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A Survey of Automated Advisory Systems in Agriculture Field

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ABSTRACT: Agriculture is a backbone of Indian economy more than that it is a field on which we are whole and sole dependent for basic needs. Continuously research is going on in this field. Many experts are dedicatedly work on Agriculture to increase the yield using available resources, to make some predictions so that farmer can plan for better yield or to help farmers to take precise decisions and so on. There are different kinds of advisory systems available for farmers some of them are at local places for face to face discussions, some are for telephonic conversations and some are online websites. This paper is to overview the different kinds of Advisory systems available and the methodologies they are using.

KEYWORDS: Advisory System, Land evaluation, Data mining

I.INTRODUCTION

Agriculture Advisory system is a expert system to guide farmers in different situations on using the technologies available like data mining, wireless networks, GPS, Artificial Intelligence and so on. Basically these help farmers to increase crop yield. It works as a guide to utilize the available resources efficiently and improve crop yield. As we know in India most of the farmers are totally dependent on the natural resources whose availability is always uncertain. In such a situation satisfying the food requirement of increasing population is a very big deal so food security remains unsolved challenge. Testing the land suitability before cultivation is a best approach instead of finding solutions after analyzing the crop production. Other important factor is adequate water supply which varies depending on the crop considered. So in multi-cropping system while deciding crop combination to be cultivated water requirement should be taken into consideration. There are different methods available to calculate crop yield as compare to methodologies to analyze land suitability. Even out of the available methods many are dependent on expensive resources.

II. STUDY OF RECENT ADVISORY SYSTEMS

One of the important issues is geographic distribution of agricultural land for efficient use. It is addressed by Elodie Vintrou et al. in 2013 by using data mining approach [1] . Data mining approach classify and map crop land using coarse-resolution imagery. Here 65 attributes of land use are considered belong to spatial, temporal and field surveys. Spatial data for cultivated surfaces are obtained at regional scale using remote sensing satellite system. The time series data analyzed from moderate resolution satellite images of agricultural practices. Data mining process works in two stages A. knowledge discovery and B. classification for learning mechanism from multi-source data. In step A knowledge extracted from images and rules formed and in B extracted rules are applied to different pixels and data which gives classification. Two methods are mentioned for mapping of land use in Mali one is Remote sensing to classify crop/non-crop using landset imagery and another is data mining of ground data and indicators from MODIS[1]. Umberto Amato et al. discussed also about land use identification using hyperspectral airborne and spaceborne sensors[5]. For agricultural monitoring of cultivated area , classification algorithms for the remotely sensed images are used. It is used for exploiting remotely sensed high spectral resolution images. Classification method used is based on discriminant analysis tools which are suitable for hyperspectrality. It can be said as the curse of dimensionality. Initially spectral bands of the sensors are assessed fully and then they are ranked as per their roles in classification and segmentation. For more appropriate results the validation of methodology done by two independent image sets. Images are gathered by Multi- spectral Infrared and Visible Imaging Spectrometer sensors. Ground validations were available for MIVIS, also comparative study done with Support Vector Machines classifier. It is proven that 10 spectral bands gives good classification, minimum 95% success rate achieved throughout all experiments. Here classification is used to understand the type of land cover depending on a pixel, through its unique spectral signature. So a high resolution spectral data is like a new avenues for applications. This approach doesn't work for desert area.Land-use and land-cover studies separately for semi desert areas was proposed in 2013 a hybrid approach. This study is mainly for assessing and monitoring the status of the natural resources, detecting the changes in spatial and temporal scale. Collected data can be used for future prediction. Dynamically changing environments has major impacts so a LU/LC database at the global level plays key role. LU/LC analysis can be done by supervised or unsupervised classification also by onscreen digitization. One of the simplest and popular approach on IRS LISS-III and Landsat-ETM + satellite data . But it may cause spectral confusion because of the similar radiometric response like scrub land with harvested land, built-up with bare hills and many other. So for semi desert areas hybrid classification approach for LU/LC classification is used[6]. It gives high accuracy for areas where spectral classes of images are inseparable. Ana Pérez-Hoyos et.al.[20] developed methodology for information and accuracy assessment of Large area Land Cover Products. Database is collected from remote sensors. Various methods are existing for the same but lagging in detailed accuracy information. The methodology developed here consider different factors like thematic uncertainty that results from the partial overlap in legend definitions and lack of homogeneity within reference and classification data. Specifically its focus is performing accuracy assessment of large-area LC products. Over this Land cover estimation various methodologies focus on specifically crop land estimation. Thus classification methodology plays important here. Oleg Antropov used probabilistic neural network for several land cover mapping in the boreal forest environment[21]. This is a study multiclass land cover mapping, forest–nonforest delineation, and classification of soil type under vegetation. PolSAR data were collected by the ALOS PALSAR. Estimations are based on probability. Accuracies improved are about 82.6% in 5-class land cover mapping and about 90% in forest–nonforest mapping.

A Land evaluation model for Benghazi region is invented by Farag F Abushnaf et.al. [3] It is a integration of limiting factor method, GIS application and multi-criteria analysis. There are 14 layers to check land suitability. Every factor affecting land suitability has different influence depending on how much they affect in particular environment, so varying degrees are computed towards suitability. Categories of land characteristics taken into account are soil, slope and erosion these are further divided with subcategories. Here suitability value for each factor and result mentioned in 4 different levels. Each value of input is weighted depending on its importance in result likewise 14 suitability (input) layers were made where each layer deals with a land characteristic finally resulting weighted values added to get output raster. AHP method was adopted to allow decision makers to assign weights to different level of hierarchy involved in suitability computation. 31 sites studied highest barley production which is classified by two sub models mentioned in this paper [3] and comparatively Mode2 is better because of more interaction between the suitability of land characteristics values.

ALSE [2] is a tool for decision and planning for crops. It helps to evaluate suitability of crop for cultivation of mango, banana, citrus, papaya and guava in tropical and subtropical regions. A programmed logic for ALSE uses eigenvalues and eigenvectors. Efficiency of this dynamic program is dependent on accuracy of specialized geo-environmental information and the computer analyzer interpreting the information. It allows maximizing land use through planning and decision support. ALSE is a kind of automated Expert system works according to Food and Agriculture Organization Framework invented in 1991. Interface to this expert system is provided through Visual Basic and it is integrated with GIS system for land quality attributes, multiple options provided to select crop types which are dynamic, spatial process organized using Arcmap Model Builder. Inputs taken through entries taken in forms, each form gives one type of details like topography, climate or soil using sub parameters. Flexible GUI is provided for these selection processes. All the inputs taken are stored in database and organized in five suitability levels on the basis of crop type and respective ranges selected before with the help of experts. Evaluation tool considers crop information like local and worldwide cultivation knowledge, cultivation history, experimental land characteristics and optimal requirements for considered crops. Climate information described by two characteristics one is annual precipitation (mm) and second is length of the dry season per month where topography effect measured by slope in degrees. soil suitability counted using soil workability, nutrient retention, availability of nutrient, rooting condition and oxygen soil drainage class. Finally ALSE gives output i.e. land suitability as either current suitability as in its present condition without improvements or potential suitability evaluation for defined use as its future condition assuming some

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improvements by fertilizers[2] . Main feature of ALSE is it allows upgrading the capability of system for each type of crop under all weather conditions. Somewhat similar to ALSE

A Decision support system for Tanzanian Agriculture and Ecosystem is developed by Eric H. Fegraus et. al.[4]. This dashboard integrates GIS data, remote sensing imagery, field data, and household and plot surveys. It is a web based decision support tool. This southern highlands monitoring pilot integrates the input data about climate, soil, water availability, agriculture productions along with its input parameters and socio-economic information. Datasets gathered through direct observations, surveys, automated sensors, mobile devices and remote sensing measurements. The challenge in the system is overcoming extreme data heterogeneity, information gaps and capturing data provenance to develop a clear, easily understandable and convincing decision-making tool. This application had integrated into an already existing portal system and a lightweight client was achieved. All client-server communications are achieved via web service calls against REpresentational State Transfer (REST) services that wrap database and mapping functions. Dashboard appearance and client-side functionality are managed by JavaScript and Asynchronous JavaScript and XML (AJAX) and no need of client plug-ins. Underlying Map server was nothing but ArcGIS server[4]. After developing those systems to convey the knowledge to farmers a simple software architecture design for Advisory System is required. It is called as a Decision Making Process. Different kinds of approaches are available for this, one of the ontology based approach is proposed by M. Kassim et.al.[8]. The architecture proposed consists of three components, users, module and knowledge database. Crop production decision making involves many complex host factors. Some factors, like climatic conditions, land characteristics are inherent to the farm and cannot controlled. These factors can be modified for the purposes of achieving maximum profitability. A new and young farmer has to depend on advice from the officer of agriculture or other experienced farmers. They can provide many kinds of useful information to the farmers such as pest control, the suitable plants, fertilizer and others. The information is important in order to ensure the good care of the plants. But the decision given by advisors can't be validated, so no guarantee that whether it will be suitable for current soil, plants etc. So the solution is collaboration of knowledge available with different sources. In this collaborative environment, computer supported collaborative working, a group of users work together and share resources by using computer technology with more flexibility. The system also help farmers to choose the crop suitable for current factors like environment, soil etc. Simply we can say it provides a simple architecture for collaboration and sharing of knowledge through this Advisory system[8].

We know that beyond the increasing population agriculture land available remains same. So the optimal solution for the challenge of crop production is only precise agriculture i.e. crop planning to maximize production which remains NP-hard type. One of the solution for the seasonal hector allocations of limited land among different required crops is addressed by Sivashan Chetty and Aderemi O. Adewumi in 2014[7]. In this case study three new swarm intelligence techniques called cuckoo search, firefly algorithm and glowworm swarm optimization are used. As compared to Genetic algorithm technique all these three algorithms provide superior solutions. Objective of Annual CROP planning (ACP) is optimizing seasonal hectare allocations of a limited amount of agricultural land to maximize gross profit by efficient use of available limited resources. This paper introduces a mathematical model for problems at existing irrigation systems in South Africa. Variety of crop plants are considered while planning like single-crop plots, double crop-plots and triple crop plots. Original characteristics of soil are considered as one of the important factor along with fresh water supply available for crop planning. Each algorithm worked primarily for increasing the hectare allocations for cotton and ground nuts, and decreasing the hectare allocations for maize. As compare to all cuckoo search algorithm delivered the best solutions. It delivered the best overall solution, was the best on average, and had the lowest 95% CI value. The strength of CS was attributed to its balance in exploring and exploiting the local neighborhood structures of the solution space and weakness in its exploitation ability it performed the worst on average. As compare to genetic algorithm and glowworm swarm optimization Firefly algorithm performed better in determining solutions, on average[7]. Another approach for improving agriculture yield was proposed by Satish Babu especially for small and marginal fields, called as Precision Agriculture[9]. This approach consider database from fields, crop calendars prepared by experts, environmental factors like temperature, sensor records of rainfall and an analytical model data. The devices like mobile phones and tablets help to observe static, semi static and dynamic inputs to simulate crop calendar. One of the dynamic inputs for Precision agriculture is analysis of spatial as well as temporal variability of soil and crop parameters. PA is a collaboration of traditional as well as emerging technologies such as automation, robotics, Geographic Information Systems, Global Positioning Systems and Re-mote Sensing Sensor Technologies, Wireless Sensor Networks and decision-support and modeling software. Scale of PA system enlarged while using in US by

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extensively using GPS and soil monitoring sensors as input medias. Basically it is Greenhouse based industrial farming which uses sensors for input measures of water, fertilizer or pesticide. Case study given around the scenario in Kerala State India, where the average holding size is much lower most of India.

As we have seen for Precision Agriculture (PA) wireless sensors play a very important role to collect and handle database. YIN Shouyi proposed a special Design of Wireless Multi-media Sensor Network for Precision Agriculture system[10]. Now a day's uncontrolled changes in different agriculture parameters is big problem faced by farmers. Climate change, environmental pollution, water shortages and the increased societal demand of food production etc. There is no any alternative to control this but we can have corrective action over it by observing and responding to intra-field variations. Here PA approach is based on information about farmland. Parameters deal with the environmental as well as plant's information. For example, the environmental information, such as temperature, humidity, soil moisture, soil composition, solar radiation, wind speed and rainfall, can be used to reveal the weather change and soil pollution, and can help to improve management of fertilizer usage and other inputs. The plant information, such as plant growth, plant disease and insect pest, can be used to predict the production and make decision about pesticide application. Therefore, how to gather such comprehensive information accurately and reliably is the core of precision agriculture. Widely used Remote sensing techniques are very effective to collect large-scale information. Basically remote sensing works on the principle of the inverse problem where the exact farmland information is also necessary for inverse.

YIN Shouyi presented Precision Agriculture Sensing System(PASS), a wireless multimedia sensor network for precision agriculture where hardware and software of PASS are tailored for sensing in wide farmland without human supervision[10]. A single chip sensor node used for sensing both scalar and multimedia information. As an output it generates large amount of data. A bit-map index reliable data transmission mechanism is used to improve the network performance for dealing with this large amount of data. To extend the lifetime of battery they have designed a battery array switching system. This dedicated design given by YIN Shouyi et.al. for PASS is very efficient for precision agriculture applications. It has already been deployed in 40 counties of China for improving agriculture performance. Askraba et. al. also work on sensor data for Precision Agriculture (PA) in 2013[11]. A novel design for an optoelectronics based real-time plant discrimination sensor is presented here which enables a high signal-to-noise ratio, and hence a low false positive rate, to be attained. Slope of the spectral response at discrete wavelengths well as the Normalised Difference Vegetation Index are measured to achieve plant discrimination. Experiment result showed that the use of a multi-spot laser generator employing a non-uniformly coated optical cavity in conjunction with a photo-detector array integrating a solar spectral filter can significantly improve the SNR performance of plant discrimination sensors. Some experts work for strengthening of specific crops. Norrasing Sangbuapuan worked for Strengthening the Rice Production in Thailand[16]. He designed policies focusing on Information and Communication Technology. Thai Government promote the farmers for the field data management and the transferring of knowledge to improve their skills and knowledge. Information sharing tool enable farmers to correlate their situations and take better decisions. Rice Department of Thailand provided Community Rice Centers as direct information channels on behalf of Government of Thailand. CRC worked for developing frameworks, models, and mechanisms to manage the ICT policies[16]. There are many such approaches are available which are crop specific or region specific.

Crop yield estimation in advance is done by various methodologies by various scientists some are listed below. One of the indirect estimation approach is based on time series data. Bin Luo discussed such approach where Multidate Hyperspectral Imagery used for yield estimation [22]. Estimation is done using hyperspectral imagery containing hundreds of spectral bands describing the biological and chemical attributes. Every spectrum is combination of the vegetation and the bare soil properties. Recently developed linear unmixing approaches are evaluated in this paper, which automatically extracts the spectra of the vegetation and bare soil from the images. The vegetation abundances are then computed based on the extracted spectra. Temporal images called multidate hyperspectral images and are captured from two grain sorghum fields. As a result correlation coefficients between the vegetation abundances computed, which is comparable with supervised methods. The variety in dates of capture gives improvement in the correlations. Multiple factors are measured and used to predict crop yield indirectly. One of the direct method to estimate crop growth is using RADAR tried by Yihyun Kim in 2014 [30].Here Radar response for wheat canopy is monitored to observe vegetation growth, tool used is radar vegetation index (RVI). A complete wheat growth cycle is taken into consideration with a ground-based multi frequency polarimetric scatterometer system to compute RVI. It is proven that

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RVI is a robust method for characterizing vegetation canopies. Yield estimation is also done on the basis of intensity measure. Some of the experiments are mentioned here.

To achieve the target of increasing need of agriculture production many farmers prefer the multi-cropping. It needs keen observations of variety of affecting factors for such crop yield estimation. This idea is discussed by Josh Gray et. al. in 2014[13]. They said that the information available related to multi-cropping at all levels, regional to global was not sufficient. MODIS sensors with high temporal resolution and moderate spatial resolution are used as a source of information. Methodology was improved and optimized for crops. This approach is an extension to established remote sensing-based methods for extracting land surface phenology from time series of SVI. It was modified for mapping multicropping intensity throughout Asia. Improvement done in the time-series segmentation procedure used to generate the MODIS Land Cover Dynamics product which gives help to A. Accommodate more than two cropping cycles per year B. To avoid problems caused by crop cycles crossing arbitrary calendar boundaries and C. To be more robust against missing data. Whereas Yonghua Qu. done observation using crop leaf area index [31]. Crop Leaf Area Index (LAI) Observed with automated measuring system based on Wireless Sensor Network. Practically LAI monitored continuously for two months by 42 different nodes planted in northwest China area in the Heihe watershed. The data were analyzed in three ways: 1) a comparison with LAI-2000, 2) a daily and 5-day aggregated time series analysis, and 3) a comparison with a Moderate Resolution Imaging Spectroradiometer (MODIS) LAI using both a ground LAINet LAI and a scaled-up. As Compare to other existing systems the results are identical though it is of low-cost and low-energy consuming system. WSN monitoring system is a promising method for collecting ground crop LAI in flexible time and space for validating the remote sensing land products. Latter LAI also derived from Airborne hyper-spectral images using vegetation indices specifically for Winter Wheat by Qiaoyun Xie in 2014 [32]. Actually it is a big challenge to monitor LAI of field crops in a growing season. Upgraded remote sensing technology developed a good tool which can map LAI timely and regionally. To model LAI of winter wheat in 2002 crop growing an airborne hyper-spectral imager also called Pushbroom Hyper-spectral Imager were used. Along with it various parameters were considered for modeling like six vegetation indices (VIs), including ratio vegetation index (RVI), modified simple ratio index (MSR), normalized difference vegetation index (NDVI), a newly proposed index NDVI-like modified triangular vegetation index (MTVI2), and modified soil adjusted vegetation index (MSAVI). Experimental results proved that NDVI-like was the most accurate predictor of LAI also the results support the use of VIs for a quick assessment of seasonal variations in winter wheat LAI and given reliable results.

As we have discussed earlier after the soil quality adequate water supply is an important factor and soil moisture content is an important factor to take decision about appropriate water supply also type of soil and slope need to be considered. Sensor technology can be applied in soil moisture mapping for more accuracy. Maëlle Aubert et.al. established relationships between TerraSAR-X signal and soil moisture and validated over different North European agricultural study sites[12]. Regardless of configuration of TettaSAR-X and soil characteristics soil moisture estimation by this technology is very accurate, gives mean error less than 4%. Mainly TerraSAR-X data (signal, texture features) discriminate bare soils from other land cover classes in an agricultural watershed and it was also evaluated. Mean signal backscattered from bare soils can be easily differentiated from signals from other land cover classes as the neighboring plots are covered by fully developed crops. If neighboring plots are covered by early growth crops, a TerraSAR-X image gained under wet conditions can be useful for discriminating bare soils. Object-oriented classifications of mono-configurationTerraSAR-Xdata used to calculate bare soil masks. The accuracies of mapping achieved were higher than 84%. The methods of bare soils moisture mapping developed in this paper can be used in operational applications in agriculture, and hydrology. Brown et al. discussed about assessing soil moisture and data required for that [18]. The results of this review provided responses that showed the connection between the needs of the user community and the high quality soil moisture data planned to be provided by the mission. A broad diversity was found in the spatial, spectral and temporal needs of the user community. The existing plans of the SMAP mission to provide highly accuracy in user's need and meet the majority of users' needs. For better understanding the uses of SMAP data their focus was on individual communication. So that it helps to identify thematic needs and challenges communicated with Mission scientist. For the discrimination types of crop, soil moisture retrieval and surface roughness the of X-band imagery approach was being used[23]. In alpine region Iftikhar Ali et al. had monitored of Natura 2000 habitats for that they investigated the potential of multi-temporal COSMO-SkyMed data. The beauty of this system is it has capability in image acquisition of continuous monitoring of nature conservation sites even though in size area. Between June and July the grazing activities in rocky habitat observed where as for forests and pastures

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backscattering profiles are stable. To make sure a continuous coverage in all weather conditions the analysis of backscattering coefficients can be used in synergy with optical images. The status of the soil moisture conditions of vegetation COSMO-SkyMed images can also be focused. The effect of parameter roughness computed using different multitemporal and multi-angular acquisitions. All these provide key information for monitoring Alpine ecosystem. A compared to X-band, the preliminary analysis of VV and VH signals gives a predominant effect of attenuation for the reduced penetration capabilities in the canopy. In 2013 Peng Guo tried to work on L-band radiometer for the same purpose that is soil moisture retrieval[24]. Specifically this algorithm was for bare surface and dual-polarization measurements was developed during this study. The base of this newly developed algorithm was Hp model a simple semi-empirical model. V and H polarization surface reflectivity ignores the surface roughness. Soil properties are directly from the radiometer measurements. For validation purpose the simulated data and ground radiometer measurements were used. Overall it has given satisfactory results for the all surface cover conditions along with bare and vegetated region.

In 2014 Clara C. Chew et.al. revised an approach for Soil Moisture retrieval by developing a new algorithm[25]. To infer volumetric soil moisture which computed around a GPS antenna they have used Global Positioning System (GPS) multipath signals. The observations conclude that the signals which are reflected by nearby surfaces holds more information about the environment surrounding the antenna. Whereas most of the users focus on the signal that travels directly from the satellite to the antenna. A GPS receiver keep track of temporal variations of the signal-to-noise ratio (SNR) which gives data about modulation produced by the interference between the direct and reflected signals. Experimental results shown that the variations in SNR data affects on near-surface volumetric soil moisture. GPS attributes in top 5cm of soil are affected by soil moisture. Soil type have no effect on the corelationships between GPS interferogram metrics and soil moisture. They came to know that phase is the best metric derived from GPS data and can be used as a proxy for soil moisture variations which is linearly correlated with surface soil moisture. Appropriate water supply is an important factor for yield growth and for that to predict the water to be supplied soil moisture is an important factor. So many researchers work on it so many approaches are available. A. Alonso-Arroyo et.al. have tried to improve accuracy in soil moisture measurement using the Phase Difference of the Dual-Polarization GNSS-R Interference Patterns[26]. This paper proved that Interference Pattern Technique (IPT) is a better technique for the determination of Soil Moisture(SM) at global Navigation Satellite Systems. SM measurements are based on observations at vertical polarization. This paper also focused on the phase difference between V-Pol and H-Pol interference patterns to improve the accuracy of the Brewster angle determination ultimately SM retrievals. Experimental results were validated of the proposed algorithm.

Like estimation of soil moisture soil drought also can be measured and it is monitored at Mid-Eastern China [27]. Actually Integrated Surface Drought Index i.e. ISDI is new term computed here. Data mining technology is used for better result the existing system was based on Vegetation Drought Response Index (VegDRI). In Improved ISDI model remote sensed temperature information also taken into consideration as input factors. If we looked into detail the integrated information including various attributes like vegetation conditions, and inherent properties of the earth's surface, traditional meteorological data, satellite-derived earth surface water and heat environments. Practically it has given good results for drought monitoring across mid-eastern China and if focus is on accuracy and detailed drought condition it works at both regional and local scale.

Similar to the soil quality and water capacity, temperature also affect on crop yield. Geng-Ming Jiang worked on algorithm for surface temperature estimation called splitwindow algorithm [28]. LST is calculated on the basis of values acquired by the Visible and Infrared Radiometer on FengYun 3A. Experimentally moderate spectral resolution atmospheric transmittance algorithm is used along with database and computer model. The system is upgraded to improve the accuracy in temperature estimation by divide rule. Here the mean of land surface emissivities (LSEs) and LST along with the total precipitable water is further divided into different subranges. Experimental evaluation is done at the Northeastern China area. Comparative study with different approaches like Terra Moderate Resolution Imaging Spectroradiometer LST and Emissivity products proved that in this approach LSTs are averagely consistent with the MODIS/Terra LST/E V5 products and accuracy achieved is better than 1.0 K. Afterword to prove that accuracy of algorithm not only limited to Northeastern China, it further examined and validated over more areas in the world and in different seasons. In 2014 Jaun c. et.al. were tried Landsat-8 Thermal Infrared Sensor Data to estimate land surface temperature[29]. Land surface temperature (LST) retrieval is one of the key factor. For LST here proposed SC and

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SWalgorithms and applied to Landsat-8 TIRS data. Simulated data from sources like simulations using atmospheric profile databases and emissivity spectra extracted from spectral libraries were used to test the algorithms and mean errors were below 1.5 K for both. If compared detail results of the SW algorithm are slightly better than the SC algorithm with increasing atmospheric water vapor contents.

After cropping with proper planning and even though providing appropriate resources one thing may affect on crop production i. e. disease. So the challenge is how to detect and treat it to avoid its effect on decreasing crop yield. Wenjiang Huang et al. proposed a system to monitor disease for winter wheat[14]. The indirect monitoring of plant diseases is done by the vegetation indices from hyper spectral data a drawback was distinguishing different diseases on crops was not possible. So they have developed new spectral indices which were able to distinguish different diseases on crops, a weighted combination of a single band and a normalized wavelength difference of two bands. The accuracies of these new indices for different types of leaves were different and above 85%. Like crop disease many reasons are there which can be risky for crop production so crop risk assessment is one of the important factors. Assessment of risk has be done by using causes of loss data[15]. The causes of crop loss are natural hazards such as drought, flood, and windstorms. Different facilities are provided by government over the loss like crop insurance, relief funds and agriculture portfolios. What should be the appropriate distribution of these funds has some platform. Crop loss risk assessment is dependent on yield history data and by following the pattern of 'Yield data-Detrend data-Distribution Fitting-Evaluation'. As scope increased accuracy of result decreased. This paper introduced only the risk assessment approach based on cause of loss data rather than yield data. It is proposed to be used to assessing the crop loss risk of a higher level region regardless of crop. Experimental results are itself proof for the advantage of proposed approach[15].

Some advisory systems are crop specific [17]. Study of crop specific advisory systems can be compared to decide, out of them which will be helpful to choose efficient existing system. It also gives the year wise modifications in the system and so depending on available circumstances we can adopt hybrid approach also. Luciana Alvim S. et.al. discussed about one of the time series mining approach for sugar cane[19]. This RemoteAgri system is a novel unsupervised algorithm a type of Association patteRns Miner. It involves Climate and Remote sensing data for mining association patterns on heterogeneous time. Basically the system developed to improve the monitoring of sugar cane fields it is an integration of large database from the source of climate data and low-resolution remote sensing Images. System is divided into three independent modules an image preprocessing module, a time series extraction module and time series mining methods. Images are of land and agriculture applications captured through satellite. To associate identified patterns in a multitemporal satellite images and patterns in other series within a temporal sliding window mining is used. Graphical user interface used to provide easy interaction and high flexibility to users. The results are validated at the end using algorithmic approach with agro climatic data and NOAA-AVHRR images of sugar cane fields along with the computation of correlation between agroclimatic time series and vegetation index images. Association mining used gives out some rules without having the burden of dealing with many data charts.

III. CONCLUSION

Various of advisory systems are available for different purposes. . Few methods for analysing land, environmental suitability some are to estimate land usage and many methods available to calculate crop yield. For estimating land usage under agriculture Image processing is used, input database is nothing but imageries collected from satellites also sensor data. Growth of the crop is also monitored using temporal images, leaf index computation etc. Some of the researchers had tried to improve the accuracy of existing systems. Most of the advisory systems available today are costly and not feasible to implement at rural areas in India also they are not user friendly for actual farmers.

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