DEVELOPMENT OF VRICT (VIRTUAL REALITY INFORMATION COMMUNICATION TECHNOLOGY) REMOTE SENSING FOR FERTIGATION OF COTTON CROPS

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ABSTRACT

This paper presents an integrated virtual reality information Communication Technology (VRICT) based on computational stereo. In this system, three-dimensional (3D) and 360° panoramic scenes are reconstructed from multiple stereo image pairs acquired with a mobile stereo machine vision system. The spatial coordinates of panoramic scenes are registered to electronic maps to obtain a real scale VRICT that is capable of efficient retrieval of spatial information and allows for navigation in virtual reality. A software program will implement for image processing, coordinate transformation, 3D surface model building, data fusion, digital mapping, and database management for the VRICT. In setting up 3D models for the virtual reality environment, We analysis fertigation parameters like nutrient and irrigation of cotton crops with the VRICT.

INTRODUCTION

India is poised to play a major role in increasing the utility of land water and other natural resources to complete with the increasing rate of population . Farmers today are faced with the challenge of meeting an ever-increasing demand for a wide range of high quality and safe foods. But these demands must be satisfied in economically viable ways whilst safeguarding natural resources and protecting the environment .Intensification of agriculture by irrigation and enhanced use of fertilizers may generate pollution by increased levels of nutrients in underground and surface waters. Therefore judicious management of plant nutrients available through different fertilizers need to be catered.

A higher efficiency is possible with the help of pressurized irrigation system is placed around the plant roots uniformly and allow for rapid uptake of nutrients by the plant. 'Fertigation' is the technique of supplying dissolved fertilizer to crops through an irrigation system. Small application of soluble nutrients saves labour ,reduces compaction in the field, thereby enhancing productivity with the help of VRICT remote sensing.

With the VRICT remote sensing fertigation we can do precision farming.

WHAT IS FERTIGATION :

Fertigation is method of applying fertilizers, soil amendments and other water soluble products required by plant during its growth stages through drip irrigation system

NEED FOR FERTIGATION

Uneven growth in fertilizer consumption resulting in state-wise crop-wise variation in consumption.
Mining of nutrient from the soil at alarming rate (soil fertility depletion due to inadequate and imbalanced fertilizer use).
Decline in crop response to fertilizer.
Stagnation in fertilizer production.
Weakening relationship between fertilizer use and foodgrain production.
Increasing dependence on fertilizer import.

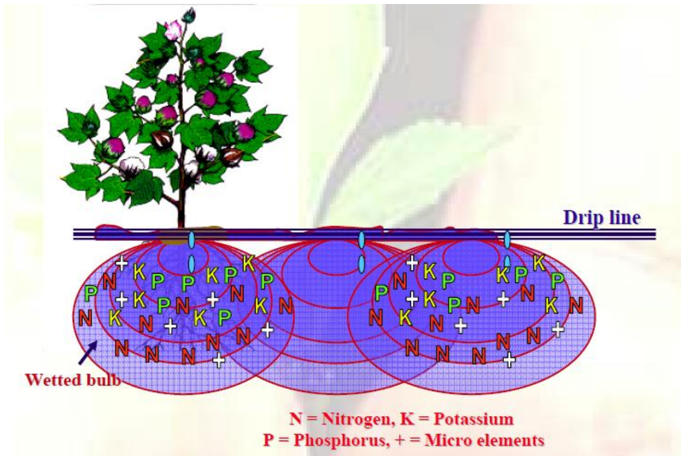

Fig 1 Schematic View of Distribution of Plant

ADVANTAGES OF FERTIGATION :

Increase in yield by 25-30%
Saving in fertilizer by 25-30%
Precise application and uniform distribution of fertilizers
Nutrient can apply as per plant requirement
Acidic nature helps in avoiding clogging of drippers, it

cleans drip system
Minimizes nutrient losses.
Major and micro nutrients can be applied in one solution with irrigation
Fertilizers can be injected as per required concentration.
Saving in time energy,labour.
Light soil can be brought under cultivation.

Existing practice of fertigation ,today testing of fertigation done manually i.e. actual presence in field work and check soil moisture as well as nutrient.

WHAT IS ICT :

The Information and Communication Technologies (ICT) are being increasingly used by the governments to deliver its services at the locations convenient to the citizens. The rural ICT applications attempt to offer the services of central agencies (like district administration, cooperative union, and state and central government departments) to the citizens at their village door steps. These applications utilize the ICT in offering improved and affordable connectivity and processing solutions.

The Information and Communication Technologies have facilitated the design of solutions to deliver government services for social development at the door step of rural poor.
Successful ICT projects involved, in the design process, all stakeholders such as government officials, legislators, regulatory agencies, citizens, voluntary organizations, technology consultants and vendors, academics, researchers, funding agencies, and media. Most of these were accomplished using the public-private-partnership (PPP) model. The benefits derived from such projects were very significant.

Based on these observations and other experiences, we consider the following as major factors responsible for successful implementation and sustenance of ICT projects for social development:

• Degree of efficiency and transparency demonstrated in citizen services
• Extent of reduction in cost and improvement of convenience for citizens
• Extent of reengineering and improvement of back-end services
• Extent of Integration of backend processes with front-end and web site
• Degree of employee involvement and change management
• Amenability for Public Private Partnership (PPP) arrangement
• Strength of PPP arrangement in the application development
• Strength of PPP arrangement in the service delivery
• Enhancement of Revenue for the government and the service provider
• Technological robustness of the project.

THEORITICAL CONSIDERATION

Currently, for most ornamental and vegetable crops, the desired EC of the nutrient solution supplied to the plants ranges from 1.1 dS/m for anthurium to 3.0 dS/m for melon,when they are grown in closed fertigation systems [11], and the preferred range for chili crops is 1.7 to 2.5 dS/m [12]. Thus, when stock solutions are injected to the mixing tank,the EC change occurring in the latter is usually not higher than 2.5 dS/m. When various amounts of a certain concentrated solution are added to the water, the changes that occur in the total salt concentration *C* in (meq/l) and in the electrical conductivity, *EC* (in dS/m) may be approximately related to each other through the equation;

$$\Delta C = a\Delta(EC) \quad (1)$$

where *a* is a factor depending on the composition of the particular concentrated solution.
During nutrient solution preparation, addition of stock solutions increases the electrical conductivity by;
$\Delta EC = ECd – Ecw$ (2)
Since the fertilizer concentration in each of the stock solutions is identical, regardless of recycling application or not, the respective dilution ratios of the stock solutions *Ai* are related with ΔC through the equation;
$\Delta C = Ai$ (3)
Thus, the desired electrical conductivity *ECd* for stock solution are derived by subtituting equations (2) and (3) in equation (1);
$ECd = Ai / a + ECw$
If fertilizer dispensers that give a constant injection rate are used, the amount of each stock solution added, when a fresh solution is prepared, has a linear relationship to injection time. For each stock solution, the injection time *T* in sec, is related to *Ai* by the expression
$T = Vn / f$
where *f* is the injection rate of the stock solution dispensers in *1/s*.

FERTILIZER AND IRRIGATION SCHEDULING

In this study, there are approximately nine substances in a fertigation nutrient solution. In a concentrated form, these stock which are prepared separately to avoid low solubility will precipitate especially calsium substance with those containing phosphate or sulphate substances. The result can be insoluble precipitate, which can plug the drip tube and lead to nutrient deficiency [14].

TABLE I. SCHEDULING OF NUTRIENT DOSAGE BASED ON WEEK

Week	EC (dS/m)
1 - 2	1.0
3 - 4	1.3
5 - 6	1.6
7 - 8	1.8
9 - 10	2.0
11 - 14	2.3
15 – end of season	1.5

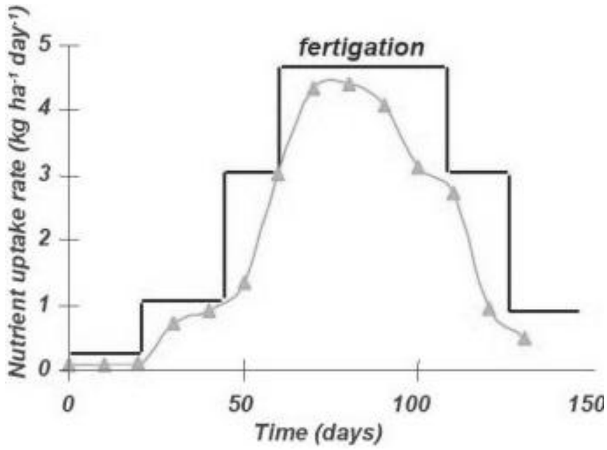

Fig 2. Application of nutrient for cotton crop

MATERIALS AND METHOD :

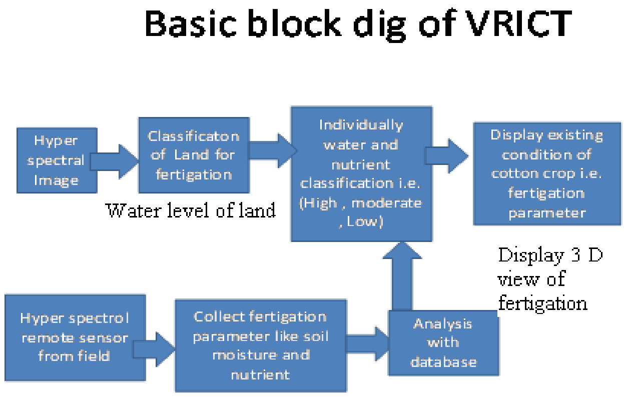

Fig. 3

As shown in fig. 3 Basic concept of VRICT : Capturing Hyperspectral Image ,first step to Classification of land in different levels. Levels is depend upon what type of nutrient as well as moisture / water condition of land. Second step , connect ing hyperspectral sensor in field we will get the parameter of fertigation i. e. moisture of soil and nutrient.

REMOTE SENSING DERIVED WATER USE ZONES

The characteristic spectral signature of vegetation in the visible and near infrared bands is recognized early in the history of remote sensing. It is perhaps surprising that satellite remote sensing techniques have found the application in agriculture. Satellite systems that have the resolution to recognize individual fields are constrained to repeat cycles that are too long to characterize the growing season of a typical annual/seasonal crop. The problem becomes much more complicated in small land holdings, having mixed cropping and multiple cropping systems with varied agricultural management practices. Water quantity variable namely crop water use zone has been delineated using remotely sensed IRS images. It includes consumptive use by crops and land. Using the above, the following can be assessed which helps in river basin/sub-basin water use assessment in a rational manner. The water utilization in each command can be had from satellite imageries when one establishes relations. The satellite derived water utilization helps in assessing irrigation performance of each command area projects with water as the main input. This map of water utilization helps in planning for better conjunctive use. Farmers participation in irrigation management increases because the current method of measuring discharges only at distribution head and gauging water height at sub distribution or pipe-outlet level .A lot of statistics for the season wise distribution of water are not comprehensible by farmers. A map depicting water use is going to increase their awareness and hence better participation. It helps in comparing precious performance of divisional/sub-divisional jurisdictions.

CONCLUSION

This paper gives a cheaper way to overcome the problem of traditional fertigation monitoring method. The maps produced by GIS will save time, energy, and money by assisting responders from water departments to locate lines and features more quickly and efficiently. With a detailed representation of every feature in the system, agriculture department employees or farmer will be able to locate and manage the fertigation more quickly. It is necessary to do more research on combining special water flow models with visualized development environment to develop the GISbased information system, which can perform more perfectly and support government to make decisions better. In the next development phase, more kinds of satellite data, more efficient and more analysis models and much advanced representation of multidimensional dynamic data will be integrated into the system.

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