketing**

The marketing system in India is totally controlled by the local traders. The farmer has no chance to fix price for their own crop. Various social and economic conditions force the farmer to sell the product in lower price. There is no systematic or procedural marketing structure to sell the products for farmers across India. Most of the profit is covered by the traders rather than the farmers. The agricultural marketing is thus requiring the following strategies to devise the method effectively.

- To spread precise and convenient promoting data in order to bolster in showcasing basic leadership and advertising endeavors of business visionaries, agriculturists, government, improvement associations, academicians, and specialists.
- To help in guaranteeing that create goes to business sectors where there is an interest for it.
- Enable shortening promoting channels and eliminates transport expenses, and guarantees that every advertising exchange is a reasonable one, and that all members share the dangers and advantages.
- Where there is a wide crevice between the ranch door cost and the cost paid in wholesale markets and by shoppers, showcasing data can contract the hole, yet just as a component of a productive advertising framework.

**Cost involved in Inputs:** The cost involved in purchasing farm inputs like seeds, fertilizer, insecticide and pesticides are increased drastically. This hike in expenditure of farming leads to very less profit or sometimes even loss to the farmer.
Global Climate change: Worldwide climate change is the latest difficulty faced by farmers. It has been anticipated that its effect on agriculture would be more. Around 70 percentage of Indian population is locked in rural exercise. The outcomes of this Global climate change like increase in temperature, ocean level increase, and unpredictable rain are the challenges towards agriculture.

Sustainable Natural Farming

Natural farming, also called as ecological, do nothing or no till farming was advanced by Masanobu Fukuoka Coco (1913 – 2008), a Japanese farmer and philosopher. Sustainable farming is also happen to a traditional farming method of India [13]. In natural farming all inputs are from natural materials, follow the law of nature and regard the privileges of harvest and animals. Natural farming restores the quality of soil by avoiding chemicals herbicides and machines.

In natural farming the dirt and water turned out to be perfect and biology is recoupled [14]. The most fundamental part of natural farming is to let nature assume an overwhelming part of the greatest degree conceivable. Subsequently, no till, range biodiversity, combination and advantageous homestead parts and assurance of soil cover all have a spot in this technique for cultivating. The great advantages of natural farming are healthy, quality foods, environment friendly and respect for lives.

The key aspects of natural farming are no pesticide, no herbicide, no tillage and no chemical fertilizer. Farm inputs and natural feeds are prepared by the farmers [12]. Natural farming does not utilise pesticides. Pesticides don't just destroy creepy crawlies; they live in the natural products. Whenever consumed, it can do genuine mischief to our bodies and even next eras. Natural farming does not utilise herbicide.

Destroying the weeds with synthetic is not by any means the only arrangement nor is it shrewd. Herbicide is also deadly to human. Natural farming uses the weeds as opposed to executing them. In natural farming, the wild grass is developed for mulching. The grass forestalls soil disintegration, holds dampness, spreads microorganisms, produces...
natural compost and enhances soil quality. The agricultural land will not be tilled in natural farming. Rather than utilising machines, natural farming utilizes earthworms, microorganisms and little creatures. Earthworms can flow 7 metres without even single rupee, whereas the best result of machine or just 20 centimetre. The discharges of earthworms transforms into the best soil.

Tilling is avoided in natural farming so the grass seeds in soil will not come up to the surface, which in turn avoids the weeds. Chemical fertilizers for completely avoided in natural farming as it is not at all good for environment. Natural inputs are used to supply all nutrition’s to the crops. It increases the nutrition level of the soil permanently. Natural farming inputs are cheap and exceptionally a compelling. An important aspect of natural farming is that the farmers make what they require.

Manures, soil improvements, infection cure, pest controllers are made by the agriculturist by utilizing the characteristics materials of the nutritive cycle. The farmers will make the required inputs based on the guidelines of nature. Some of the significant farm inputs are cow dung, urines and other available useful materials available around the farm. Self-sustainable natural farming will not deviate in the basic eco system. This farming works based on the relationship between the environment and organism [15].

This farming will concentrate on creating integrated farming instead of cash crop based farming. It is defined as “An integrated system of plant and animal production practices having specific application that will last over the long-term”. Self-sustainable farming will ensure the following aspects,

1. Fulfil the human food requirements and fibre needs
2. Upgrade ecological quality and normal asset base whereupon the farming economy depends
3. Make most productive utilization of non-renewable and on homestead and incorporate, where suitable, common biological cycles and controls
4. Manage the monetary practically of the farming operations

**Applications of Information and Communication Technology (Agro Informatics) Agriculture in India**

Agro Informatics is an emerging research area where the application of Information Technology and computer science in agriculture to invent thought methods in scientific knowledge extender the advances in technology agriculture society.

Farmers need data on rural assets, inputs, showcasing and rehearses in arranging and dealing with their agriculture generation exercises to expand efficiency, benefit and to support their work [1]. Government and different partners
connected with agriculture similarly needs the data for arranging and enhancing conveyance of their administrations to farmers.

Applications of Information and Communication Technology in Agriculture

Climate Updates to Farmers

Rain and other climate changes in the world create lot of impact on Agriculture. Agriculture groups far and wide have dependably searched for ways and intend to adapt to atmosphere variability including the utilization of different conventional markers to anticipate the occasional atmosphere conduct. Natural disasters, dry season due to rain failure prompts to damaging impacts like loss in crops, unavailability of foods, bulk relocation and economic failures. Environmental change, expanding atmosphere variability, and additionally other worldwide natural issues like land corruption, loss of organic differing qualities and stratospheric ozone exhaustion, debilitate our capacity to meet the fundamental human needs of satisfactory sustenance, water and vitality, safe sanctuary and a solid situation.

The powerlessness of agriculture to characteristic atmosphere variability and environmental change can be to some degree diminished through more educated arrangement decisions, practices and advancements. Negative effects of environmental change on increasing so as to farm can be further diminished atmosphere learning and enhancing forecast capacities, which will prompt the improvement of significant data and expectation items for applications in agriculture.

The atmosphere conjecture group is presently fit for giving a multi-scale (in space and time) incorporated expectation framework that gives skilful, valuable forecasts of variables with financial hobby. Climate forecast must translated as far as generation results at the right scale like the neighbourhood land level and occasional time scale for farmers and other rural leaders to advantage [8]. The ranger service segment utilizes recorded atmosphere information to create
vital arrangements from planting to gathering. These choices spread practices, for example, zoning land for business ranger service in view of atmosphere suitability, site readiness, recovery, diminishing and preparing. Data on potential environmental change is just as imperative. Information and updating system for agriculture for climate monitoring is a most helpful for the agriculturists [2].

Precision Farming

Precision based agriculture is a rural framework that has the capability of drastically changing agribusiness in this era. The indention of Precision farming is to apply information technology, which empowers the farmer to gather data and information for better judgement [7]. It is an expert dynamic approach that diminishes a percentage of the danger and variables regular to agriculture. Precision farming is all the more ecologically solid and will be and essential part in supporting regular assets. Various information technology areas like data mining, pattern recognition can be utilized to take accurate decisions in precision based farming. Precision farming can be applied for better irrigation system and water conservation.

Precision farming evokes pictures of agriculturists beating the components with electronic apparatus that is unequivocally controlled by means of satellites and nearby sensors and utilizing arranging programming that precisely predicts crop advancement.

Irrigation Informatics

Irrigation informatics is a recently rising scholastic field that is a cross-disciplinary science utilizing informatics to think about the data streams and information administration identified with watering system [9]. The field is one of numerous new informatics sub-specialities that use the art of data, the act of data handling, and the building of data frameworks to propel a biophysical science or designing field.

Irrigation informatics is all that much a piece of the more extensive examination into watering system wherever data innovation or information frameworks are utilized, however the term informatics is not generally used to portray research including PC frameworks and information administration so that data science or data innovation might then again be utilized. The Australian Bureau of Meteorology has as of late actualized a XML information design, known as the Water Data Transfer Format (WDTF) and standard to be utilized by Australian government offices and meteorological information suppliers while conveying information to the Bureau. This configuration incorporates determinations for evapotranspiration and other climate parameters that are helpful for watering system and may be utilized through executions of watering system informatics.
Yield Estimation

Maintaining data on potential harvest yield at an early stage is extremely helpful for the farmer, additionally for nations that vigorously depend on farming generation, to fulfil the national requirements for the products furthermore for money through fares. Making instruments on harvest yield has been a cultivating hone for a long time. Indeed, even today, experienced agriculturists can make unpleasant evaluations of the last harvest yield, just by taking a gander at the plant life and wellbeing status part of the way through the season and considering the climatic conditions up until that point. Obviously, assesses that are made closer to the harvest season have a tendency to be more precise, as there is more data about how the products advanced through the season, furthermore there is less time for things to turn out badly.

In view of the specific way vegetation mirrors the electromagnetic radiation, we can evaluate the product status by utilizing remote detecting information [3] [4]. By consolidating this information with extra information like the climatic conditions in complex models, it is conceivable to appraise the last yield of a product field at an early stage.

Crop Identification

It is critical for a government to recognize what crops the nation is going to create in the current and flow developing season. This information has budgetary advantages for the nation, as it permits the monetary allowance making arrangements for importing and sending out of nourishment items. One technique is for somebody to go around the nation and see what harvest is developed in every field. Be that as it may, this takes an excessive amount of time and costs a great deal of cash. Cadastral Mapping is conceivable to outline limits of the fields by watching the different sorts of yields [10]. Mapping of the limits of area parcels provides data for the formation of cadastral maps. Cadastral
maps are as a rule in a vector design and in this structure can be utilized as a part of a GIS framework, alongside different sorts of information (possession, crop sorts developed and so forth.). These can be utilized by the neighbourhood and national powers, to gauge the amount of area is utilized for farming, and the amount of zone is utilized for the development of every product.

**Agricultural Products Marketing**

Agriculture products marketing covers the administrations included in moving a harvested crop in various format from the farmer to the purchaser [6]. Various interconnected exercises are included in doing this, for example, arranging generation, developing and gathering, reviewing, pressing, transport, stockpiling, agro-and sustenance preparing, dispersion publicizing and deal. Such activities can’t occur without data or a proper system. National wide information maintenance and a marketing system are ultimately required to market the agricultural products in correct way [5]. There is huge scope of such kind of software with Information and Communication technology, which can interact with farmers and consumers directly. This will avoid the intermediate brokers who are generally stealing the money of both the parties.

**Live Stock Management**

A self-sustainable farmer will surely maintain live stocks like cattle, sheep, goats and horses in their farm. The inventory management of the animals, respective foods, productions are the big challenge for the farmers. There are lot of tools available in market intended for the current domesticated animals business that needs nitty gritty domesticated animal’s administration records [11]. It is adaptable to handle various creature recognizable pieces of proof while following medications, weaning’s, families, rearing, and creature development. Chronicled data for farm animals is anything but difficult to discover and the date-book gives the perfect answer for oversee up and coming occasions. Notes can be added to keep you sorted out while reports can be modified for review creature and crowd execution, by-items, deals.

**Educating and Training Farmers**

The Indian Agriculture is on the edge of a second upheaval. It is turning out to be progressively clear that the following jump will originate from the data and the information force exchange to the agribusiness segment, together with the other conventional inputs and intercessions. The genuine test before the approach producers is to conquer the information to every farmer in all the corners of India. The improvements in the field of Information Technology and Communication India make it conceivable to endeavour this mission [16]. Almost all the villages and farmers in
India are connected with various telecom networks. Technology can be utilized to train the farmers in various emerging improvements of agriculture.

**Conclusion**

Farming in India has a broad foundation which does a reversal to ten thousand years. At present, India holds the second position in farming generation. It likewise contributes a noteworthy offer in the Gross Domestic Product (GDP) of the nation. Furthermore, the area initiates around half of the whole labour. Despite the way that there has been a continuous droop in its commitment to GDP of the nation, agribusiness is right now the greatest business in India. In general, it assumes a key part in the financial development of the nation. Most of the farmers in India are failing in sustainability due to various reasons. This article are reviewed the various aspects on requirement on self-sustainable natural farming. The Information and Communication Technology tools and research can play a major role on supporting several sectors of Agriculture in India.

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