

GIS to boost horticultural production

The GIS is a transverse information system that helps the farmers by: instantaneously locating of plots for cultivation, performing of comparative studies of the plots in a specific area, based on their variety, year of planting or condition. All sectors in horticultural enterprise can use GIS technology to share data, increase yields, predict outcomes, and improve business practices. By applying GIS technology, the field operations can be effectively managed, saving resources and efficiently managing the enterprise. The use of interactive maps, developed using GIS tools can prepare information-dense reports which can give a unique perspective to the operations. The powerful analytical capabilities of GIS offer an array of options for visualizing farming conditions, as well as measuring and monitoring the effects of farm management practices and to support management decisions.

GEOGRAPHICAL Information System (GIS) is an integrated system of hardware and software, for data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. The GIS can perform complicated analytical functions and then present the results visually as maps, tables or graphs, allowing decision-makers to virtually see the issues before them and then select the best course of action. The GIS is playing an increasing role in agricultural production throughout the world by helping farmers to manage their land more efficiently. Where, what and when are all related to the spatial phenomenon. By understanding geography and people's relationship to location, an overall idea of environmental, administrative and social set up of an area of interest is generated. A GIS is a technology for comprehending geography and making intelligent decisions. A thematic map has a table of contents that allows the readers to add layers of information to a base map of real-world locations.

GIS IN HORTICULTURE

There is a wide range of applications in various scientific fields. In horticulture, some of the important applications are given below.

- It gives opportunities to increase production by optimising the use of inputs and manage their land more efficiently.
- Agricultural pest control relies on accurate data about the quantity and location of pests or other infestations within a specified area. GIS plays an important role in data collection, interpolation and analysis.
- Using mobile GIS technology, farmers can measure, record, and map field characteristics for such things as vector control, nutrient deficiencies, and water usage during their regular inspections.

- By incorporating GPS into standard farming practices, farmers, researchers, and consultants have been able to improve the precision of existing agronomic management activities by implementing them at precision farming.
- GIS is a familiar tool for those managing water resources for agricultural and conservation purposes.
- GIS softwares are wonderful tools to locate diversity and help in surveys.

Methodology

A good GIS programme is able to process geographic data from a variety of sources and integrates it into a map project. Many countries have an abundance of geographic data for analysis, and governments often make GIS datasets publicly available. Map file databases often come included with GIS packages, can be obtained from both commercial vendors and government agencies. Some data is gathered in the field by global positioning system (GPS) that attach a location coordinate (latitude and longitude) to a feature.

The GIS allows viewing, understanding, questioning, interpreting, and visualizing data in many ways that reveal relationships, patterns, and trends in the form of maps, globes, reports, and charts. It answers questions and solve problems by looking at the data in a way that is quickly understood and easily shared. The GIS technology can be integrated into any enterprise information system framework. The GIS has mainly three views;

Database view: A GIS is a unique kind of database of the world—a geographic database (geo referenced database). It means all the attribute data should be with longitude and latitude and could be plotted in digitized map.

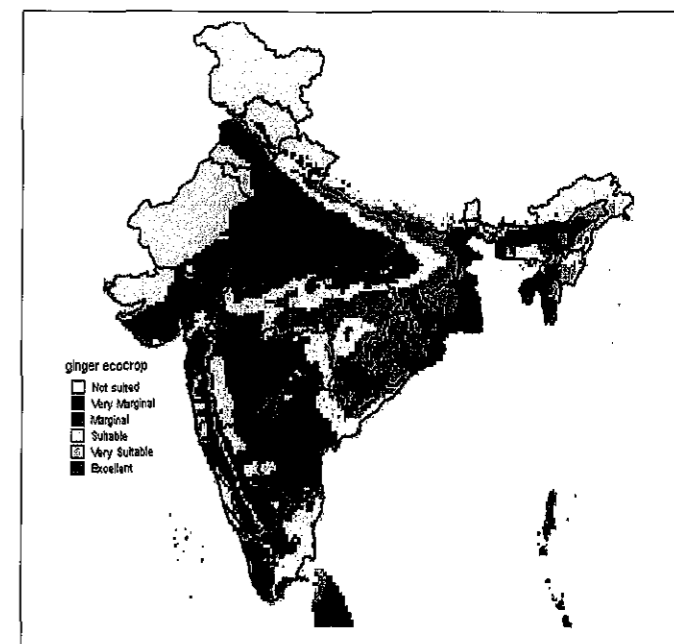
Map view: A GIS is a set of intelligent maps and

other views that show features and feature relationships on the earth's surface. Maps of the underlying geographic information can be constructed and used as "windows into the database" to support queries, analysis, and editing of the information.

Model view: A GIS is a set of information transformation tools that derive new geographic datasets from existing datasets. These geo-processing functions take information from existing datasets, apply analytic functions, and write results into new derived datasets.

Global Positioning System

This GPS technology has provided an indispensable tool for management of agricultural and natural resources. It is a satellite- and ground-based radio navigation and locational system that enables the user to determine very accurate locations on the surface of earth. It is a complex and sophisticated technology. But the recent user interfaces have evolved to become very accessible to the non-technical user. Simple and inexpensive GPS units are available for the non-technical person to manage their jobs.

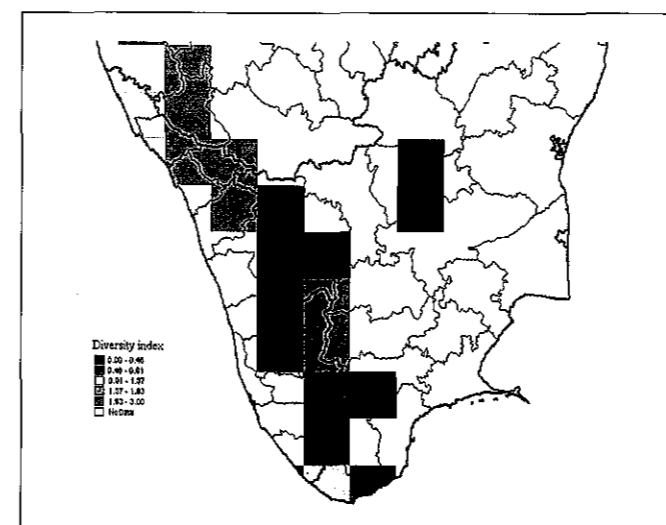


Ginger site suitability map for India

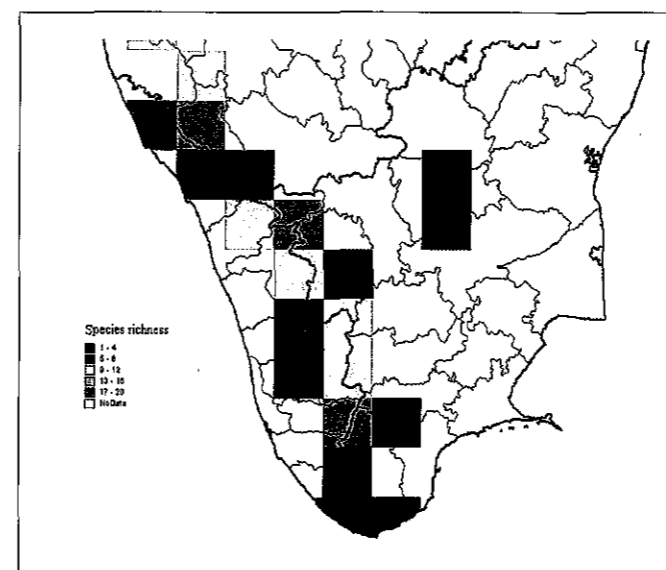
Case studies

The scientist at IISR, Kozhikode, have carried out a lot of studies using GIS. Some of the case studies carried out by the authors which indicate the use of GIS in Horticulture.

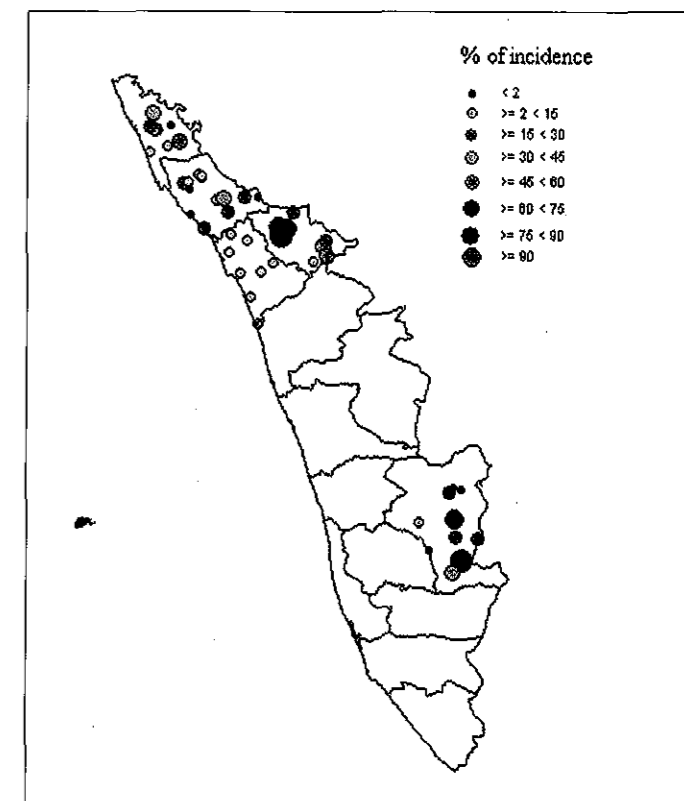
Different types of Cymbidium species are given in different symbols and precipitation range are given in different colour which tell what intensity of rainfall is suitable for what species. At the time of collection survey the longitude and latitude of the place of collection is recorded with the help of GPS. The attribute table prepared in Microsoft Excel software is superimposed on the rainfall



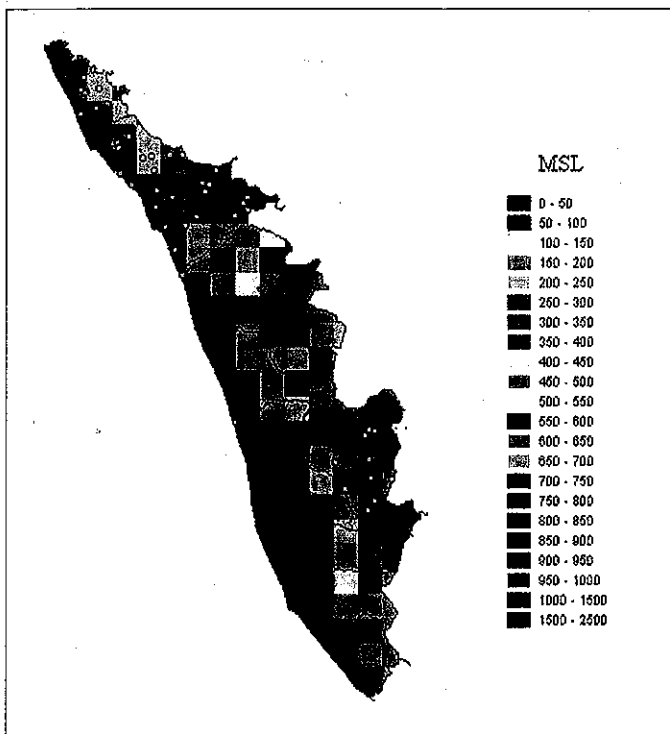
Piper species diversity index



Richness in Piper species Richness



Incidence of stunted disease in black pepper



Incidence of stunted disease with altitude variation in black pepper

map of Sikkim. The map gives a clear idea of collection places, rainfall range of collection site, etc. In this way, temperature grid, altitude grid, seasonal rainfall grid etc can be superimposed and analyze the environmental influence on the species if any.

The map drawn by the Domain model of DIVA GIS, shows diversity index of Piper species and richness at the Western Ghats. The area under high diversity of species are shown by red colour. Diversity is an index that incorporates the number of species in an area and also their relative abundance. Two hot spot areas (red) one in between 75°92'-77°06'E longitude and 10°95'-11°03'N latitude consisting Achankovil, Kulathapuzha, Silent Valley

and Tirunelley of Kerala and Nilgiris of Tamil Nadu. Another is in the extreme south in between 77°02'-77°96'E longitude and 8°12'-8°98'N latitude consisting of Neyyar and Poovanathmodu of Kerala and Brynoore of Kanyakumari and Kodayar, Kariardum, Kanikatty of Tirunelveli district of Tamil Nadu, where 7-8 species are available in the same site. Species richness is the number of different species in a given area. This type of maps is very useful for natural resource management purpose. The hot spot of richness should be protected to control the extinction of the species.

The eco-crop suitability model for ginger indicates the present condition. The study reveals that Odisha, West Bengal, Mizoram, Assam and Kerala are very highly suitable while Gujarat, Rajasthan, Uttar Pradesh and Madhya Pradesh are marginally suitable or unsuitable. North-eastern and south-western states are ideally high suitable for ginger cultivation

Disease prediction for stunted disease in black pepper has explained. The disease survey data of Kerala when plotted in the map gave a clear idea that Wayanad and Idukki districts have very high incidence (70-90%). The GIS study indicates that Wayanad and Idukki have higher altitude than other areas and have comparatively less temperature and rainfall, which are conducive for the multiplication of virus as well as the vectors for stunted disease.

SUMMARY

Geography plays a role in nearly every decision in various scientific fields including agriculture. Selection of sites for cultivation, targeting market segments, planning distribution networks, effect of climate change, outbreak of pests etc. can be addressed involving geographical tools.

For further interaction, please write to:

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