

DESIGN AND COMPILATION OF AGRICULTURAL ELECTRONIC ATLAS AT COUNTY-LEVEL

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ABSTRACT: With the rapid development and application of new techniques, cartography has entered the 21st century's digital period from computer-assist mapping in the 1970s, traditional map representation has transformed from 2-D, mono-medium, static into 3-D, multi-media, dynamic and network (including internet), and gradually is developing towards 4-D (time, space). There appeared digital map, electronic map, soft map, hard map, interactive map, mingle map etc. Agricultural map needs to include much more contents in 3-D, multi-media than other types of map. Only electronic map can represent completely these contents. Compiling agricultural electronic atlas at county-level aims to reflect scientifically China's modernization agriculture development level, the new achievements of agricultural science and technology. Agricultural electronic atlas at county-level should take "sustainable development" as the theme; systematically reflect the natural resources and natural environment in a county; the spatial and temporal distribution and changing law of agricultural resources (including climate, soil and water). In the paper the authors introduce the concrete contents of agricultural electronic atlas, their compilation process, and corresponding software and hardware as well as an example. In agricultural electronic atlas design the most advanced multi-media techniques must be used. The procedure of agricultural electronic atlas includes the study on compilation aim, content selection analysis, overall framework and data organization, determining compilation program. Agriculture includes many contents; each county has its own emphasis. In designing we set up a county's theme according to its concrete situation, the atlas contents are selected around the theme. For example, the main problems faced by the agriculture of Da'an City in Jilin Province is land desertification, so land desertification and its control are the theme of agricultural electronic atlas of Da'an City. When we compile other county's agricultural electronic atlas, only changing theme contents, can we get another county's agricultural electronic atlas.

KEY WORDS: agricultural electronic map at county-level; design of electronic map; compilation of electronic map; agricultural electronic atlas

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1 INTRODUCTION

With the rapid development and application of new techniques such as computer, cartography has entered the 21st century's digital period from computer-assist mapping in the 1970s, traditional map representation

has transformed from 2-D, mono-medium, static into 3-D, multi-media, dynamic and network (including internet), and gradually is developing towards 4-D (time, space)(TAYLOX, 1997).

Map's concept has been fully expanded, thus there appeared digital map, electronic map, soft map, hard

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map, interactive map, mingle map etc. (BAI, 2000).

Agricultural map needs to include much more contents in 3-D, multi-media, than other types of map. Only electronic map can represent completely these contents. Design of agricultural electronic map aims to show agricultural phenomena dynamically, to observe the agricultural results with different methods and from different angles, to demonstrate the process of agricultural phenomena evolution with time, to invent the future development patterns. China has a vast territory, a large population and various land types. A county is the basic unit of agricultural production (There are more than 2000 county-level administration units in China) (ZHAO, 1992). Within a county range, natural conditions are generally similar, taking a county, as the unit to compiling agricultural electronic atlas is favorable for agricultural production management.

Compiling agricultural electronic atlas at county-level aims to reflect scientifically China's modernization agriculture development level, the new achievements of agricultural science and technology in vivid, audio-visual map language; to accumulate complete data to serve agricultural production; to provide agricultural policy-maker with the theoretical basis and technological guarantee of exploiting, utilizing and protecting natural resources in line with local conditions, rational arranging agricultural allocation and formulating production planning.

2 DESIGN OF AGRICULTURAL ELECTRONIC ATLAS AT COUNTY-LEVEL

The compilation of agricultural electronic atlas at county-level should stress three elements of agricultural production — soil, water and fertilizer; emphatically represent developing agricultural measures and research achievements. In order to meet the requirement of agricultural workers, the atlas should use excellent picture and texts, can represent practical data and information with multi-statistical diagrams and tables. The atlas should have dynamic, interactive and mingle functions; and convenient inquiry and retrieval functions; and each sheep should have digital memory, and transmit through computer network and Internet and WWW net, so as to arrive

joint share of resources to the largest limit. Fig. 1 The content of agricultural electron atlas (counties).

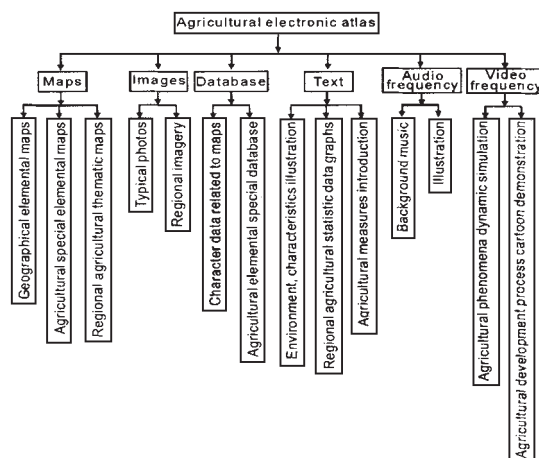


Fig. 1 The content of agricultural electron atlas (counties)

2.1 Content Design

At first, when we design atlas contents, we must make them practical, and consider the storage capacity, the storage capacity of atlas contents don't be more than 650MB the better. Agricultural electronic atlas at county-level should take "sustainable development" as the theme; systematically reflect the natural resources, natural environment in a county, the spatial and temporal distribution, and changing law of agricultural resources (including climate, soil and water) and their mutual linkage and restriction, and the present situation of exploitation, utilization and sustainability. The concrete contents include the following aspects:

- 1) Natural elements: water system, soil, topography and landform, climate.
- 2) Social elements: settlement, roads and administration boundary.
- 3) Special elements: agricultural natural division, agricultural limit temperature, precipitation and evaporation, agricultural meteorological disasters, soil nutrient potential analysis, agricultural energy, water resources, land resources, soil types and quality, etc.
- 4) Agricultural production conditions and level: present situation of land use, water conservancy irrigation engineering, agricultural production structure, various crops sowing area, unit area yield, commodity ratio, land production ratio, labor production ratio, a-

gricultural output value of unit area farmland, animal husbandry, etc.

5) Agricultural measures: benefit proportion of high effective agriculture, transformation of saline-alkaline land and sandy land, water-saving irrigation network, stereo breeding, agricultural natural disaster analysis, forecast and preventing measures, etc. (ZHOU, 1989).

2.2 Representation Method

In agricultural electronic atlas design we should use the most advanced multi-media techniques, for example using satellite images, illustration, dynamic simulating, using high-quality practical images, file attached text for expounding the event content and cause and results in detail, using audio frequency file and sweet background music and language to simulate the process of event occurrence and future trend dynamically, to arouse users' visual, hearing and mental capacity fully (WANG, 1998; 1999).

The design of agricultural electronic atlas at county-level should stress color adjustment, 5 – 8 types of color in a sheet is the better, white and light gray background can get the better result. The color of dynamic design in a sheet should not use much more, bright color is not suitable, and one tone and different saturation of this tune are suitable. 3-D model design should select right observation height, angle and proportion, simulate the observation effect of different time at different time-phase through changing and color, use images and pictures to show the fine features that can not be shown in maps, using sweet music and beautiful illustration, increase information volume, strengthen impression of human to map, using text shows more detailed data and other contents, individual map suit to apply conventional map representation method, obey map standardization. In order to have a clear show color contrast must be strong, each map should have related database (LI, 1998; ZHANG, 1998).

2.3 Interface Design

The interface of agricultural electronic atlas of

county-level is suitable to apply tree structure, including 3 levels. The first level is the main interface, which provides the path to enter any module, at the same time; any module can return here, it is at the root of the structure diagram. The second level is the basic interface; it is conventional form of any module, reflecting the fundamental functions of every module. All module functions don't need the same functions, map show module must possess such basic functions as page up and down, return, enlarge, reduce and roam, for controlling present window and articulate other windows. The third level is medium material interface, it provides relevant detail description, should randomly hit (XIA, 1999; WANG, 1998).

The interface design should apply icon based on practical situation.

Interactive form should apply keyboard response form, mouse response form, and touch response form and phonetic response form.

3 COMPILATION OF AGRICULTURAL ELECTRONIC ATLAS AT COUNTY-LEVEL

The procedure (flow chart) of agricultural electronic atlas includes the study on compilation aim, content selection analysis, overall framework and data organization, determining compilation program, as shown as Fig. 2.

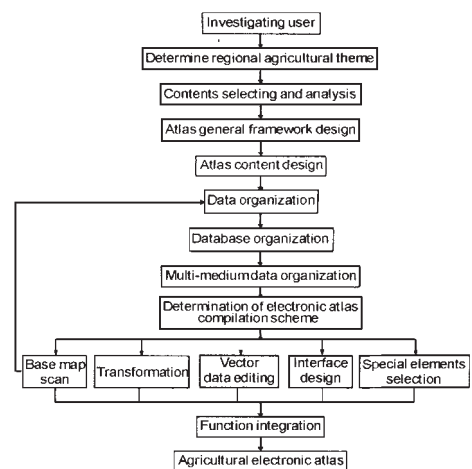


Fig. 2 The making flow chat of agricultural electron atlas (counties)

The compilation process of agricultural electronic

atlas is as follows:

- 1) The determination of atlas theme: to determine atlas theme according to a county's characteristics.
- 2) Design of atlas contents: to select sheets around atlas theme.
- 3) Materials collection: to collect relevant materials around atlas theme.
- 4) Base map scanning, vector: to establish basic data-base.
- 5) Compilation of individual sheets.
- 6) Making titles and end: making title and end of atlas is the important part of the making process of agricultural electronic atlas at county-level. The making effect (result) directly influence the overall quality, the title and end should apply audio frequency and video frequency editing system, make the most strong functions of multi-media, do the best to (strive to) be rich and colorful intensify attraction.
- 7) Main interface design: to design index icon of individual special sheet, and cancel system icon; the main interface is the interface that users select functions, must design the index icon, should change between different function conveniently.

8) Main map setting-up and correlation: the main map is the particular sheet that open a map group to autonomously install, it is a map group introduction, at the same time it includes some important sheet index.

9) Management and main sheets: in a sheet open a map level, then relevant contents can be added on it. There are three forms of dotted, string and surface. They are correlated with the corresponding special maps or typical demonstration areas map respectively. One map level can include multiple secondary map levels, which include different contents.

10) Data-base setting-up and connection: data-base include audio frequency, video frequency, text, when compiling sheets set up corresponding data-base, both of them should articulate and have interactive functions(GUO, 1995).

4 AN EXAMPLE OF AGRICULTURAL ELECTRONIC ATLAS AT COUNTY-LEVEL

Agriculture includes many contents; each county has its own emphasis. In designing we set up a county's theme according to its concrete situation, the

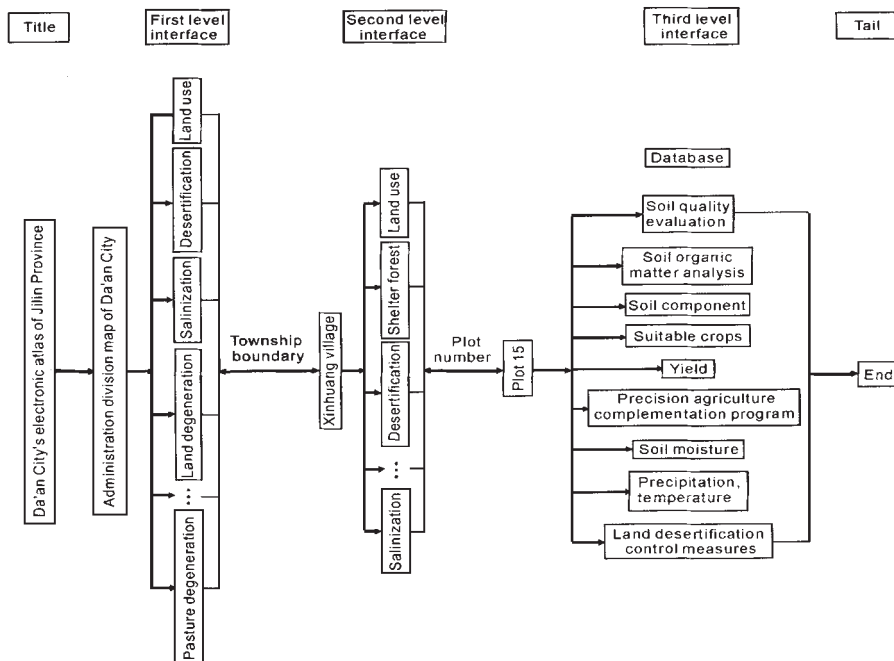


Fig. 3 The content of agricultural electron atlas of Da'an City in Jilin Province (part)

atlas contents are selected around the theme. The main problems faced by the agriculture of Da'an City in Jilin Province is land desertification. The control of desertification is the prerequisite of developing agriculture, so land desertification and its control are the theme of agricultural electronic atlas of Da'an City. Around this theme we designed and compiled the contents about land desertification of such as land desertification, land salinization and pasture degeneration, stressed the land desertification control and precision agriculture program (the practical contents of agricultural electronic atlas of Da'an City are shown in Fig. 3).

The compilation of agricultural electronic atlas of county-level must obey certain principle. When we design and compile the overall framework, we must make it have adaptability and comprehensiveness. When we compile other county's agricultural electronic atlas, only changing theme contents, can we get another county's agricultural electronic atlas? For example, if we want to compile the agricultural electronic atlas of other counties in Jilin province, we only exchange corresponding special elements and database under the overall framework of electronic atlas of Da'an City.

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