ISSUE 3 • SEPTEMBER 2017
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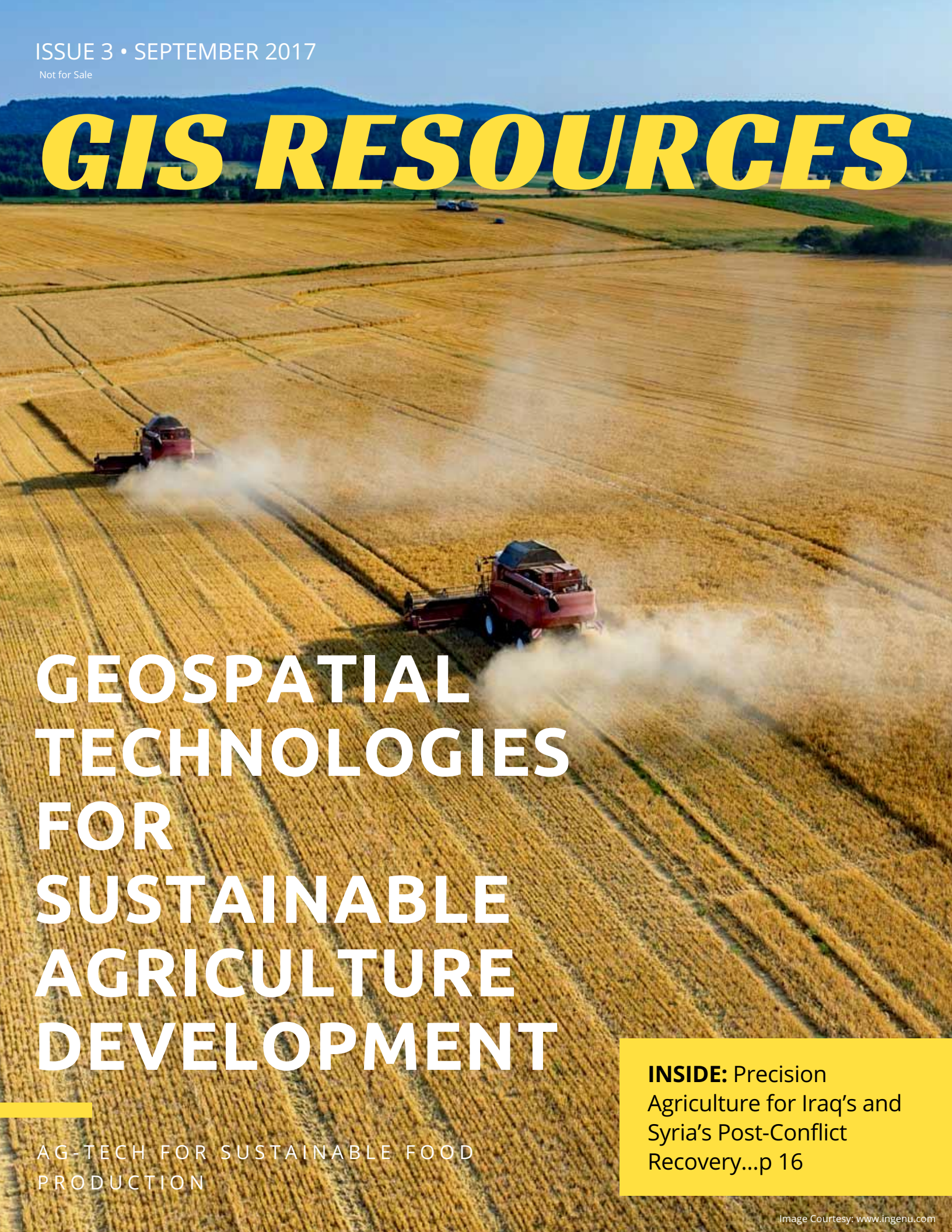

GEOSPATIAL TECHNOLOGIES FOR SUSTAINABLE AGRICULTURE DEVELOPMENT

AG-TECH FOR SUSTAINABLE FOOD PRODUCTION

INSIDE: Precision Agriculture for Iraq's and Syria's Post-Conflict Recovery...p 16

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Ashok Prim
Editor

An Increasing Role of Geospatial Technologies in Agriculture Management

Most will be aware of the recent crisis that hit the Agriculture sector wherein despite a scenario of plentiful produce the individual farmer was in acute distress.

Sound agricultural practices entail the use of good quality disease resistant seeds sown in good quality soil, the use of appropriate soil nutrients and pesticides and the availability of water among others. Under such salubrious conditions the crop would be bountiful and both the farmer and the consumer go back happy to continue the cycle.

However, sustained agricultural development goes beyond increasing the quantity of agricultural produce and sustaining that increase for the near future. As was seen, the farmer was not happy with the money he was getting for his bountiful produce. On the other hand, the consumer was happy that the prices of vegetables had fallen and had become affordable. Thereafter the converse happened. The prices of certain vegetables suddenly shot up leaving a big hole in the consumers pocket without any benefit to the farmer.

A central objective of sustainable development is to ensure social inclusion. To enable all stake holders to optimise the returns from the efforts & investments made in agriculture, it becomes important to monitor crop quantity with other socio-economic indicators such as crop acreage, soil type, crop type, crop yield, socio-economic status, geography, gender, age, transportation facility, storage facility, a fair return on investment, market trends and other dimensions in order to track and address marginalization and inequalities across sub-populations.

New Geospatial technologies & tools, such as, GIS, remote sensing, social networking, mobile phones, crowd sourcing, etc. would give capabilities to provide 'Decision Support Scenarios' which would be vital to monitor the overall health of the Agricultural sector. Embedded within the GIS would be a robust MIS that incorporates the above mentioned and other factors as 'national indicators' to be maintained on a regional and national basis. Models can be generated from the aggregated data to produce food supply & demand projections. Refinements in the models would be required over time depending on data quality and assumptions made for the model scenarios. This would go a long way in mitigating the causes for the farmer crisis that occurred recently.

Many of the actual solutions will need to be implemented at the state and district levels, all the way down to the household, farm, field and even within-field scales where changes in behaviour as well as farming technologies, such as, precision farming, modern low-pressure drip or other micro-irrigation systems etc, will be a critical condition for success.

India is on route to create an Agricultural Market Information System (AMIS). Incorporating Geospatial technologies into this system would improve basic socio-economic & crop statistics for the overall management of crops and demand & supply. It would also enable an equitable distribution of crop insurance due to more accurate crop forecasts and more precise assessment of crop damage due to disease, natural disasters such as drought & flood etc.

This quarterly issue attempts to give a balanced information on the research and practical aspects of the application of Geospatial technology for Agricultural Development. It is hoped that readers will use the information to get a better understanding of the issues involved. This is also an attempt to engage the stakeholders in an exchange of technology and information.

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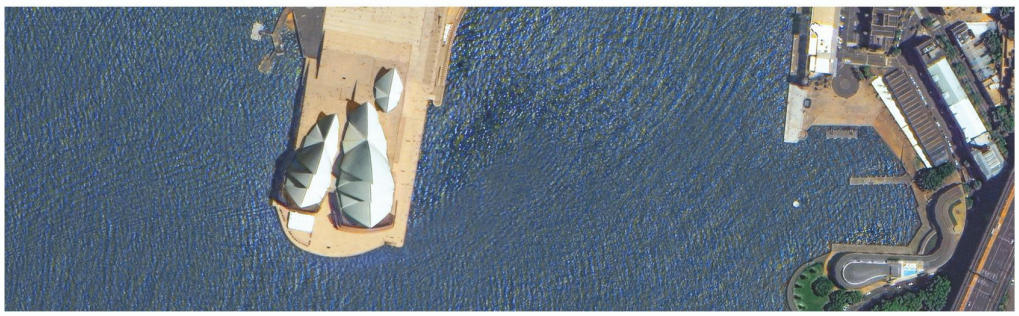

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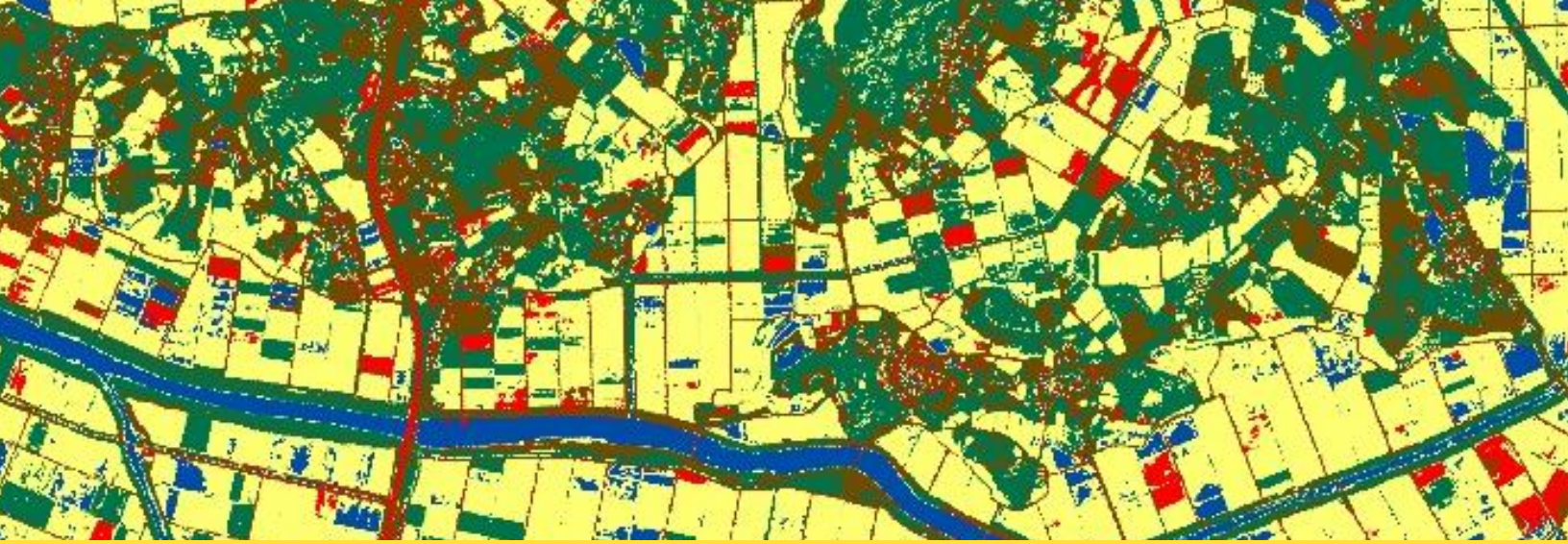

Land Cover Classification Using a KOMPSAT-3A Multi-Spectral Satellite Image

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In this study, land cover classification of multispectral data was performed using four supervised classification methods: Mahalanobis Distance (MahD), Minimum Distance (MinD), Maximum Likelihood (ML) and Support Vector Machine (SVM), using a KOMPSAT-3A multi-spectral imagery with 2.2 m spatial resolution. The study area for this study was selected from southwestern region of South Korea, around Buan city. The training data for supervised classification was carefully selected by visual interpretation of KOMPSAT-3A imagery and field investigation. After classification, the results were then analyzed for the validation of classification accuracy by comparison with those of field investigation. For the validation, we calculated the User's Accuracy (UA), Producer's Accuracy (PA), Overall Accuracy (OA) and Kappa statistics from the error matrix to check the classification accuracy for each class obtained individually from different methods. Finally, the comparative analysis was done for the study area for various results of land cover classification using a KOMPSAT-3A multi-spectral imagery.

Study Area

An approximate area of 25 sq. km. in central south western region of South Korea was selected for the study (Figure 2). The area lies in Jeollabuk province and is geographically bounded by 35◦34049.3800 N to 35◦3800.4700 N and 126◦4308.4100 E to 126◦45054.4800 E. Most of the area is agricultural land with barren and vinyl house farmlands. Few areas were covered by the forest or built-up structures like roads and residential areas. A river passes through the center which is dammed to preserve water for irrigation. The selection of the area was due to its availability of data and ease in identification of diverse land cover classes.

Classification and Accuracy Assessment

The study area was classified into five land cover classes: agriculture, barren, built-up, forest and water (Table 1). These classes represent the most dominant and important land cover in the area. Selection of only five classes was due to ease of selection and an

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associated decrease in the error of misclassification. Well known classification methods MahD, MinD, ML and SVM were applied to the study area using Environment for Visualizing Images (ENVI) 5.1 software (Exelis Visual Information Solutions, Boulder, CO, USA). The training and validation data sets were common for each of the classification algorithms.

#	Class Name	Description
1	Barren	Land areas of exposed soil and barren areas
2	Built-up	Residential, industrial, roads, vinyl houses
3	Farmland	Crop fields and fallow lands
4	Vegetation	Mixed grasslands and forests
5	Water	River and reservoirs

Table 1. Land cover classes classified in the study

Results and Discussion

Figure 1 shows the example of two ratios and two indices examples where we can see some specific objects are clearly separable, even visually. Based on the assumption that derived bands may help in classification, two composite images were created for classification. The first one consisted of only four bands whereas the new derived composite consisted of 12 bands. Figures 2 and 3 show the classified maps for the original and indices and ratio composite case studies for the study area. The results of the classification of the study area were based on the same 70% of the sampled training data set. Similarly, on the basis of the remaining 30% sampled validation data, the accuracy of classification were evaluated. Table 2 shows the PA, UA, OA and Kappa statistics for both composite cases using various classifiers.

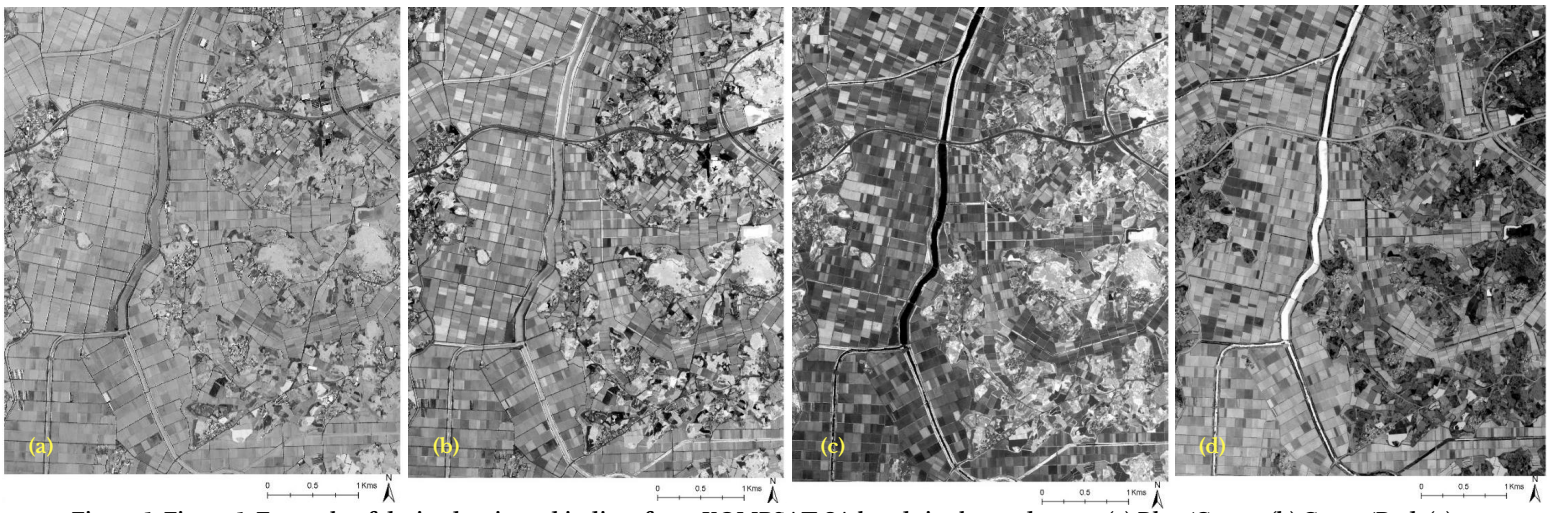

Figure 1. Figure 1. Example of derived ratio and indices from KOMPSAT-3A bands in the study area: (a) Blue/Green; (b) Green/Red; (c) Normalized Difference Vegetation Index (NDVI); and (d) Normalized Difference Water Index (NDWI). Compositing these bands could provide better classification information for original bands.

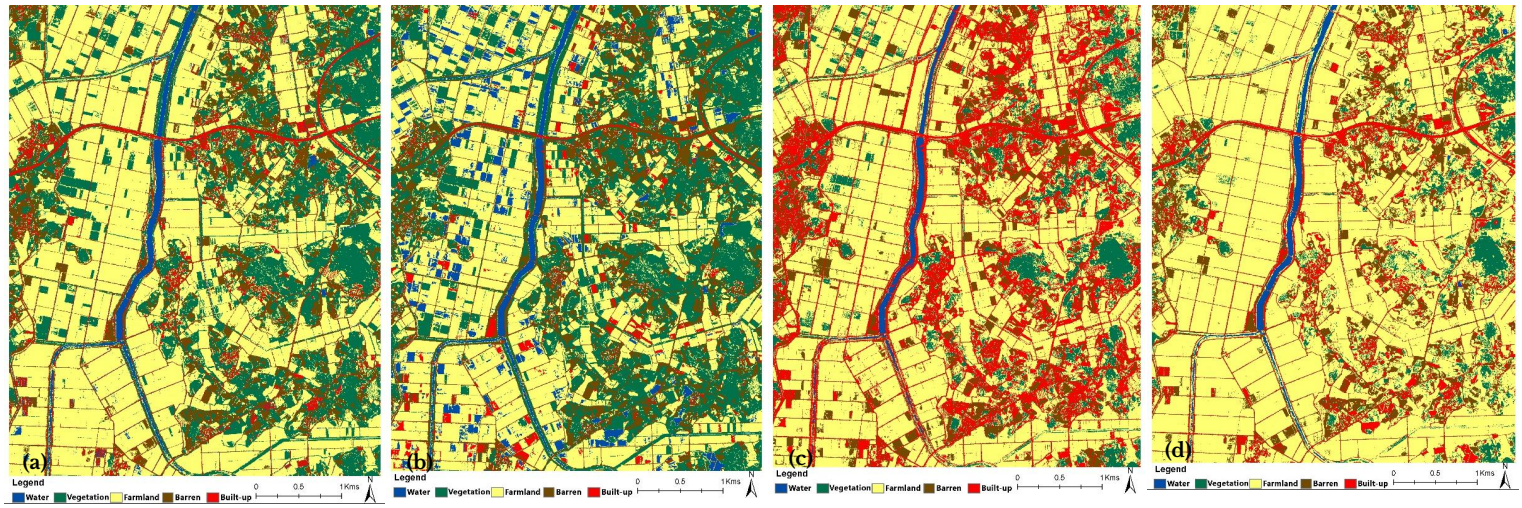

Figure 2. Land cover classification of the test site using original four bands composite: (a) Mahalanobis Distance (MahD); (b) Minimum Distance (MinD); (c) Maximum Likelihood (ML); and (d) Support Vector Machine (SVM)

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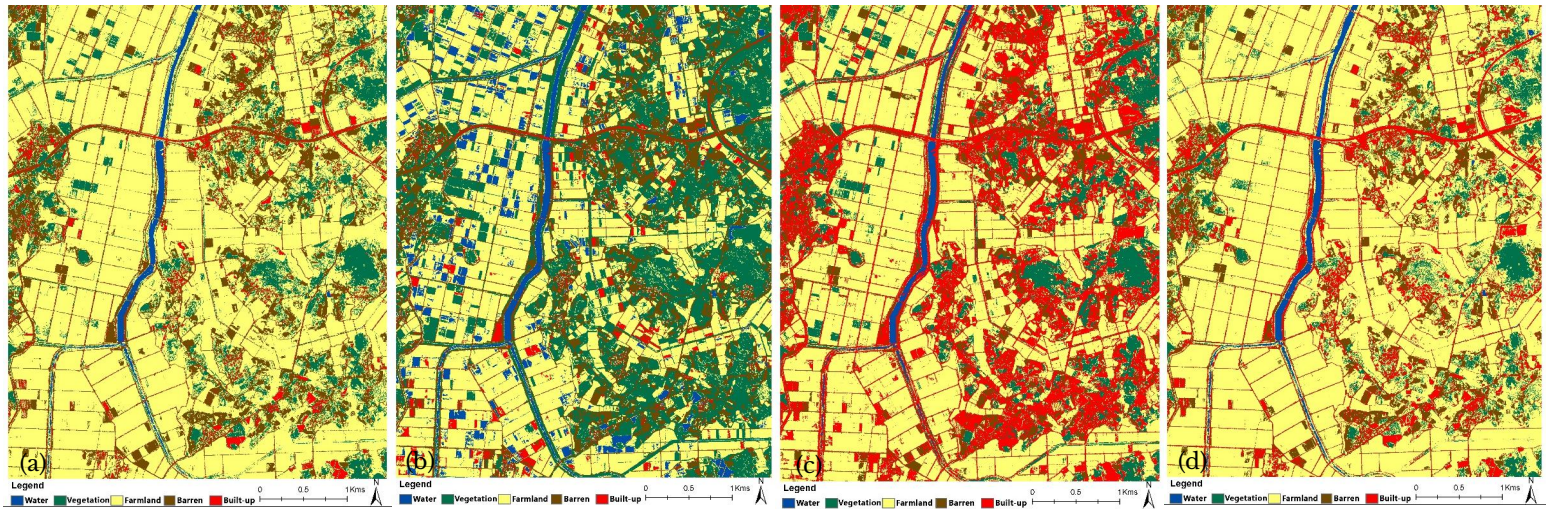

Figure 3. Land cover classification of the test site using ratio and indices bands composite: (a) MahD; (b) MinD; (c) ML; and (d) SVM

Case	Classifier	Water		Vegetation		Farmland		Barren		Built-up		OA	Kappa
		PA	UA	PA	UA	PA	UA	PA	UA	PA	UA		
Original	MahD	100	90.85	96.48	52.39	78.47	92.96	84.56	85.60	51.84	98.49	80.93	0.682
	MinD	100	38.46	91.09	48.74	65.84	90.87	47.69	53.77	24.51	60.83	67.33	0.493
	ML	99.33	100	97.36	68.57	87.11	99.00	98.49	71.80	69.77	85.76	88.90	0.812
	SVM	99.69	100	76.62	83.18	95.94	93.52	96.55	90.25	86.20	97.66	92.46	0.862
Ratio & index composite	MahD	99.69	100	96.32	70.84	90.34	97.07	97.37	82.86	68.98	99.89	90.68	0.838
	MinD	100	38.46	91.09	48.74	65.84	90.87	47.69	53.77	24.51	60.83	67.33	0.493
	ML	99.59	100	98.65	58.90	81.33	99.44	99.14	92.07	92.34	85.27	87.20	0.791
	SVM	99.74	100	83.36	85.98	96.47	95.24	97.41	91.42	87.11	97.25	93.98	0.890

Table 2. Accuracy measures of Mahalanobis Distance (MahD), Minimum Distance (MinD), Maximum Likelihood (ML) and Support Vector Machine (SVM) classifiers in the study area. PA, UA and OA are Producer's Accuracy, User's Accuracy and Overall Accuracy. All are represented in percentage (%)

From Table 2, the well classified land cover seems to be water except in the case of MinD where the UA is very low, i.e., 38.46%. Moreover, it is clear that the overall accuracy of MinD is very poor and is unchanged in the case of the derived composite. MahD showed much improvement of about 10% form 80.93% to 90.68% in overall classification accuracy with the addition of composite ratio and indices, SVM also showed an increase, but only of 1%.

Visually, the results of the classification of the study area seem to be very variant in each cases. The classification from MahD and SVM seems to have visually balanced classification of land cover. However, MahD seems to be covered with more vegetation than SVM which is a built-up area. Whereas, MinD and ML shows very poor classification, they were more favored in classification of vegetation and built-up areas, respectively. The vegetation and the farmlands were misclassified by the MahD classifier. Similarly, the ML classifier seems to be confused by barren open areas with built-up, roads and vinyl houses. The misclassifications shown by MinD classifier identified black mulching vinyl in farmland as water class, which was due to its dark nature. Additionally, with its better visual classification, SVM has a salt and pepper effect in areas where vegetation was confused with farmlands and vice versa. ML showed higher accuracy compared to MahD and MinD in the first case and the results were more localized in the sampling polygon only. In the second case the results were also localized but with lower accuracy. The compositing derived bands had a negative effect on the probability of the pixel classifications. MahD is a direction-sensitive distance classifier that uses statistics for each class. Also, it is similar to the ML but assumes all class covariances are equal and therefore is a faster method. The increase in classification accuracy that the MahD classifier seems to consider the derived band information for the classification.

Conclusions

In this study, different classification techniques have been examined for the classification of land cover in a rural area of southwestern Korea. Various supervised classifiers were applied to examine the classification of KOMPSAT-3A data in two cases: original composite and derived ratio and indices composite. Due to minimum bands and high resolution, the classification was not as efficient as Appl. Sci. 2016, 6, 371 11 of 11 expected for large areas. MahD and SVM showed better classification accuracy and also improved with the addition of derived bands, whereas the MinD showed lower overall accuracy and was unchanged.

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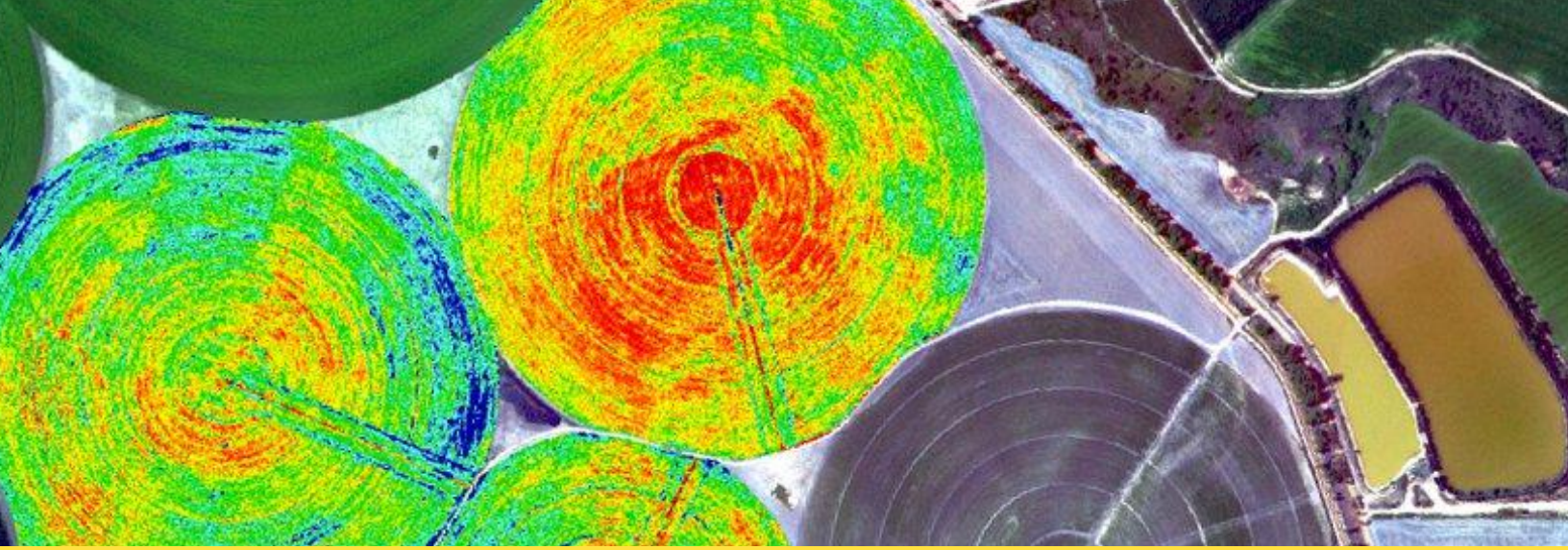

Hyperspectral Remote Sensing for Agriculture

Image Courtesy: www.specterra.com.au

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Advanced analysis of natural resources particularly crops and soil requires high spatial and spectral resolution data to increase producers' sustainability and environmental protection. The studies pertaining to crop growth requires assessment and quantification of biochemical and biophysical attributes. More better spatial resolution cannot provide satisfactory analysis results because of limited number of wavebands in multispectral data. The multispectral broadband-based remote sensing is not capable of providing accurate quantitative estimates of biochemical properties because of low spectral resolution. This limitation of multispectral remote sensing data led to the concept of hyperspectral remote sensing particularly imaging spectroscopy. The hyperspectral remote sensing data comes with hundreds of narrowly defined contiguous bands and offers very minute details about plant biochemical and biophysical attributes related to its health through various spectral regions. For instance, changes in chlorophyll a and b is characterised by early wavebands in 350 to 2500 nm range data.

Spectral Properties of Vegetation

The hyperspectral remote sensing data can be acquired through field based spectroradiometers, satellite borne sensors or airborne sensors. The spectroradiometers are very useful instruments in agriculture related studies. Fig-1 Shows a typical vegetation spectrum of reflectance for rice crop recorded by ASD field spec-3 spectroradiometer. It records the reflectance of the objects in 350 to 2500 nm wavelength region with 1 nm interval. Using this reflectance spectrum data for crops and soils, very useful studies can be executed. The vegetation spectrum (Figure 1) shows the regions of absorption for water, chlorophyll, etc. The visible (VIS) region of spectrum is mostly used for chlorophyll a and b related studies. The near infrared (NIR) region is governed by cell structure of plants and the short wave infra red (SWIR) region shows the absorption troughs for water and also have reflective properties for leaf biochemical parameters like protein, lignin and cellulose, etc. The region between 690-740 nm is called red edge position where the reflectance changes from very low in the chlorophyll red absorption region to very high in the near infrared because of leaf and canopy scattering. This region is found to be sensitive to total canopy chlorophyll by many researchers. This region is also an indicator of water stress in plants. Besides the spectroradiometer data, the Hyperion sensor is also a source of satellite borne hyperspectral data. Figure 2 shows the spectral reflectance profiles of various

features extracted from Hyperion data.

Many airborne hyperspectral sensors are also available like Airborne visible/infrared imaging spectrometer (AVIRIS) and Compact Airborne Spectrographic Imager (CASI), etc that provide high spectral and spatial resolution, high temporal resolution and precise ground coverage with high geo-location accuracy. Figure 3 and Figure 4 shows spectral responses of crop plants due to change in biophysical parameters i.e. relative water content and chlorophyll respectively. These figures present the sensitivity analysis for relative water content (RWC) and chlorophyll a & b (Cab) in crop plants.

Hyperspectral Remote Sensing Data Analysis for Agricultural Crops

Hyperspectral remote sensing provides many ways to analyse the crop health, to develop prediction models for crop health parameters as well as modelling for monitoring of timely water deficit stress in crop etc. The basic analysis on a hyperspectral data can be done using spectral indices (ratio of 2 or more bands).

Hyperspectral data comes in narrow contiguous bands, therefore minute changes related to a parameter of interest can be observed and the most optimum wavebands for that parameter can be extracted for prediction model development. This prediction model may be useful for future assessment of that parameter. The most sensitive/ optimum bands related to a important parameters of crop can be detected using various approaches like lambda by lambda plotting, multivariate modelling techniques i.e. PCA, PLSR, MLR, SVMR, RF MARS etc., wavelet analysis and artificial neural networks. The lambda by lambda plotting is useful for development of a new effective hyperspectral index. For instance, The vegetation water content which is a vital biophysical parameter of plants need to be monitored at precise timings because lack of water content in plants will lead to low yield of crop. The reflectance data of the target crop and simultaneously measured any parameter of crop related to water content can be used to develop a new hyperspectral index (ratio index or normalized difference index) for assessment of water content and a prediction model can also be developed for timely identification of water status in crop. The radiative transfer modelling approach (e.g. - PROSAIL model) is also used by many researchers to retrieve the vegetation parameters for monitoring of crop health status.

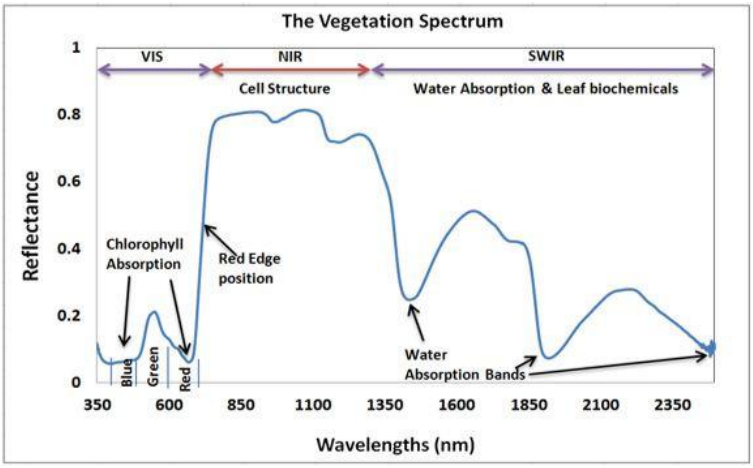

Figure 1. The typical vegetation reflectance spectrum of rice crop in 350 nm to 2500nm range showing details

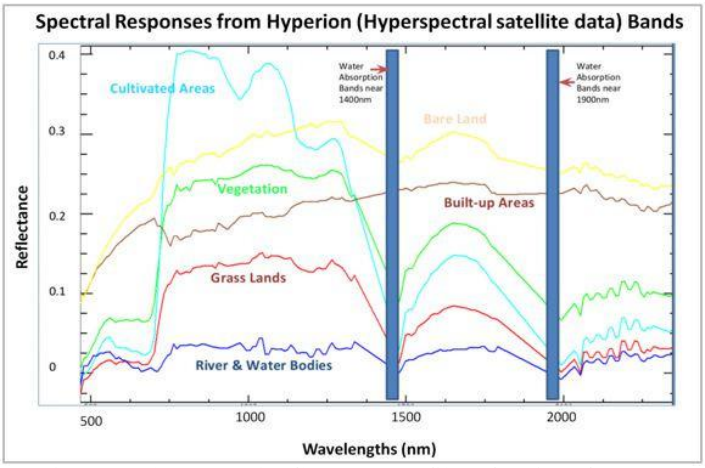

Figure 2. The spectral reflectance profiles of various features extracted from Hyperion satellite imagery.

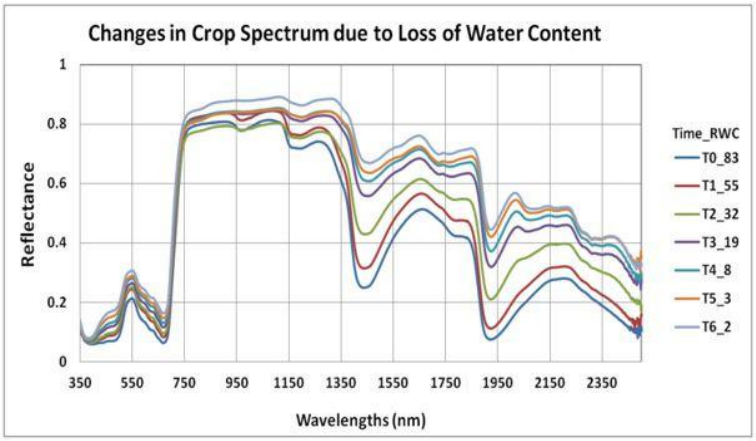

Figure 3. Changes in reflectance spectrum of crop due to water deficit stress. With loss of water content, spectra in SWIR region goes higher because SWIR region is dominated by water content in leaves

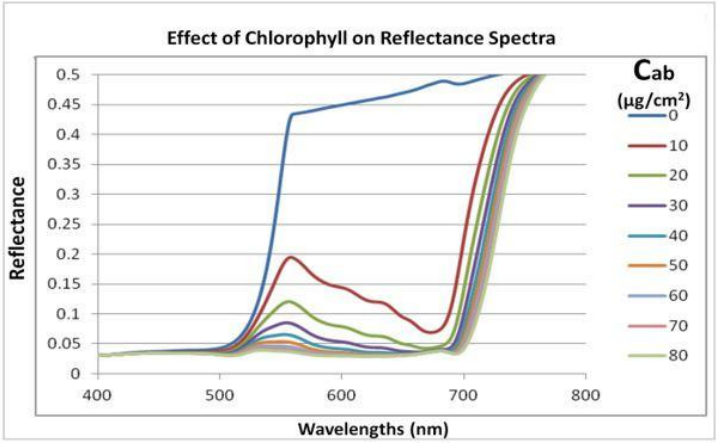

Figure 4. Changes in reflectance spectrum of plant due to quantity of chlorophyll. Higher the chlorophyll, lower the reflectance

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There are many other areas where hyperspectral data can be utilized in agriculture. The most common applications where hyperspectral remote sensing data is extensively used are early detection & diagnostics of plant diseases, weeds & pests; prediction of yield & crop growth monitoring; nutrient deficiency diagnostics & stress detection; and crop variety discrimination. Early detection of diseases in plants enables quick and targeted responses.

The yield prediction provides policy makers to get insights of the production in a region and thus enables to take an effective decision. The timely detection of environment stresses such as extreme temperature, nutrient deficiency and water shortage in crops enables the precise prescription of required quantity of macronutrients i.e. Nitrogen, Phosphorus and Potassium (N, P, K). Remote sensing's wide area coverage and hyperspectral data's rich spectral resolution helps greatly to monitor these environmental stresses.

In a nutshell, the hyperspectral remote sensing data has ample capability to provide satisfactory analysis results for monitoring health of the crops. This enables effective decision making for the farmers and policy makers.

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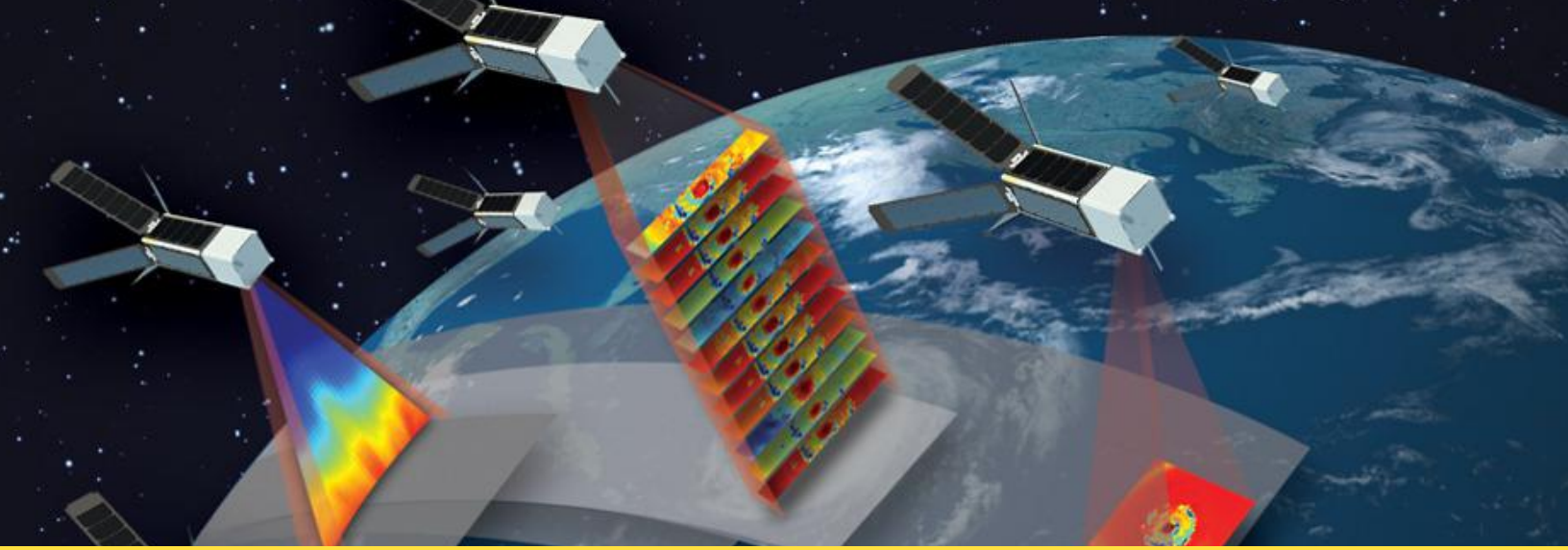
"Hyperspectral sensor is capable of acquiring data well beyond the spectral range of a multispectral sensor, every pixel in the image thus contains a continuous (in radiance or reflectance) spectrum and enables critical insight for scalable, very high spectral-resolution vegetation monitoring in several key ways... this increased spectral-resolution is used to make accurate machine learning models of crops.



Trinity in Space for Agriculture

Image Courtesy: www.jpl.nasa.gov

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Farmers may not be interested in a space mission for searching 'water' in Mars or Jupiter. They may sometimes, ignore the breaking news of astronaut harvesting 'red roman lettuce' in space. For them the news of PSLV failed while lifting off at the bad weather is no much important.....! Farmers in India still believe that these all are for administers or scientists. They lost their faith in scientists and administrators. Farmers started ignoring the pieces of advice and the gap between the 'agricultural research' and the 'farming' widened today to a greater extent.

Farmers stopped listening to speeches about climate change and water resources. They don't want any 'expert advice' or 'complicated graphs' from a research paper to understand that water resources are depleting and climate is negatively changing. They already know much better than what we know and they take measures in a sustainable way without seeking any reward.

Farmers know how to cultivate crops better than any agricultural scientists. They always lack certain precise information which is critical to the crops and its atmosphere, which they cannot guess based on their experiences. They need scientists or research centers or administers to help them by measuring climatic variables or forecast parameters with sophisticated instruments. They seek some simple answers.

They want somebody to tell them that when does the next rain going to come? Is that our village is drying up gradually? Is this dry spell will last for a coming week also? Is that the available water in dams is enough for the coming crop season? Is that our crops are stable or gradually wilting?

Too many unanswered questions, make them live and die in uncertainty. Here we are trying to analyze how optical, thermal and microwave remote sensing can help to reduce their agricultural uncertainties. 'Trinity' or the combination of these remote sensing techniques can deliver farmers with value-added products for improving their farming.

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Satellite Images - Still a Research Tool ?

Scientists have developed many indices to monitor crops. For example, the NDVI (Normalized Difference Vegetation Index) is one among them. Hundreds of papers published in every year in peer-reviewed journals where NDVI is a scientific term of discussion. But, how many farms in India are monitored or by satellite images to understand their relative variation in canopy signal strength. Whether we are attempting to monitor the crop heath from space in routine basis to help the farmers? Have we ever alerted any farming community saying that your sugar cane or paddy is gradually dying?

In India, INCOIS inform fisherman about the coordinate where fish is plenty on each day. For farmers beyond weather updates, we deliver nothing to them. They still not fully aware that there is a mighty camera in the space as earth observation satellites to help them to improve their farming situations.

Farmers do not have any technology to get directly connected with that friend at high heavens. They need some intermediate people like scientists to connect to them. 'Intermediate people' or 'middlemen' are always a problem to the farmers in their experience. In agricultural markets, they have bitter experiences with 'middlemen', looting them by taking the lion's share from the profit. In seed shops, fertilizer shops, crop insurance, agricultural subsidies, everywhere the 'middlemen' appear and disappear with the money they made by toiling in the hot sun and puddles.

Need of Satellite Missions for Farmers

Many space agencies have launched satellites to help the farmers. But finally, many of them became just a tool for administrators to take a decision about agricultural policies. They use satellite images to know about crop loss acreage, crop statistics, expected agricultural production, etc. Farm-level information that can be used by farmers are not being collected (may be collected) and processed to a greater extend.

Farm-level information related to crops, soil and micro climate can be collected directly by sensors. Installing sensors for soil moisture, leaf temperature, Evapotranspiration and climatic variable turns to be a costly affair for a small-scale farmer in India. Moreover, it's a point measurement and has no reliability for a larger area.

In remote sensing, we use different satellites for understanding different variables on the ground. But choosing satellite for the service of farmers has to be based on cost and reliability as a prime factor. Satellite images which are freely available can be used as data sources. Sentinel-1A, Sentinel-2A, Landsat 8, MODIS etc. are such satellites provide free satellite images for users. 'Free availability' sometimes don't serve the purpose of farmers. We should see whether the spatial resolution and temporal resolution suits for farm level applications. MODIS has a very good temporal resolution (1 day) but the spatial resolution is not suitable for farm level applications. Where as Landsat 8 and Sentinel-2A have better spatial resolution. Landsat 8 senses the same place on earth at 16 days interval and Sentinel-2A at 5 days interval. Sentinel-1A is an active remote sensing satellite which uses SAR (Synthetic Aperture Radar) technology. It has a spatial resolution of 20m and temporal resolution of 6 days. In India, we get Sentinel-1A images at 12 days interval.

When we look into the specialty of these satellites they give specific and mutually exclusive information about the land. Sentinel-2A has a red-edge region, which is centered at 705, 740 and 783 nm. It can give reliable information about Leaf area index (LAI) and chlorophyll content. The improved spectral capabilities of Sentinel-2A make it a unique friend of farmers. The values of LAI and Chlorophyll content can tell many things about the crops and vigor. LAI gives insights into density and crop height from empirical relationships.

Landsat 8 has no red edge bands. It has two thermal bands centered at 10890 and 12000 nm.These bands are used for estimating the Land Surface Temperature (LST). LST is one of the major parameters to calculate evapotranspiration (Loss of water from crops by evaporation and transpiration).The measure of evapotranspiration in mm will give us an idea how much water is lost from the cropped areas in a day (for eg. 1mm Evapotranspiration means 1 liter/day from 1m2 of land is lost to the atmosphere). There are many well-known efficient models which can give evapotranspiration values such as METRIC, SEBAL, TSEB etc.

Sentinel-1A data also has its own unique features. It records information about the ground in different bands of polarisations. It sends active microwave pulses and records its scattering by different objects in the ground. It gives information about the geometrical properties as well as dielectric properties of targets. When agriculture is concerned the geometric properties are crop height, leaf density, trunk density etc., whereas dielectric properties are the canopy water content and soil moisture content.

Question of Availability of Three Satellites Together.....

Will this trinity of satellites make us available the remote sensing data for the same day? If the satellites give data for three different dates for a single

Satellite	Uniqueness	Agricultural Aplications
Landsat 8	Thermal band	Estimation of evapotranspiration
Sentinel-2A, 2B	Red edge bands	For crop health monitoring
Sentinel-1A, 1B	SAR polarimetry	Structural parameters of crops, soil moisture

Table 1. Satellite and their unique sensor application in agriculture

RESEARCH

area, the correlation is meaningless. For instance, When we are able to correlate soil moisture content with the growth of crops for the same day we get meaningful results. At present this trinity visits on the same day above a particular place, once in 240 days.This gap of 240 days is too long for a farmer to assess his crop.

Does this tell us the importance of a constellation of satellites with a thermal band, red edge bands and SAR capabilities which revisit the area together at every day or every 5 days?

Keeping this in mind, we have conducted studies near Hyderabad in a village called Warangal where most of the farmers with small land holding primarily fed by monsoon and no canal irrigation facilities available. We were able to derive leaf area index, soil moisture variability, evapotranspiration values for the area for the same day and was validated with an extensive ground truth. The data from Landsat 8, Sentinel-1A and Sentinel-2A obtained for single a day is used. The meteorological observatory owned by the Nagarjuna innovation center located in the midst of the study area was used for validating evapotranspiration values. Three satellites missions together were able to deliver a large amount of information pertaining to each cropped field in moderately high resolution. The only limitation was that the revisit period was too long for these satellites.

Satellites with high resolutions dedicated to agriculture is a need of the time. Optical remote sensing along with thermal and microwave remote sensing can deliver value-added information products to the farmers. This trinity in the space can definitely safeguard the agriculture in our country, provided scientists have to be a better 'middlemen' for them.

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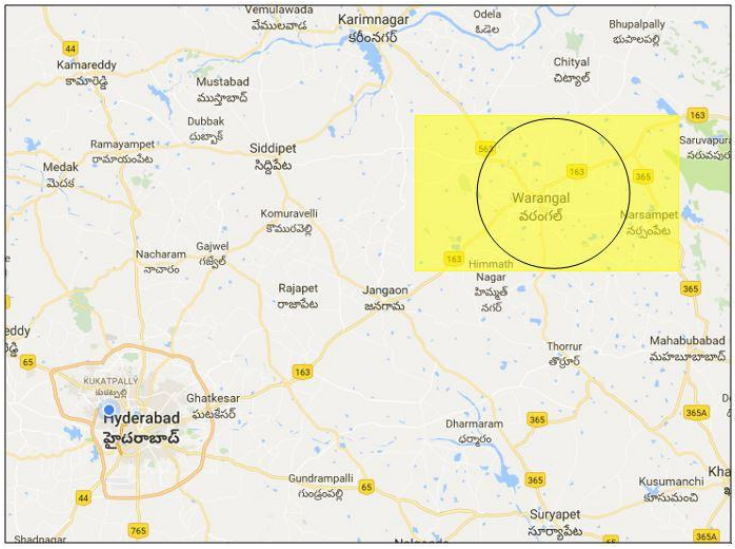


Figure 1. Study area demarcated on Google Maps

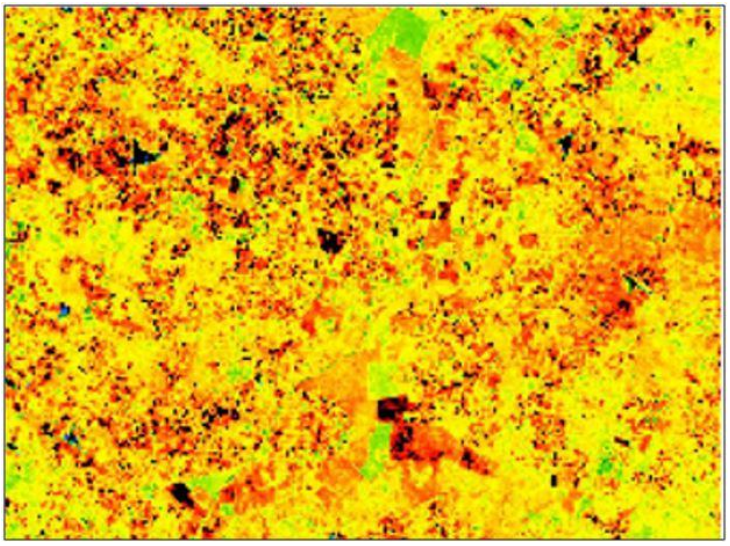


Figure 2. LAI image from Sentinel-2A
Values range from 0.2 - 3
(Red - High LAI, Yellow - Medium LAI, Green - Low LAI)

All satellite images were taken on February 03, 2017

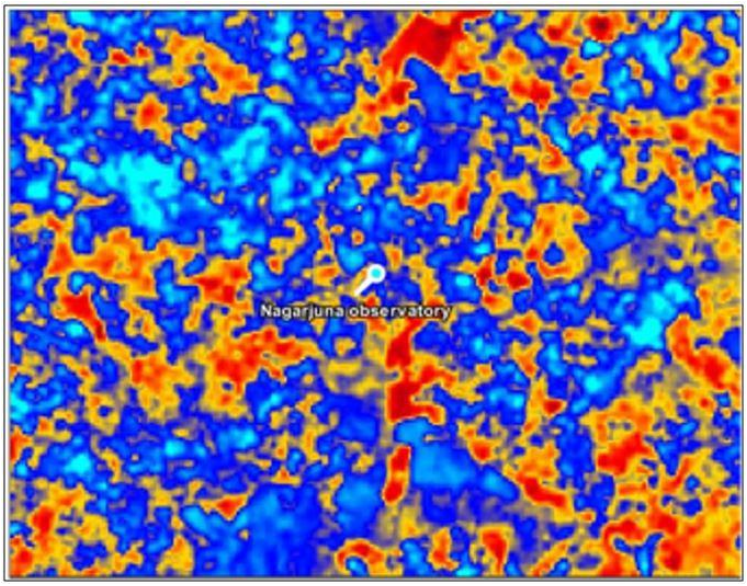


Figure 3. LST image from Landsat 8
Values range from 300 - 306K
(Red - High LST, Orange - Medium LST, Blue - Low LST)

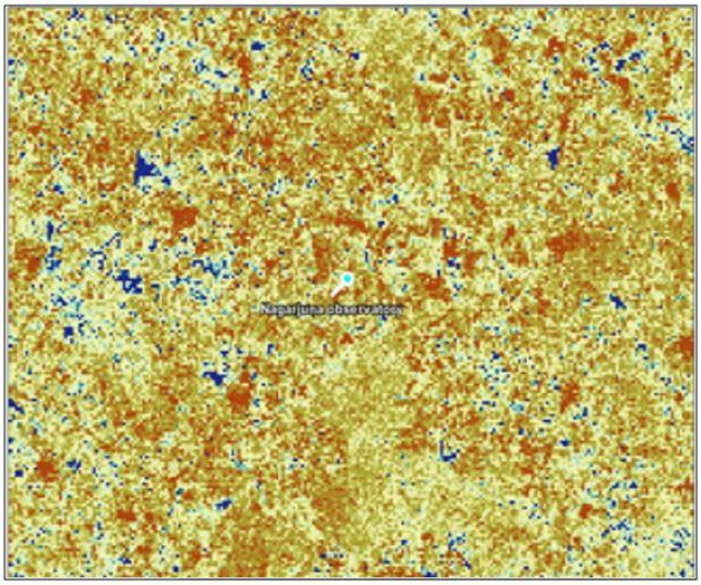
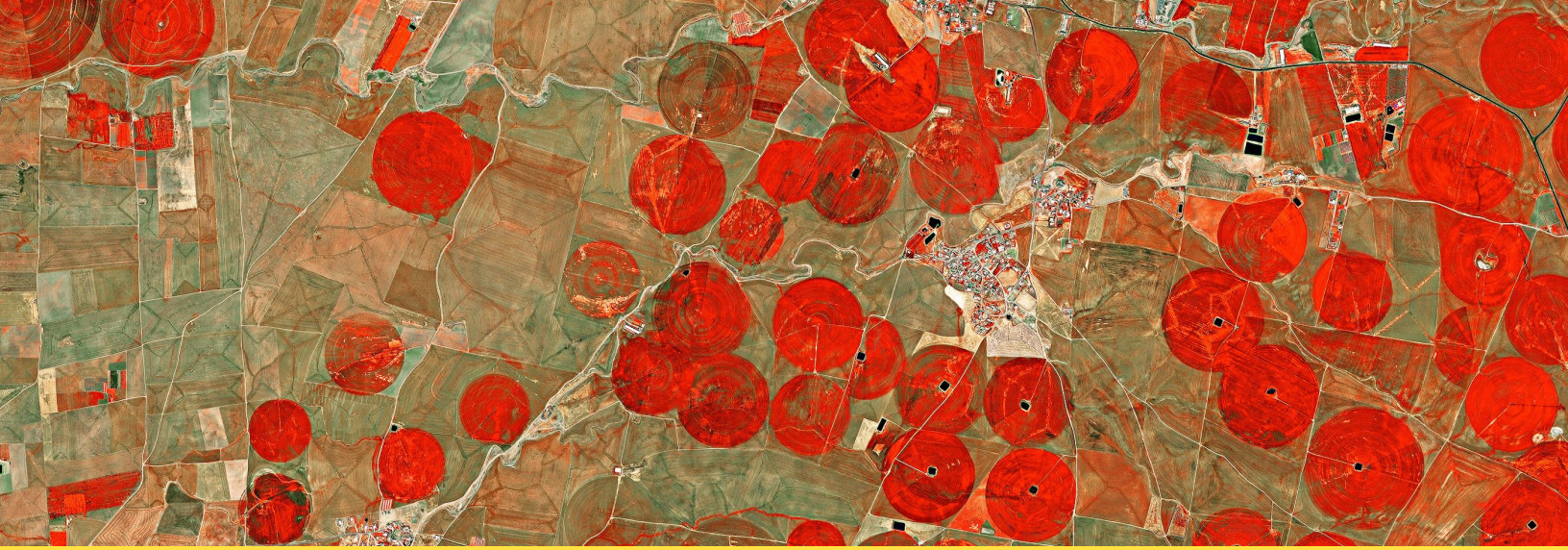


Figure 4. Soil moisture from Sentinel-1A
Values range from 0.1 - 3 %
(Brown - High moisture, Blue - Low moisture)

RESEARCH



Precision Agriculture for Iraq's and Syria's Post-Conflict Recovery

Ana Isabel Martínez
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Historically, agriculture has played a very important role in the fertile crescent between the Tigris and Euphrates rivers. Today, after years of ongoing conflicts in Iraq and Syria, agriculture and the livelihoods that depend on it have suffered massive loss in this area. The fighting is not only putting civilian lives in danger, but also jeopardizing the agricultural production in the region. Several families dedicated to rural farming and herding have been forced to migrate or look for other sources of income. Moreover, vast areas of agricultural land, resources and infrastructures have been destroyed.

The regions where agriculture have been more affected are the Nineveh, Kirkuk and Salahuddin governorates in Iraq and Al-Hassakah, Ar-Raqqa, Rural Damascus, Deir-ez-Zor, Dara'a and Idleb in Syria.

According to a research carried by the Food and Agriculture Organization of the United Nations (FAO), food production is at a record low in Syria and around half the population remaining in this country are unable to meet their daily food needs. In spite of the crisis, agriculture remains a stronghold for the country's economy, accounting for around 26 % of the gross domestic product (GDP). However, FAO reported loses of around USD 16 billion in terms of production, along with damaged and destroyed assets and infrastructures within the agriculture sector. In Iraq, after a period of stagnation in the 1990s, agriculture rapidly declined. Iraq's oil-driven economic growth resulted in the neglection of the agricultural sector, in low investment levels and in rural populations leaving farms to move into urban areas. In addition, the conflict with ISIS and their scorched-earth strategy is estimated to have reduced Iraq's production capacity by at least 40%, according to the Jordan-based organization Regional Food Security Analysis Network.

Agriculture is not only an important source of income that benefits poor population, reduces the need of humanitarian assistance and stems migration, but also a key element for political legitimacy by ensuring food provision to the broader population. Thus, agricultural development efforts are key to rehabilitate livelihoods and prevent radicalization and conflicts.

Assessing the Impact of Conflict on Agriculture

Deimos Imaging launched a campaign to monitor agricultural fields in Syria and Iraq with the Earth Observation satellites Deimos-1 and Deimos-2. Both satellites include the near-infrared band and they provide analytic-ready imagery supplying the information needed for vegetation indices calculations.

Vegetation indices provide an indication for the relative density and health of plants for each pixel of Deimos-1 and Deimos-2 imagery.

In addition, the high temporal revisit capacity of both satellites ensures a systematic data collection, enabling consistent monitoring and analysis. The data supplied by Deimos Imaging can be used to supply a powerful operational service for precision agriculture with an accurate multi-temporal overlay at pixel level. This can empower the precision agriculture users at different stages: planning; in-season practices and yield.

Deimos-1, the very first Earth Observation Spanish satellite, has been continuously providing data since 2009. With a spatial resolution of 22 m, a 650 km swath and a 3 days revisit frequency, it enables to timely monitor any area of interest. The satellite's 3 spectral channels (red, green, NIR) were designed to be compatible with the ones of the Landsat series, ensuring continuity with existing tools and harmonization with historical data, enabling cross-calibration and comparisons across satellites and locations and enabling a seamless analysis of extended time series. This multispectral capability makes it an easy-to-use and cost-effective tool to improve the efficiency of cultivation practices and to implement precision agriculture techniques. It can be used in a wide range of applications such as drought assessment, crop analysis and grazing management.

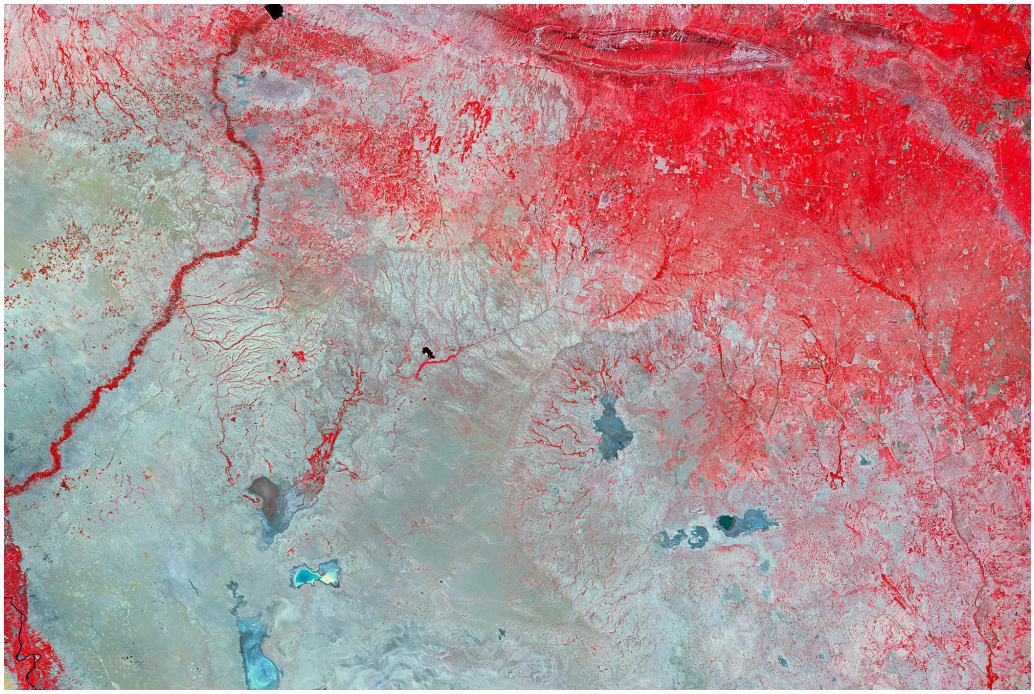

Figure 1. Part of Al-Hassakah, in Syria, and of Nineveh, in Iraq captured by Deimos-1

Figure 2. Smaller part of Al-Hassakah, in Syria, and of Nineveh, in Iraq captured by Deimos-1

The image on Figure 1, captured by Deimos-1, shows part of Al-Hassakah, in Syria, and of Nineveh, in Iraq, two of the main agricultural regions in this area. Vegetation appears red in this false-colour image that was processed including the near-infrared channel. That's a traditional band combination very useful to see changes in plant's health. Different shades of red provide crucial information on chlorophyll content and plant health. The denser vegetation grows and the more intense is the red colour.

Deimos-2 is the perfect tool to obtain very high-resolution imagery for close analysis when anomalies are detected in a specific area. With its high spatial resolution, Deimos-2 data is used to precisely outline the affected areas and accurately determine the spatial variability.

Figure 2, captured by Deimos-2, shows a smaller part of Al-Hassakah, in Syria, and of Nineveh, in Iraq, the same region previously captured by Deimos-1, in true-colour and very-high resolution that allows to appreciate the fields in greater detail.

Figure 3 shows precision agriculture crops in Erbil, a region bordering the Nineveh Governorate. The circled shapes come from a central-pivot irrigation system, where the long water pipe rotates around a well at the centre.

Space Technology at the Service of Sustainable Development

Investment in technology will be crucial to modernize and implement productive agricultural techniques in Syria and Iraq that help in the recovery of these countries' economies. Geospatial information and imagery are an easy-to-use and cost-effective tool to improve the efficiency of cultivation practices and to apply precision agriculture methods. For instance, the satellites Deimos-1 and Deimos-2 that captured the images above can be used in a variety of agriculture applications such as drought assessment, season monitoring, crop administration, and grazing management. Deimos Imaging, owner and operator of these satellites, can directly provide value added agriculture services to customers, or rely on its global network of partners who can offer a wide portfolio of tailored services. Launched in 2009, Deimos-1 was designed especially for agriculture applications and it has quickly become one of the leading sources in this kind of services worldwide. Meanwhile, Deimos-2, launched in 2014, provides imagery with a much higher resolution – 75 cm/pixel – that also present a powerful and affordable solution for precision agriculture services.

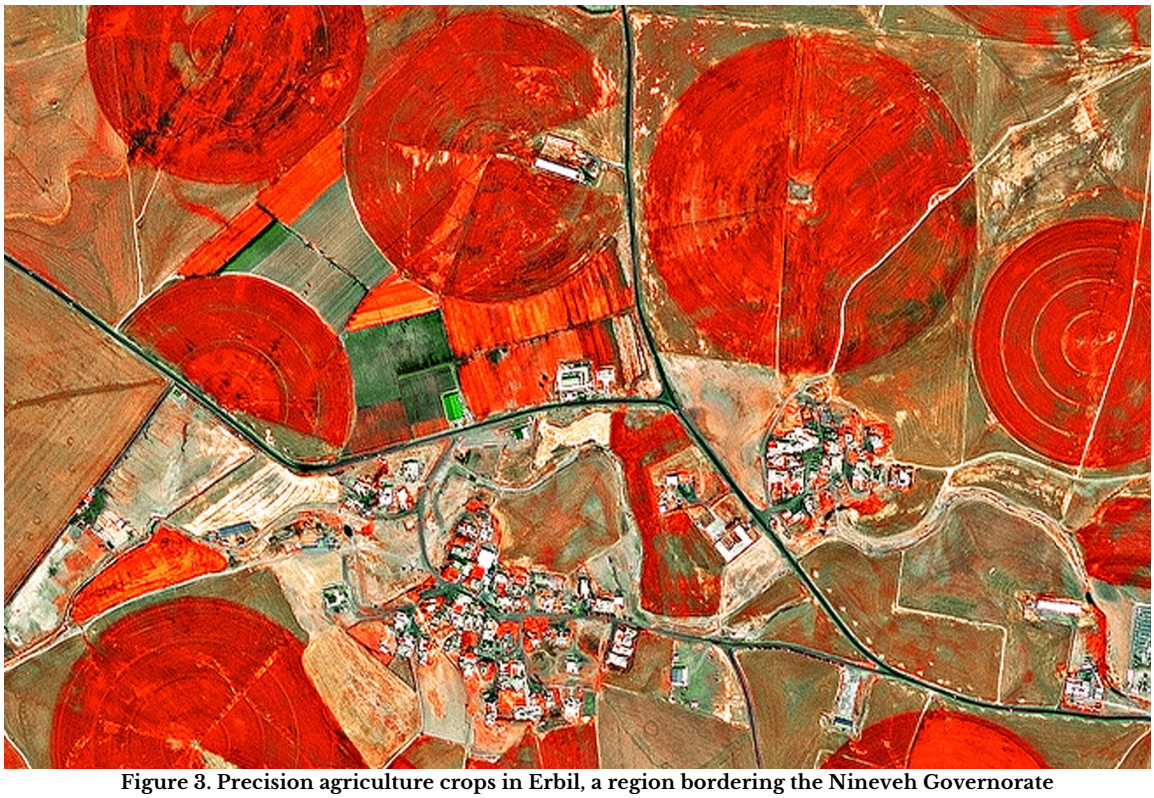

Figure 3. Precision agriculture crops in Erbil, a region bordering the Nineveh Governorate

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Ag-Tech for Sustainable Food Production

Three steps to approach the food security, climate change and the finite resources challenges using aerial/satellite data

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The world's population is presently growing at a staggering pace of 1 billion inhabitants every 12 years. By 2050 we will need to feed at least 9 billion people, while developing countries will drive further demand for animal protein and richer diets. The World Bank forecasts that at least 50% more food needs to be produced while climate change could cut crop yields by more than 25 %. But agriculture is also one of the largest contributors to global warming, being responsible for more greenhouse gases emissions than the transport sector altogether. Fertilizers when used in excess or in poor farming practices are the largest source of nitrous oxide emissions, a greenhouse gas that is believed to contribute 200 to 300 times more to global warming than carbon dioxide. Nitrous oxide is also the greenhouse gas with the longest atmospheric lifetime, lasting up to 150 years.

Finite resources and volatile food and agricultural commodities prices are also responsible for price spikes, making many families vulnerable to infant malnutrition with social, physical and mental effects on the well-being of young people that it can bring.

Agriculture is also the largest user of water supplies and a major polluter as excess fertilizer usage contaminates fresh water reserves. The excess usage of agrochemicals is also responsible for biodiversity loss, clearing areas of grassland and forests for farming and a major driver of wildlife extinction.

The above challenges demand we act urgently at three fronts:

1. Optimize Fertilizer Usage

Being one the largest reasons for potential yield losses, for global warming and a major source of contamination of water supplies, it is required that a modern farming practice takes into account soil fertility, nutrient availability and the crop demands.

The use of prescription maps enables the shift from a "one-fits-all practice" in fertilizer usage application to a "use the fertilizer quantity needed, at the location is needed".

At Skylab Analytics we supply food producers with digital prescription maps as a service. The prescription maps are based on the present status of soil nutrient availability and actual crop nutrient demand.

These prescription maps are compatible with modern Variable Rate Application (VRA) agricultural machinery able to use liquid (VRA sprayer implements) or solid granulate

(VRA spreader implements) fertilizers.

The prescription maps can be uploaded to the machine controller via an USB stick or remotely pushed to the tractor implement controller through the use of third-party farming management services.

2. Manage Water Resources Responsibly

The biggest cause of yield losses: water. Too much or not enough. While one cannot control the weather, one can monitor it and forecast important parameters such as soil moisture at several soil depths and cumulative precipitation rates. Soil moisture monitoring and forecasts are thus an essential part in managing water resources and in monitoring the risk of a modern food production practice.

Skylab Analytics' technology can provide near real-time information related to both flood and drought risk. It can also provide with micro-climate weather forecasts, providing field level forecasts for several weather parameters such as soil moisture. These field level forecasts can be accessed in near-real time and used to create soil moisture alarms that can be used to trigger irrigation and manage water resources.

3. Limit the Usage of Agro-chemicals to What is Really Needed

Excess agrochemical usage is the main reason for biodiversity loss in agricultural landscapes. This "runoff"as it is known can carry pesticides into aquatic environments while wind can carry them to other fields, grazing areas, human settlements and undeveloped areas, potentially affecting other species. When their use is unavoidable, it is important that agrochemicals are used responsibly and in the right quantities. Prescriptions are often advised by the product manufacturers themselves leading to potential conflict of interests.

Again, aerial/satellite technology can help here. The example below shows a trial made by Skylab Analytics on a potato crop parcel. It shows that savings up to 50% on agrochemical usage with respect to the manufacturer recommendation are possible, providing the desired outcome in the whole parcel (preparing the field for harvest).

We have seen in the three steps above how aerial/satellite data can help solving some of the world's biggest problems. This includes enabling a more sustainable agricultural practice, while standardizing data-driven supply chain practices.

Figure 1. Automatically generated VRA taskmap enabling the input where and on the quantity needed

Figure 2. Pre-harvest desiccant trial on a potato parcel cutting agrochemicals usage by 50%

INDUSTRY

WE USE SATELLITE DATA

to solve some of the world's biggest problems.

By combining artificial intelligence, machine learning and computer vision to remotely sensed data we uncover information from data, providing actionable insights to solve business problems.

Skylab Analytics provides spaceborne geospatial analytics technology to global businesses in fintech and agriculture.

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WWW.SKYLABANALYTICS.COM

Arid Regions Problems Can Be Solved With the Help of Remote Sensing and AI

Image Courtesy: Wikipedia

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Earth Observing System,
California, USA

In recent years many areas of the US territory suffer from a drought of varying intensity. It is difficult to forget the consequences of the Great Drought of 2015, which was considered the largest in the last 1200 years.

As of July 2, 2017, according to the US Department of Agriculture, the abnormal dryness and some amount of moderate drought (D1) expanded in parts of the Northern Rockies and Northwestern U.S., with short-term drought impacts being more prevalent than long-term drought impacts. Several large wildfires developed in these regions, concomitant with the encroachment of abnormally dry and moderate drought conditions. On average, drought conditions worsened slightly in the Southern Plains, with parts of central Kansas, central Oklahoma, and South Texas showing deterioration. Drought improvement was observed in a fairly limited area of the Southwest, stretching from southern portions of Arizona and New Mexico into west Texas.

This situation affects not only agriculture but also the quality of life in the cities. In such conditions, the issue of water saving becomes a sticking point and causes many problems in densely populated areas of the country. About 9 percent of the contiguous US fell in the moderate to extreme drought categories (based on the Palmer Drought Index) at the end of July (NCEI Drought Repirt July 2017).

Is It Possible to Reach a Peace Agreement With the Population?

If it isn't too subversive to say so, the state authorities are aware of the fact that loyal methods and propaganda do not bring proper results, not mentioning the fact that the mass installation of water meters can not be influenced. Water Districts tried to recalculate the indicators and bill residents post-factum, adding the cost of overruns to the general account. This leads to protests - no one wants to pay more!

According to Prop 218, Water Districts are not profitable organizations. The change in tariffs requires justification, for this purpose, it is necessary to provide a new method for planning the flow of water, and calculating wasteful use.

How to Recognize the Perpetrator?

One of the such approach is to calculate the average flow of water resources per district and to determine the extravagance of consumers by identifying "more than twice the average." We can calculate

PRODUCT WATCH

water consumption in the regions accurately, using only the latest technologies and remote sensing data (RS), meteorological data and data from meters for estimating and planning the flow of water resources.

The human factor not only affects the accuracy of the data but also causes distrust of the population and the court proceeding afterward. For example, human can not always recognize where the pool is, where the plants are, and where the tracks are using the pictures of the territory. In addition, the water management inspector can not obtain this information, without violating the sovereign right of private property (without intrusion into private property for measurements). This approach is extremely inaccurate, and not fair in relation to consumers who have a high flow rate due to the evaporation of water from a large area of green plantations.

The newest technology was developed by California-based company EOS. WaterCloud service in cooperation with and California's Water Districts with the help of the best quality images classifies objects in the private sector and separates the information on the areas of foliage of plants and pools from roofs, paths and buildings and compares it with data on evaporation or use of water to care for a certain type of plant. Then, the planned flow rate is compared with the counters, which allows identifying wasteful consumers and marking their areas on the district map, for example, in red.

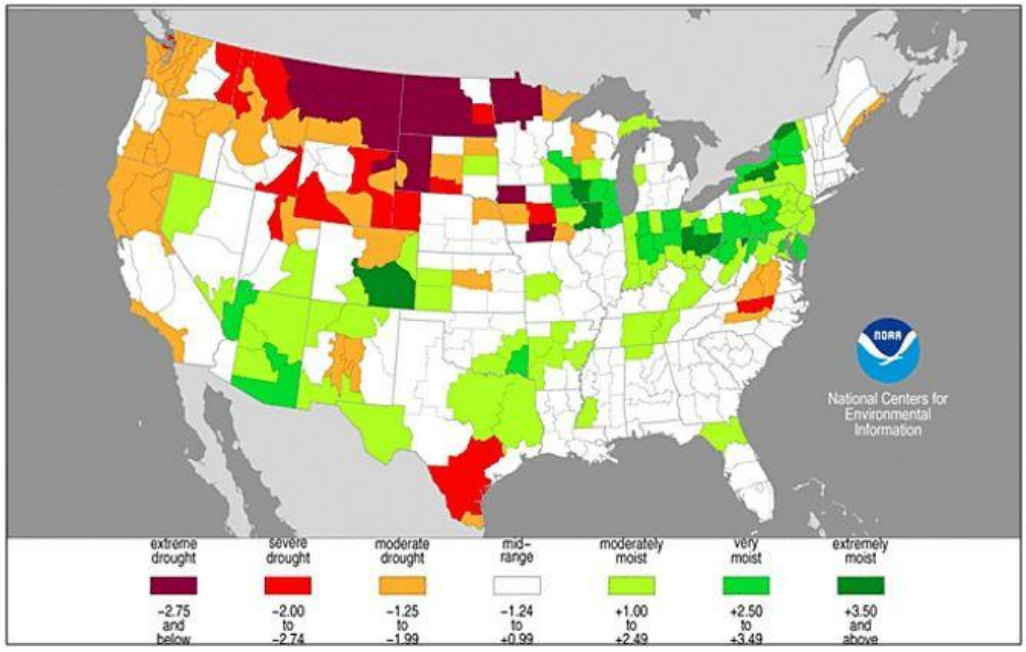

Figure 1. Palmer Z-Index, July 2017

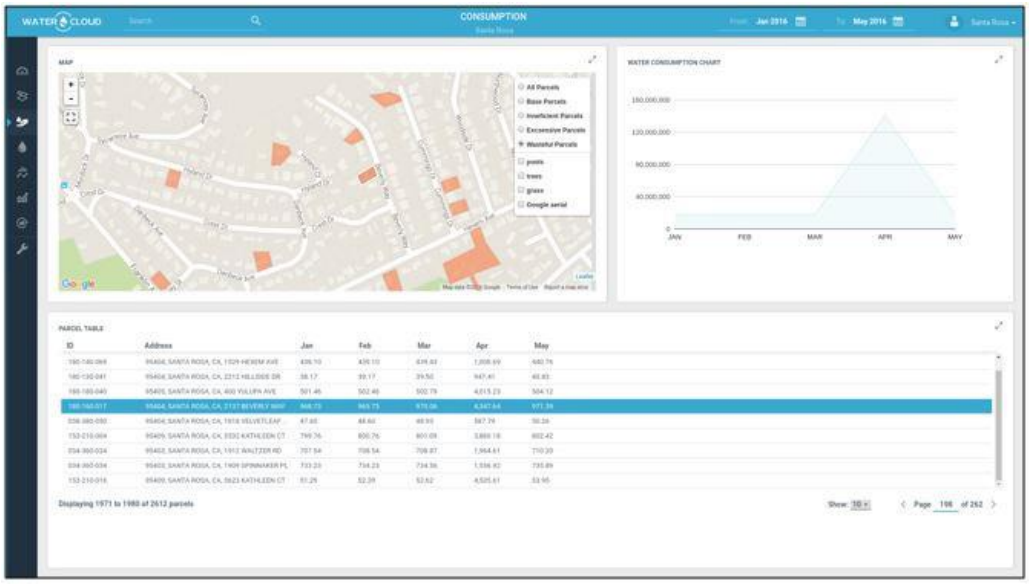

Figure 2. Screen shot of EOS WaterCloud Service - Water Consumption

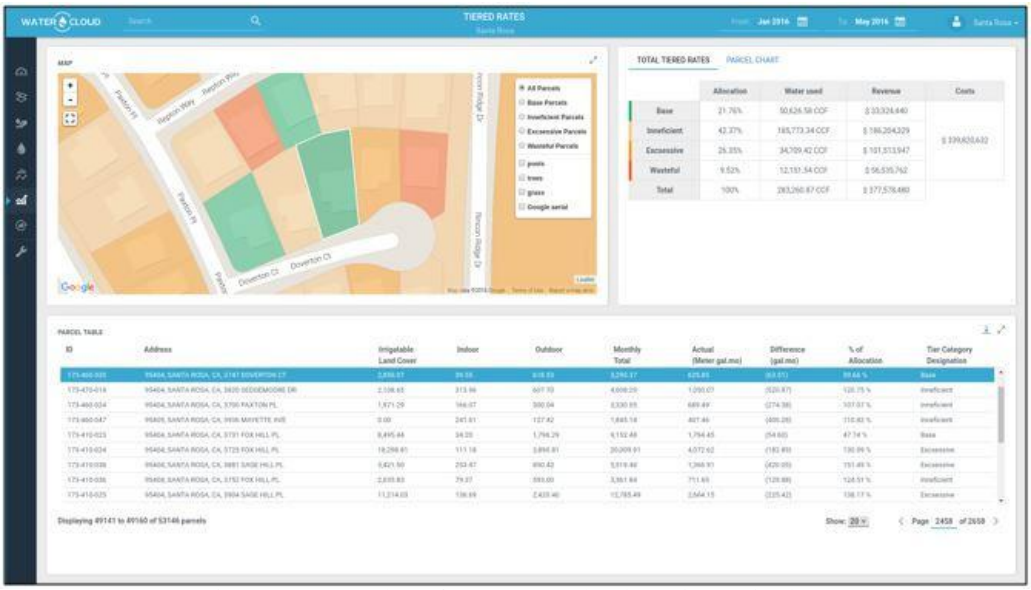

Figure 3. Screen shot of EOS WaterCloud Service - Tired Rates

The Heavy Artillery for Data Processing - Algorithms and Artificial Intelligence

It's hard to believe, but such arrays of graphic and statistical information can be processed,

calculate and analyze the total area of each kind of surface on a scale of the whole district.

The calculation of water consumption uses the methodology approved by Department of Water Resources. For indoor use, the daily water consumption per capita is *55* gallons. For calculation WaterCloud uses the data about the requirements for the incoming file with the initial data from the water district: APN - subscriber number of the site / unique parcel ID; postal address, street, city state, ZIP-code; registered number of residents; data from the meter in gallons; the size of the plot Ft2, etc. To assess outdoor use, the map of the imported data to the sites is made through APN; the total water consumption in the building, etc.

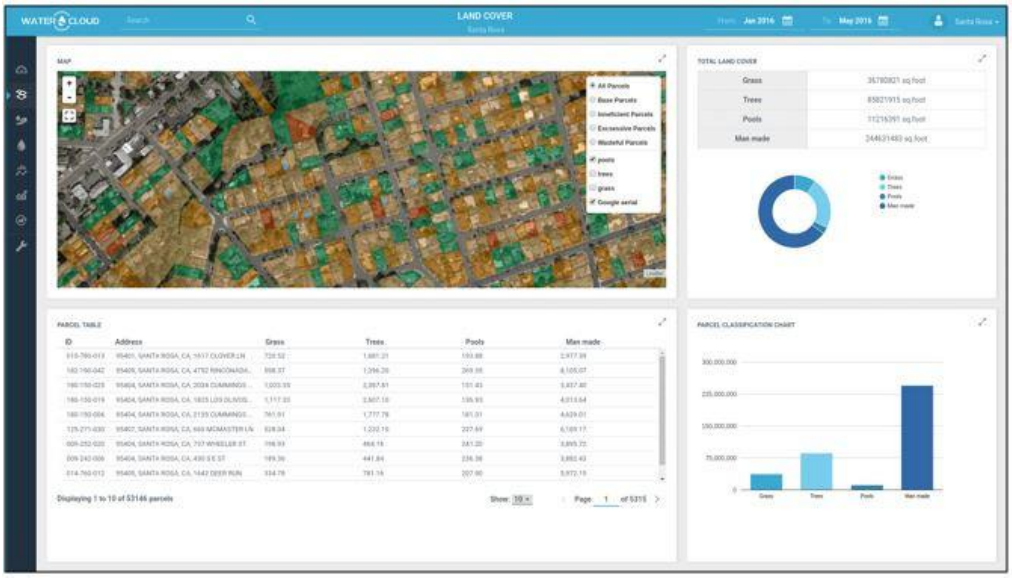

Figure 4. Screen shot of EOS WaterCloud Service - Land Cover

Who Can Become a Pioneer of the Technology?

EOS company using WaterCloud technology is ready to solve a number of problems with water overflow in Water Districts of California even today. A comparative assessment of the accuracy of automatic classification of buildings, vegetation, and water objects using multispectral aerial images and neural network. The average value of the accuracy for testing is over 90%.

Thus, using WaterCloud data we can even closer approach to solving the problem of drought within the California State Program - "20X2020 Water Conservation Plan" as accurately as possible without causing protests from the population and court proceeding.

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PRODUCT WATCH

GIS Based Decision Support System for Agriculture in India

Image Courtesy: www.agrimachinerynews.com

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Soul of rapid growth in the Indian economy has witnessed various revolution related with agriculture since primitive era. In India, agriculture is a primary source of economy for the mass population. Agriculture based revolution has resulted in balancing the supply of increasing demand for cereals for the rapidly growing population of India. A study reveals the fact that over 60 % of the rural population in India is dependent on agriculture as the prime source of their livelihood. With advancement in agricultural techniques and selection of crop pattern has increased the yield manifold on the same agricultural area. If agriculture along with allied sector is taken into account such as fisheries, forestry, horticulture etc. it will account for one of the major and single largest contributors of nations GDP. Since Independence, the government has come up with various policies, which supports industrialization or infrastructure development with the help of foreign investment or by promoting the small industry. In spite of the same, agriculture is the only sector in India, which supports a mass population in terms of employment and a major contributor to Indian economy.

In recent past despite the fact that there is an increase in agricultural productivity, the inclination towards the selection of agriculture as a prime source of livelihood has decreased. India has witnessed the maximum population of youth who is contributing towards the building of a nation in a positive direction. Despite this fact, after higher studies the inclination to work in formal agriculture sector or selection of farm cultivation, as a career is merely a thought. It results in old agricultural practice, which is being used by a majority of the farmers which results in comparatively less yield as compared to other countries i.e Canada, China. Currently, the advancement in agricultural technology has its limitations up to the laboratory and research institutes only. It is because due to lack of decision support system farmers are not getting the right advice at right time.

The risk of Crop failure due to changing environmental condition across the globe is also a challenge. Unavailability of real time database of demand and supply is also one among the major factors, which is directly affecting the profitability of the farmers in a negative way despite high crop yield.

The Geographical Information System (GIS) can be considered as the boon for agriculture industry if its use can be practiced in a way that is more effective. In Next Section this article will cover the details that will reveal the fact that despite high agricultural productivity why profitability is less. What is the major pain area for agricultural practice? How can GIS as a technology be effectively used by formal sectors to help farmers in decision support system for selection of crop until obtaining maximum profits in terms of the selling price?

Introduction

India is prone to all aspects of the natural disaster. Amongst that flood and drought, are the major contributor that directly affect the agro based industries. In the promising era of information technology where India has witnessed in laying down the successful milestones in space technology, there is no active decision support system, which can help and support the farmers in their routine life for cultivation activities. Until now, the selection of crops is being done by old farm practice or by getting influence from productivity/income of other farmers.

Selection of crop or what is to be produced as horticultural practices, which can be more profitable, requires some advance practices, which will be based on decision support system, analyzing the current market requirement. The lack of decision support system can be understood by various examples where farmers have cultivated Onion by breaking all record of past productivity without understanding the fact that what will be the market requirement when yield will be ready for sale. This is the common trend where productivity of certain yields get maximized result in reduced market value due to less demand and high supply.

Understanding the agriculture based market dynamics; selection of yields, risks, real time market database can be taken on priority for a better decision support system. Here Geographical Information system can play a major and vital role, which will reduce the risk of agricultural failure for farmers at great extent.

GIS is explained in an easy way is a system, which can provide the information of a target area or geography considered for the study. In agriculture practices, geography plays a vital role in day-to-day cultivation related activity. Selection of crop, choosing the area, targeting the market segment, understanding risks associated with that, planning of distribution network all these requires the help of GIS.

GIS Based Decision Support System

The government has planned for various means of support systems for farmers however if all their individual effort or effort being done in segments come up on a common platform then an effective decision support system can be made. GIS based this system will help all farmers in taking the day to day decisions where the agriculture expert suggests the selection of crop based on geography by understanding all risks. Other stakeholder plans the distribution of network of the yields based on analyzing the market demand. Currently, in spite of high yields, farmers are not happy due to lack of decision support system by government.

Here GIS will help in analyzing the past record or database with reference to the geographical maps which can be used in producing various models for agricultural practices.

How This System Can Work?

a) Selection of site and crop:

GIS as a tool can help the decision makers in identifying the sites, which is being used for cultivation, and analyzing the details of potential sites that can be used for various means of agriculture such as floriculture etc. This can be correlated with an example where in the state of Bihar in Indo-Gangetic flood plain cultivation of banana is the only option as most of the time these areas are submerged in water. Irrespective of market requirement, farmers have no option other than to cultivate banana. By understanding, the situation one of the farmers is now trying to cultivate Orange instead of Banana. Here it is to be noted that supply of orange in the major part of north India is being done by Maharashtra including Bihar. Hence In a different environmental condition by identifying the market, demand and taking the risk the orange farming introduced has succeeded to a great extent.

This is one of the examples where government stakeholders can use the GIS based decision support system by creating awareness among the farmers

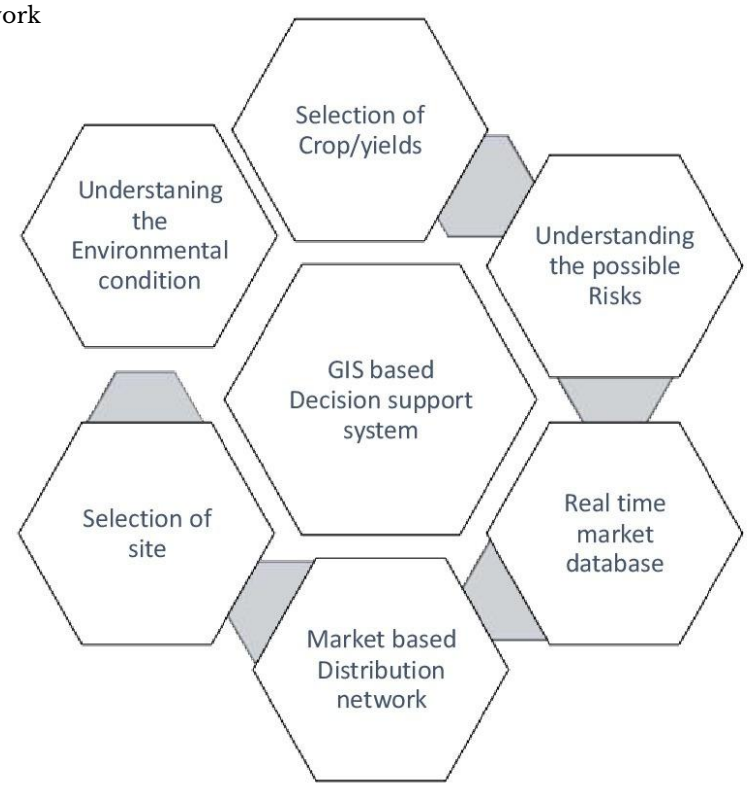


Figure 1. A typical GIS based agri decision support system

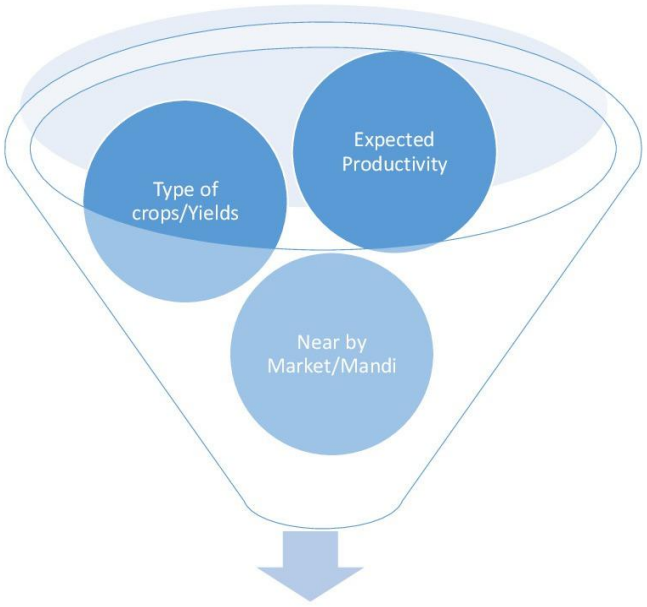
for selection of site, which is not exploited for cultivation due to various environmental, based disaster. The selection of site will largely depend upon the various physical, physiological, hydrological, hydrogeological, the morphology of the area.

b) Understanding the Environmental Condition:
Recent past has witnessed various environmental disaster which has concluded in a huge loss for the agriculture industry.

Hence, by understanding the varying environmental conditions, an alert mechanism can be planned for farmers. Flood and drought are most common amongst them. Here GIS can play an important role in identifying the potential site that may have maximum impact. It will help in reducing the feasible adverse impact on farming activity.

c) Understanding the Risks:
In a current practice, the traditional pattern of cultivation with seasonal crops is being done across India. In no, any condition farmer is taking risk of cultivation of other agricultural yields. Here GIS based decision support system can be used for evaluating the other geographical area of similar environmental condition with their productivity and market output. Based on the same the local farmers can be motivated for the production of the same.

d) Real-time Market Database:
One of the major disadvantages of Indian farm industry is lack of real time database. This results in the gap while considering the demand and supply of agricultural output. This can be better understood by an example where farmers burn their yields in the farm, on the other hand, the same product is being in highest demand in another part of a country. Every crop agricultural yields have its own cycle, some have a short span and some take few month to get ready. Database of yields that has a life cycle of one month to the maximum can be linked to the geographical map. Here it will help the agricultural market or government storage agencies or distributor to understand from where the yields can be obtained to fill the gap in demand and supply. This can be done at panchayat level across the country, where the type of yield with its probable output can be linked to the central database. There are various government schemes at panchayat level, which is in practice. Even government has more focus on providing positive strength to the panchayat.



Updation of the above information by every panchayat on central server of Agriculture based decision support system

For a better GIS based Decision support system the Information from the Panchayat can be utilized in different ways;

- Analysis of the type of crop, Agriculture products
- Analysis of location of agriculture products across the country
- Analysis of probable quantity of products
- Analysis of estimated quantity vs produced quantity
- Analysis of route cause analysis for low productivity
- Analysis of high productivity and preparation of case study for awareness amongst other farmers at different location
- Analyzing the demand and supply curves (Based on temporal study)
- Analyzing the quantity that can be exported by maintaining demand and supply in country
- Analyzing the selection of crop in next season

e) Market Based Distribution Network:
Based on input data from every Panchayat analysis of storage and distribution can be further planned. This will also help in estimating the quantity of agricultural products with reference to its coordinates/locations across the country. Which can be further utilized for export across the neighboring countries if required. Route planning for transportation of agricultural products across the mandis (whole sale markets) of different state can be done so that cost of productivity for farmers can be optimized.

Conclusion

The major reason behind the failure of the participation of private players for crop insurance in India, is lack of the GIS based decision support system. Currently, the demand and supply curve is being maintained by using Political decisions. How much should be the support price for the agricultural product is dependent upon the willingness of the government to pay the money. By GIS based decision support system the participation of Private players may get increased in crop insurance and agricultural loan. GIS based decision support system can be required across the country where each panchayat will participate by providing the information of expected agricultural productivity. The input of this information can be then used by government stakeholders for the planning of storage, distribution, and analyzing the demand and supply.

Author Correspondence

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OUTLOOK

Ordnance Survey Appoints Lisa Woodall as its New Chief Enterprise Architect

Ordnance Survey (OS) has announced the appointment of Lisa Woodall, as its new Chief Enterprise Architect. Lisa joins OS after more than 20 years with Zurich Insurance Company, where she was Head of Strategy, Architecture and Governance.

Maj. Gen. V. P. Srivastava Appointed as New Surveyor General of India

Major General V. P. Srivastava has been appointed as Surveyor General of India (on Additional Current Duty Charge). He is 69th Surveyor General of India since the establishment of Survey of India.

Autodesk Names Andrew Anagnost President and CEO

Autodesk, Inc. has announced that its board of directors has appointed Andrew Anagnost, current interim co-chief executive officer and chief marketing officer, as the company's new president and CEO, effective immediately. He will also join Autodesk's board of directors.

Vricon Adds Von Eckartsberg to Leadership Team

Vricon, a global leader in 3D imagery, has announced Eric von Eckartsberg as its Senior Vice President of Government and Chief Revenue Officer. Von Eckartsberg comes to Vricon from the software firm Basis Technology, where he was Senior VP for Business and Corporate Development, managing worldwide sales and strategic initiatives.

Velodyne LiDAR Appoints Robert Brown as Chief Financial Officer

Velodyne LiDAR Inc., the world leader in 3D real-time perception systems for autonomous vehicles, has announced Robert (Bob) Brown as its Chief Financial Officer. Brown will report to founder and CEO David Hall.

Hexagon Receives Recognition from Huawei for Safe City Solution

Hexagon AB, a leading global provider of IT that drive productivity and quality across geospatial and industrial enterprise applications, received the "Best Developer Partner Award" and the "Business Win-Win Award" at Huawei Connect 2017. This expo and forum brings together global IT leaders with the industries Huawei serves.

Rolta Selected for a Prestigious Geospatial Digital Transformation Program in Middle East

Rolta has announced that it has been selected to provide a transformational Geospatial solution worth $10.8 million for one of the largest countries in the Middle East. This solution will be an integral element for supporting a prestigious national level Digital Transformation program to fulfil their ambitious vision for the next 15-years.

SuperSurv 10 Wins Golden Map Award Issued by TGIS

Supergeo has announced that its mobile GIS software, SuperSurv 10, won the Golden Map Award for Best GIS Technology from TGIS, Taiwan Geographic Information Society. The Golden Map Award is the highest honor given by TGIS, the biggest GIS community in Taiwan.

ISRO Signs MoU with CSIR-NPL for Time and Frequency Traceability Services for NavIC

ISRO has signed an MoU with CSIR-National Physical Laboratory for time and frequency traceability services. This move will help the NavIC – Navigation with Indian Constellation also called as IRNSS, get formally synchronized with the Indian Standard Time which is being maintained by the Delhi-based NPL.

SI Imaging Services Signs MoU with Luciad NV in Belgiumand G-Ros in Korea

SI Imaging Services has signed a MoU with the Luciad NV in Belgium and its certified reseller in Korea G-Ros Co., with the goal of cooperating on offering a joint solution using KOMPSAT data.

Esri and Smart Dubai Sign Enterprise Agreement

Esri has announced that Smart Dubai, the government agency leading Dubai's smart city transformation, has signed an enterprise agreement (EA) providing ArcGIS technology to 44 entities across the government. The EA will be used by Smart Dubai for its smart city platform, called Dubai Pulse, to integrate and map data for better decision-making.

China, Russia to Sign Agreement to Boost Space Cooperation

China and Russia are set to sign a milestone agreement on joint space exploration from 2018 to 2022. The deal is expected to be signed in October and will bring significant benefits to both nations, particularly in manned and future missions to the moon, the People's Daily reported.

S. Korea to Share Spatial Information Technology Internationally

The National Geographic Information Institute (NGII) and the Korea International Cooperation Agency (KOICA) has announced that they would impart South Korea's up-to-date spatial information technologies to eight developing countries' 20 government employees. South Korea has accumulated experience and knowledge in the field of GIS database establishment and related policy development since 1994 based on its NSDI.

DigitalGlobe Delivers WorldView-4 High-Resolution Satellite Imagery to Power PSMA Australia's Continent-scale Mapping Initiative

DigitalGlobe has announced that it has delivered high-accuracy, high-resolution imagery from its WorldView-4 satellite to PSMA Australia to further build out Geoscape®, a digital representation of the Australian continent's built environment. PSMA Australia offers national geospatial datasets to support a range of public and private business solutions and is among the first commercial customers to leverage WorldView-4 imagery.

India-Nepal Conducted Fourth Boundary Working Group meeting

The fourth meeting of India-Nepal Boundary Working Group (BWG) was held at Dehradun from 28th – 30th August 2017. The Indian delegation was led by Major General V. P. Srivastava, Surveyor General of India, Govt. of India, and the Nepali Delegation was led by Mr. Ganesh Prasad Bhatta, Director General, Survey Department. Govt. of Nepal. BWG finalised the comprehensive Plan and modalities for execution and completion of the boundary work in next five years.

$800,000 for 3-D mapping of Northland, New Zealand

Economic Development Minister Simon Bridges and Primary Industries Minister Nathan Guy have announced government funding of up to $800,000 for 3-D aerial mapping of Northland to provide the region with highly accurate geographical data to make better business decisions.

ISRO Successfully Launches Cartosat-2 Series Satellite Along with 30 Co-passenger Satellites

ISRO's PSLV-C38 successfully launched the 712 kg Cartosat-2 Series Satellite along with 30 co-passenger satellites on June 23, 2017 from Sriharikota. This is the thirty-ninth consecutively successful mission of PSLV. One of the 30 co-passenger satellites carried by PSLV-C38 was the 15 kg NIUSAT, a Academic Institute satellite from Nurul Islam University, Tamil Nadu, India. The remaining 29 co-passenger satellites carried were international customer satellites from USA (10), United Kingdom (3), Belgium (3), Italy (3), Austria (1), Chile (1), Czech Republic (1), Finland (1), France (1), Germany (1), Japan (1), Latvia (1), Lithuania (1) and Slovakia (1).

USACE Mobile District Signs WMR-532 to $46M Coastal Mapping Contract

The U.S. Army Corps of Engineers (USACE), Mobile District, has contracted with WMR-532, the joint venture of Woolpert and Optimal Geo, to provide bathymetric and topographic lidar and imagery in support of the Joint Airborne Lidar Bathymetry Technical Center of Expertise (JALBTCX). The five-year, $46 million contract addresses the operation, maintenance and technical support of individual JALBTCX task orders in the 48 contiguous United States (CONUS) and outside the mainland U.S. (OCONUS).

UrtheCast Announces the Signing of a Contract exceeding $100M for the Delivery of a SAR-XL Satellite as an "Accelerator Mission" for the OptiSAR™ Constellation

UrtheCast Corp. has announced that it has entered into a contract with a confidential customer for the development and delivery of a dual-frequency stand-alone Synthetic Aperture Radar (SAR) operational-class satellite as an "accelerator" for the OptiSARTM Constellation. The exact amount of the contract is not being disclosed at this time for confidentiality and competitive reasons, but the Company can confirm that it is a substantial contract worth in excess of one hundred million Canadian dollars.

OGC Seeks Public Comment on Proposed Geocoding API Standards Working Group

The Open Geospatial Consortium (OGC®) is requesting comments on the draft charter for an OGC Geocoding API Standards Working Group (SWG). The Geocoding API SWG aims develop a new OGC candidate standard for access to geocoding services and to progress it to the state of an adopted standard.

Boundless Donates $100,000 to LaunchCode in Support of CoderGirl Education Program

Boundless has announced that it has donated $100,000 to LaunchCode, a nonprofit that places aspiring technologists in apprenticeships and jobs in technology. CoderGirl is a LaunchCode education program designed to educate women in the technology in St. Louis. It is a year-long technology training program consisting of two six-month cycles: a learning cycle and a project cycle.

CompassDrone™ Announces CIRRUAS Drone Program for Public Safety Agencies

CompassDrone, developers of unmanned aerial solutions for high-quality data collection, will unveil a comprehensive drone-based mapping program designed specifically for Public Safety applications. The Complete Incident Response Recovery Unmanned Aerial System (CIRRUAS) program is designed primarily for Accident Reconstruction and Crime Scene Mapping, but is also applicable to Search & Rescue and Reconnaissance missions.

Carbomap Ready to Map the World with Advanced LiDAR on High Performance UAV

Carbomap, an environmental survey company, in collaboration with high performance LiDAR manufacturer RIEGL, UAVE and The University of Edinburgh, has announced the first successful demonstration flight of a RIEGL VUX-1LR survey-grade waveform laser scanner on a fixed wing, long range unmanned aerial vehicle (UAV). This is likely the first time that such a high-performance scanner has ever flown on a fixed wing UAV with such an advanced specification for long duration (8 hrs) and long range (1,000 km).

ADSIC Contracts Proteus FZC to Provide TCarta Marine Spatial Data Package for Arabian Gulf

Proteus FZC has been contracted by the Abu Dhabi Systems & Information Center (ADSIC) to provide 2m Satellite Derived Bathymetry, 90m Bathymetric GIS Package and Marine Basemap for the Arabian Gulf.

Honeywell Launches UAV Industrial Inspection Service, Teams With Intel On Innovative Offering

Honeywell has launched its first commercial UAV inspection service, InView inspection service will combine the Intel® Falcon™ 8+ UAV system and Honeywell's expertise in the aerospace and data-driven software customized to the needs of the utility, energy, infrastructure, and oil and gas industries.

Malaysian Geospatial Master Plan to Be Completed in 2018

The Natural Resources and Environment Ministry (NRE) is developing the National Geospatial Master Plan (NGMP) towards realising the potential of geospatial technology, in line with the government's National Transformation 2050 (TN50) plan. There are five important deliverable through the implementation of NGMP, draft on the Geospatial Policies, draft on the Bill for National Geospatial Implementation, proposed structure of the Governance to Manage Geospatial Systems, proposed Design of Enterprise Architecture for National Geospatial Implementation and National Geospatial Strategic Plan (2017-2027).

DLR Provides Satellite Data for Hurricane Harvey

The German Aerospace Center (DLR) provided real-time recordings and archive data from the German radar satellite TerraSAR-X, which enabled a detailed analysis and an overview of the flood situation. Using these and other satellite data provided by 16 Charter members, the Center for Space Research at the University of Texas is currently working on providing assistance and information to disaster relief personnel on the ground.

Smart Map Bhopal: A City Level Web-Based GIS solution

Smart Map Bhopal is an enterprise-wide web-based GIS solution created using ArcGIS platform and seamlessly functions across various the web & mobile devices. This solution made government data more accessible for the citizens; it not only comprises of different map data representations for citizens to view and scrutinize but also provides citizens with avenues to truly participate by providing feedbacks & report their grievances. Smart Map Bhopal can be accessed by url - *https://smartmapbhopal.city*

ISRO Develops Optical Imaging Detector Array for Hyperspectral Imaging Applications

ISRO is endeavouring to enter the domain of operational hyperspectral imaging from earth orbit. To find a suitable detector array for the proposed Hyperspectral Imaging Satellite's (HySIS) payload in terms of performance and delivery schedule for meeting the project requirements, a detailed survey was conducted. Following the survey to find detector arrays, Vis-NIR Hyperspectral Imaging payload was originally conceptualised around a commercial off-the-shelf detector array developed by a foreign supplier.

Flood Monitoring using SCATSAT-1 Satellite

SCATSAT-1 is a continuity mission for Oceansat-2 Scatterometer for Ocean weather forecasting, cyclone detection and tracking. The satellite carries Ku-band Scatterometer and scans in a conical fashion in HH and VV polarizations and allows developing high-resolution datasets due to high overlapping areas. SCATSAT-1 observations in Ku-band for backscattering and brightness temperatures have been analyzed for flood detection and monitoring over India with special emphasis in Gujarat and southern parts of Rajasthan.

ISRO: Haze Removal Algorithm Developed for Cartosat Images

The Space Applications Centre, Ahmedabad has developed a new algorithm for AC of high-resolution VNIR remote sensing data in which aerosol information is retrieved from sensor measurements in VNIR channels and by selecting appropriate aerosol optical properties from a set of defined aerosol models. The algorithm uses lookup tables generated with vector radiative transfer calculations. Derived aerosol information and pre-computed lookup tables are employed to derive surface reflectance. Good quality surface reflectances have been obtained when this algorithm was applied on Cartosat-2 Series Satellite data.

Uninhabited Lakshadweep Island Vanishes, Study using GIS & Remote Sensing

One of the biodiversity-rich uninhabited islands part of Lakshadweep has vanished due to coastal erosion and another four such territories in the sea are shrinking fast, claims a new study. Parali I island, part of Bangaram atoll, which was 0.032 km2 in 1968 has been eroded to an extent of 100 per cent. On an overall assessment of the changes in the aerial extent of islands using RS/GIS, it has been noticed that all the five islets of Bangaram atoll had undergone coastal erosion.

SpaceX Falcon 9 Successfully Launched Taiwan's Formosat-5

A SpaceX Falcon 9 successfully launched a long-delayed remote sensing satellite Formosat-5 for the government of Taiwan Aug. 24, 2017. Equipped with the Remote Sensing Imager (RSI) payload, providing multispectral and panchromatic imaging capabilities.

TCarta Marine Changes the Way Dynamic Environments are Managed and Monitored with Introduction of Vector Shorelines

TCarta Marine has made the world's most dynamic environments easier to monitor and manage with the introduction of its new multi-scale Shoreline Products. Offered in GIS-ready vector format, the Shoreline data sets are derived from satellite imagery and accurately delineate mean sea level for the land-water interface at coastal areas around the world.

Managing Assets from Different Angles- SuperGIS 3D Earth Server

SuperGIS 3D Earth Server has newly included hotkeys to make it more easy to use. Users can hence switch between the keyboard and mouse to view the map and building models in a more delicately way. The smoothness and the performance of 3D rendering have been significantly improved. SuperGIS 3D Earth Server also supports higher levels of details and can switch the appearance with ease.

LiDAR

June 16 - September 15, 2017

Automotive LiDAR Market is Expected to Witness a Steady Growth by 2025

According to Persistence Market Research report, automotive LiDAR market is expected to witness a steady growth by 2025. The prime factor boosting the growth in the global automotive LiDAR market is the increasing integration of LiDAR in the vehicles by OEMs to automate the driving. With OEMs integrating LiDAR in ADAS (Advanced Driver Assistant System), the vehicles provide a safe navigation and avoid a collision.

Orbit GT Updates 3D Mapping Cloud With Oblique Imagery Support

Orbit GT has announced the support for Oblique Imagery and Aerial Point Clouds. From now on, anyone owning Oblique data can upload this data and share in seconds. Oblique content can be immediately fused with Mobile and UAS Mapping content, on the fly.

Boeing and JAXA to Flight-test Technology to Improve Safety

Boeing and the Japan Aerospace Exploration Agency (JAXA) will flight-test Long-range Light Detection and Ranging (LIDAR) technology next year. This remote-sensing technology could help commercial airplane pilots better detect and avoid weather disturbances to improve flight safety. Boeing and JAXA have been collaborating on the integration of LIDAR technology into a commercial airplane platform since 2010. The JAXA LIDAR technology offers the potential to accurately measure winds as much as 17.5 kilometers in front of airplanes and provide pilots with sufficient time to take appropriate action to avoid wind shear and clear air turbulence, which does not have any visual cues such as clouds. The flight demonstration of LIDAR technology will involve emitting pulses of laser light, which will scatter off of small dust and other particulates. Observing the reflected light, the pulse provides measurement of the wind speed at increments all along the direction of the laser.

Portland State Laser Mapping Project Shows Global Warming Effects in Antarctica

Portland State University researchers and the National Science Foundation (NSF) have publically released high-resolution maps of the McMurdo Dry Valleys, a globally unique Antarctic polar desert. The PSU scientists led a team of researchers supported by the NSF to map the area using LIDAR technology.

PrecisionHawk Brings Leading Drone LiDAR Solution to Market

PrecisionHawk, a provider of advanced commercial drone technologies, is making strategic moves to provide its customers with a drone LiDAR solution that matches or exceeds standard manned aircraft data outputs. Team will work to create LiDAR deliverables with metadata and formats that parallel what PrecisionHawk's traditional geospatial and government clients expect. These standardized deliveries will also have high accuracy, which will help PrecisionHawk integrate LiDAR datasets into existing client programs.

GNSS

June 16 - September 15, 2017

Trimble Launches VRS Now Correction Service in France

Trimble has announced the availability of its Trimble® VRS Now™ Global Navigation Satellite System (GNSS) correction service in France. The service is ideal for a variety of geospatial and construction applications including surveying, cadastral, land administration, and urban and rural construction that would benefit from easy access to high-accuracy, centimeter-level positioning. Trimble also recently announced Galileo support for its VRS Now correction service. Powered by the Trimble Pivot™ Platform, VRS Now in Europe fully supports GPS, GLONASS, BeiDou, QZSS and now, Galileo satellite systems.

TerraGo Adds TopCon® GNSS Receiver Integration to Mobile Data Collection Platform

TerraGo has announced the integration with Topcon's Sokkia high-accuracy GNSS receivers to meet the needs of the most demanding field positioning tasks. TerraGo Magic now offers advanced integration and support for the Sokkia line of GNSS receivers, including the new GCX3. TerraGo Magic is a zero-code platform-as-a-service that enables customers to build their own custom mobile apps without writing any code by choosing from a menu of available, field-tested features.

Japan Successfully Launches 3rd Satellite of Quasi-Zenith Satellite System

Mitsubishi Heavy Industries, Ltd. and JAXA successfully launched H-IIA Launch Vehicle No. 35 (H-IIA F35) at 2:29:00 p.m. on August 19, 2017 (JST) from JAXA's Tanegashima Space Center. The launch and flight of H-IIA Launch Vehicle No. 35 proceeded as planned and the separation of the satellite was confirmed at approximately 28 minutes and 37 seconds after liftoff.

Trimble Adds Galileo Support to its VRS Now Correction Service to Improve Network Positioning Performance in Europe

Trimble has announced that Trimble® VRS Now™ networks - powered by Trimble Pivot™ Platform software - can now process Galileo observation data in its network-modeled Virtual Reference Station (VRS) solution. As a true five-constellation technology using GPS, GLONASS, BeiDou, QZSS and now Galileo observations, Trimble VRS Now delivers even better real-time positioning performance for customers using Trimble networks throughout much of Europe.

Product Launch

June 16 - September 15, 2017

GIS & EO

USGS Releases New JavaScript Library to Create Location Search Widgets for Web Applications

The U.S. Geological Survey Search API is a custom JavaScript library useful for creating a location search widget in a webpage, typically in conjunction with a web map. The widget connects to a database created for the API, or Application-Programming Interface, to quickly find and suggest locations as the user enters text to navigate to areas of interest. The purpose of this API is to provide a search tool for locations contained in the Geographic Names Information System database, the official United States government registry of places names.

Cloud-Enabled Constellation Planning From Orbit Logic

Orbit Logic has announced the release of a new version of their Collection Planning & Analysis Workstation (CPAW) software with enhanced constellation collection planning optimization. CPAW is mission planning and scheduling software for imaging satellite operations, and is deployed operationally on multiple commercial and government programs. The new version of CPAW provides enhanced constellation planning optimization, support for gimbaled sensors, configurable figure-of-merit enhancements, and an external plan import capability, among other new and enhanced features.

Embarcadero and TatukGIS Announce New Tool for RAD Studio

Embarcadero Technologies and TatukGIS has announced that TatukGIS has released version 11 of its GIS SDK - the TatukGIS Developer Kernel — for Embarcadero's Delphi and C++Builder products. The TatukGIS SDK is a professional level GIS SDK licensed as native Delphi source code component.

Hexagon Imagery Program Announces Updates to 2017 Airborne Imagery Collection Plans

The Hexagon Imagery Program (HxIP) has announced updates for 2017 airborne imagery collection plans of Wide Area Coverage (WAC) at 30-centimetre accuracy and Urban Area Coverage (UAC) at 15-cm accuracy. By the end of 2017, the HxIP will update its content for more than 3.9 million km² in North America. This includes a refresh of 18 previously captured U.S. states and completes the full coverage of the continental United States, Hawaii, Puerto Rico, the U.S. and British Virgin Islands, and select areas of Alaska. In addition to the 30-cm program, the HxIP expands its 15-cm collection by 100 cities for a total of 347 U.S. urban areas covering more than 492,000km². The HxIP also includes 23 Canadian cities at 30 cm with efforts underway to refresh and expand the Canadian library.

Work Easier with Satellite Images – LandViewer Launches New Features

The California-based company EOS have launched cloud based tool LandViewer, that allows non-expert users to select a geographic area for analysis, an earth observation data types, and then apply it for on-the-fly imagery analytics. Since the solution was first launched June 2016, the software developers have added many new features that allow the use of simple and innovative LandViewer instrument in various industries. It allows partly free access to the huge data archives of Landsat 4, Landsat 5, Landsat 7, Landsat 8, Sentinel-2 and MODIS, including coverage of the entire surface of the Earth and daily updates.

Spanish Language Version of Global Mapper Now Available

Blue Marble Geographics has announced that a Spanish language version of Global Mapper is now available. The Spanish language version provides access to this renowned GIS software in the world's second-most spoken native language.

Sentera Provides Deeper Crop Health Insights with AgVault Feature Enhancements

Sentera, a leading designer and manufacturer of remote-sensing technologies for precision agriculture, has announced new features for the NDVI Toolbox™ in Sentera AgVault™ Desktop. The new tools offer agriculture professionals improved field insights for use on and off the field. New capabilities include zone management, a basic prescription-writing tool, and dynamic orthomosaic colormapping. Agronomists, advisors, and producers can use these tools to analyze crop data and streamline prescription workflows throughout the growing season.

Photogrammetry

Insitu™ Announces High Accuracy Photogrammetry Payload for Broad Aerial Survey

Insitu has announced the successful integration of a 50-megapixel camera into its ScanEagle™ Unmanned Aerial Vehicle (UAV) for delivering High Accuracy Photogrammetric (HAP) aerial imagery. This new capability is part of Insitu's INEXA™ Solutions, a comprehensive suite of remote sensing products and information delivery services for enterprise customers, particularly mining and oil and gas operations.

Formwerk3D helps 3D scan rare bust of Ancient Egyptian pharaoh Akhenaten

In collaboration with local 3D printing service Formwerk3D, the German museum recently undertook a project to digitally scan and capture the pharaoh's ancient bust. To complete the scans, the Formwerk3D team used a variety of 3D scanning equipment, including Artec's Eva-M structured light 3D scanner, photogrammetry, and Reflectance Transformation Imaging (RTI). Photogrammetry was used to capture high-resolution images of the bust, and RTI was used to capture a finely detailed surface relief (they describe it as a 2.5D model) of the bust.

NEWS DIGEST

LiDAR

LandScape 7.4: Faster Point Cloud Loading, Change Detection Tools & VR Option

DAT/EM® Systems International has released version 7.4 of its software suite, including significant updates to LandScape, a 3D stereo point cloud editing and visualization tool. In LandScape version 7.4, operators can expect to load points in half the time as previous releases, utilize more filters and tools to explore their point clouds, and have the option to purchase the new Point Cloud VR to view their point cloud in virtual reality (VR).

CARIS Bathy DataBASE 4.4 Released

Teledyne CARIS™ has announced the release of Bathy DataBASE™ (BDB) 4.4. This new version addresses the important areas of feature generalization and automation of product generation for chart compilation, as well as the increasing emphasis on bathymetric Lidar surveys. A collection of new techniques for generalizing bathymetry in chart compilation workflows can be found in BASE Editor™, which is part of the BDB suite.

Leica Cyclone REGISTER 360, Cloud Services Offer Speed, Scale and Simplicity to the Digital Reality Capture Market

Hexagon, a leading global provider of information technology solutions, has announced its new Leica Cyclone REGISTER 360 laser scanning software for simpler, automated registration, and its Cyclone Cloud Services platform for secure global collaboration through an on-demand software-as-a-service model. Cyclone REGISTER 360 is the only professional-grade registration software to combine automation, high performance and ease of use into one powerful package available to novices and experts alike. Simplifying and automating the entire production process, Cyclone REGISTER 360 enables users to automatically process, validate and deliver point clouds.

Drone/UAV

Icaros and TeAx Announce an Integrated Drone Mapping Solution for Radiometric ThermalCapture Sensors

Icaros Inc., has announced that version 5.1 of OneButton™ Standard and Professional image processing software for unmanned aerial systems (drones) contains advanced algorithms to process Thermal IR images from Radiometric microbolometer sensors. Icaros' OneButton family for drone image processing lets end users easily and automatically generate geospatially precise, fully orthorectified 2D maps and 3D models from frame-based aerial imaging systems.

Terra Drone Dedicated Image Processing Software Terra Mapper Begins Sales of Its Cloud Version and Desktop Version at the Same Time

Terra Drone has launched their image processing software "Terra Mapper" designed to assist drone surveying services. Terra Mapper is an automated drone navigation, image processing, and 3D image analysis program. It can be utilised on its own, rather than requiring the use of multiple different supplementary software. Terra Mapper enables users to accurately inspect the 2D & 3D data images produced by their nominated drone service.

Icaros and Agrowing Announce Integrated Drone Multispectral Mapping Solution for Agriculture

Icaros Inc., a leading provider of aerial imaging software, and Agrowing, a leading supplier of multispectral sensors and analytics software, are pleased to announce an integrated drone product that bundles Icaros' OneButton software into Agrowing's solution stack, automating the entire workflow from image capture through generation of fully indexed orthomosaic maps for agriculture. s part of the agreement between the companies, Agrowing will offer an exclusive product bundle that includes Agrowing's multispectral sensor, Icaros' OneButton Standard Edition, and Agrowing's agriculture solution.

Mobile Apps

Trimble Introduces New Android Application for Field Surveying and Data Collection

Trimble has introduced Trimble® Penmap® for Android™, a cloud-connected application for field surveying and high-accuracy Geographic Information System (GIS) data collection that works on mobile handhelds, smartphones and tablets. Trimble Penmap for Android focuses on core survey and mapping tasks such as cadastral and boundary surveys, establishing local control, stake-outs, quality checks and asset management for utilities.

TerraGo Mobile Apps Add New Advanced Mapping Features and Laser Range Finder Integration

TerraGo Edge 4.1 and any app created with the TerraGo Magic zero-code app platform includes enhanced mapping and surveying features to accelerate and improve field data collection in remote or off-road locations. Whether you need to locate an asset in challenging terrain or quickly navigate to a new project location, the latest features in TerraGo Edge and TerraGo Magic apps will help you get the job done faster, while saving time and money.

Google Earth iOS App Updated With Flyover-Like 3D Views and 64-Bit Support

Google Earth for iOS has received a major update that brings a collection of new features to the interactive mapping app, as well as introducing 64-bit app support so it can run on iOS 11 devices. In its announcement, Google positioned the updated app as a way for users to discover new travel destinations. With the new add-ons, users will now be able to explore locations around the world with a 3D button that refocuses Google Maps and begins circling around a city chosen by the user, similar to Flyover in Apple Maps.

GNSS & Surveying

Harxon Introduces All Constellation GNSS Antenna for Surveying and Mapping

Harxon has released the all constellation GNSS antenna GPS1000, receiving GPS L1/L2/L5, BDS B1/B2/B3, GLONASS L1/L2, Galileo E1/E2/E5a/E5b and L-band signals. GPS1000 can be used in land survey, marine survey, channel survey, seismic monitoring, bridge survey and agriculture applications, with a consistent performance across the full bandwidth.

Nikon NPL-322+ Total Station, Available in Both Reflectorless and Prism-only Versions

Nikon-Trimble Co., Ltd. has launched a new version of the Nikon NPL-322+ Total Station, now available in both reflectorless and prism-only versions. The NPL322+ delivers an economic, versatile, and easy-to-use platform. Nikon's legendary optics effectively allow in more light to give brighter and clearer images. Even in the low-visibility conditions, the NPL 322+ allows you to see more detail and much less distortion, especially over longer distances.

Harxon Releases Rover Radio for RTK Surveying and GNSS Positioning

Harxon has introduced an advanced, high-speed, Bluetooth-enabled wireless rover radio.The HX-DU1603D, designed for GNSS/RTK surveying and precise positioning, will be showcased this September at the Intergeo trade show in Berlin.The HX-DU1603D is a lightweight, ruggedized UHF receiver designed for data communications between 410 MHz and 470 MHz in either 12.5 KHz or 25 KHz channels, which can be widely used in GNSS/RTK surveying and GNSS precise positioning fields. It is equipped with a Bluetooth transceiver for wireless communications with external devices. It features a 6800 mAh rechargeable internal battery and configurable transmit power between 0.5W and 2W.

New Data Resource

Voyager Search Launches Open Data Network With Searchable Geospatial Catalog of Global Content

Voyager Search™, a global leader in enterprise search specializing in geospatial data and content, unveiled VoyagerODN™ today, a single point of search for publicly available data. VoyagerODN makes the most of Voyager Search's core software capabilities by providing public access to millions of free, geospatial pieces of content.

OGA Makes Another Set of Data Packages Openly Available for Oil and Gas Explorers

The Oil and Gas Authority (OGA) is continuing to make more and more data openly available in an effort to help revitalise exploration of oil and gas in the UK Continental Shelf (UKCS). The latest significant data release follows the publication of a suite of subsurface data packages in June related to undeveloped discoveries.

Safeguarding Sustainability through Forest Certification Mapping

To address the lack of openly accessible data on forest certification on a sub-national level, the global map shows certified forest areas at 1 kilometer resolution–far more detailed than currently available maps. The map, which is available freely online and described in an article in the journal Forest Policy and Economics, was developed by International Institute for Applied Systems Analysis together with Mercator Research Institute on Global Commons and Climate Change and the Norwegian University of Life Sciences.

Geo Events

02-03 October
2nd International Conference on GIS and Remote Sensing
Vienna, Austria
https://gis-remotesensing.conferenceseries.com/europe/.com

10-12 October
INTERGEO 2017
Berlin, Germany
http://www.intergeo.de

10-12 October
Bentley Systems 2017 Year in Infrastructure Conference
Singapore
https://www.bentley.com

16-19 October
FROM IMAGERY TO DIGITAL REALITY: ERS & Photogrammetry
Israel
http://conf.racurs.ru/conf2017/eng/

24-26 October
Commercial UAV Expo Americas
Las Vegas, USA
https://www.expouav.com/

13-14 December
Esri India User Conference
New Delhi, India
http://www.esri.in/events/2017/uc

13-14 December
Esri India User Conference
New Delhi, India
http://www.esri.in/events/2017/uc

17-19 March, 2018
GISTAM 2018
Funchal, Madeira, Portugal
http://www.gistam.org/

NEWS DIGEST

Supergeo

SuperGIS Mobile Series

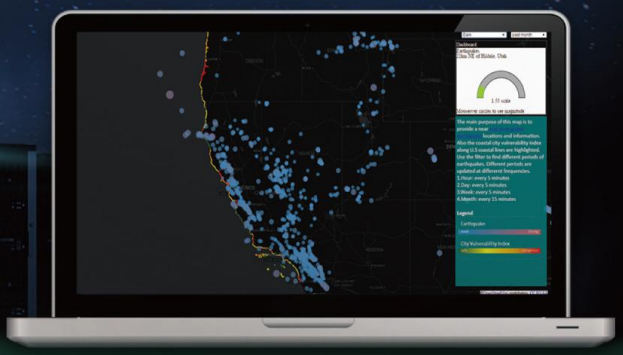
Superb GIS for Mobile Devices

SuperGIS® Desktop

Make Smarter Decision with Spatial Insights

SuperGIS Server

Integrate and Share GIS Services Effectively over the Web



SuperGIS Products

Server GIS
SuperGIS Server
SuperGIS 3D Earth Server

Cloud GIS (TW Only)
SuperGIS Online
- Data Services
- Excel Add-in
- Address Locator
- Statistical API

Desktop GIS
SuperGIS Desktop
Analyst Extensions
- Spatial
- Spatial Statistical
- 3D
- Biodiversity
- Network
- Topology

Add-ons
- Image Analyzer
- LiDAR Tool
- Mapnote Tool
- Dimension Tool
- Temporal Slider
- Cache Generator

and more...

Mobile GIS
SuperSurv (Android/iOS)
SuperPad
SuperVeyor (Hardware bundle)

Solution
Forestry APP (Android)
SuperGIS Mobile Tour (Android)
Mobile Cadastral GIS (TW only)

Developer GIS
SuperGIS Engine
SuperGIS Mobile Engine

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