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### Development of dynamic thematics for cropping pattern using GIS- A case study of Tiruchirappalli District, Tamil Nadu, India

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Crop Combination  
Analysis

### Introduction

Development of dynamic thematic for cropping pattern using WebGIS is the energetic or force in actual operation. Dynamic cropping pattern to create a crop production environment that is changing. Such mapping environments are now easier to create with recent advances in web technologies and standards. The user can, to a large extent, determine what information is to be displayed and in what context. This project aimed to provide data,

visualization tools and a cartographic toolbox to the user in a web-based interface.

The cropping pattern of a particular area exhibits the effort of man to overcome the climatic conditions in that area. Analysis of Kharif season data showed that rice was the single most dominant crop of the state. Cropping patterns are the yearly sequence of crops grown and the spatial

arrangement of crops. It is formulated within view to obtain maximum crop production under a given situation. Cropping patterns are dynamic and changes occur with changes in factors of production and physiological and social environments. Modification made in cropping patterns are always to drive the maximum benefit from changed crop growing conditions.

However, there is considerable variation in the temporal profile of rice subclasses. This was expected as there is significant variation in rice cultural practice leading to variation in crop variety, calendar and vigor. The distribution pattern showed that the two classes belonged to the irrigated areas and the difference arise from the crop calendar. The profile of the rain fed wetland rice was different from the irrigated rice showing significant low value peak.

The study of crop combination regions constitutes an important aspect of agricultural geography as it provides a good basis for agricultural regionalization. The crops are generally grown in combinations and its rarely that a particular crop occupies a position of total isolation from other crops in a given aerial unit at a given point of time.

The distribution maps of individual crops are interesting and useful for planners, but it is even more important to view the interrogated assemblage of the various crops grown in as aerial unit. For example the demarcation of India the rice and wheat regions does not explain the agriculturally significant fact that very often the wheat region also have a nice crops and vice versa for comprehensive and other better understanding of the agricultural mosaic of an agro-climatic region, the study of crop combination is of great significance.

Geographic Information System (GIS) ‘a set of tools for collecting, storing, retrieving at will, transforming, and displaying spatial data from the real world for a particular set of purpose’, and the Department of the Environment ‘a system for capturing, storing, checking, integration, manipulation, analyzing and displaying data which are spatially referenced to the Earth’, fall into this category. Those provided by Burrough (1986,).

Cartography and GIS have both emerged as major capabilities on the web. Distributed maps are different from traditional static maps in that they link information from various sources and provide a user-defined environment (Crampton, 2001).

Open source systems and applications often appear to offer significant benefits vis-a vis proprietary systems. Consider some of the merits they compete on. First of all, open source products are usually free of direct cost. They are often superior in terms of portability. The products may arguably be both more secure and more reliable than systems developed in a proprietary environment. It has traditionally been perceived that “open source software is often geared toward information technology specialists, to whom the availability of source code can be real asset, proprietary software is often aimed at less sophisticated users”(Hahn,2002).

Tiruchirappalli District is a Centrally Located in Tamil Nadu State. It comprises Three Revenue Divisions and Eight taluks. The Pachamalai Hill is situated partly in Perambalur District and Thuraiyur Taluk and is the important hill in the District. The Cauvery and Coleroon are the major rivers and there are other small rivers, which are contributed to the irrigation potential of the

district. Tiruchirappalli is one of the major districts of the state and it is centrally located with an international airport. Alluvial sandy loam and loamy soil constitutes major portion of the Delta regions bordering the river. In Lalgudi, Mannachanallur and Andanallur Blocks, loamy soils are predominant. In dry tracks Red soil is predominant, followed by Black soil.

A detailed analysis about Development of dynamic thematics for cropping pattern programmes with aid of the web technology. With the development of the space technologies, webGIS and remote sensing have been proved as useful tools for obtaining, saving, management, querying, monitoring and analyzing information of development of dynamic thematics for cropping pattern .To achieve the goal ,a monitoring information system that is dynamic, interactive was developed using WebGIS and remote sensing techniques. The aim of the present study is to provide how about "Development of dynamic thematics for cropping pattern using GIS" it involves the Web application in cropping Pattern using GIS a case study on Tiruchirappalli District

## **Materials and Methods**

### **Geographical Location**

Tiruchirappalli District is a Centrally Located district in Tamil Nadu State, has an area of 4403.83 Sq. Km Stretching North Latitude: Between 10 00' and 11 30' East Longitude: Between 77 45' and 78 50'. Altitude is 78m above sea level. The topography of Tiruchirappalli District is almost plain except for the short range of Pachaimalai hills in the North. Tiruchirappalli is one of the major districts of the state and it is centrally located with

an international airport. With river Cauvery flowing in the district (Figure 1).

### **Administrative Division**

It comprises three Revenue Divisions and Eight taluks viz. Tiruchirappalli, Srirangam, Manapparai, Lalgudi, Mannachanallur, Musiri, and Thottiyam which includes 14 blocks, 408 Village Panchayats and 1590 Villages. This district consists of 4 municipalities namely Ponmalai, Srirangam, Thuraiyur and Manapparai. Tiruchirappalli is the only Municipal Corporation which is also the Head Quarters of the District .

### **Physiography**

Tiruchirappalli District is almost plain except for the short range of Pachaimalai hills in the North. It is not only an Inland District without any coastal line but also most centrally located district in the state. The District has no marked natural divisions. The Bounded by Namakkal and Perambalur District on the North Thanjavur and Pudukkottai in the east, Sivaganga District, Madurai and Dindugal District in the South and Karur District in the west. It is not only an Inland District without any coastal line but also most centrally located district in the state. The District has no marked natural divisions. The Pachamalai Hill is situated partly in Perambalur District and Thuraiyur Taluk and is the important hill in the District. The Cauvery and Coleroon are the major rivers and there are other small rivers, which are contributed to the irrigation potential of the district.

### **Slope**

The general slope of the district is towards east. It has a number of detached hills, among which Pachamalai Hill is an

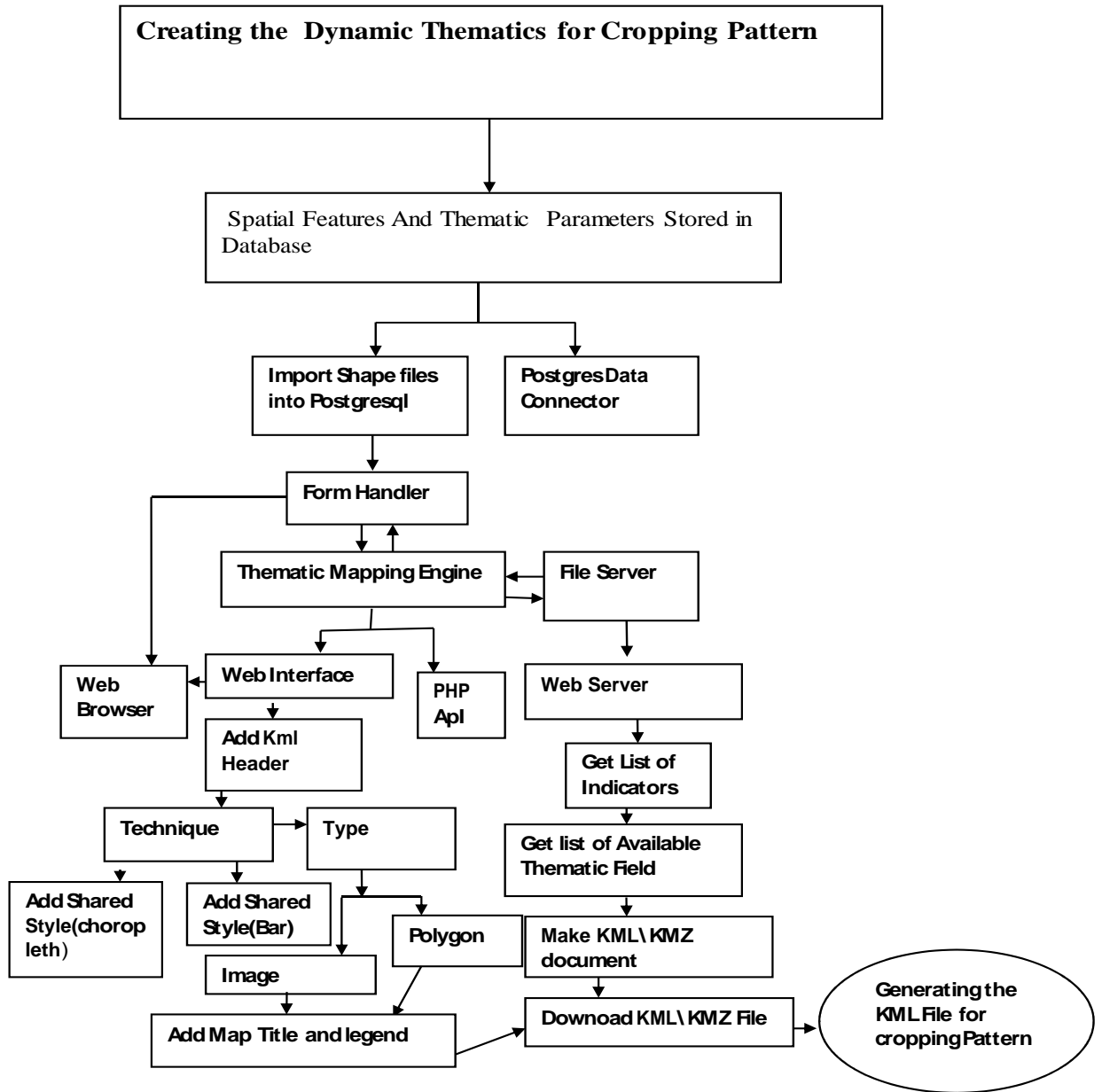
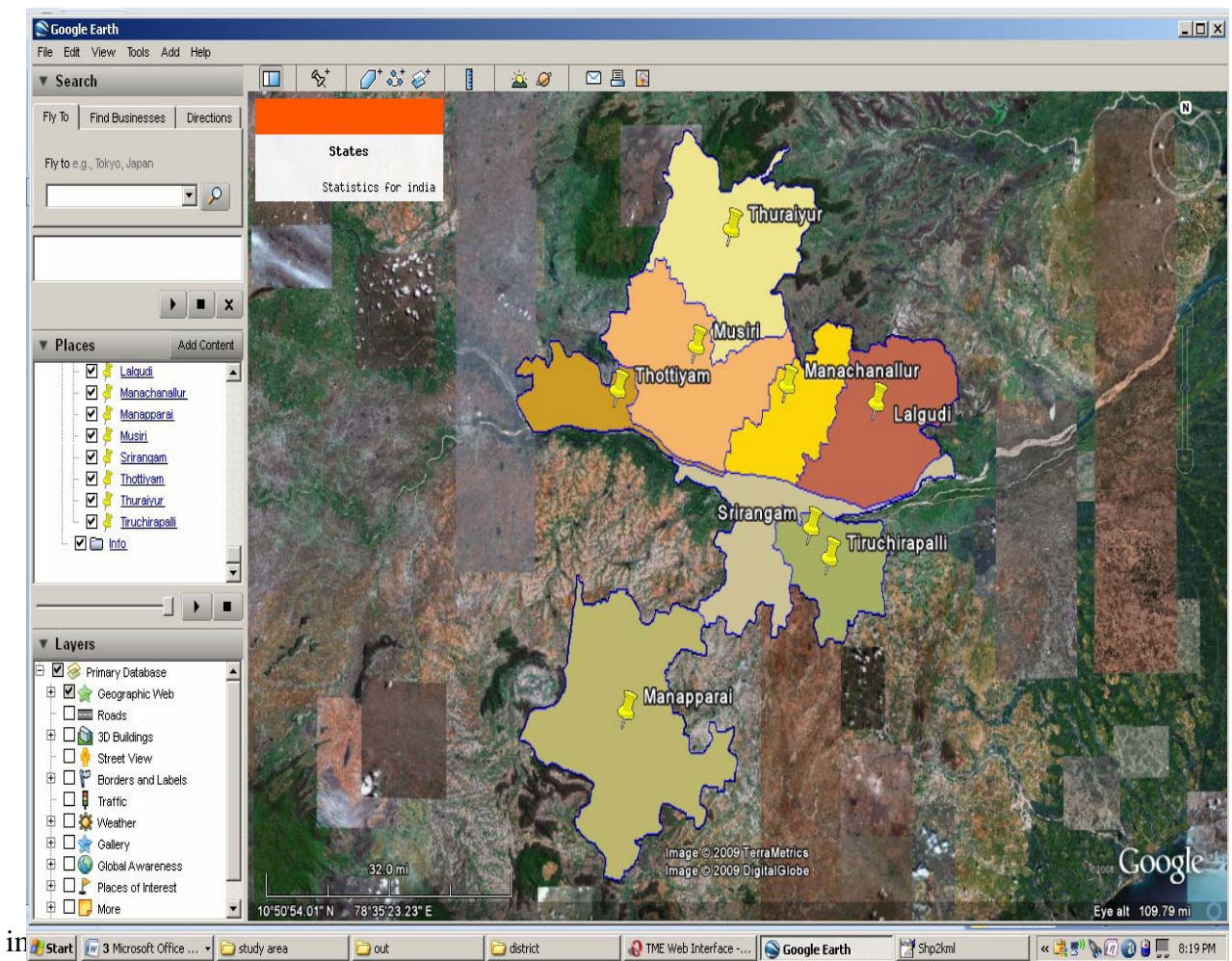
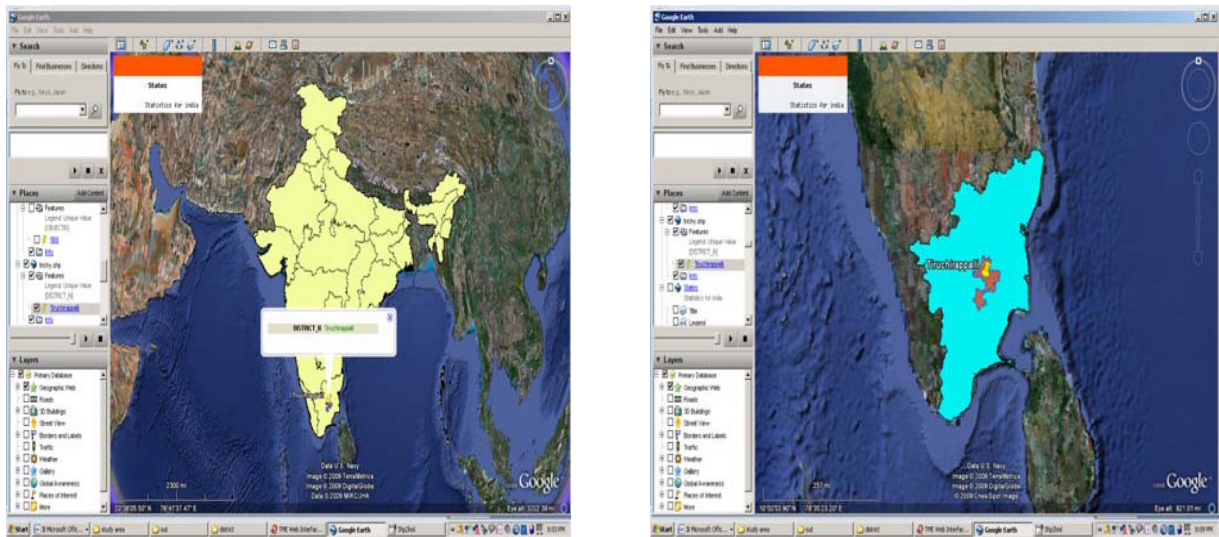


Figure.1 Location Map of the Study Area



### **Climate and Temperature**

The variation of temperature throughout the year exhibits hot and dry climate with high. Generally, the region has a long spell of hot climate with a short spell of rainy season and winter. Temperature is low during the month of January with average mean daily temperature of 28°C. The maximum daily temperature recorded during the hot season in the month of May is 42°C.

### **Rainfall**

The district receives seasonal rainfall from September to December. The average annual rainfall during the period from 2006 to 2007 is 842.60 mm, of which major quantity of rain is received during the Northeast Monsoon period from October to December. Southwest monsoon generally sets in at the beginning of June and blows with great force till the end of August.

### **Soil**

In Tiruchirappalli district, majority of the area is under Red Sandy soil and this soil type covers 18% of the total area in the district. Black soil is distributed along the rivers of Cauvery and Ayacuts near big tanks, this soil type cover 14% of the total area in the district. The other soil types like Clay, Red Ferruginous, etc., are occupying the remaining extent of land cover the district. Out of the total area nearly 93678 hect. of lands are identified as soil problem area with Salinity and Alkalinity, which is 29% to total area of the district. More over, nearly 1,31,785 hect of lands are identified to be prone to soil erosion in the district.

### **Drainage**

The Cauvery river is the most important river in the district and the tributaries of

Cauvery, i.e. Coleroon river, Koraiyar river, Ariyar, Malattar channel, Uyyakondan channel also drain in this district. Cauvery is one of the major rivers in South India and Tamil Nadu, which flows towards east. The Cauvery Basin extends over an area of 81155 Sq.km, which spread across the states of Kerala, Karnataka and Tamil Nadu.

In Tiruchirappalli district, the river splits into two branches, the northern branch being called the Coleroon (Kolidam) and the southern branch is called river Cauvery. The river carries water from catchment areas of Puttanattam, Viralimalai, Malaikudippatti, Tennai, Illupur, Kalluppatti, Arur, Kulakkattaigudi, Keeranur and Thuvrankurichi. The catchment area of river is 632 sq.km and the length of 75 km. Ariyar River rises in Manapparai area from Pallivelli Mukku at an elevation of about 700m. The catchment area of the river is about 832 Sq.km.

### **Agriculture**

Basically, Tiruchirappalli district is agriculturally rich due to the availability of fertile lands and presence of perennial rivers. Cauvery with numerous tributaries forms the basis of sustained paddy cultivation on an extensive scale throughout the year. Agriculture is the main occupation of the area. Success of agriculture crops mainly depends on the rains. Irrigation facility is available only in few pockets and the most limiting factor for agricultural development of the area. Poor farmers having small holding, still adopt traditional farming practices. However, rich farmers having larger land holding are adopting modern improved technology and equipments. Use of nitrogenous fertilizer is very common in the area.

There are two distinct cropping season, namely, Rabi and Kharif. Showing of Kharif crops starts from last week of June and harvesting takes place in October. Important Kharif crops grown in the catchment area are maize, jowar, groundnut, cotton, arhar, soyabean, and til etc. Showing of Rabi crops are commonly started from the middle of October and harvesting in the late February.

The major crops grown in Rabi season are Wheat, gram, barley, linseed and mustard. Cereals, Pulses and Oil Seeds are the Major crops cultivated in the district and majority of the area is used for the production of Cereals and Pulse. Agriculture is the main occupation for most of the people in the District. Nature of soil and availability of water are the two key factors of agricultural production in tropical regions where adequate heat permits year round growing season. A variety of crops are grown in the study area. The rivers Cauvery and Coleeron start branching out to form the Cauvery delta irrigating vast tracts of land in the district. However, for detailed analysis all the crops are categorized into eleven major groups depending upon their acreage. These groups are paddy, cholam, cumbu maize, ragi, pulses, sugarcane, cotton, food oil crops and vegetables.

### **Irrigation**

Irrigation is an artificial application of water to the soil usually for assisting in growing crops. In crop production it is mainly used in dry areas and in periods of rainfall shortfalls, but also to protect plants against frost. Additionally irrigation helps to suppress weed growing in rice fields. In contrast, agriculture that relies only on direct rainfall is referred to as rain-fed farming. Irrigation is often studied together with drainage, which is the natural or artificial removal of surface and sub-

surface water from a given area. Nearly 0.89 hectare of forest land are converted for formation of tank by Public Works Department (PWD) in Sembianatham RF in Tiruchirappalli Division. Laying of pipeline and construction of shed for the water supply project in Mayanur RF by Tamil Nadu Water Supply and Drainage Board (TWAD), Namakal. Laying of pipeline in Evur RF by Tamil Nadu Water Supply and Drainage Board (TWAD), Musiri. In Tiruchirappalli District 1,86,778 ha. (42.41 % to the total geographical area) of land are under irrigated area. The major source of irrigation is through wells and Canals. The presence of canal irrigation is found in all blocks of Tiruchirappalli except Thuraiyur, Marungapuri, and Thathaiyangarenpet.

### **Demographic Details**

The study area has a total population of 24,18,366 (2001 census) in which 12,08,534 are male population and remaining 12,09,832 are female population. The population density of the district is 549 persons per sq.km. Among the taluks the maximum population is concentrated in the Tiruchirappalli Taluk, which accounts for 45% to the total population of the district. The trend in death rate and infant mortality rate in the district was recorded as 5.8, The birth rate has increased from 16.6 in which shows improved medical facilities in the district.

### **Energy Resources**

No power plant is located in Tiruchirappalli district. The Mettur Hydro Electric power meets the electricity needs of the district. The power distribution in the district is made through the electricity sub-stations at Tiruchirappalli. The consumption of electricity is highest in the case of Domestic sector, which accounts for 55%

to the total consumption and Agriculture is the next important category registered with 16% of power consumption and 17% of the electricity are utilised by industrial and commercial purposes. Streetlights and other purposes consume 12% of electricity in the district.

### **Transportation**

Tiruchirappalli district is well connected with major cities in Tamil Nadu by rail and road network. By virtue of very central location, Tiruchirappalli City has become the meeting place of Transportation lines (both road and rail) from north to south and east to west while travelling across the state. Tiruchirappalli, Srirangam and Goldenrock are part of Tiruchirappalli urban agglomeration and also developing as regional metropolis, extending its influence over the entire Tiruchirappalli and Thanjavur districts. The influence of Tiruchirappalli extends upto Cuddalore, Villupuram, Vellore, Salem, Erode, Dindigul Anna, Pasumpon Muthuramalingam Thevar and Pudukottai Districts. Tiruchirappalli City is one of the progressive industrial areas of the state. Tiruchirappalli, Manapparai, Srirangam (part of Tiruchirappalli), Thuraiyur and Ponmalai (part of Tiruchirappalli) are the important urban centre in the district and are well connected by roads.

### **Industrial Development and Environmental Status**

Sugar Factory, Distillery, Tannery, Engineering Units, Cement Industries and Automobile Service units are the predominant industries in the district. SIDCO has established three industrial estates and SIPCOT has established one industrial complex in the district. BHEL is one of the major industrial units. The

industries in all these industrial complexes are mostly non-polluting in nature. Moreover, most of the Industries in Tiruchirappalli district are provided with effluent treatment plant and Cement industries are provided with air pollution control measures, to monitor the pollution level.

### **Educational Institutions**

Considered an educational city, Tiruchirappalli has schools and colleges that are hundreds of years old. College Road in Chatram has three colleges and five schools. Notable educational institutions from the city include: the National Institute of Technology, Trichy (formerly known as REC Trichy — Regional Engineering College), Anna University Trichy, Bharathidasan Institute of Management, Bharathidasan University and the Government Law College. St. Joseph's College is another important institution in Trichy. R. Venkataraman, another former President of India also had his education in Trichy

### **Results and Discussion**

In this paper, put forward the architecture of open WebGIS and construct an open WebGIS demonstration system for cropping pattern issuing services. Though the function of the system is basic WebGIS function, it offers a new solution to GIS interoperability integration and display in web. Help links are available, including information and images of the tools, detailed instructions on using the form and background information on the purpose of the data collection.

The registered user has limited permissions to change the data, and changes are tracked so that reversion is possible. The results of queries may be tabulated or shown visually in the map. The database administrator has



full access to the database, and responsible for maintaining user accounts, security, backups, modifying the schema if necessary, maintaining support tables as well as maintaining the application or scripts.

Development of dynamic thematic for cropping pattern using WebGIS is the energetic or force in actual operation. Dynamic cropping pattern to create a crop production environment that is changing. Such mapping environments are now easier to create with recent advances in web technologies and standards. The user can, to a large extent, determine what information is to be displayed and in what context. This project aimed to provide data, visualization tools and a cartographic toolbox to the user in a web-based interface.

The application also demonstrates what it is possible to achieve using open source tools, open standards and datasets in the public domain. For thematic provide for various techniques for using the cropping pattern analysis. This is define for the web browser and web server interactions method, we can get any formation of the style of the technique. Dynamic method for viewing querying or analyzing maps and data can be done at any identification and analysis. Attribute data can be queried to provide more information for identification of dynamic cropping pattern for various techniques.

The integration of multiple datasets can include locally stored and remotely served data. This is achieved through an interactive web form where the user can select between statistical indicators and various thematic mapping techniques. Mapping parameters, like the colour and size, can be readily changed. The browser is

asking for a list of all available statistical indicators, and this list is returned by the web server. This information is added to the first drop-down box in the web form. When the user selects one of the indicators in the list, a new request is sent, asking for a list of crops details where data is provided. The crop details are added to the second drop-down box.<sup>3</sup> The third request is sent when the user clicks the Preview or Download button. All of the map parameters, representing the choices made by the user, are then transferred to the web server.

The parameters are used to generate a KML document, which are zipped into a KMZ file and stored on the server. A reference (URL) to the KMZ file is returned to the browser. If the Preview button was clicked, the KMZ file is automatically loaded by the Google Earth Plug-in. If the Download button was clicked, a link to a KMZ file is displayed. The user can download the file by clicking on this link. Anyone with an internet connection should be able to access the mapping examples. The terms of use of the Google mapping technology also states that “your service must be freely accessible to end users. When doing thematic mapping on the web, it is important to limit the amount of data transferred between the server and the mapping client. In addition, modern web browsers are only capable of displaying low-resolution vector data. This reduces the total file size and improves the performance.

The colour can also be specified in the shared style if only one colour is used. If the colour varies, it needs to be defined as an inline style for each feature, together with the scaling factor: The fill colour is specified for each feature, since the polygons are coloured according to a

statistical value. Development of dynamic By using the time primitives in KML, one can create animated thematic maps showing how a variable changes over time. This is a relatively easy way to provide sophisticated map animations in a geobrowser. Whenever a time element is specified in a KML file, the geobrowsers automatically displays a time slider that corresponds to the beginning and ending times in the file. The user can see the animation by using play button or moving the slider itself. This turned out to be a crucial way of obtaining information and keeping up-to date with the latest developments and trends. Now widely used among “geeks” and professionals alike, to present their own work and perspectives and to comment on other people’s work.

### **Development of Dynamic the matics for Cropping Pattern**

To develop a cropping pattern in an area on availability of irrigation water from an irrigation project, It is essential to know the physiological and social environments and the prevailing factors of production in the area. Thematic for giving forceful and powerful technique. The possibilities of introducing new crops and crop varieties, the possibilities of multiple cropping, application of advanced agricultural techniques, availability of agricultural implements and machinery and expected capital requirements, availability of credit facilities and water from the proposed project. The dynamic thematic for cropping pattern we can get any application. For example we can select kml/kmz format, change detection, distribution of various analysis, ,3-d format,choropleth maps, bar charts, prism charts, Collada objects, map

legends, including examples of animated time series.The physical conditions of an area affect the extent of agricultural operations.

However, the role of human activity is equally important. Many a time, man is able to make satisfy his needs. Extensions of irrigation and use of drought resistant high yielding varieties are some of the agricultural purposes. The cropping pattern of an area exhibits the effort of man to overcome the vagaries of climatic conditions in that area. With this background it is opt to describe and analyst the patterns of crop cultivation in the study area.

### **Crop Combination Analysis**

The study of crop combination regions constitutes an important aspect of agricultural geography as it provides a good basis for agricultural regionalization. The crops are genereally grown in combinations and its rarely that a particular crop occupies a position of total isolation from other crops in a given aerial unit at a given point of time. The distribution maps of individual crops are interesting and useful for planners, but it is even more important to view the interrogated assemblage of the various crops grown in as aerial unit.For example the demarcation of india the rice and wheat regions does not explain the agriculturally significant fact that very often the wheat region also have a nice crops and vice versa for comprehensive and other better understanding of the agricultural mosaic of an agro –climatic region, the study of crop combination is of great significance.

**Table.1** Crop Combination Regions of Tiruchirappli District

S.No	Taluks	Crops	Number of crops combination
1	Manapparai	Paddy,Cholam,Chumbu,Ragi, Pulses,Sugarcane,Cotton,vegetable And food oil crops.	9
2	Tiruchirappli	Paddy and pulses.	2
3	Srirangam	Paddy , Sugarcane and pulses	3
4	Thottiyam	Paddy,Cholam,Chumbu,Sugarcane, Vegetable and Food oil crops.	6
5	Ialgudi	Paddy,Cholam,Chumbu,Maize, Pulses,Sugarcane,Cotton vegetable and Food oil crops.	9
6	Manachanallur	Paddy,Cholam,Chumbu,Ragi,Maize, Pulses,Sugarcane,Cotton,vegetable And food oil crops.	10
7	Musiri	Paddy,Cholam,Chumbu, Maize, Pulses,Sugarcane,and vegetable.	7
8	Thuraiyur	Paddy,Cholam,Maize, Sugarcane,Cotton,vegetable And food oil crops.	7

In recent years the concept of crop combination has engaged the attention of geographers and agricultural land –use planners. The studies made so far for this field range approach from tropical region and vary in extent from small areas of minor political units to the entire country. The different methods applied in the delineation of crop combination regions can be summed up under two headings.

The first method for the demarcation of crop combination regions is the arbitrary choice method. Example: The first crop only, the first two only etc... the crop combination delineated on arbitrary choice method are however, not nation and

judicious, as by applying arbitration the rest of crops grown in the area or irrationally excluded without any consideration of their percentage weightage in the total cropped area. The second method is developed in terms of variable based on certain differences, which are relative and not absolute. This method being based on the geographers have modified statistical techniques about crop combination suitable from time to time. The arbitrary choice method and some of the quantitative techniques used in the delineation of crop combination. Manachanallur has maximum number of crop combination, namely ten crop combinations.

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