Intelligent and Integrated Agricultural Information Service Platform for the Rural Training and Technological Extension

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ABSTRACT: With the spread of Internet in the rural areas and its upgrade of bandwidth, the way of providing information services to farmers has been changing fundamentally. This paper reports the structural design, main functions, innovative characteristics of an Intelligent and Integrated Agricultural Information Service Platform, and its current situation and possible prospect of enhancing its application in the rural areas. This paper mainly focuses on the integrated application of information network transmission technology and website management technology, information integration and sharing technology, information customization services and intelligent push technology. In this paper, the principal and practicality of all-in-one touch-screen computer as the agricultural information service terminal are introduced.

KEY WORDS: Agricultural information service, farmer, information push

INTRODUCTION

There are many advantages, such as low cost, high efficiency and high speed, in making the best of information network technology, computer technology and multimedia production technology, to provide real-time information services and transmit modern practical agricultural knowledge and technology for the farmers in remote rural areas. It is no exaggeration to say that the extension of new agricultural technology can verily improve the level of farmers’ production technology, and promote the development of agricultural productivity.

Currently, myriad villages the farmers live in have been connected to the broadband network; however, not every household has access to the information network, and it is by no means tantamount to the fact that farmers are connected to the world of information, when the network has been brought to villages. The world of information is literally vast as the ocean, even if farmers can surf the net, how can they effectively get the information needed most? A couple of issues, such as popularization of computers in farmers’ family, internet fees and computer use, will remain difficult to solve in the short term. Consequently, farmers urgently need simple information products and information services with lost cost. The most important thing is to have an information terminal that could be used by all farmers to replace the complex computer operations, information search and information access.

We can solve these problems by combining the information technology resources, information
network channels and information service terminal to create an integrated information service platform that could be used by the majority of farmers. Through technology integration and innovation, Jiangsu Academy of Agricultural Sciences in China has successfully developed the rural information service management system and all-in-one touch-screen computer by integrating access to the Internet, information services, distance education, telephone counseling, video interaction and other technical features, to provide convenient, fast and practical information services to farmers. At the same time, the application of computer touch screen technology realizes the intelligent operation, and farmers can browse the network information, flip through electronic newspapers, technical books, and request thousands of kinds of distance education courseware, only through a touch with no need to use the keyboard and mouse. This all-in-one touch-screen computer greatly saves the cost of rural information services, solves the difficulty in door-to-door rural information services, and directly pushes science and technology to farmers. [1]

RESULTS

1 Structural design of integrated agricultural information service platform

The integrated rural information service platform uses the SQL Server design and management database on the Windows Server system platform, uses the ASP.NET technology to conduct web application development on the Visual Studio development platform, and uses C# to write code that runs in the background. As for the page design, Ajax page-without-refresh technology is used. Meanwhile, the platform also uses component-based technology, Flex, FMS and other key technologies.

The topology model in Fig. 1 Agricultural information service from Experts to Farmers by Communication in Fig. 1. The entire platform consists of Experts to Farmers by Communication final sites. The management center integrates some functions, such as information push, resource management and remote terminal maintenance. The system implements one-stop management from the
provincial management center to rural information terminal. The terminal only retains the information output function, that is, you can browse, read and query information, but not edit, modify and write information.

The all-in-one touch-screen computer is the terminal of information services, and also a sub-website of rural information service system. The formation of the sub-website pages, setting of information column, and updates, maintenance and push of daily information are all automatically generated by the information platform software system or operated by the central administrator. Sub-website does not undertake the task of information maintenance. This management model solves the problems of lack of rural grass-roots IT personnel and high costs of website construction and maintenance.

![Diagram](image.png)

**Fig. 2 Agriculture information center for rural service**

Information management system has powerful function of system management. Via the broadband network, the management center, interconnected with various sub-websites (namely rural information service terminal), pushes public service information and local information from the community (village) to all terminal devices of all-in-one touch-screen computers simultaneously. It can realize the data support and centralized management of the foreground application systems, releasing information outside and transmitting information inside. The management system integrates the functions of information push, resource management and remote terminal maintenance.

All data interfaces all levels of information release system, information content and operating authority of the terminal machine, are subject to the management and control of the system

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management center. The administrators can remotely examine the real-time operation of any one terminal and carry out remote maintenance of the terminal. Through collecting the statistics concerning click-through rate of all kinds of information, we conduct a comprehensive analysis of the attention to the column and information and assess the information use effect, to provide the basis for adjustment, updates and services of the information resources.

**1.2 Rural information service sub-site**

In rural communities (villages) or agricultural enterprises, the all-in-one touch-screen computers for information services are installed as the terminals of information services, and websites are established for the terminals, respectively, as the sub-sites of integrated information service platform. Its webpage is automatically generated by the information management center, and the column content is also customized by the platform management center based on the actual needs of local agricultural production in the site. Logically, the all-in-one touch-screen computer is a personalized sub-site of integrated rural information platform. Although they share a database system and background management system, the content of information services can be tailored to local specialties.

Via the broadband network, the management center is interconnected with the terminal device of the all-in-one touch-screen computer, to implement integrated management and control, responsible for pushing various kinds of information to each service terminal, including public service information and local information from the community (village). In addition to the all-in-one terminal computer, other ordinary computers can also have access to integrated rural information service platform.

**1.3 Information service terminal: all-in-one touch-screen computer for rural information services**

(i) Service object: village-oriented, serving farmers, solving difficulties in having access to the Internet and information.

(ii) Key technologies: intelligent push technology, self-organizing network technology, wireless networking technology, touch-screen technology.

(iii) Innovative features: no mouse, no keyboard, having access to information only by finger touch.

The design and production of the all-in-one touch-screen computer for rural information services.
services combine the computer technology and electronic sensor technology. It includes two types: vertical double-screen setting (touch screen + display screen) and single-screen setting (Fig. 3). The display screen is mainly used for playing the video of agricultural courseware or TV programs. To reduce the cost of the machine, we can adopt the single-screen design (touch screen).

The all-in-one touch-screen computer for rural information services integrates the multimedia features of network information browsing, video playing and distance video interaction. By the camera, we can instantaneously chat with the remote experts through distance video, without using a keyboard, a mouse; a finger touch can realize surfing the net, browsing information, reading e-newspapers and scientific and technical books, and requesting thousands of kinds of practical distance education courseware. The terminal machine offers rich content, visual information and easy operation. The villagers touch the screen with a finger, and one touch can instantaneously bring up kinds of needed information. For the farmers having never used a computer, they can also conduct operation to have access to information according to the operation instructions on the terminal screen.

All information in the all-in-one touch-screen computer is invoked from the information resources and databases of the provincial rural information service center via the Internet. The information content is customized by the information service platform management centers to push to each all-in-one touch-screen computer. The all-in-one touch-screen computer for information services itself does not need to conduct complex information production and management.

2 Main functions of integrated agricultural information service platform

2.1 The function of information services

Based on the hot issues concerning agricultural production, it aims to provide information services focusing on technology, market, agricultural management, rural policy, rural culture and rural health care to the rural grass-roots cadres, technicians, agricultural enterprises and farmers, including public information, hot issues, agricultural situation report and village affair information.

Information push technology is a new information communication technology, which describes a style of Internet-based communication where the request for a given transaction is initiated by the publisher or central server. It is contrasted with pull, where the request for the transmission of information is initiated by the receiver or client. A client "subscribes" to various information "channels" provided by a server; whenever new content is available on one of those channels, the server pushes that information out to the client. [2]

Information push technology has changed the way of information access on the Internet, from the users’ search for information to the users' receipt of information purposefully. This customized, simplified, integrated, classified and pushed information service way is very suitable for the current situation of rural areas and characteristics of farmers.

2.2 The function of distance education
The function of steaming video-on-demand is provided through the central management platform. We can optionally play multimedia courseware online for on-the-spot watching and learning new agricultural technologies and new knowledge after setting the multimedia video programs of agricultural science and technology. The agricultural technology training can be achieved on the video, even if the experts do not go to countryside and farmers do not come into the city.

In accordance with the regional agricultural characteristics and needs for developing industrialization of agriculture, the agricultural experts employ advanced digital technology, to produce new varieties and new practical technologies that need to be applied and promoted in production into the multimedia television programs integrating video, audio, pictures and text. The content should be rich to meet the needs of farmers. In terms of the form, it has to be vivid and easy-to-understand so that the farmers love to see, hear and understand at a glance. At the same time, it should technically measure up to standard of streaming media, and can be used for Internet transmission and playing. [3]

2.3 The function of distance diagnosis (video interaction)

The all-in-one touch-screen computer can help the farmers and experts to realize face-to-face online video interaction. By the office computers, agricultural experts can realize direct information consultation dialogue with the farmers in the front of the all-in-one touch-screen computers in far-off rural areas, to solve problems for farmers in real time, such as helping farmers to correctly identify pests and diseases, and diagnosing the obstacles to crop production. Due to the urban-rural distance between agricultural experts and farmers, obviously, merely relying on traditional activities of bringing science and technology to the countryside can not solve the farmers' special needs. Information technology and networks develop by leaps and bounds, which makes the distance diagnosis possible. Agricultural distance diagnosis is based on the rich practical information of central information service platform and database, and real-time live services of experts. By the video camera installed in each terminal device of all-in-one touch-screen computer, the distance diagnosis uses the network and information management center to establish information transmission channels, thus we can make online face-to-face conversation with the experts and conduct technical advisory activities in the appointment time. By the point-to-multipoint communication with several terminals, we can simultaneously realize videoconference and interaction. We can also use the multimedia classrooms in the community (village) to interconnect with the studio of information management center, and carry out real-time activities of expert lectures.
3 The protection of agricultural information resources

3.1 Information resources as the core of rural information services

The building of agricultural digital information resource center aims to meet the diverse needs of agriculture, rural areas and farmers for agricultural information. The content will cover many aspects on agricultural production and rural life, including new varieties of plants and animals, practical agricultural technology, modern and efficient agriculture, new rural construction, digital library of farmers, rural community development, pests and diseases picture identification and query, and distance education video libraries. The database technology is used for the management and maintenance of a variety of information resources. The database built should be oriented toward technology, production, market, management and other different areas, with scientificity, practicability and accuracy. The whole system takes the database server group in the form of distributed storage as the center, which is updated and maintained by the central platform.
3.2 The collection and processing of information resources

According to the local farmers' production type and industry needs, it is necessary to develop information resources construction plan, and collect various kinds of practical agricultural information with clear aim, to produce it into standardized agricultural technology database, such as resource library of new varieties of crops, resource library of practical agricultural technology, resource library of modern high-efficiency agriculture, resource library of rural development, digital library of farmers, picture library of main agricultural pests and diseases, and multimedia video database of distance agricultural education.

It is necessary to focus on the following aspects as the content of collection: technology information, market information, agricultural natural resource information, agricultural product information and rural socio-economic information. There is also a need to establish a uniform data standard, to achieve the functions of database building, information dissemination, metadata management and unified multi-database search. For the collected text, images, video, audio and other information resources, they should be processed into digital information and metadata, to be stored in the central server and released on the network platform. \[4\]

Each information service station needs to be equipped with an information administrator who masters computer use and routine maintenance, responsible for collecting the local information, uploading it to the information management center, and providing technical guidance and help.
for the farmers to use the all-in-one touch-screen computer. The management center should carry out concentrated technology training and solve the problems at any time for the information administrator.

3.3 Update of information resources

Information resource library needs to be constantly updated. The professionals are responsible for the production, combination, integration, and extension; the normal knowledge-based database can be relatively stable, so the update cycle can be longer. It is necessary to timely update and release the dynamic information, such as technical information related to the production season, agricultural price related to the market, weather information, and the information of major agricultural disasters and epidemic forecasting information. We can receive real-time data and information regularly from the agricultural technology extension center, wholesale markets of agricultural products, supermarkets of agricultural production materials, government information network and other data interfaces. Then we should gather the data and information to the agricultural information service management center, and selectively push various kinds of information to the information service terminals of the villages, according to the production characteristics and needs of rural service stations in different regions. All service stations are required to have a full-time information administrator to collect and collate the information on local products, the information on village affairs, and the information on local production and operation activities, which will be timely submitted to the information service center, and released by the management personnel in the information platform center. [5]

4 Technological vanguard nature and application prospects of the integrated agricultural information service platform

The integrated agricultural information service platform is an information service platform for farmers, consisting of the intelligent network-based rural information management system software, and the novel all-in-one touch-screen computer for rural information services. It has been widely welcomed by farmers in China, and the government also pays attention to it. It is being widely promoted and applied, with rosy prospects.

By 2012, there had been 2 800 rural technical service stations in the rural areas of Jiangsu Province, equipped with all-in-one touch-screen computer for rural information services. Jiangsu Province will extend the computer to the province’s 16 000 villages in two years. Jiangsu Academy of Agricultural Sciences is responsible for provincial technical services, and Agricultural Information Center of the Committee on Agriculture of Jiangsu Province is in charge of the extension and management. All funds are supported by the provincial government finance.

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