The regional approach mostly used in agricultural development planning had not received the sufficient attention in the past. There are several factors like land degradation, loss of bio-diversity, global warming, ozone depletion etc., which are jeopardizing our food security system. In view of such issues, it has now become imperative that we should have a systematic survey and inventory of our soil resource for ascertaining their potential and problems and also their evaluation for optimum land use to increase the food production and sustainability of the system. Soil resource inventory is very helpful in ascertaining potentials and problems, which has impact on sustainable food production. GIS is the powerful tool to input, storage and retrieval, manipulation and analysis, and output of spatial and attributable data which is useful in land evaluation. Hence, the location specific needs of various regions of the country are needed to be given thorough attention to meet the demands of growing population with proper land use planning.

Use of land to human kind is multi-facet. As a source of production, it serves as a store house of water and nutrients and provides environment required for plants and other living organisms. Proper land use is essential to obtain the maximum benefit which includes conservation of soil and water resources and growing of suitable crops. Land as a resource cannot be measured by the surface area alone; hence it is the type of soil, underlying geology, topography, hydrology and plants which are critical for productivity. These attributes limit extent of land available for various purposes. The increasing population requires more space, food, fuel and other resources. There are several factors like land degradation, loss of bio-diversity, global warming, ozone depletion etc., which are jeopardizing our food security system.

separately subjected to Duncan’s multiple range test (DMRT) at 5 per cent probability under MSTAT-C programme.

The regional approach mostly used in agricultural development planning had not received the attention in the past four decades and, therefore, the location specific needs of various regions of the country remain neglected (Kadrekar, 1993). Hence unless we know the soil distribution, resources and their dynamic situation it is increasingly difficult to practice scientific agriculture. All our recommendations in agricultural production should be soil oriented. Therefore, an attempt has been made to review importance of soil resource inventory and GIS for land evaluation to tackle the ever increasing pressure on soils.

Soil survey and mapping:

For methodology of soil survey and mapping, the principles and guidelines as prescribed in the soil survey manual (Soil Survey Staff, 1966) of USDA and the soil survey manual of All India Soil Survey and Land use organization are widely used under Indian conditions. The criteria used for mapping soils largely depend on the purpose and scale of mapping, land form and soil characteristics (Sehgal, 1987). Bali (1985) summarized different kinds and intensities of soil survey and different levels of abstractions.

Soil classification:

Soil classification is to organize the knowledge about soils in such a way that their properties are clearly conceived and...
their relationships can easily be understood. Taxonomy also aids in reducing the number of individual soils to a few well-defined classes or units. For a good classification, precise criteria and objective description of individual soils are very necessary. The grouping of soils into distinct units or taxa is based on the morphological, physical and chemical properties. The development of modern comprehensive system of soil classification above the level of soil series is based on a sequence of approximation. The 7th approximation popularly known as comprehensive system of soil classification was published in 1960 (Soil Survey Staff, 1960) and it was followed by supplements published in 1964, 1967 (Soil survey staff, 1964 and 1967). Finally, ‘Soil Taxonomy’ a basic system of soil classification for understanding and interpreting soils was brought out in 1975 (Soil survey Staff, 1975) and an abridged version of this classification was published in 1983 as “Keys to soil taxonomy” (Soil survey staff, 1983). This was further modified and updated in subsequent years (Soil Survey Staff, 1998). In Orissa and Andhra Pradesh Machkund catchment area the red laterite soils were classified as Udic Haplustalfs, Ultic Paleustalfs and Ultic Rhodustalfs (Dagar et al., 1973). The soils of Kandi area, Punjab were classified as Entisol, Inceptisol; Typic Ustochrepts, Typic Usti Fluvents and Typic Ustipsamments at sub group level (Sharma et al., 1986). Saxena (1992) classified the soils of Gharagar plains of Patiala, Punjab as Entisols and Inceptisols and further up to family level. Soils developed on sandstone basalt and alluvium representing different landforms in Raisen district, Madhya Pradesh has been classified taxonomically as Vertisols, Inceptisols and Entisols.

Sohanlal et al. (1994) studied the major soils of India, and grouped them under six orders viz., Entisol, Inceptisol, Alfisol, Vertisol, Aridisol and Mollisol. These orders were further classified into suborders, great groups, sub groups, families and series. The laterites and associated soils along the east coast of Andhra Pradesh were classified under the orders Alfisols, Inceptisols and Entisols based upon their physical and chemical properties (Bhaskar and Subbaiah, 1995). Red soils of Bihar developed on different parent rocks were classified as Ustic Dystrudept, Udic Rhodustalf, Aquultic Haplustalf, Typic Hapludalf and Vertic Fluvaquent (Tiwary et al., 1996). Walia and Rao (1997) classified piedmont plain soils of Banda plain in Bundelkhand region of Uttar Pradesh as Inceptisols; Fluventic Ustochrept at sub group level. Most of the soil units in the command area belong to the Typic and Vertic subgroups of the Ustochrepts followed by soils of the subgroups Typic Chromusterts. The soils of Loktak catchment area of Manipur were classified as Humic Dystrudepts, Humic Hapludults, Typic Dystrudepts, Humic Hapludults, Typic Hapluhults, Typic Paleudults and Aquic Hapluhults (Sarkar et al., 2002).

Chaudhary et al. (2005) classified the soils based on field morphology and physico-chemical properties. Alfisol with argillic horizon and base saturation more than 35 per cent, Mollic with Mollic epipedon, Inceptisol with diagnostic cambic B horizon and Entisol with only ochric epipedon were found to occur.

Concepts of land suitability evaluation:

According to FAO (1976), land evaluation (LE) is the assessment of land performance when used for a specified purpose, involving the execution and interpretation of surveys and studies of land forms, soils, vegetation, climate and other aspects in order to identify and make a comparison of promising kinds of land use in terms applicable to the objectives of the evaluation. Land suitability evaluation can also be defined as the assessment or prediction of land quality for specific use. This process includes identification, selection and description of land use types relevant to the area under consideration; mapping and description of the different types of land that occur in the area and the assessment of the suitability of the different types of land for the selected land use types.

Land suitability evaluation is the prerequisites for sustainable agricultural production. It involves evaluation of the criteria ranging from soil, terrain to socio-economic, market and infrastructure (Prakash, 2003). Land evaluation for ecological regions and territories aims at creating a new good production power together with stability and sustainability (Jamal, 2003). Land suitability evaluation requires specialists of different disciplines like soil scientists, agro-ecologists, socio-economists and planners. The evaluation relates to the environmental and socio-economic conditions of the area as it includes a consideration of inputs and projected outputs of production process.

Land suitability evaluation can also be defined as the assessment or prediction of land quality for a specific use, in terms of its productivity, degradation hazards and management requirements (Astin and Basinsky, 1978). Abiotic, biotic, and socioeconomic factors decide the success of a crop. So the assessment regarding crop value should include the abiotic, biotic and socio-economic factors that determine the profitability (Prakash, 2003). The level of material inputs is defined in the evaluation as land improvements such as soil conservation or drainage and their overall impact is taken into account in predicting crop yields or outputs. Recommended land uses must not
cause soil erosion but should conserve the land for long-
term production; improve the productivity of land use
systems which may involve introduction of new crops,
changes in land management or other innovations in the
existing farming system (FAO, 1986).

**Land suitability evaluation systems:**

The suitability of a given piece of land is its natural
ability to support a specific purpose. Suitability can be
scored based on factor rating or degree of limitation of
land use requirements when matched with the land
qualities. In other words, land suitability evaluation is a
comparison and matching of land utilization type’s
requirements with land units’ characteristics. Land
suitability classes reflect degrees of suitability as shown
in Table 1.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land suitability orders</td>
<td>Reflecting kinds of suitability</td>
</tr>
<tr>
<td>Land suitability classes</td>
<td>Reflecting degrees of suitability within orders</td>
</tr>
<tr>
<td>Land suitability subclasses</td>
<td>Reflecting kinds of limitation or main kinds of improvement measures required, within classes</td>
</tr>
<tr>
<td>Land suitability units</td>
<td>Reflecting minor differences in required management within subclasses</td>
</tr>
</tbody>
</table>

According to the FAO general framework for land
suitability evaluation (1976), the land suitability
classification consists of assessing and grouping the land
types in orders and classes according to their capacity.
There are two orders represented by the symbols S and N. The classes (1, 2 and 3 for suitable and; 1 and 2 for
unsuitable order) express the degrees of suitability or unsuitability, presented in the Table 2. The areas that were
not assessed are allocated to an extra class “NR” meaning
not relevant. Land suitability orders indicate whether land
is assessed as suitable or not suitable for the use under
consideration. Land may be classed as not suitable to a
given use for number of reasons. It may be that the
proposed use is technically impracticable, such as the
irrigation of rocky steep land, or that it would cause severe
environmental degradation, such as the cultivation of steep
slopes.

Suitability categorization with very highly suitable
(S1), moderately suitable (S2), marginally suitable (S3)
and not suitable (N) only are being used by many
researchers for different crops like *Pyrethrum* flower

Table 2 : Structure of land suitability classes and subclasses (FAO, 1976)

<table>
<thead>
<tr>
<th>Order</th>
<th>Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>S1 (Highly suitable)</td>
<td>Land having no, or insignificant limitations to the given type of use</td>
</tr>
<tr>
<td>S</td>
<td>S2 (Moderately suitable)</td>
<td>Land having minor limitations to the given type of use</td>
</tr>
<tr>
<td>S</td>
<td>S3 (Marginally suitable)</td>
<td>Land having moderate limitations to the given type of use</td>
</tr>
<tr>
<td>N</td>
<td>N1 (Currently not suitable)</td>
<td>Land having severe limitations that preclude the given type of use, but can be improved by specific management</td>
</tr>
<tr>
<td>N</td>
<td>N2 (Permanently not suitable)</td>
<td>Land with very severe limitations which are very difficult to overcome</td>
</tr>
</tbody>
</table>

production in Kenya (Wandahwa and Ranst, 1996),

Robusta coffee in Brazil and date palm in the Middle
East. Land suitability classes reflect degrees of suitability.
The classes are numbered consecutively, by Arabic
numbers, in sequence of decreasing degrees of suitability
within the order. Within the order suitable number of
classes is not specified. There might, for example, be only
two, S1 and S2. The number of classes recognized should
be kept minimum necessary to meet interpretative aims;
five should probably be the most ever used. Land suitability
subclasses reflect kinds of limitations, e.g. moisture
deficiency, erosion hazard. Subclasses are indicated by
lower-case letters with mnemonic significance, e.g. S2m,
S2e, and S3me. There are no subclasses in class S1. The
number of subclasses recognized and the limitations
chosen to distinguish them differ in classifications for
different purposes. Limitation factors as indicated in FAO
(1976) has been used by Choung (2007). Such limitation
factors are indicated by small alphabets (Table 3)

Land suitability units are subdivisions of a subclass.
All the units within a subclass have the same degree of
suitability at the class level and similar kinds of limitations

Table 3 : Limiting factors reflecting land suitability (FAO, 1976)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>d</td>
<td>Limitations by rootable soil depth</td>
</tr>
<tr>
<td>f</td>
<td>Limitations by flooding in rainy season</td>
</tr>
<tr>
<td>g</td>
<td>Limitations by inappropriate soil conditions</td>
</tr>
<tr>
<td>p</td>
<td>Limitations by fertility conditions</td>
</tr>
<tr>
<td>t</td>
<td>Limitations by soil texture condition</td>
</tr>
<tr>
<td>sl</td>
<td>Limitation by land slope of an area</td>
</tr>
</tbody>
</table>

at the subclass level (Table 4). The units differ from each other in their production characteristics or in minor aspects of their management requirement. Their recognition permit detailed interpretation at the farm level planning. Suitability units are distinguished by Arabic numbers following a hyphen, e.g. S2e-1, S2e-2.

<table>
<thead>
<tr>
<th>Land suitability orders</th>
<th>Land suitability classes</th>
<th>Land suitability subclasses</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>S1 (highly suitable)</td>
<td>e.g. S2t° or</td>
</tr>
<tr>
<td></td>
<td>S2 (moderately suitable)</td>
<td>S3sl</td>
</tr>
<tr>
<td></td>
<td>S1 (marginally suitable)</td>
<td>t°</td>
</tr>
<tr>
<td>N</td>
<td>N1 (Currently not suitable)</td>
<td>temperature, sl = soil slope</td>
</tr>
<tr>
<td></td>
<td>N2 (Permanently not suitable)</td>
<td></td>
</tr>
</tbody>
</table>

There is no limit to the number of units recognized within a subclass.

**Productivity and land suitability assessment:**

Unplanned and indiscriminate use of land is a cause for concern as land and soils are finite resources and have to be utilized on scientific lines without causing imbalance to the natural eco system. The need to put the land under sustainable management assumes all the more significance in the context of the ever increasing pressure on land due to burgeoning population. Sustainable land management attempts to balance the often conflicting ideals of economic growth and environmental quality and viability.

Land evaluation portray the suitability of the land for agriculture and other uses, wherein land is classified considering a number of soil characteristics, associated land features and environmental factors such as climate. Land evaluation is the process of estimating the potential of land for alternative kinds of uses. Vink (1975) stated that the land evaluation is an essential tool in land use planning. The uses can be productive such as (i) Arable farming, (ii) Fodder / Forage production (Livestock production), (iii) forestry (or) other uses as (a) Catchment protection, (b) Recreation, (c) Tourism, (d) Wildlife conservation. It involves interpretation of survey, climate, soils, vegetation and other aspects of land use and land qualities.

Requier _et al._ (1970) have evolved a system of soil appraisal in terms of actual and potential productivity. Productivity or actual productivity (P) is initial soil capability to produce a certain amount of crop per hectare per annum and expressed as a percentage of optimum yield per hectare of the same crop grown on best soil. Potentiality or potential productivity (P’’) is productivity of a soil when all possible measures for improvement have been made. Nine factors viz., moisture, drainage, depth, texture, base saturation, soluble salts, organic matter, CEC and mineral reserves are rated on a scale 0-100 and the percentages cumulatively multiplied to obtain productivity index (P). In a similar manner the potentiality index (P’’) is calculated after indicting the extent to which productivity can be improved. Co-efficient of improvement is the ratio between P’ and P. Soil with rating index 65-100 are excellent, 35-64 good, 20-34 average, 8-19 poor and below 8 extremely poor. This system of land evaluation has the limitation in that one limiting factors reduces the index of productivity. Also, assigning value to factors should be chosen according to the limitations affecting crop growth within a particular region to obtain a more realistic productivity rating.

Mayalagu _et al._ (1990) assessed the productivity classification for laterite soil tract, Sivagangai taluk, Tamil Nadu. Productivity of Kothakottai and Pattukottai series were good and Padulur and Mudukulam series were excellent. The productivity of these could be raised to 1.61 to 1.74 times. Detailed soil survey conducted at horticultural research station farm, Periakulam by Mayalagu and Paramasivam (1992a) reported that there can be 320,330 and 640 per cent improvement in productivity by scientific management in Palaviduthi, Peirakulam and Irugur series, respectively. The productivity rating of the soils occurring in Srivilliputtur were of grade fair to good (Mayalagu and Paramasivam, 1992b). Mayalagu and Paramasivam (1992c) worked out the productivity rating of the soils occurring in Agricultural Research Station farm, Paramakudi and the productivity was of grade fair. Improvement in production could be made up to 220 and 250 per cent by scientific management in Subramaniapuram and Padugai series respectively.

Natarajan _et al._ (1997) assessed the soil productivity in the delta and coastal land forms of Ramanathapuram district of Tamil Nadu. The potential and actual productivity ratings for field, fodder and tree crops were worked out and the possible improvement measures were suggested.

The productivity classification for salt affected soils of Purna valley, Vidhharba region, Maharashtra was done by Padole and Deshmukh (1998). The soils of Walagon and Hara were grouped under good productivity class. Soil of Khartalegaon, Keliveli, Papura Adsul and Kinkhed fell under poor productivity class. Suresh Kumar and Mura (1999) made productivity rating, for the soils of denuded hills, weathered pediments and valley fills. These were rated as extremely poor to poor in productivity whereas

buried pediment soils had average to good productivity. Sarkar and Sahoo (2000) studied six typical Aquepts occurring in Indo-gangetic plain of Bihar and evaluated their suitability for major crops. Soil site suitability evaluation exposed that these soils were moderately to marginally suitable for cultivation of rice and were marginally suitable for wheat and unsuitable for the cultivation of sugarcane.

The government research farms soils in seven districts of Chattisgarh state were studied. Soils were evaluated for paddy by using parametric approach. The actual crop yields were correlated to identify and establish relationship among soils sub-groups and yields of paddy (Tamgadge et al., 2002). Mandal et al. (2002) studied the cotton growing soils of Nagpur district and mapped according to their suitability classes based on modified Riquier’s criteria developed from farmer’s yield and Riquier’s criteria developed from farmer’s yield and Riquier’s productivity index correlation derived from the attributes of soil information. The Riquier’s parametric index showed high correlation (r = 0.85) whereas Sys method showed poor correlation (r = 0.42) with crop yield indicating that the Riquier’s method was more meaningful when soil survey data are utilized for land evaluation study. The modified criteria based land suitability map depicted that 57.5 per cent of the area was highly suitable, 28.5 per cent of the area was moderately suitable, 5.00 per cent of the area was marginally suitable and 9.0 per cent of the area was unsuitable.

Vadivelu et al. (2004) evaluated the soil of Hingini village in Wardha district, Maharashtra and found five series within the village. Hingini-1 series was not suitable for any of the four crops viz., cotton, pigeonpea, sorghum and banana due to shallow depth, higher slope and severe erosion. Hingini-2 series was marginally suitable for cotton and sorghum and not suitable for pigeonpea and banana due to shallow depth, higher slope and severe erosion. Hingini 3 series was marginally suitable for pigeonpea and banana and moderately suitable for cotton and sorghum due to moderate depth and moderate to severe erosion. The soils of Hingni – 4 and Hingni – 5 series were highly suitable for all the four crops, as they do not have the limitations noticed in other soils. Similar works were reported from Maharashtra by several other workers (Yadav et al., 1994; Wadodkar et al., 1996; Mohekar and Challa, 2000).

**New trends of land suitability evaluation:**

Land evaluation is either qualitative or quantitative in nature. Quantitative evaluation is important for economic surveys. Most of the land evaluations are qualitative in nature based on the expert judgment of soil surveyors and agronomists who interpret their field data to make understandable to planners, engineers, extension officers and farmers. More recently in depth studies of specific soil related constraints (in particular soil fertility, available water, available oxygen, soil workability and degradation hazards such as soil erosion and soil salinization) have all facilitated quantitative simulation of specific land use processes and opened the way for yield prediction. The development of information technology during the last twenty years has enabled researchers to make rapid progress in the analysis of interactions between land resources and land use in quantitative land evaluation based on quantitative land use systems analysis.

**Qualitative to quantitative land evaluation:**

Quantitative economic evaluations, however, require estimates of crop yields, rates of plant growth, or other measures of performance. Quantitative models have been developed for several major crops but these demands reliable data. Such decisions need only qualitative land evaluation even when predictions are based on carefully controlled trials, they may be confounded in practice by variations in management. Therefore, it tries to estimate a range of performance under the likely standards of management (Beek et al., 2000). The Framework for land evaluation (FAO, 1976) is meant particularly for use in the areas with limited availability of basic data and can function at several levels of detail. But most applications are qualitative, matching degrees of limitation of the land with the corresponding requirements of specific kinds of land use, and the overall suitability class.

**Multi-disciplinary land evaluation:**

Some other requirements include both the biophysical requirements and the socio-economic setting. A choice is offered between a two-stage land evaluation procedure where the biophysical analysis is followed by socio-economic analysis (which is preferred by most of the physical scientists) and a parallel procedure that attempts to integrate biophysical and socioeconomic analyses (favoured by social scientists, especially at the farm level). Land suitability analysis and land use planning are important and being considered as a very complex question since it is usually solved by multi-criteria and interdisciplinary approaches. In general, land suitability analysis indicates the influences of physical aspects whereas social-economic and infrastructure database are used and described for maps manipulation in land evaluation and land use planning (Chuong, et al., 2006).
**Land suitability assessment approaches:**

There are several studies round the globe carried out aiming on linking local and scientific knowledge (Kundiri et al., 1997 in Nigeria; Guillet et al., 1996 in Peru and Norton et al., 1998 in New Mexico). Little work has been done in Asia and North Africa. Briggs et al., (1998) studied the choice and management of cultivation sites in Upper Egypt. Recently Zurayk et al., (2001) carried out a participatory land capability classification for suitability and a land use analysis in a semi-arid mountainous village in Lebanon. These efforts were attempted to establish relation between farmers’ perception and expert knowledge. A generalized land use planning approach was adapted and integrated into a prevalent political and administrative system. The issue of planning approaches has become significantly important and examined under seemingly opposed centralized top-down planning and participatory bottom-up planning, influenced by the increasing orientation to local needs and people (Chambers, 1994).

- **Top-down approach**

  When land use planning and land use evaluation are carried with the decision from the state or expert or policy maker and implemented at the bottom level i.e. at farming level, then it is termed as top-down approach. The classic or traditional model of top-down planning places the state as the administrator of the environment, and the state makes all decisions about resource utilization. This makes land use planning an instrument of governmental guidance and control, closely linked to national development plans. Development potentials are assessed for all regions and goals set for all administrative levels, while monitoring is purely an assessment of goal achievement. This approach was particularly widespread in Indonesia in the National Land Agency and Sri Lanka in the Land Use Planning Division (Betke, 1994).

- **Bottom-up Approach**

  The opposite term is bottom-up planning initiated at the local level and involves the active participation by the local community. Main decision of the land use planning is based on the view and information from the level of the growers and later it incorporate in the national plan by policy makers or experts. The aim of the community at village or one level higher is the development of local planning and implementing capacities in natural resource management (Betke, 1994). The experience and knowledge of land users and technical staff are mobilized to select development priorities and to formulate implementation plans. In terms of actors at the local level and responsible administrators, there are a great variety of institutions. Similar approach given in revised frame work for land evaluation (FAO, 2007).

**Land evaluation using GIS:**

GIS is the tool for input, storage and retrieval, manipulation and analysis, and output of spatial data (Marble et al., 1984). GIS is an information system including works and links together with the ability to perform numerous tasks utilizing both spatial and attribute data stored in it (ESRI, 2001). It has the ability to integrate variety of geographic technologies like GPS, Remote Sensing etc. The ultimate aim of GIS is to provide support for spatial decisions making process (Foote and Lynch, 1996).

The powerful query, analysis and integration mechanism of GIS makes it an ideal scientific tool to analyze it for land use planning. Management of agricultural resources based on their potentials and limitations is essential for development of land and other resources on sustainable basis. GIS technology is being increasingly employed by different users to create resource database and to arrive at appropriate solutions/strategies for sustainable development of agricultural resources (Venkataratnam, 2002). GIS techniques are being effectively used in recent times as tools in carrying out the morphometric analysis, which helps in suitability evaluation and management of the land resources (Obi Reddy et al., 2002). The land suitability classifications are determined by overlaying thematic maps and by analyzing attribute data with supporting of GIS which lead to the presentation of results faster and more exactly.

Geographical Information System (GIS) was used to develop farm level action plan keeping survey boundaries as unit of implementation, for Vadakkalur village in Annur block, Avinashi taluk, Coimbatore district, Tamil Nadu covering an area of 1,158 hectares of land. Mapinfo desktop mapper and Excel spreadsheet were used for digitizing village map and for extraction and integration of thematic maps. The action plan indicated alternate land use options with the aim of optimum utilization of soils and ground water resources (Sivasamy et al., 1998). Martin and Saha (1999) made an attempt to evaluate the soils of part of the Dehradun district for suggesting suitable cropping pattern using remote sensing and GIS.

Geographic information system was used to suggest an alternative land use planning based on land capability for Panchal region of Gujarat state (Anjana Dasai and Chandra Subramanian, 1999). Jaishankar (1999) developed Decision Support System (DSS) for village level
planning for Naranapuram village of Coimbatore district. Data inputs included the land use map, geomorphology map, slope map, soil map, socio-economic data, detailed soil survey report of the village, rainfall data etc. A sequence of analytical task was performed using these inputs as the base upon which a decision support system was developed to aid the planners to assist in village level planning.

Kumar et al. (1999) used GIS to assess the soil productivity of West Bengal. Soil of denuded hills, weathered pediments and valley fills were rated as extremely poor to poor in productivity where as buried pediment soils had good productivity. The studies highlighted the spatial modeling and cartographic capabilities of GIS software in generation of productivity map. Kumar et al. (2002) used GIS and false colour composites (FCCs) to evaluate the soil and land resource in Tillari irrigation project for the land capability and irrigation suitability for its sustained use under irrigation. Potential land use map was generated by integration of land capability and land irrigability map. The study showed that 14.66 per cent area had no limitation and can be brought to intensive agriculture by double cropping.

The land suitability analysis has been carried out to identify suitable areas within the University of Peradeniya, Srilanka for a production forest. Climate, slope, soil, topography, vegetation, accessibility were considered as important factors in identifying the suitability. The spatial layers were digitized and incorporated into the GIS environment. Using GIS, suitability map was prepared with three suitability categories namely, suitable, moderately suitable and not suitable. According to the final suitability map, 5.35 ha of land under highly suitable category and 0.65 ha of land under moderately suitable category were identified (Ekanayake and Dayawansa, 2003).

Shekinah et al. (2004) used GIS technology for land capability evaluation in a part of Sahaspur block of Dehradun district, Uttarakhand. The soil series belonged to four major soil orders viz., Entisol, Inceptisol, Alfisol and Mollisol and the major physiographic units of the area are river terraces, hills, mountains, pediments and uplifted terraces. The study area was classified into six major land capability classes (II, III, IV, VI, VII, and VIII). Nearly 85 per cent of the area was found suitable for cultivation and the rest was non-arable. Erosion hazard was the major limiting factor. The land use for physiographic soil units was also suggested for sustainable development, relating with the land capability class. Dadhwal et al. (2006) used index based method for assessing erosion hazards in suarna rao watershed in Dehradun district of Uttarakhand. Average accuracy of erosion hazards mapped by remote sensing data was 85.3% inclusive of all the available land uses in the watershed. Thus the index based method for assessing erosion hazards was found to be satisfactory. It was also observed that problems in assessment with remote sensing data are mainly due to infrared reflectance of prevailing vegetation which masks the effect of other reflectance, while interpreting erosion hazards.

Raghavendra Reddy et al. (2004) characterized the land resources in and around Mohgaon and Degama villages of Hingna tehsil, Nagpur district, Maharashtra using remote sensing and GIS techniques for cotton suitability. GIS based data generation and cotton suitability analysis revealed that soils of Mohgaon – 8 and Mohgaon – 10 are highly suitable; Mohgaon – 5 and Mohgaon – 9 are moderately suitable and Mohgaon – 1, Mohgaon – 2, Mohgaon – 6 and Mohgaon – 7 are marginally suitable.

**Conclusion :**

Land evaluation plays an important role for sustainable land use planning. It involves identification, selection and description of land use types relevant to the area under consideration; mapping and description of the different types of land for the selected land use types. Also it is helpful to predict inherent capacity of a land unit to support a specific land use for long period of time without deterioration in order to minimize the socio economic and environment costs. For precise land evaluation soil resource inventory and GIS play crucial role.

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