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A Modern Business Approach by Using Geographic Information Systems as a Decision Tool for the Logistics of Oranges to the Peshawar City Markets in Winter Season

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ABSTRACT

Supply chains management has gained importance due to tough competition in today's Business markets, the emerging of products having shorter life cycles, and ever increased expectations of customers from business enterprises. Now Firms are investing a lot on their supply chains. Logistics is the important component of supply chain management that is related with the flow of goods from the point of origin to the point of consumption in order to meet customers' demands. Logistics covers a wide range of business functions. This paper discusses the use of modern technology for the transportation of oranges from fruit farms to city centers to meet the customer's requirements and overcome problems in logistics for a fruit farm owner. Geographic Information systems is a sum of computer hardware, software, and earth data for storing , managing, analyzing, and displaying all forms of geographically referenced information. GIS is playing an increasingly efficient role in different areas of modern business .

KEYWORDS: Geographic Information Systems, Remote Sensing, Supply Chains management, Logistics.

I. INTRODUCTION

Supply Chain Management (SCM) has gained importance in business and manufacturing technology for improving organizational competitiveness and standards. SCM is now considered a very vital strategy for helping suppliers and customers with the primary goal of increasing response time. Due to competition in today' business place and challenges of reducing response time, cost prediction and improving customer service levels thus leading to improving product quality is now dependent on the ability of these business firms to overcome these challenges. In the past, production, sourcing, distribution and marketing were working as an independent entity. The organizational units have different objectives but they look to be working towards a common objectives, nowadays, the objectives is towards digitally integrated demand and Supply Chain (SC) methodology that more relay on establishing networks of relationships between the firm, its suppliers, customers and individual entities [1].

The name logistics comes from the military which describes the movement of troops and equipment during times of war. Later it was implemented by businesses Community and was added to business related studies. Council of Supply Chain Management Professionals (CSCMP) defines logistics management as that "part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements". In short, business firms need logistics operations for the movement of supplies, goods, equipment and people among supply chain partners [2].

GIS has shown ability to become one of the important and evident areas in logistics/SCM system design. Since the process layout on logistics has geo-referenced spatial data. GIS is highly recommended for the management of logistics systems, because it offers constructive solutions to controlling logistics problems. Among previous studies on pickup and delivery and vehicle routing problems are those by Cluff (1987), Gillet and Miller (1974), and Laporte (1992). Sam R., H. Osman, Tong Sun. (1994), Sexton, and Bodin (1985), and Solomon (1988) developed the algorithms for time windows VRP. Grefenstette et al (1995) and, Hau, Kut, Christopher, and Tang (2000) applied the

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genetic algorithm and value information problem for VRP solution .Hwang (2000), (2003) developed an Integrated Logistics/SCM system using GIS and extended this to the 3-D GIS problem. If we apply Geographic Information systems to selection of best possible shortest route for transportation of goods then reliability and efficiency of Logistics increases [3-4].

This paper provides a solution for the transportation of oranges from far away areas towards the city markets in winter season with the help of geographic information systems and remote sensing approach.

II. GIS AND LOGISTICS

Geographic information system (GIS) is a computer-based software tool that facilitates the mapping and analysis of information within a geographical area. It has similar functions as a map but with the extensive features that increase it flexibility, speed and ease of use because of its ability to perform statistical analysis, geographic analysis or the analysis of vehicle routes. Although mapmaking and geographic analysis can be performed via manual methods, it is far easier and faster using GIS. There are two primary types of geographic models used in the geographic information systems: the vector model and the raster model. The vector model is designed to store and encode information as a collection of coordinates. The raster model can describe continuous varying features such as the accessibility costs for hospitals or the soil type. The raster model will encode the image into a collection of multiple grid cells .There are five basic tasks involved when using GIS: input, manipulation, database query and analysis, and visualization. During the input process, geographic data in a GIS compatible format will be entered into the system. There are various types of geographic data that can be obtained from the data suppliers [5].

The logistics system comprises of suppliers, warehouses, distribution centers, retail outlets. Important decisions related to any logistics system include:

1. Finding the exact number of warehouses.
2. Finding the location of each warehouse.
3. Finding the area of each warehouse.
4. Finding the space for products in each warehouse.
5. Finding which products need to be relocated, and in what quantity.
6. Finding the less crowded and shortest route for a vehicle in a transportation network.

It is clear that geographic information system can play a major role in logistics network management. GIS is used to help top management of business logistics is now an emerging area. With the help of GIS we are able to answer these s logistics-related business questions such as [2]:

- Which will be the best path for delivery of goods using trucks?
- How and when deliveries should be scheduled?
- What kind of mobile resources are easily available?
- How to avoid difficult terrain?
- Which place will be the best location for delivery of goods?
- How can the available sources must be arranged to meets objectives and minimize costs?

Geographic Information Systems fulfill all the requirements of a modern business industry and clearly help the logistics management in its implementation of real time decisions [6].

III. METHODOLOGY AND STUDY AREA

Supervised digital image classification (Campbell, 1987; Thomas, Benning, & Ching, 1987) is used to mapped Land classes from remotely sensed data.. The outcome of the image classification method is to form and categorize all pixels in an image into land cover classes or themes (Lillesand & Kiefer, 1994). When classifying an unknown pixel the maximum likelihood classifier quantitatively evaluates both the variance and covariance of the category spectral response patterns. It is based on statistical parameter that's the reason it is considered to be one of the most accurate classifier [7-8].

Simple remote sensing instruments does not record well the complex nature of the Earth's land and water surfaces .There are constraints such as spatial, spectral, temporal and radiometric resolution .As a result of these constraints error jumps into the data acquiring method and can degrade the quality of the satellite sensed data. It is important to preprocess the remotely sensed data before the analysis being performed. Distortion, degradation and noise introduced during the imaging process is corrected using image restoration technique. Geometric and Radiometric errors are the common types of error emerged in satellite image data. The geometric errors of the Satellite image were here corrected with the help of (GPS) points before the analysis [9].

Satellite image will be used for land cover analysis in this paper. It is from spot -5 having resolution 2.5 m.Remotely sensed data processing and preprocessing, is done using software ILWIS.

A satellite map of Peshawar city center (Pakistan) is shown in Fig. 1 below with the help of false color composite different features are shown having different colors.

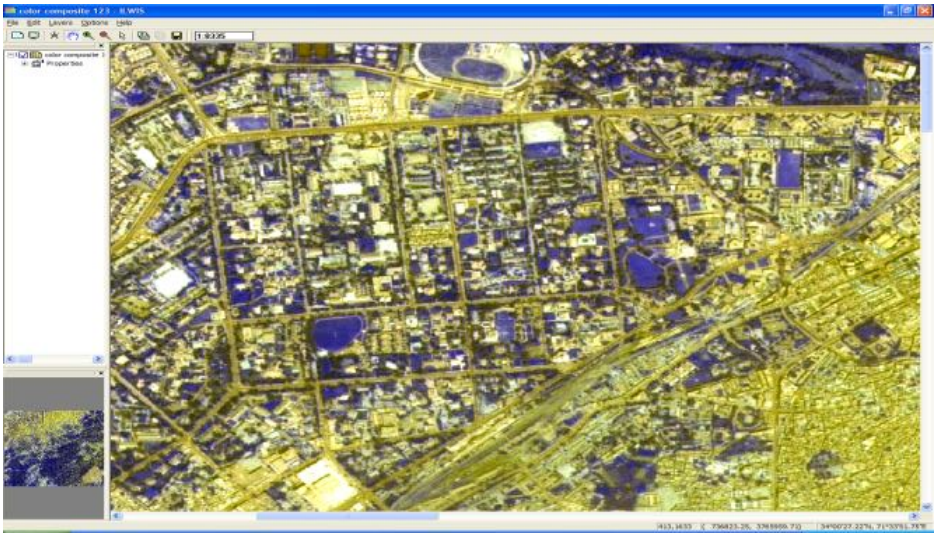

Figure 1.Satellite Image of Peshawar city

A segment map showing different roads to make a separate layers is shown in Fig. 2.These roads are shown in different colors and consists of kohat road ,badaber road, ring road ,link roads etc.

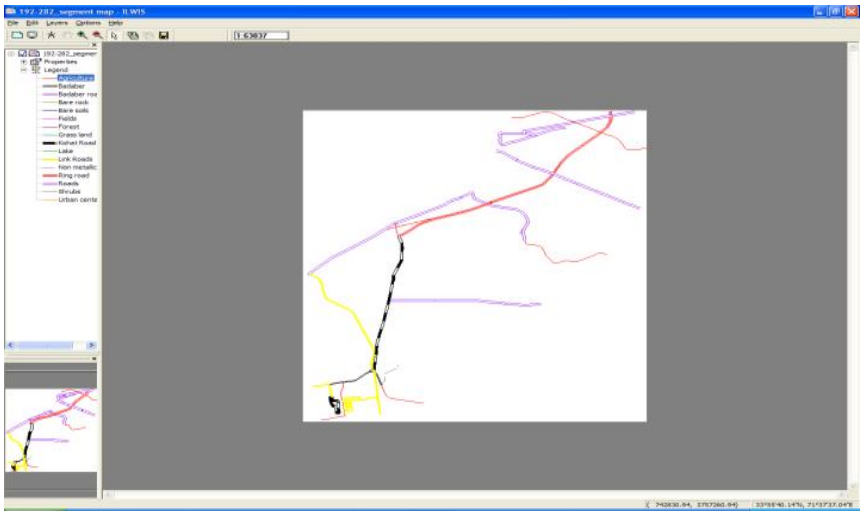

Figure 2**.** Multiple access roads

The Histogram operator gives the histogram of a raster, polygon, segment or point map. Histograms calculate frequency information on the values, classes, or IDs in your map. Results are normally displayed as a histogram window (Fig. 3), table or as a graph.

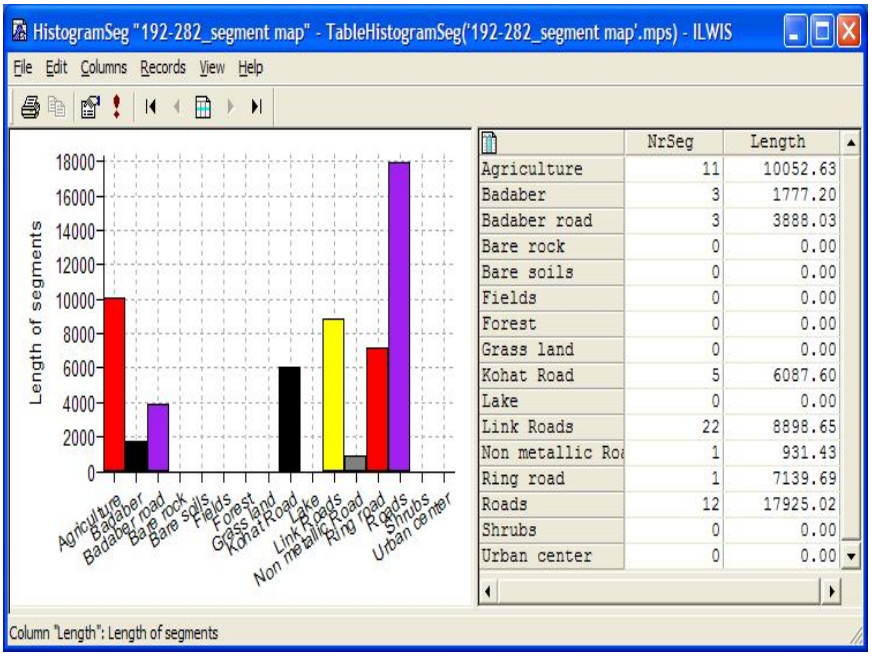

Figure 3. Length of Roads

IV. CONCLUSION

It is clearly shown that with the help of satellite map which digitized vector map shown in Fig. 2 the multiple access roads to city centers can be easily planned for the logistics of oranges from the fruit farms and finally to the consumers hands .we can get the following information from the satellite maps i.e Length of each road whether short or long route, metallic or non metallic road, narrow or wide road thus saving money and overall cost of logistics. By counting the number of pixels, length of roads can be calculated.

Table 1. Number of Pixels showing each road

S.No	Roads	No of Pixels
1	Badaber road	3888
2	Kohat road	6087
3	Link roads	8898
4	Non metallic road	931
5	Ring road	7139

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