1. INTRODUCTION

1.1 GENERAL

Any developmental program implemented on any area or nation a microlevel planning is required. To do Micro-level planning decision makers and planners have to directly depend on spatial data and aspatial data for optimal interpretation.

Hence, the planners need to have at their disposal sophisticated data management systems to handle such spatially correlated data.

Studies at village level is one of the most efficient ways understand the rural areas farming systems and also helps in determine the socio-economic and constraints faced by the farmers and their community.

The emergence of Remote Sensing and Geographic Information System as a powerful tool for spatial analysis and storage has in effect alleviated the problem by computerization of the spatial data. This new technology can reduce the time and cost to the planners in organizing the data in arriving at precise conclusion and decisions.

Village Information System, generated in the present project which integrates the spatial village maps with non-spatial or tabular information, has demonstrated its potential for grass-root level development planning taking into consideration the local needs and constraints. It has also established its usefulness to the decision-makers in the district to generate views for decision-making at local-level.
Keeping the fact of development to make India as developed nation, thematic information on 1:10,000 scales, so that micro level planning is possible for the development at village level.

1.1.2 Importance of Village Information System

Village Information has been defined as the “process of recording and dissemination information about the villages resources information, census, utilities, land use and use of land its associated resources”. A good administration system should permit the integration of village information and land use with economic, sociological and environmental data in support of physical planning. The availability of up-to-date large-scale spatial data provides the basic framework within which development schemes can be planned and assessed and acceptable designs implemented.

Village administrations are created to take care of the general health, welfare and prosperity of their citizens and communities. Examples of village administration concerns include: regulating physical growth of the community; providing infrastructure for roads, water and sewer; providing water and power for agriculture, stimulating economic development; minimizing crime; building schools; and securing publicly accessible recreational opportunities and utilization of agriculture, forestry, pastures, urban, industrial and environmental sectors. Village
information system is applied to a wide range of local government functions. The main village government functions are: health and safety, facilities for agriculture, public works, recreation and culture, urban development, administration, finance, and management.

Health and safety applications rely primarily on emergency services. Those two are the key government functions, and in many cases, the backbone of local government usage of information system. Street network files coupled with accurate addresses and routing software allow for prompt response to emergency calls. With increased of natural disasters geospatial technologies have also become a prominent tool for disaster mitigation and evacuation planning. Village development applications span most of the planning department’s functional areas including neighborhood and economic developments, land use and comprehensive planning, and environmental protection. A land use map draped over a three-dimensional model of earth surface representing the physical characteristic and features in an area of interest. Population data is providing the basis for socio-economic analysis for different government schemes for public.

Public works applications are usually performed by engineering units and often entail datasets with higher degree of positional accuracy then those used by planners. Administration and management applications focus on inventorying and allocating local government resources, providing public access to those resources, performing
political functions, and creating long-range plans and policies. Recreation and cultural related applications focus on providing public amenities and facilities in the areas of recreation, education, and culture. This information system can be useful in planning and managing those recreational amenities and facilities. Land use / Land cover data derived from satellite images are used to understand the vegetation. Finally, property assessment is probably the most fundamental local government function in the area of finance for which village information system with geospatial technologies are becoming extensively applies.

Village information system (VIS) would allow planners and citizens to quickly and efficiently create and test alternative development scenarios and determine their likely impacts on future land use patterns vis-à-vis ever-increasing population allowing public officials to make more informed planning decisions. In short, use of VIS in local government administration would increase efficacy, save time, improve accuracy, generate revenue, automate tasks, provide better decision support as well as being economical. To Develop VIS and to understand the status and other aspects of spatial data, very large scale maps of natural resources, utilities, Land use / Land cover and other details are necessary. Hence the DST- NRDMS has considered the scale of 1:10,000 on which the entire data model is developed.
1.1.3 Land Use Planning and GIS

Where there is competition for limited resources, planning aims to strike a balance between a rational technical approach of resource valuation and a social basis for conflict resolution, as defined by the Food and Agriculture Organization “Land use planning means the systematic assessment of land and water potential, alternatives for land use and economic and social conditions in order to select and adopt the best land use options... Planning also provides guidance in cases of conflict”. A participatory process of classification and mapping of natural resources at village level is very important for nation development. There are a number of participatory mapping methods, but it is often difficult to produce information that can be standardized and geo-referenced for planning purposes, or even in a way that allows area measurements, so that it is difficult to combine them with remote sensing tools. In order to go beyond land demarcation and to carry this process up from village level to higher planning, the research project examined possibilities to enter the data from village maps into a Geographic Information System (GIS), so as to provide visual information that is understandable by the people who displayed it. There are several challenges when combining participatory approaches and GIS.

- Scaling up to show local concerns as well as broad regional or national perspectives, so that local priorities can be integrated into regional plans.
The access of local people to decision making power through the ownership and use of data, since in the past this access was limited to a few high-level decision makers and thus constituted a merely extractive extension tool.

A land use model and GIS turns local knowledge into public knowledge and out of local control, and can be used to locate resources.

The proper planning, design and management of land use demands a careful balancing of many goals, viz., search for desirable land uses, effective and sustainable management practices, coupled with interactions among the environment, economy and society. One of the main reasons underlying the growing interest in multi-criteria analysis for land use management for the planning at micro-level is the need for an integrated approach to such complex problems. The GIS (Geographic Information System) based spatial data infrastructure is very important in the development of planning support systems.

1.1.4 Land Use Planning with Village Information System

Land use relies on varied information from different databases. The information requirement is, in fact, becoming complicated as planning and monitoring are now being integrated into various applications, such as economics, demography, agriculture, and the like. The expected outputs are also becoming diverse as land use information is widely
being used in many activities of different sectors, such as in social service delivery, development permits, land valuation, infrastructure projects, village and municipal development planning, and many more. Thus, the need for a land use information system has become necessary not only to handle and integrate data also to provide products and services to clients. The use of GIS in land use is becoming popular as it has the ability to link attribute data to spatial data, integrate several map layers, do spatial analysis and modeling, and automates map processing.

Land use in village information system is seen as a tool for planners to do spatial and non-spatial analysis and to produce relevant information for policy makers. As a planning system, its function is described in the following manner.

Beyond analysis and decision-making, the information system can also be developed to track and manage change, generate knowledge, and stimulate public discourse. This broad functional view is emphasized in the passage below. Planning information systems are collection of spatially referenced data, studies, analyses, and models used for public planning and change management recommendations, negotiations, debates, and decisions. Planning information systems differ from other information systems in their need for relating information to space and spatial location, and in their focus on the action implications of community planning and change knowledge. An important aspect in the design of a land use information system is defining the data
requirements necessary to meet the various applications and needs of governmental, private and other organizations.

1.2 OBJECTIVES

- To generate both spatial and non spatial data: through field survey. Thematic data using high resolution satellite data and topographic data using SOI top sheets and collateral data from various concerned organizations.
- To develop a standardized data model for Land use/Land cover on 1:10,000 scale for object oriented mapping of Karamchedu mandal.
- Development of detail socio-economic database of the study area.
- To prepare digital thematic map namely, base, drainage, transportation, Land use/Land cover, watershed, soil, Geomorphology, Physiography using high resolution satellite imageries and survey of India toposheet data on ArcGIS platform and to maintain a spatial digital database.
- To prepare digital cadastral level maps with survey numbers on 1:10,000 scale on ArcGIS platform.
- To develop and maintain Village Information System (VIS) and its database, which can be used for micro level planning.
- To develop decision support system for Karamchedu mandal using Visual Basic 6.0 software.
1.3 STUDY AREA

The study area selected for the project is Karamchedu mandal, Prakasam district of Andhra Pradesh in India. Prakasam is an administrative district in the state of Andhra Pradesh with the district headquarters located at Ongole. Karamchedu is a very prosperous model village located 8.5 km from the busy commercial town of Chirala in Prakasam district of Andhra Pradesh in India. Karamchedu mandal has its own significance right from the time of British Raj because of its zamindars and other influential personalities. The study area Karamchedu mandal is located at Longitude of 80°11′5.64″ to 80°22′15.80″ and Latitude of 15°56′56″ to 15°47′22″. Area of Karamchedu mandal is 163.220 sq km (approximately). It has a total population of 39,356.

Karamchedu mandal has seven Revenue Villages, (Audipudi, Karamchedu, Daggubadu, Kodavalivaripalem, Kunkalamarru, Swarna, and Kesavarapadu) all belong to Chirala constituency.

<table>
<thead>
<tr>
<th>s.no</th>
<th>village name</th>
<th>village area in Ha.</th>
<th>village area in sq km.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Audipudi</td>
<td>1938.60</td>
<td>19.386</td>
</tr>
<tr>
<td>2</td>
<td>Karamchedu</td>
<td>3864.60</td>
<td>38.645</td>
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<tr>
<td>3</td>
<td>Kunkalamarru</td>
<td>2239.08</td>
<td>22.390</td>
</tr>
<tr>
<td>4</td>
<td>Daggubadu</td>
<td>1711</td>
<td>19.0</td>
</tr>
</tbody>
</table>
Table 1.1 Village wise area in hectares and square kilometers

<table>
<thead>
<tr>
<th></th>
<th>Village</th>
<th>Area (hectares)</th>
<th>Area (square kilometers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Kodavalivaripalem</td>
<td>2288.78</td>
<td>22.88</td>
</tr>
<tr>
<td>6</td>
<td>Swarna</td>
<td>3914.74</td>
<td>39.147</td>
</tr>
<tr>
<td>7</td>
<td>Kesavarapadu</td>
<td>366.275</td>
<td>3.662</td>
</tr>
</tbody>
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1.3.1 Karamchedu Mandal Divisions

<table>
<thead>
<tr>
<th>REVENUE VILLAGES</th>
<th>PANCHAYATHI’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.Kunkalamarru</td>
<td>Kunkalamarru</td>
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<tr>
<td>2.Karamchedu</td>
<td>Karamchedu</td>
</tr>
<tr>
<td>3.Audipudi</td>
<td>Audipudi</td>
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<tr>
<td></td>
<td>Thimidithapadu</td>
</tr>
<tr>
<td></td>
<td>Yarramvaripalem</td>
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<tr>
<td>4.Daggubadu</td>
<td>Daggubadu</td>
</tr>
<tr>
<td></td>
<td>Pothinavaripalem</td>
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<tr>
<td></td>
<td>Naiduvaripalem</td>
</tr>
<tr>
<td>5.Kesavarappadu</td>
<td>Kesavarappadu</td>
</tr>
<tr>
<td>6.Swarna</td>
<td>Swarna</td>
</tr>
<tr>
<td></td>
<td>Swarnapalem</td>
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<tr>
<td>Table 1.2 showing Karamchedu mandal divisions</td>
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<tr>
<td>---------------------------------------------</td>
<td></td>
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<tr>
<td>7. Kodavalivaripalem</td>
<td></td>
</tr>
<tr>
<td>Rangappanaiduvaripalem</td>
<td></td>
</tr>
<tr>
<td>Jarubulavaripalem</td>
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</tbody>
</table>
Fig 1.1 Showing location map of the study area
1.3.2 Geographical Aerial Extent of the Villages

Audipudi : Longitude : 80° 13’ 53” to 80° 17’ 38”
            Latitude : 15° 55’ 46” to 15° 51’ 51”

Karamchedu : Longitude : 80° 16’ 31” to 80° 21’ 46”
             Latitude : 15° 54’ 51” to 15° 50’ 54”

Kesaravapadu : Longitude : 80° 13’ 58” to 80° 15’ 22”
               Latitude : 15° 52’ 4.2” to 15° 50’ 33”

Kodavarivalipalem: Longitude : 80° 13’ 13” to 80° 18’ 50”
                   Latitude : 15° 31’ 30” to 15° 47’ 24”

Kunkalamarru : Longitude : 80° 18’ 48” to 80° 22’ 13”
               Latitude : 15° 56’ 53” to 15° 53’ 32”

Swarna : Longitude : 80° 15’ 15” to 80° 19’ 44”
        Latitude : 15° 53’ 33” to 15° 49’ 19”

Daggubadu : Longitude : 80° 09’ 59” to 80° 40’ 58”
          Latitude : 15° 55’ 08” to 15° 49’ 59”
1.3.3 Area and Population:

Area of Karamchedu mandal is 163.220 sq km. It has a total population of 39,356 as. The population in Karamchedu mandal is 39,356, almost 30% of the concentrated population is in Karamchedu village, 21% in Swarna village, 14% in Daggubadu village, and rest of the 35% of the population is residing in the other villages.

1.3.4 Topography

The topography and relief of the study area has shown sandy and plains physiographic feature.

1.3.5 Soils, Minerals and Crops:

Soils existing in Karamchedu mandal is Deep, well drained, red coastal clayey soils with high awc, on very gently sloping plains, the crops grown are paddy, bengalgram, black gram, maize, cotton, chillies, jute, and tobacco.

1.3.6 Climate and Rainfall:

Karamchedu mandal receives mostly its rainfall from South West and North-East monsoon. Normal rainfall of the mandal is 950.2 mm. The receiving of maximum rainfall recorded during 2007-2008 from South-west monsoon is 1355.4 mm. The minimum rainfall recorded during the
year 2002-2003. From the month of February, the day temperature gradually increases till May, which is the hottest month of the mandal. The maximum temperature recorded during the year 2008-2009 is $42.5^\circ$ in the month of May.

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<tbody>
<tr>
<td>KARAMCHEDU</td>
<td>950.2</td>
<td>669.1</td>
<td>864.9</td>
<td>939.7</td>
<td>1323.0</td>
<td>742.4</td>
<td>993.5</td>
<td>1035.9</td>
<td>1077.2</td>
<td>763.2</td>
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</tr>
</thead>
<tbody>
<tr>
<td>KARAMCHEDU</td>
<td>950.2</td>
<td>1297.6</td>
<td>861.3</td>
<td>609.8</td>
<td>1007.2</td>
<td>691.5</td>
<td>1199.6</td>
<td>1073.9</td>
<td>1355.4</td>
</tr>
</tbody>
</table>

*Table 1.3 Showing Rainfall in Karamchedu Mandal (in mm)*

### 1.4 RURAL DEVELOPMENT

Total number of villages in India according to 2001 census are 6,38,365; among them, in Andhra Pradesh, the total numbers of villages are 28,123. In India, rural development is the major factor for the development of Indian economical condition. Indian people are mainly dependent on agriculture. Contribution of the agriculture is just about one-fifth of the India’s Gross Domestic Product. Indian government has numerous program plans suitable for rural development in order to enhance the growth rate of agriculture.
The rural development minister in India is the summit body for regulations, formulating policies and acts for the development of the rural areas. Agriculture fisheries, handicrafts, dairy and poultry are the major contributors from the rural economy and business.

The central and state level governments are implementing and formulating numerous developmental programs in rural sectors.

These programs fall short to formulate predictable outcome on the rural areas. The reason behind it is lack of non-availability of the spatial and non-spatial information of the rural areas. For making success of these governmental programs, a village level information system is required, which helps the planners, decision makers, and even government to implement there programs in rural areas.

According to census 2001, total number villages in Prakasam district is 1,093; among them, 1,058 are revenue villages and rest of the 35 villages are forest villages.

Micro-level planning implement requires scientific and organized collection, representation, and documentation of the related data for future and present use.

For these purposes, an inclusive information system is required for storage, processing, and retrieval for micro-level planning, which should be useful for gram panchyat, planners, decision makers, researchers, and academicians.
1.5 DECISION SUPPORT SYSTEM (DSS)

The collateral data and attribute data obtained and collected during fieldwork and the spatial data prepared during the study (maps obtained) are together related in a user-friendly manner in the form of a decision support system using VB software. This system named as Decision Support System is a user-friendly system in which the end user can access the information and make a decision by mere clicking the options. The system is designed in Integrated Development Environment (IDE), a term commonly used in the programming world to describe the interface and environment that is used to create the application we need and can function on a desktop computer.

1.6 RESEARCH APPROACH

The step by step procedure to carry out this research work is as follows:

- Delineation of the study area from toposheet no: 66A01NE, 66A01SE, 66A05NW and 66A05SW 1:25,000 obtained from Survey of India (SOI) and Conversion of raster data to vector format and creation of baseline data using ARCGIS 9.1 and ERDAS 8.6 software.

- Pre-processing and georeferencing of the satellite imagery of IRS–P6, LISS-IV MX having spatial resolution 5.8m x 5.8m in order to prepare thematic maps of the study area.

- Development of land use/land cover data model and general legend at 1:10,000 scale for preparation large scale maps.
- Thematic maps preparation by adopting typical methods of visual and digital interpretation of satellite imagery.
- Collection of non-spatial data from concerned departments and organizations.
- Integration of spatial and non-spatial data using ARCGIS (9.1) platform.
- Development of Village Information System (VIS) for micro-level planning.
- Development of Decision Support System using visual basic 6.0.