Constructing Digital Information Platform based on WebGIS for Safety Vegetable Production

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Abstract: From the necessity of constructing vegetable safety production management digital information platform, based on the pertinent exploitation about ArcIMS and it’s script, this thesis indicated distributing high quality map by Internet, and building technique supporting database of vegetable safety production. Through the integration of the geographical information, natural information, technical and management information, a platform was constructed, which has the function of data acquisition and manipulate, special service, assisted decision-making, harmony and command. At the same time, the management platform could realize information resource share and the information is refreshed Real-time.

Keywords: WebGIS; ArcIMS; production management digital platform; Vegetable Safety

1 Introduction

In our country, vegetable production has been taking the maximal output as target for a long time. And that the vegetable quality and safety are ignored. Along with the increasing vegetable trade with other country in the world, and improving of life quality, the vegetable quality and safety has become the key factor that influencing international competition of agriculture. The problem of vegetable safety has become momentous problem which relating to the people's health and the national economy and the people's livelihood. Therefore it is necessary to build a perfect technique supporting system, a expedite channel of information, a safe decision-making supporting system of vegetable safety production and management.

Presently a good deal of research about production and management systems construction has been done at home and abroad (1-5). Those systems play an important action in promoting the course of informatization, but inevitably there are some deficiencies. Most of them are the systems which only could settle a single problem such as soil fertilizer management, diagnoses of plant diseases and insect pests, suitability evaluation or disaster forecast analyse, and could not realize the integration of system, technique and function which could settle integrated problems such as production management, assisted decision-making, environment control. Beside, there are some deficiencies in information sharing too.

Mainly direct at problems of vegetable safe production presently, a networking basic frame of vegetable safe production and management digital platform was constructed. Moreover the module design and implementation method are indicated. This platform will provide multi-professional and multitiered services for vegetable production and management. And it will satisfy the requirement that government’s decision-making, macro regulation of the market, producer to know the market sentiment, prevention of plant diseases and insect pests and improving the plant safety factor.

2 Systems Design

2.1 Hardware and software environment

2.1.1 Operating system
After investigating and comparing, Windows Server 2003 was chosen as the servers operating system, and Windows2000 or Windows XP was chosen as the clients operating system.

2.1.2 Software environment
In order to satisfy the need of friendly interface, practical, convenient and shortcut operating, this platform adopts Windows SQL-Server as the database to construct Browse/Server structure. And it is exploited by integration of ArcIMS, Hypertext Preprocessor (PHP) and Active Server Page (Asp) technology.

2.2 Systems target
The platform makes use of the GIS technology, DBMS technology and Internet technology, adopts B/S structure, takes spatial variability of soil nutrition, relational technology and method as the subjects. With the utilization of various means and methods of geographical information science and computer...
science to memory, update, manage, query, analyse and simulate the geographical information, and to implement the construction of vegetable safety production and management digital platform. In virtue of the predominance of WebGIS which has mass storage, taking full advantage of spacial data and attribute date to manage the vegetable safe production information alternately, and to realize a networking work mode.

2.3 Collective design

Firstly organized the soil special data, did spatial variability analysis and spatial overlay analysis, formed new date set by combining with statistical analysis of attribute data. And then organized and designed the site in ArcIMS environment, compiled a friendly user interface. Afterwards connected the sites that have been constructed using PHP, Asp or Dreamweaver. At last, user will get the query result by referring SQL query qualification or normal HTML(6).

2.4 Detailed design

Four function modules were designed in all. The Function structure diagram is like Fig.1.

2.4.1 Thematic map module:

Thematic maps of the test region such as agrotype, surface texture, soil profile construct, topography and geomorphology are provided in this module. Besides, the produce character is involved in the attribute date too. Users could inquire about the attribute data and spacial data. Combing with the spacial information, users could more intuitively and pertinently to query the idiographic information such as distributing status quo of the soil nutrient, spatial variability, vegetable planting, etc. Function of WebGIS could really realize the networking management, decrease workload of maintenance, and improve the work efficiency.

2.4.2 Producing technique supporting module

According to the mode of “vegetable species—specific vegetable—technique supporting”, it is intended to give a comprehensive introduction of the five aspects including vegetable variety, cultivation techniques, diseases, insect pests, and nutrition. And it is rich in content, and convenient in querying.

![Function structure diagram of the platform](attachment:image.png)
2.4.3 Quality control module
Primary content includes the latest information of vegetable safety problem at home and abroad, domestic and foreign trade policy, rule of law, quality standard of food safety; some practical, easily understood special technology. Explanation of the hot spots, leave word online, and the special administrative area of download constitute a interactive information platform for farmers to study advanced technology.

2.4.4 Statistical analysis module
This mostly includes thematic date statistical analysis and Geostatistical Analyst. Thematic date statistical analysis is to analyse the numerical type date. Geostatistical Analyst mainly to research the spatial variability of geographic information.

3 Platform Realization
3.1 Basic date organization
Database construction mainly includes the organization of geographic date and attribute date. Geographic date mainly includes current land utilization map, district map, soil map, physiognomy map, soil profile construct and texture map, distributing map of total nitrogen, distributing map of organic matter, land standard diagrams and etc. In order to convenient for web publication, the .shp file format was chosen. Simultaneously did spatial overlay analysis in ArcInfo.

3.1.2 Kriging analysis
Did the Kriging analysis of soil available N, Phosphorous, Potassium by utilizing the 212 samples of Shouguang county in August 2004. According to the stated standard, compared the parameter of different models. And at last maps of soil nutrients were drawn by using Ordinary Kriging (7).

3.2 Map distribution
3.2.1 Thematic map distribution
Firstly, 8 web map projects were organized by the Author. There are district map, traffic map, soil map, physiognomy map, soil profile construct and texture map, distributing map of total nitrogen, distributing map of organic matter, land standard diagrams and map of Yangkou town. Secondly, using Administrator established 8 ImageServers which are correspond to the 8 projects respectively, and that could respond to the client request. Lastly, to distribute map with Designer. HTML Viewer and Java Viewer are the two means of map distribution that are provided by ArcIMS (8). We chosen the HTML Viewer, because it is not need to download the Tomcat and SDK program, and belong to Thin Client. Users could browse map nothing more than inputing the address, and that is suitable for department to make decision.

3.2.2 Map of the soil nutrients distribution
By the new function of ArcMapServer, the .mxd files could be published immediately. And that the ArcIMS will inherit the abundant symbol system, annotation, linear reference in ArcMap and the abundant date sources supported by ArcMap. Therefor a high quality map was distributed in Internet. Furthermore it is not needful to organize project with the Author, and just need to build server with the .mxd files immediately. Lastly published the map with Designer. HTML Viewer was chosen too, because it is more steadily and convenient for customization exploitation than Java Viewer. Besides, classified statistical maps of Yangkou town were published

3.2.3 hyperlink
There are many large-scale production bases of vegetable in Shouguang county, distributing in the villages and towns. The hyperlink adoption will implement the mode of managing all the production bases as a whole. Furthermore, as required, it is easy to link with the multimedia, setting the display of sub-class. But as a result of default setting of ArcIMS, it is needed to modify the ArcIMS param.js when published map.

4 Conclusion
The digital platform of vegetable safety production and management which is based on WebGIS and B/S structure, contained diverse graphics and attribute date of soil, nutrient, soil profile construct, diseases and insect pests, balanced fertilization, safety production, etc, and provided many tools such as
Geostatistical Analyst, search-orientation and so on. Various Internet service (for example document, table and picture files) could be provided at user’s request. Pertinently exploitation has been down to ArcIMS and it’s scripts, including user interface customization of web publishing, the pop-up query result window, shielding invalid field, hyperlink technology and realization of classification and statistical of the numerical attribute date. After tested at Shouguang county and other area, it is proved that this platform could fulfill the networking management and application, improve work efficiency, reduce expense of maintenance, and it is worth to be used widely.

References