Designing and Developing the Agricultural Information Management System of North Korea

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Abstract

In North Korea, there has been the considerable loss of human lives every year due to the deficiency of foods. Thus, in order to reduce such damages, a research project should be launched to provide various information for cooperation with North Korean government, and to develop proper agricultural management system. Furthermore, based on the water resources information map generated by KOWACO (Korea Water Resources Corporation) and the environmental information system developed by MOE (Ministry of Environment), an agricultural information infrastructure of North Korea and a management system need to be effectively performed. Therefore, this research is mainly to develop the Agricultural Information Management System of North Korea (NKAIMS), which can collect, manage and analyze agricultural information and water resources utilization status of North Korea, and further support to make relevant decisions and establish the agricultural land-use plans. This research has three phases. The major outcome of the first phase is collecting the agricultural and water resources utilization data such as soils, rivers, streams, collective farms, etc., designing and building database, and developing integrated management system considering the users' requirements. The main work of the second phase is improving and reinforcing database such as adding the information of dams, land-over data, bridges, tunnels, satellite images, etc., inspecting and renewing such as importing detail attribute information of reservoirs, and improving system for more conveniently using. The third phase will be to supplement more useful functions such as statistic analysis, continually inspecting and improving database, and developing web-based system. The product of this research supports collecting and analyzing relevant data to facilitate easier agricultural activities and support effective decision making for food production in the preparation of unification. Moreover, through designing database considering sharing information and system expendability, it can support systematic data usability of agricultural information and save cost for data management.

Keywords: agricultural information, water resources

1. Introduction

1.1 Agricultural Information

In North Korea, there has been considerable loss of human lives every year due to the deficiency of foods. The reasons of inducing this grievous issue include many aspects, such as fickle weather, natural disasters and so on, but the most important one is the lack of awareness, utilization and management of agricultural information.

Agricultural information is one category of information about agricultural facilities (dams, reservoirs, etc.), resources (soils, croplands, etc.), environments (transportations, streams, rivers, etc.), cropping conditions (temperature, humidity, rainfall, etc.) and many other descriptions of the agriculture such as developing plans, harvest status, supports of governments and relevant organizations, etc.

This kind of information plays a very important role in our agricultural lives. It gives us various informational and equipment aids, accelerates and regulates our agricultural productions, and then provides people more abundant foods and materials.

1.2 AIMS and NKAIMS

However, these benefits cannot directly and automatically visit us. We need use our knowledge, experiences and technologies to effectively obtain, manage, analyze and utilize them, derive the useful and advantageous information, reduce and ameliorate the effects from the adverse and endangered information.

With the rapid progress of computer science and other related technologies, more and more people have been aware of a large profit if integrating these modern and high-effective technologies into our agricultural production. GIS is just such a useful tool because it has an outstanding ability to collect, manage and analyze spatial information, especially on a developed application system.

And recently KOWACO (Korea Water Resources Corporation) generated the water resources information map in 2003, and MOE (Ministry of Environment) developed the environment information system, so one requirement of using these and other useful information to develop an applied agricultural information system (AIMS) for North Korea region is coming urgently.

Therefore, in this paper, a "GIS-Agriculture" research is presented, in order to develop the Agricultural Information Management System of North Korea (NKAIMS), which can collect, display and manage the large numbers of agriculture information about North Korea, and then provide query and analysis operations and support making decisions for developing North Korean agricultural infrastructure by KORICO (Korea Refractory Industry Cooperative) and for other relevant organizations.

2. Research Contents

2.1 Data Preparation

As we know, the data used in one GIS

application system can be normally classified to two types: graphic data and attribute data. The graphic data of this research mainly has 2 parts (fig. 1):

Type	Contents		Configuration
Graphic	Basic Maps	Digital Topographic Map	Polyline(VPF)
		District Map	Polygon
	Thematic Maps	Road Map	Polyline
		Soil Map	Polygon
		Land-over Map	Polygon
		River Map	Polyline
		Stream Map	Polyline
		Reservoir Map	Polygon
		DEM	Raster
		Satellite image	Raster (Tiff)
		......	......
Attribute	Weather		Text (Table)
	Population		
	Agricultural Facilities		
	Land-use Status		
	......		

fig. 1. Graphic Data and Attribute Data

1) Basic maps

● Digital topographic maps: two kinds of scales (1:50,000, 1:25,000), VPF format, and polyline-type entities.

● District maps: polygon-type entities, and covering whole North Korea (1특별시, 2 직할시, 9도, 170 군, 146 읍, 3,382 리, 717 동, 208 노동자구, totally 123,623 km2).

2) Thematic maps

● Vector maps: drainage area, road, river, stream, soil, land-over, reservoir, etc.

● Raster maps: DEM (generated from the digital elevation map, DTED format), Satellite image.

The attribute data of this research is mainly composed of agricultural and water resources information by the text format, such as weather, population, agricultural facilities, land-use status, etc.

2.2 Database Construction

Database construction is the key step of a whole GIS application system development. It can help us to conveniently and effectively manage and use data

In this research, the database is built by three steps (fig. 2):

1) Graphic database construction;

2) Attribute database construction;
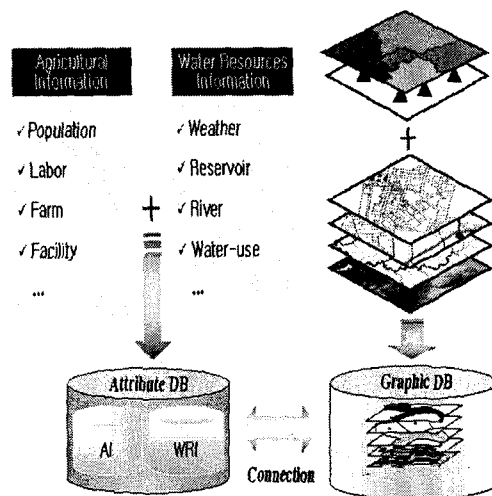
3) Connection between graphic DB and attribute DB.

fig. 2. Database Construction

2.3 System Development

2.3.1 User Requirements Analysis

Analyzing user requirements before designing and developing an application system is very necessary and important, because it can make the whole development more user-oriented, and then the final products can gain our anticipative ends.

So in this research, the user requirements analysis is mainly concentrated on 2 sides:

1) User-oriented consideration:

● Convenient data conversion and share in different local governments and organizations;

● Facile operation and management;

● Economy.

2) Technological consideration:

● Security;

● Availability;

● Connected and combined to other relevant information management systems.

fig. 3. System Framework

2.3.2 System Design

Considering the user requirements that have been mentioned before, in this research the NKAIMS is designed to include 4 main sub-

systems (fig. 3):

1) Data inspection system

● Graphic data inspection;

● Attribute data inspection.

2) Graphic query system

3) Attribute query system

4) Statistical analysis system

● By district;

● By drainage area;

● Tendency analysis.

2.3.2 System Development

As we know, ESRI provides plentiful techniques and methods for spatial information, such as collection, processing, conversion, management, etc. Besides, ESRI also provides some mapping software components that let us develop GIS application systems, such as Mapobjects (MO), Arcobjects (AO), etc.
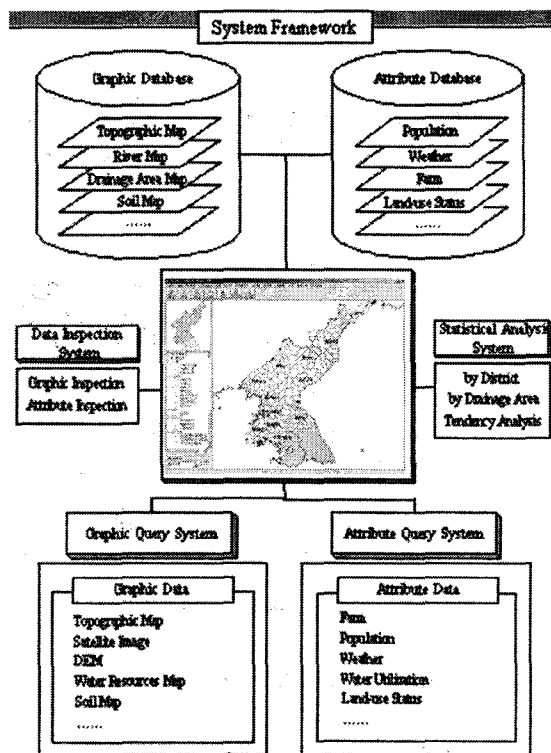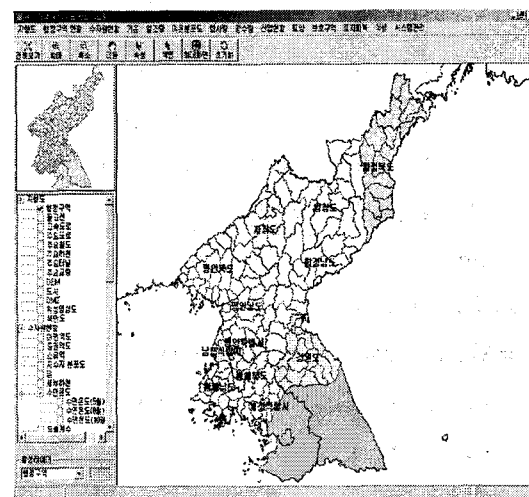

fig.4. Initial Interface of NKAIMS

Therefore, in this research, we use MO, Visual Basic, and other programming tools (ADO, ODBC, etc.) to develop NKAIMS (fig.

4 shows the initial interface of NKAIMS, fig. 5 shows the display and overlay abilities of graphic maps, fig.6 shows the attribute query ability).
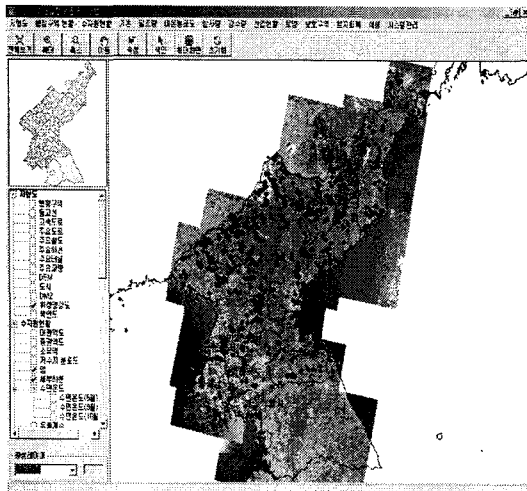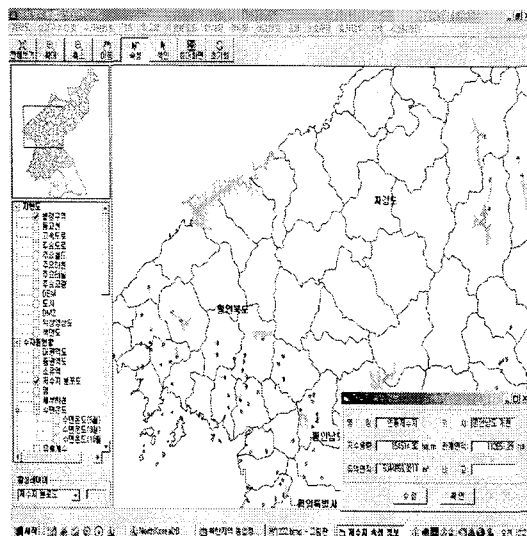

fig.5. Display and Overlay of Graphic Maps

fig.6. Attribute Query (Reservoir)

3. Conclusions

In this research, we have mainly performed a designand development work, in order to build an available and effective agricultural information management system of North Korea, and support relevant governments to plan and develop North Korean agriculture more orderly, scientifically and systematically. The product of this research, NKAIMS, integrates data collection, graphic and attribute query, statistical analysis, and other spatial analysis functions, and uses multiple data source and processing methods to display, query and analyze North Korean agricultural and water resources information. So NKAIMS will be a very useful tool for North Korean agricultural production.

However, there are still several insufficiencies in our research, which are needed to improve and reinforce in future.

On one hand, either agricultural information or water resources information is very huge and includes a mass of contents or embranchments, so we need constantly mine and gather useful information to renew and supplement. On the other hand, we also need continually append and improve the function modules, and provide more and more useful tools to the users.

Moreover, we are now planning to combine and integrate many modern technologies to reinforce our research, such as using Internet-GIS technology to realize more extensive corporations and shares.

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