

# **BRIDGING THE DIGITAL DIVIDE CREATING DIGITAL DIVIDEND – THE INVESTIGATION IN GUIZHOU PROVINCE AND THE ANALYSIS OF GZNW**

*Linbo Jing*

*Institute of Finance and Trade Economics, CASS*

*Email: [jinglinbo@sina.com](mailto:jinglinbo@sina.com)*

## **ABSTRACT**

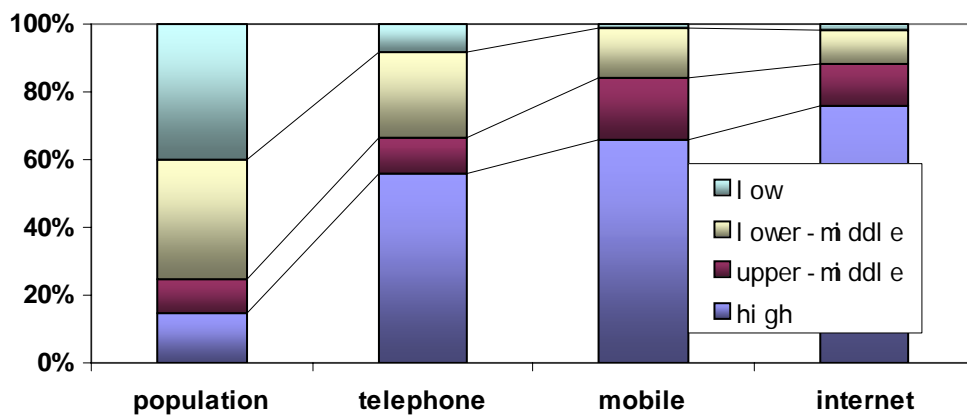
*This article begins with attention to the digital divide. It gives a brief overview of the digital divide on a global basis and analyzes specific aspects of the digital divide in our country. It also introduces the informationization construction of Guizhou Province and points out problems with the digital divide in that province. Then it focuses on the practice of Guizhou Province to bridge the digital divide --- the practice and experience of GZNW. The final section gives a series of policy recommendations on how to bridge the digital divide, realize digital dividends, and how to build a new socialist countryside.*

**Keywords:** Digital divide, Digital dividend, ICT, Rural networks

## **1 CONCERNING THE DIGITAL DIVIDE**

We should not ignore the digital divide (Morrisett, 2000) existing between developing and developed countries. In accordance with the usual understanding, the digital divide refers to the failure to share information and advanced knowledge because of the differences in the capabilities of collecting and processing information and in the application levels of the network technology. This information gap, information asymmetry, and knowledge block will inevitably lead to the polarization of the rich and the poor. The digital divide exists not only among different countries, but also within different regions of a country, within industries, and even among different groups of an organization (Jing, 2001). Its presence and expansion will exacerbate the gap between rich and poor around the world, thereby endangering the prospects for global prosperity. Now the expanding digital divide is becoming mankind's new gap between rich and poor in the information age. In China, the digital divide has become another gap along with the worker-peasant gap, urban-rural gap, and the gap between mental work and physical work and is becoming more and more obvious under the influence of the other three gaps. Specifically, the digital divide in our country has three aspects.

First is the digital divide between China and the world. The statistics of the World Bank show that the global high-income countries account for around 15% of the world population but have about 80% of the world's computers, almost 90% of the Internet users, and on average, the number of computers per capita in high-income countries is 40 times large as that in sub-Saharan African countries (World Bank, 2002). ICT levels in various types of income countries are as shown in Figure 1.



**Figure 1.** ICT levels in various countries in the world according to income

Compared to the rest of the world, China has become a digital poverty country. Hu Angang from the Chinese Academy of Sciences calculated the development gap between China and developed countries, which showed the following two aspects: the economic development gap and the gap between knowledge and information. The latter was very significant. In comparison to the G7 group of rich countries, there was a difference of 32-90 times in numbers of computers per capita and a difference of 143-1761 times in the Internet penetration rate in 1997. It is obvious that the economic gap is relatively small, while the digital divide is surprising (Beijing Youth, 2000). In Table 1, we have outlined the ICT level in China and other countries. Except for the number of TV sets per thousand people, which is greater than the world average, all other indicators are below the weighted average of the world. Even when compared with lower-middle-income countries, China lags behind in number of personal computers and Internet penetration. If compared with the United States, the ratios of computer numbers and Internet penetration are respectively 1:42 and 1:3507, and the gap in the Internet penetration rate is much larger than what Hu Angang calculated in 1997. The question is often discussed whether the digital divide in Internet penetration and applications trends is widening.

**Table 1.** ICT levels in China and various countries in the world according to income (World Bank, 2002)

	Newspapers	Radio Sets	Television Sets		Fax	PC	Internet
	Copies per thousand persons 1996	Numbers per thousand persons 1999	Numbers per thousand persons 1999	Cable television subscribers in one thousandth 1999	Numbers per thousand persons 1999	Numbers per thousand persons 1999	Numbers per ten thousand persons July,2000
<b>The World</b>		420w	268w	58.5w	12.3w	68.4w	152.47w
<b>China</b>		334	292	47.2	1.6	12.2	0.69
<b>Low-income countries</b>		157	85		0.4	4.4	0.48
<b>Middle-income countries</b>		360	279	44.5	2.0	27.1	13.20

<b>Lower-middle-income countries</b>		322	273	41.4	1.5	17.7	3.55
<b>Upper-middle-income countries</b>	89	498	304	50.2	3.8	60.9	48.45
<b>Low-income and middle-income countries</b>		264	193	32.8	1.3	16.6	7.15
<b>East Asia and the Pacific</b>		302	252	46.8	1.5	17.0	3.98
<b>Europe and Central Asia</b>	102	446	370	49.9	1.5	39.3	24.10
<b>Latin America and the Caribbean</b>	71	419	272	29.6	3.1	37.7	29.62
<b>Middle East and North Africa</b>	33	272	175			25.4	0.67
<b>South Asia</b>		113	71	36.3	0.3	3.2	0.31
<b>Sub-Saharan Africa</b>	12	201	43			8.4	3.10
<b>High-income countries</b>	286	1,289	693	160.4	73.0	345.9	981.74
<b>EU</b>	208	821	582	101.6	47.9	234.9	263.37

Source: World Bank, "World Development Indicators 2001," p. 308, China Financial and Economic Press, May, 2002

Note: w indicates the weighted average.

Considering China's large population base, the average is often lower when calculated. The State Statistics Bureau in 2000 conducted an assessment of China's information capacity. "Information capacity here is the national integrated capabilities of the production, the development and use of information products." It covers the use of information technology and information equipment capacity, the quality of the population, industrial inputs, and R & D funding. The rankings are shown in Table 2 .

**Table 2.** The total index ranks and scores of the information capacity of some countries in the world (State Statistics Bureau, 2002)

<b>Rank</b>	<b>Country</b>	<b>Score</b>	<b>Rank</b>	<b>Country</b>	<b>Score</b>
1	United States	71.76	15	Poland	21.57
2	Japan	69.97	16	Mexico	17.43
3	Australia	65.59	17	South Africa	17.11
4	Canada	59.40	18	Brazil	15.34
5	Singapore	57.07	19	Romania	12.92
6	Holland	54.06	20	Turkey	12.71
7	United Kingdom	53.45	21	the Philippines	11.54
8	Germany	53.25	22	Egypt	10.64
9	New Zealand	52.32	23	Indian	9.28
10	France	49.26	24	Indonesia	8.46

11	Korea	40.23	25	Thailand	8.34
12	Italy	34.71	26	Sri Lanka	8.19
13	Spain	33.75	27	China	6.17
14	Russia	26.21	28	Pakistan	5.28

Source: “the comparison of the national information capacity”, the State Statistics Bureau, 2000

China's ranking is higher than only Pakistan, in the penultimate place of the 28 assessed countries. Such results may be surprising, but this is the real situation of our ICT development level.

The second digital divide is among domestic regions of our country. The eastern region has a certain degree of development, while the central and western regions have largely become digital extreme poverty areas. The eastern region takes the lead in Internet penetration level; it is 1.97 times much as the national average. The central and western regions have levels of 0.45 and 0.32 times respectively. For the number of domain names per ten thousand people, the eastern region has eight times as many as the central and western regions. In Beijing, Shanghai, Guangdong, Zhejiang, and Fujian, the number of domain names per ten thousand people is 4.6 times large as the national average, while the level of per capita GDP is 1.9 times as high as the national average. This shows that the regional gap in the development of networks is significantly higher than the gap in the level of economic development.

As of June 30, 2005, China had 103 million Internet users, 45.6 million computer hosts, and a total of 677,500 websites. The international bandwidth had reached 82,617 M. Looking through previous surveys, we can see that the geographic distribution of websites shows a similar situation to that of domain names: large gaps also exist and remain unchanged in Internet applications and services. Today, websites in north, east, and south China account for 86.9% of the total domestic websites, compared to 11.1% in north-east, south-west, and north-west. See Figure 2.

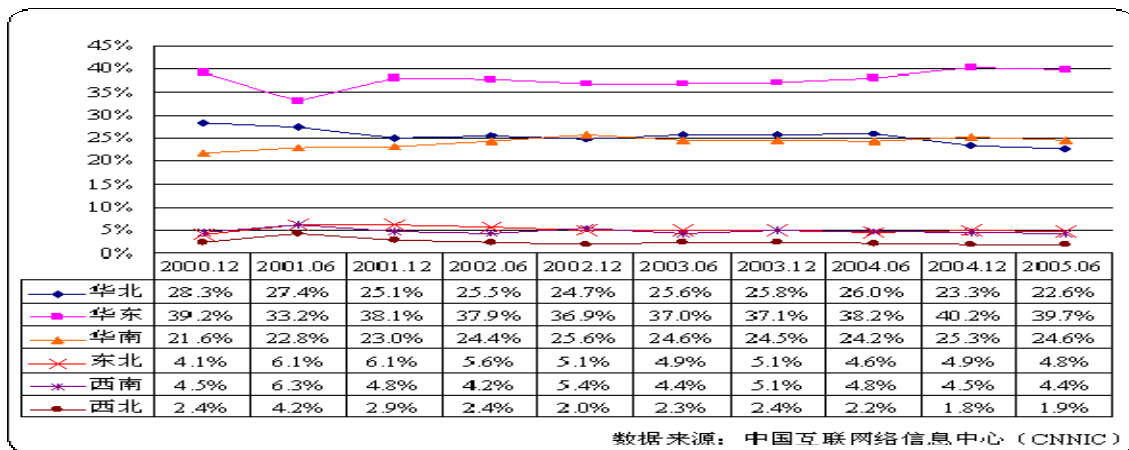


Figure 2. Geographical distribution of websites in previous surveys

The third digital divide is urban-rural. From the comparison, it can be concluded that rural areas have become digital marginalized areas. In China, the growth of Internet penetration and application has taken place mainly in urban areas. Agricultural, forestry, animal husbandry, agricultural sidelines, fishery, and water conservancy workers account for 0.76% of total Internet users; only 0.3% of the users are farmers, and the urban penetration rate is 740 times larger than the rural. This also reflects that the opportunity to access public information services is grossly unequal for urban and rural residents.

Since the reform and opening up, China's post and telecommunication services have achieved rapid development. From 1979 to 2002, the annual growth rate of the volume of post and telecommunication services was 25.3%, significantly higher than the corresponding GDP growth rate (9.4%) and the tertiary industrial growth rate (8.0%). Up until the end of 2003, there had been a total of 532 million telecommunications users, the largest user community in the world. The telephone penetration rate had reached 42 per hundred, two years ahead of schedule reaching the "10th Five-Year Plan" telephone penetration goals (a national telephone penetration rate of over 40%). The telephone penetration rate in our country was equivalent to the levels in middle-income countries in the world, including the urban telephone penetration rate, which had become close to or reached the level of developed countries. This was not, however, commensurate with the fact that we were still far from the rural communication universal service goals (over 95% administrative villages with access to telephones) in the "10th Five-Year Plan." By the end of 2003, administrative villages that had access to telephones throughout the country accounted for 89.2%, in comparison with the 10.8% of villages that had none. It was estimated that in the nearly 700,000 administrative villages of China there were 74,800 administrative villages that had no access to a telephone. In addition to the urban-rural gap in telecommunication development, the amount of development was also uneven in rural areas; the proportion of villages with no access to telephones in the eastern region was only 1.03%; in the central region it was 7.44%; while in the western region it was as high as 25.31%. These rural areas are the blank areas of universal communication services, in which the more economically backward the area, the further the universal communication services lagged behind.

## **2 GUIZHOU PROVINCE: INFORMATION DEVELOPMENT AND DIGITAL DIVIDE ISSUES**

### **2.1 The development situation in Guizhou Province**

During the "Ninth Five-Year Plan" period, Guizhou Province launched the "Guizhou Province CAD (computer-aided design) applications project" in 10 key industries and achieved great performances at the beginning: in 24 normal application enterprises the average efficiency in product design increased 92%; the average cycle of the product design and manufacturing was reduced by 65%; product design quality was significantly enhanced; output value increased by 1.04 billion yuan; taxes and profits increased by 140 million yuan; and costs were reduced by 115 million yuan. At the same time, 24 CAD normal application engineering enterprises were regarded as "national CAD normal application engineering enterprises" by the Department of Science and Technology. "The manufacture informatization in Guizhou Province whipped up huge waves" (Guizhou Daily, 2002).

During the "Tenth Five-Year Plan" period, the focus of Guizhou Province manufacturing informatization projects is to choose industries which not only have a certain base but also have a great impact on the economic development of the province, such as mechanical, chemical, medicine, and light industries. Then they would continue to deepen the application of CAD technology, focus on promotion and application of integrated manufacturing technology represented by CIMS and ERP management systems, and choose enterprises with better foundations and conditions as models. This would establish 10-15 key normal provincial application enterprises with integrated manufacturing technology represented by CIMS, first individually and then gradually popularizing the work. At the same time, Guizhou has prepared to establish a provincial technology center of CIMS application engineering in order to provide technical support and services to comprehensively upgrade

manufacturing informatization and transform traditional industries. In the implementation of the manufacturing informatization project, Guizhou Province emphasizes and does well in combining three areas: the manufacturing informatization project must be implemented with a combination of industrial structural adjustment and upgrading, with an enhancement of the ability of enterprises to innovate and develop new products, and with lowered production costs and increasing market competitiveness (Information Center of Guizhou Province, 2005).

To move informationization forward in the province, in 2002, the Guizhou Provincial Economic and Trade Commission, the Office of Science and Technology, and the Office of the Information Industry jointly selected 20 enterprises as manufacturing informatization models, focused on the machine, chemical, and pharmaceutical industries, which had strong industrial bases, deepened the applications and popularization of CAD and CAM, focused on the comprehensive promotion and application of the integrated manufacturing technology represented by CIMS within the domestic province, and provided technical support and services to promote manufacturing informationization and transform and upgrade traditional industries (Guizhou Provincial Economic and Trade Commission, 2003).

By 2004, key enterprises had developed 31 kinds of new products and realized an industrial output value of 1.73 billion yuan, taxes of 150 million yuan, and profits of 120 million yuan. The Guizhou Province manufacturing informatization project focused on the combination of technical innovation and enhancement of the market competitiveness of enterprises. Presently, the province has set up six training bases and four training centers of manufacture informatization (Yi, 2005).

## **2.2 Guizhou Province and digital divide issues**

(1) The overall development status of the Internet in Guizhou Province and differences from other western provinces:

Guizhou Province has 980,000 Internet users, 460,000 computer hosts, 1902 names registered in the CN domain, and 2,712 websites. Compared to other western provinces in the project of developing the western regions, we find that Guizhou Province has lagged far behind in the population of Internet users, computer hosts, names registered in the CN domain, and websites.

**Table 3.** A comparison of Internet development in Guizhou Province and other western provinces in the project of developing the western regions (Jing, 2005)

	<b>Internet users (ten thousand)</b>	<b>Computer hosts (ten thousand)</b>	<b>CN. domain name (excluding EDU)</b>	<b>Website (including websites registered in .CN .COM .NET .ORG)</b>
Guizhou	98	46	1902	2712
Sichuan	523	243	8665	12892
Chongqin	181	74	4600	8125
Shaanxi	258	101	5348	5575
Yunnan	206	71	4568	4490
Guangxi	285	88	3613	7921
Gansu	120	44	1592	2566
Ningxia	31	14	1394	1212
Qinghai	20	8	524	463
Inner Mongolia	93	42	2094	2587
Xinjiang	119	50	2206	2272

Tibet	7	3	748	2153
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Source: Jing Linbo, adapted from the statistics of China Internet Network Information Center, December 2005

(2) Agriculture, rural areas, and farmers far from the Internet:

Among Internet users in Guizhou Province, the majority of people who have home access to the Internet (excluding college students living on campus) are male students, unmarried, aged under 18, with a high school (or secondary technical training institute) educational level, monthly income below 500 yuan, and working in education. Most users actually spent 100 yuan and below in using the Internet per month, and on average, were on the Internet 4.2 days, and 13.8 hours per week, with the peak time being at night. They own, on average, 1.2 E-mail accounts per capita, including 1.1 free accounts, and receive 4.5 e-mails per week (excluding junk mail), 10.1 junk mails, and send 3.6 e-mails per week. Their main purposes are for leisure and entertainment.

(3) The relation between information and outside work:

Lack of non-agricultural skills and the insecurity of labor remuneration are the problems faced by farmers in finding jobs elsewhere. According to the survey, more than half of the farmers say the lack of non-agricultural skills has a great impact on their finding jobs elsewhere; when asked what the greatest difficulties in finding jobs are, 52.10% of farmers chose "lack of non-agricultural vocational skills" and 18.49% chose "lack of information and difficulty in finding jobs." After finding work through efforts, the farmer workers, of course, are hoping to gain remuneration, but the results of the survey show that 47.06% of workers are worried about not being paid. When asked how well they understand the labor law, which deals with their rights and interests, only 2.52% of the people say "very well," 58.82% only "know somewhat," and 38.66% of the farmers do not know at all (Survey Team, 2004).

In most rural areas of Guizhou Province, especially in poor areas, there are no formal agencies providing employment services, so the migrant workers have no link with the labor market and cannot get timely information about employment. Most are linked with enterprises by friends or relatives and some even blindly look for jobs in cities. Among the migrant farmer-workers surveyed, only 6.9% were employed by units directly, 44.83% were through acquaintances, and 48.28% by themselves. This not only increases the farmers' costs for being employed, but also provides an opportunity for illegal employment agencies and hurts the interests of the working farmers.

As for the relationship between labor training and income, when the per capita net income is below 500 yuan, the proportion of trained labor is 2.27% and untrained is 97.73%; when the per capita net income is more than 4,000 yuan, the proportion of trained labor is 12.37%, increasing by 10.1% compared to that when the per capita income is below 500 yuan. Conversely, the proportion of workers that are not trained is 87.63%, dropping by 10.1 percentage points. In other words, with the proportion of trained labor improving, income is also rising. In recent years, in Guizhou, the educational level of the rural labor force has increased, but compared with other provinces, it is still rather low. Among the Guizhou rural labor force in 2002, illiterate and semi-literate workers accounted for 19.67%, just below Tibet, Qinghai; the proportion with primary school education was 39.42%, just below Chongqing, Yunnan, Tibet, and Xinjiang; workers with high school education accounted for 3.66%, higher than only Tibet. In 2003, the share of the rural workforce with primary school education and below declined slightly; the share of the rural workforce with a junior high school level and above increased slightly, but the former was still more than half of the workforce. As for labor training, because of the absence of sound rural labor force training institutions, training fees and other factors, many of the workers are not trained. In

2003, of 6,258 laborers, only 4.19% were trained, and over the years the level has remained the same, without any improvement (Survey Team, 2004). Various characteristics of Internet users in Guizhou are shown in Box 1.

<b>Box 1: Characteristics of the Internet users of Guizhou Province,</b>	
<b>Educational level</b>	The largest group have received high-school (or secondary technical training institute) education, the co-respondent ratio is 37.4%; the next group is 2-3 year college educated users, accounting for 32.5%; university educated users account for 16.5%; users with education level below high-school (or secondary technical training institute) account for 12.6%; 0.9% of the users hold a master's degree and 0.1% hold a doctoral degree.
<b>Industrial distribution (excluding army men, students and the jobless)</b>	Users who work in education make up the largest proportion (15.7%); the second largest group is users who work in public management and social organizations (11.8%); users who work in manufacturing (9.4%); users who work in IT (8.7%); users who work in transport and storage (7.9%); users who work in wholesale and retail (7.1%); users who work in health, social security and welfare (6.3%); users who work in financial institutions (3.9%); users who work in production and supply of electricity, gas and water (3.3%); users who work in community services (2.9%); users who work in water conservancy (2.7%); users who work in culture and arts and in consultant services (2.4%); users who work in real estate (2.3%); users who work in catering service (2.2%); and users who work in other sectors only account for an insignificant portion of all users.
<b>Occupational distribution</b>	Students make up the largest proportion of users (28.2%); the second largest group is specialized technicians; the following group is the (10.0%); school teachers (9.6%); managers in enterprises and non-profit organizations (9.1%); users who work in business and service industry (8.6%); users who work in government agencies, party-organizations (6.8%); 6.6% users work as assistants, and operators of producing and transport equipment (2.9%). Users with all other occupations only account for an insignificant portion of all users.
Source: the Statistics of China Internet Network Information Center, July 2005	

### **3 BRIDGING THE DIGITAL DIVIDE – EMPIRICAL ANALYSIS OF GZMW**

#### **3.1 The simple recall of the establishment and development of GZMW (2005)**

On April 17, 2000, the Office of the CPC Guizhou Provincial Committee and the Office of the Guizhou Provincial People's government issued the document of "the proposal of doing well in agriculture and rural work 2000" (SBF, 2000) which pointed out: " based on existing technology and equipment of the weather system throughout the province, accounting to the information provided by the functional departments of the government, from top to down, build the rural economic information network of our province, provide timely information about policy prices, supply and demand, weather and others to farmers, and make networks an important tool of guiding farmers to modulate the industrial structure for the government."



On June 12, 2000, the governors held a meeting in the provincial government office and decided to form a joint leadership and coordination of the work of the GZNW construction. They requested them to accomplish the first construction tasks before August 18, when the national township enterprises cooperation and trade fairs between the East and the West would be held. On July 27, 2000, Huang Yao, deputy secretary of the provincial committee, examined the building of GZNW and inspected the agricultural science and technology, investment introduction, price information and other columns. Huang Yao pointed out: "To realize the change from traditional to modern agriculture, we must take full advantage of modern information technology, use information as the decision-making basis of production and guidance. At the same time, we should emphasize that the collection of information should be standardized, quick and accurate. Because rural markets vary, all areas should utilize network technology sufficiently, extend the GZNW to the town and township and provide good service to farmers and the countryside."

On August 17, 2000, the provincial government issued the document of "The notice of implementation suggestion on setting up the rural comprehensive network of economic information of our province, issued by the provincial Meteorological Bureau, the provincial Agricultural Office and the provincial Department of Finance, transmitted by the General Office of the provincial government" (QFBF [2000]No.77), which mentioned the specific requirements about the organization, security measures, focus of work, and overall objectives of GZNW.

On August 18, 2000, GZNW was formally put into operation. During August 18th-23rd, it appeared on the "the National township enterprises cooperation and trade Fairs between the East and the West 2000" and was publicized online in over 300 cooperation projects related to agriculture throughout Guizhou province. At the same time, it was located on the site of the fair to provide real-time information dissemination and consultant services for the fair, gained the approval of the General Assembly committee and the relevant units, and achieved satisfactory service results. On October 23, 2000, the provincial Establishment Office issued the document of "The reply of setting up the rural comprehensive economic information center of Guizhou Province" (SBBF [2000] No.48) to approve the establishment of the rural comprehensive economic information center of Guizhou Province.

On November 8, 2000, the first session of the joint meeting on the rural comprehensive network of economic information of Guizhou Province was held. On January 27, 2001, the provincial government held a board meeting and ceremony for the provincial center of GZNW. From December 1, 2002 to November 30, 2003, "The first exhibition on the network displayed by Guizhou Province for its famous, special superior and new farming products" was held jointly on GZNW, the Chinanews and the provincial government web site in both Chinese and English versions, and introduced Guizhou farming related enterprises and produce to the international market. On April 27, 2003, the News Broadcasting on CCTV-1 reported on the work GZNW did to help farmers increase their income. In 2004, GZNW was recognized as "the most popular website in the Internet users" in the national network system of farmers' prosperity. On August 13, 2004, "the friendship reception and concert in celebration of the 4th anniversary of GZNW" was a success. The famous Chinese violin virtuoso Sheng Zhongguo, and Seta's Yuko, a famous Japanese musician, were invited to put on performances for the 200 representatives present, and they were invited to be art consultants for GZNW. On September 8, 2004, a conference about "promoting standardized work patterns of the county and township management mechanisms" was held successfully, and it played an advanced typical and normal role in the establishment of the promotion of standardized work patterns and management of the county and township management mechanisms of GZNW.

In 2005, the provincial committee and the provincial government enlisted "building another 370 GZNW information service sites, etc" as a major goal.

### 3.2 The home page of GZNW



Figure 3. The home page of GZNW

### 3.3 The main practices of GZNW

#### 1. The construction of a close-knit system of the organizational security:

GZNW has established a joint meeting system to lead and coordinate the construction of the rural comprehensive information network and examine and approve the important affairs of the network. Its convener is the vice governor; the Provincial Planning Commission, Economic and Trade Commission, Agricultural Office, Agricultural Department, Forestry Department, Water Conservancy Department, Trade Cooperation Department, Civil Affairs Department, Finance Department, Investment Introduction Bureau, Township Enterprise Bureau, Crops Bureau, Meteorological Bureau, Administration Bureau of Price, Tobacco Bureau, Agricultural Machinery Bureau, Bureau of Statistics, Administration Bureau for Industry and Commerce, Supply and Marketing Cooperative, Material Corporation, Academy of Agricultural Science, etc are the members (Province Bureaus, 2000); later on, the Provincial Information Industry Department, Communication Administration Department, Broadcasting and Television Bureau joined (Conference No. 128,2000, 2000). An office subordinated to the joint meeting is in charge of the daily administrative affairs of the network. It is located in the provincial meteorological bureau. People in charge of the provincial meteorological bureau serve as directors; one vice director is the vice director of the provincial agricultural office and the other is the vice director of the provincial agriculture department. At the same time, in the states, municipalities, and regional offices, the corresponding leading and operational management agencies of GZNW have been established to

work on construction planning for GZNW, organize the construction of the information system based on actual conditions, and strengthen the two-way feedback of information and services.



Figure 4. Organization structural chart of GZNW

2. The creation of six databases and five service systems:

GZNW has completed the preliminary construction of six databases: agricultural policies and regulations, practical agricultural technology, agricultural experts, Guizhou dynamic market information of farming products, Guizhou meteorological disasters, and Guizhou agriculture-related enterprise resources databases. At the same time, five service systems have been established: agricultural produce market analysis and forecasting release, agricultural diseases and pests intelligent search, experts online, electronic governing, and e-mail systems.

3. The establishment of information quality assessment measures:

To enhance the quality of GZNW information products, standardize collection and dissemination of information and objectively assess the quality of information in order to better serve agriculture, rural areas and farmers, the rural comprehensive center of economic information of Guizhou Province in 2001 formulated the "GZNW prefectural level information quality assessment measures." The rural comprehensive center of economic information at the provincial level publicizes the examination results of the previous month throughout the province on every 10th of the month in the information quality assessment column of the work space in GZNW. Detailed columns and appraisal criteria are as follows:

Table 4. The information quality assessment measures of GZNW

Area	Number required to be rounded off	Points	Standard
Price information	50pieces × D × S	100	One piece more add 0.01 point, one piece less discount 0.01 point
Supply and demand	8 pieces × S	100	One piece more add 1 point, one

information (including replies)			piece less discount 1 point
Investment introduction (including replies)	4 pieces $\times$ S	100	One piece more add 2 point, one piece less discount 2 point
Agricultural science and technology	8 pieces $\times$ S	100	One piece more add 1 point, one piece less discount 1 point
Industry guidance	2 pieces $\times$ S	100	One piece more add 5 point, one piece less discount 5 point
Experts' advice	8 pieces $\times$ S	100	One piece more add 1 point, one piece less discount 1 point
Current affairs on agriculture	8 pieces $\times$ S	100	One piece more add 1 point, one piece less discount 1 point
Market survey and forecast	1 piece $\times$ S	100	One piece more add 5 point, one piece less discount 5 point
The window of corporations	1 piece $\times$ S	100	One piece more add 10 point, one piece less discount 10 point

Notes: D represents days, S represents the number of counties, computed by the number of operational county centers in the region that month. Source: the documents of the rural comprehensive economic information center of Guizhou Province, August 20, 2001

For example, the rural comprehensive network of economic information of Anshun City has spread across 83 towns in the city, creates economic benefits of 50 million yuan, and has become an important information platform for enriching farmers. Within the four years since the rural sub-centre of economic information of Anshun City has been set up, it has invested a total of 2.4 million yuan and has built a three-level network, including one prefectural branch information center, five county service centers, and 83 town and township service stations. Besides providing cities, counties, and townships with more than 40 types of *the decision-making services for rural economical information* and more than 10 types of *special decision-making services*, the networks have collected and issued over 300 thousand pieces of supply and demand information for the farming related enterprises, have contracted cooperation agreements with 17 farming related enterprises, and established 17 information intermediary contact points on GZNW, which periodically provide farming related enterprises and professional associations with agricultural science and technology, analysis of industry prospects, analysis of the product market, product dynamics about supply and demand, and product dynamics about prices. These are praised by the farming related enterprises and farmers. "GZNW covers 83 towns of Anshun city and creates economic benefits of 50 million yuan in the local [economy]" (Tu & Xiang).

#### 4. Training, the backbone of IT:

It is necessary to utilize radio, television, newspapers, websites, and other media, as well as organize various forms of training, technology demonstrations, and the exchange of experience to widely publicize national and provincial policies about agricultural information work, spread knowledge of informatization, and improve the informatization awareness of leaders at all level and farmers. It is also necessary to utilize many forms of continuing education, such as on-the-job training and short-term special topics or special skills training, and strengthen staff training. The rural comprehensive center of economic information of Guizhou Province has compiled training materials, which provide an overview of agricultural information work, the service system about agriculture informatization, the construction of agriculture informatization in Guizhou, applications of

GZNW, and basic knowledge of computers and networks (Duan & Li, 2001).

5. An effective solution to the problem of "the last kilometer" in the information service:

Most farmers lack the conditions and intellectual capacity to access the Internet, and therefore, breaking "the last kilometer" is a big problem in the leap of GZNW. Considering current practices, GZNW has taken diversified measures in the information services, including publicity by:

- Internet media of GZNW
- Radio television newspapers and other traditional media
- Wireless calls and electronic display for rural economic information
- Intermediary contact points of the marketing information services on GZNW
- Bringing science and technology to the countryside and "experts online"
- Happy farmers voice services of 96,111

Box 2 and Figure 5 contain examples of how this problem has been approached.

**Box 2: Guiyang City is one of the areas in which the problem of "the last kilometer" is well solved.**

At the beginning of last year, the city committee and government had made it a main task that year and created a unified plan. At the same time, the city invested 400,000 yuan to provide 200 farmers with information receivers, installed electronic LED displays for 10 trading centers of the produce, and established an information system about vegetables for Guiyang City. Within only a half year since the system set up, there have been 230 various sets of information issued and over 800 various sets received by districts (counties or cities). The information is quite rich and extensive. Vegetable cultivators acquire the new varieties and new technology about the vegetable cultivation and real-time dynamics on supply and demand. The information helps guide farmers to establish a suitable production orientation and marketing, thus effectively solve the problem of "slower sales" farmers often encounter at last.

According to Duan Luya, who is in charge of the provincial centre of GZNW, the province has many ways to settle the problem of "the last kilometer" in information service. Apart from establishing an information system through wireless, some counties and townships provide information service through television (radio) plus the rural comprehensive network, and so on. They establish information networks of the wholesale markets and intermediary contact points of the marketing information services in the rural comprehensive networks of economic information.

Farmers' brokers, rural industry associations, and rural professional cooperation organization are the intermediary organizations that are well aware of information value and strongly demand it in the countryside. They often have a producing-selling relationship with farmers, are close to farmers, and even their members are farmers. So they participate in the information services and thus lead in helping ordinary farmers to become acquainted with and use information, another effective solution to "the last kilometer" in information services. In addition, GZNW has jointly established 96 intermediary contact points of marketing information services on GZNW with prefectural and county rural brokers and professional associations throughout the province to serve farmers, which have increased economic benefits of 113 million yuan in total.

Source: Zeng Juren, Chai Qin, "The 'breakthrough' of the last kilometer - the documentary on the information services of GZNW," "Guizhou Daily"

The poster is divided into several sections:

- Top Left:** China Telecom logo and slogan "用户至上 用心服务".
- Top Center:** GZMW logo and website "贵州农经网 www.gzmw.gov.cn".
- Center:** Large "96111" text with "幸福农家" (Happy Family) below it. Text: "固定电话3元1月打个够 (低资费, 全国全覆盖) 小灵通仅收市话费".
- Bottom Left:** Text: "轻松、快乐、趣味 歌曲点播、趣味心理测试、星座数字游戏、恋爱宝典... 为您提供及时的农业科技、农产品价格、供求信息、农事天气等诸多实用信息和知识".
- Bottom Right:** Illustration of various farm products like pumpkins and corn.
- Right Side:** A detailed list of services under the heading "为您提供及时农业资讯的 96111 幸福农家".
  - 一、96111人工服务**
    - 9611111 所有项目的人工转接或业务解释
  - 二、农业专家热线**
    - 9611110 贵州农经网专家咨询热线
  - 三、贵州农经网人工服务热线**
    - 96111000 贵阳农经网短信信息中心人工服务热线
    - 96111001 转接各地农经网信息中心(站)人工服务热线
  - 四、农市时事**
    - 农业专题
      - 96111010 政策指导
      - 96111011 专家点评
  - 五、价格行情**
    - 1、收购产品价格**
      - 96111020 贵阳市五里冲农副产品批发市场
      - 96111021 遵义市汇川区苟家井农副产品批发市场
      - 96111022 铜仁市农业贸易市场
      - 96111024 凯里市农贸市场
      - 96111025 铜仁市十里堡农贸市场
      - 96111027 六盘水市康乐农贸市场
    - 2、特色农产品价格**
      - 96111031 遵义县虾子辣椒批发市场
      - 96111032 安顺西南市场
      - 96111033 独山县城大场镇中药材批发市场
    - 3、市场指数分析预测**
      - 96111030 贵州省农副产品市场价格周动态
        - 1号键 上周农副产品市场价格指数动态
        - 2号键 上周农副产品市场价格指数动态
        - 3号键 上周农副产品市场价格指数动态
        - 96111039 贵州省农副产品市场价格月动态
          - 1号键 上月农副产品市场价格指数动态
          - 2号键 上月农副产品市场价格指数动态
          - 3号键 上月农副产品市场价格指数动态
  - 六、供求与招商**
    - 1、供求信息**
      - 96111040 粮油供应信息
      - 96111041 畜产品供应信息
      - 96111042 蔬菜供应信息
      - 96111043 水果供应信息
      - 96111044 水产品供应信息
      - 96111045 花卉供应信息
      - 96111046 辣椒供应信息
      - 96111047 茶叶供应信息
      - 96111048 中药材供应信息
      - 96111049 农资供应信息
      - 96111050 其他产品供应信息
    - 2、求购信息**
      - 96111060 粮油求购信息
      - 96111061 畜产品求购信息
      - 96111062 蔬菜求购信息
      - 96111064 水产品求购信息
      - 96111066 辣椒求购信息
      - 96111068 中药材求购信息
      - 96111069 农资求购信息
      - 96111070 其他产品求购信息
  - 3、招商引荐**
    - 96111080 产品生产加工项目
    - 96111081 开发项目
    - 96111082 基建项目
    - 96111083 旅游开发项目
    - 96111084 其他项目
- 七、农事天气预报**
  - 96111121
    - 1号键 农气专题
    - 2号键 农气预报
    - 3号键 安顺天气预报
    - 4号键 气象科普知识

Figure 5. Information aimed directly to farmers

In summary, GZMW has become a network platform, which not only provides on time, accurate information about the market as well as science and technology, but also is able to encourage farming products trade. It is an important tool for the government at each level to direct the modulation of the farming industrial structure and the development of agricultural industrialization. It also is a media for propagandizing and popularizing the products and technology of enterprises and large households relevant to farming.

GZMW has basically completed the construction of the information collection and system design and software system for price forecasting and analysis and has issued over 4400 sets of daily price information of main farming products from 195 farming trade markets in the province. By now, it has collected and issued a total of over 2.6 million sets of information relevant to farming, trained key members at the basic level (prefecture, county and town) totaled over 1500 person-instances on network technology and information service, and created web pages for over 150 leading enterprises relevant to farming. At present, it has over 3350 member units, has introduced more than 10 species of famous, special, superior, and new products, reported and publicized nine significant social or economic activities, especially, the first exhibition on the network displayed by Guizhou Province for its new farming products, which has a tremendous impact.

Within the four years since the network was set up, it has increased implementation of the total sales of the farming products of the province and introduced investment of 1.65 billion yuan in total, including 1.193 billion of the trade volume of farming products and 457 million of introduced investment.

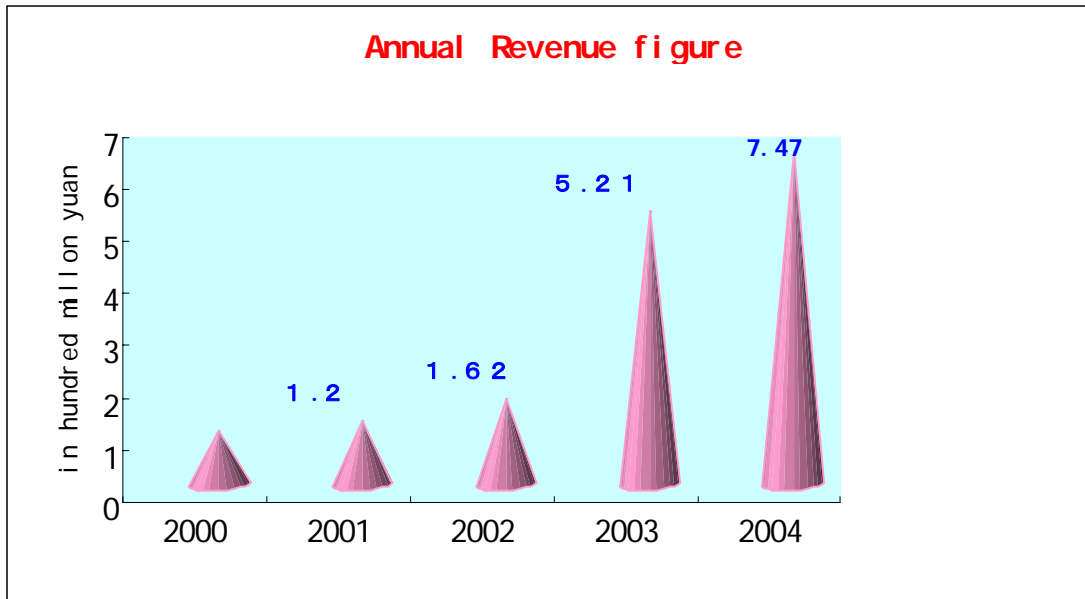


Figure 6. Annual revenues of Guizhou province

#### Example 1: Promoting the investment introduction

In the winter of 2001, Xu Jinyin and Mei Xiangdong, investors from Jingning, Zhejiang, invested a huge sum of money in the construction of the Yongfu power-station, which was delayed for 6 years. Within more than one year, they invested 42.8 million yuan, so that this power-station with 7,500 kW installed could be put into operation. For the Sanjunyan power-station projected in November 2002, Wang Zhipan, the investor from Linhai, Zhejiang, invested 60 million yuan and installed 10000 kW in capacity. At present, it is under intense construction. This year, Xiaoli station introduced 25 million yuan and installed 4,000 kW. An investor, Liu Xianlu from Zhejiang, had formally contacted with the parties of construction on June 20. The reporter in the Weather Bureau of Rongjiang County was also informed that: In the past, various crops, fruits, and local special products were produced and sold in the local areas. Since this year, the farming products and their by-products in the county, in addition to meeting the needs of producers themselves, are traded online, and the volume has reached 300 thousand yuan. What makes outsiders pay so much attention to this place after all? Workers responsible for the investment introduction in Rongjiang County give the answer. Since the opening of GZNW, many foreign businessmen come here because of the online information. From January to April of this year, the center has issued a total of 7153 sets of information, including 29 sets relevant to investment introduction, 57 sets about agricultural science and technology, 8 sets about industry guidance, 36 sets about experts' advice, 47 sets about current affairs on agriculture, 8 sets about the market overall forecast, and 12 sets about agricultural intelligence. The number of information sets they issue is gradually rising, and all the information reflects the actual situation in their county. Take the investment introduction section for example. Every month they issue all kinds of project information provided by the Investment Introduction Bureau of each county on GZNW to make Internet users aware of those projects and facilitate transactions. Long Anyue, the vice-county magistrate of Rongjiang County, often asks and inspects the work of the service center. At present, although there are financial difficulties, 20 towns in the county have built 11 township information service sites, and another six are under construction. The enthusiasm of the towns in building sites is growing. On April 20 of this year, the Zaima township government with the village leaders from more than 20 villages made a special trip to the meteorological bureau of their county to visit GZNW. They said that they had many farming products and



by-products that could be introduced to the outside, and they would report the situation to the service center as soon as possible.

Rongjiang set up a rural service center of economic information that provides convenience for investment seekers and investors, where low-costs lead to good benefits. From January to December in 2002, the county on this fast service received 16 projects contracted, 745.1 million yuan of negotiated funding, 13 projects implemented, and 64.3 million yuan in funding. From January to June of this year, they had eight projects signed, 143 million of negotiated funds, 6 projects implemented, and 35 million yuan in funding.

### **Example 2: Building an information network to enrich farmers**

Yang Guowei, a farmer from Aoshi town, Liping County, was still taking delight in talking about it, that last year he issued the descriptive information of wood ginger oil through the rural service centre of economic information of the county. Then 30 tons were bought by the businessmen from inside and outside the province only within less than a month. In fact, this is a microcosm of serving "agriculture, rural areas and farmers" over the two years since Liping County set up the rural service centre of economic information.

Since the official opening of the rural service center of economic information of Liping County on August 8, 2000, they have overcome the difficulties of rudimentary equipment and lack of personnel. Over the two years, the rural service center of economic information of Liping County has in total issued 56320 sets of free information, an average daily of 65 sets, in which there are 55 thousand information sets about the demand, supply, and price of their important farming and forestry products, such as superior rice, fruit, medicinal herbs, edible wild vegetables, seedling, and so on; 328 sets about investment possibilities, and 948 sets about supply and demand. The rural service center of economic information has been built in 16 townships through the county. In the first half of this year, the county compound fertilizer factory, Dongfeng forest plantation, Guilong beer corporation, Guihuatai tea plantation, the county tea company and other enterprises in the county sold many kinds of farming products amounting to more than 1.5 million yuan through GZNW. In addition, the Shenzhen World Overseas Chinese Business Promotion Association and the Shenzhen Overseas Chinese Businessman Elite Industries Corporation, Ltd. contacted the tourism development project of Tiansheng Bridge, the expansion project of the Bazhou power-station and the second phase of the project Shuanjiang power-station, accounting to the information about investment introduction issued on the GZNW (Lu, et al., 2005).

The special geographic environment and climatic conditions in Qianxinan state determine the diversity and nature of the farming products. However the sluggishness of information availability in the state has been the bottleneck of the agricultural and rural economic development. GZNW fills the void in the transmission of the agricultural information about the state and becomes a window for putting forward the agriculture of Qianxinan state to the country. At the present time, the constructed information organization in the state has included 1 prefecture branch information center, 7 county centers and 35 town and township information service stations, and has 256 member units.

Focusing on the service purpose of "facing to the market, serving the agricultural business, promoting agricultural development and increasing workers' income," the rural branch service center of economic information of Qianxinan state deeply digs into the market potential of various farming products in the state, solidly promotes "agriculture to order." The rural comprehensive network of economic information of the state is becoming an important means of guiding the growth and change of the agro-industrial structure in this area.



Since GZNW was formally opened in the Qianxinan City on December 1, 2000, the counties have achieved remarkable economic benefits because of the information services provided by the rural network of economic information. The trade volume of ginger in Qingshui Town, Xingyi City has reached over 2 million yuan; the trade volume of rowan in Xingbei Town, Zhenfeng City has reach more than 4 million yuan; the trade volume of gutta-percha, Lily, tea in Puan County has reach more than 700,000 yuan; the trade volume of medicine in Xingren County has reached 760,000 yuan; in Wangmo county 50 tons of tung oil have been exported. Farmers in the state do online business through the information service of GZNW that reaches 10 million yuan. The information on the local farming products posted on GZNW attracts lots of businessmen inside and outside the province (Yuan & Cha).

### **Example 3: Flood prevention and disaster relief**

From June 1 to 3, the rural branch service center of economic information of Qiannan State issued meteorological information that there would be hail and rainstorms in Qiannan State on GZNW. Then the air defense sector immediately organized tens of artillery to fire the clouds. According to the preliminary statistics, this meteorological information for local farmers reduced losses of over 60 million yuan.

In Qianna State, there annually is extensive hail at least two to three times, even up to seven times a year; as to high hail and rainfall intensity, Qiannan State ranks first in the southwest region. In the past five years in succession, the average annual losses have been more than 100 million yuan for local farmers.

Since last year, Qiannan State has been determined to match more than 1,000 million yuan and invested a total of 21.38 million yuan to the construction of the high-tech Doppler radar project with the help of the higher-level departments. At the same time, 12 counties and cities in this state have established a rural comprehensive service center of economic information, which monthly disseminates more than 30,000sets of information on agricultural technology, weather forecasts and other topics to help farmers prevent and mitigate disasters and expand the marketing channels of farming products.

On April 20, an extraordinarily serious forest fire happened in Longli County, spreading over 600 mu of forest. Even thousands of people still could not control the fire. The local service center issued timely information about the fire and weather on GZNW. Then the provincial and state air defense sectors immediately analyzed the situations and helped seek solutions. After several rockets were launched, within a half hour there was a heavy rain in the forest area, saving 3,000 mu of forest and several filling stations. It only took 40 minutes from the information dissemination to the extinction of the fire (Zeng & Chen).

## **4 BRIDGING THE DIGITAL DIVIDE, REALIZING DIGITAL DIVIDENDS**

### **4.1 Changing the digital divide into the digital dividend**

The growing digital divide causes the concern of the national leaders in the Asia-Pacific countries. On November 16, 2000, President Jiang Zemin, in his speech on the eighth APEC informal leadership meeting, pointed out with the rapid development of the science and technology, developed and developing countries were in very different situations. A large number of developing countries were faced double challenges: they not only had to exert great efforts to transform their traditional industries, but also had to strive to develop new industries. Otherwise, it would be difficult for them to achieve the desired development of their economies and to deal with

the severe challenges brought by the development of the global economy. Now, the emergence and expansion of the "digital divide" left the North-South gap unabated, which was likely to result in the new imbalances of the world economy. On November 12 of the same year, Chinese Foreign Minister Tang Jiaxuan at the APEC Ministerial Meeting called for the "APEC members [to] jointly exert efforts to narrow the digital divide among members' economies."

Former U.S. President Bill Clinton, in the speech delivered at the APEC meeting, also noted that the digital divide existed not only within a country, but also between different countries. If we did not develop distant education, donate software and cheap computers to rural residents, and educate people to use these tools, it would be impossible to bridge the digital divide. "People often mention that the online population in our region will increase by 300% by 2005, whereas in our joint efforts, I believe that growth can reach four times, or even higher." Clinton said that although the introduction of free trade and the simplification of customs procedures between APEC members would contribute to the completion of e-commerce, APEC members should not develop electronic commerce at the cost that left some people without access to the Internet.

Therefore, both developed and developing countries are faced with how to turn the "digital divide" (Digital Divide) into "digital dividend" (Digital Dividend), not "digital red (deficit)." Of course, the purpose of the digital revolution launched by the developed countries and transnational corporations is the return on investment, just as Cisco CEO Chambers said: "All the companies involved in the Internet revolution have the opportunity to eliminate the it revolution of the digital divide caused by the IT revolution, and then they will eventually enjoy the market opportunities."

## **4.2 Policy recommendations for further bridging the digital divide in rural areas**

First, governments at all levels should attach great importance to the rural digital divide and shift the focus of the traditional anti-poverty work to the "information anti-poverty ". Only by realizing the dissemination of information and knowledge popularization can fundamentally help farmers embark on the road to prosperity, and realize the gradual transition from rural to urban civilization. The UN Food and Agriculture Organization believe that the information revolution has completely ignored nearly 1 billion rural people. The emergence of information and communication technologies is expanding the gap between them and others who have access to these technologies. When comparing the differences between urban communities and rural communities, men and women, as well as successful farmers and their less successful neighbors, the rural digital divide is quite evident. Given that the majority of the hungry live in rural areas and agriculture is the main activity in rural areas, it is essential to keep the agricultural sectors in developing countries up-to-date using the information revolution. All agricultural activities, regardless of size, require a variety of skills and knowledge. The farmers' pressure increases as they diversify their output, adopt new cultivation systems, and compete in the national and global market. To support farmers, agricultural service providers also need to acquire the relevant information in time. The information and communication technology can benefit all these areas (FAO website: [http://www.fao.org/qil/rdd/index\\_zh.htm](http://www.fao.org/qil/rdd/index_zh.htm))<sup>1</sup>.

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<sup>1</sup> Collated from the content on the FAO website. FAO believes that the United Nations should ensure that the poor in rural areas and the organizations providing services for the poor to integrate and exchange information better, use the information and communication technologies to exchange -- in short, to reduce and eventually bridge the rural digital divide. The specific examples include: poor farmers in Senegal are using mobile phones to obtain the price quotation on the produce market in several places from a local entrepreneur, rather than, rely on information provided by some intermediaries as before. Peru

Second, expand the practice of GZNW, making full use of existing meteorological equipment, and constructing a rural comprehensive network of economic information. At the same time, strengthen further the construction of the network, expand and improve the integrated communication network, take full advantage of the terrain and technology, combine fixed, mobile, and satellite communication networks to make telecommunication networks cover all rural areas. In accordance with the planning of the Ministry of Information Industry, China will continue to promote the development of rural communications, and in the "11th-five-year," it will achieve the goal of "every village access to the phone, every town access to the Internet."

Third, in the light of international experience, establish a national telecommunications universal service fund. Hu Angang advised to levy on the income of telecommunications operators (such as between 5%~10%) as one source of a communications universal service fund. In accordance with the public budget system, non-tax revenues should be in the central budget management to " earmark the fund for its specified purposes only", and only the NPC Financial and Economic Committee can authorize to use it.<sup>2</sup> This proposal is a good target and fairly practical.

Fourth, take different approaches to resolve the "last one kilometer" problem.<sup>3</sup> Not only rely on new media -- Internet media, but utilize traditional media, including newspapers, magazines, radio and television, make use of the existing means of communications, construct an integrated information dissemination system in urban and rural areas. Consider the possibility in poor areas of abolishing farmers' monthly fees for cable television to improve television transmission capacity, as in the course of the investigation we found that many farmers cannot afford the price of cable (10 yuan/month) and use their television sets only to watch videos.

Fifth, forcefully publicize typical examples about improving farmers' ability to use information to enrich themselves and cultivating the farmers' ability for information collection, filtering, processing, and use. Use the existing teaching infrastructure in the primary and secondary schools, establish distant training centers to train

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Ministry of Agriculture has set up the rural network of electronic information to link with the farmer representatives from the provinces. Some radio stations in African countries are broadcasting programs on how to use the messages of scientific research institutions and farmers' experience to treat the livestock's diseases. The extension services of the rural private sector in India are providing the agronomists in the village with network information on every aspect of the agricultural production.

<sup>2</sup> First, this is a "sustainable development" model. Even if it is levied at the scale of 5%, there will also be hundreds of billion yuan in all by 2009, which will play an important role in address China's information gaps and provide the peasants with universal communications services. Second, it is a "wealth of information" transfer payment model. It uses effective national institutional arrangements to achieve the transfer of "information resources" from the urban to rural, from the "information rich" to the "information poor" or "those without information". Moreover, it's a "promotion of competition and fair competition" model; the operators must promote technological innovation, reduce costs, cut expenses, so they can't only cancel the preferential policies to certain operators, but reduce the various government subsidies.

<sup>3</sup> The issues FAO enlists which are needed to emphatically address include: the content and background tailored to local circumstances: ensure information sources and the presentation to be suitable; strengthen the present systems: strengthen rather than replace the existing channels of communication; address diversity issues: meet the different information and communication needs of men and women, youth and other groups in poverty; capacity-building: strengthen the institutions and people's ability to provide appropriate content and gain broader information; the ability to get and empower: ensure that the poor benefit from the information and give their power, and enable them to participate in decision-making processes; strengthen partnerships and participation: establish the horizontal and vertical linkages between the community, organizations and sectors, and strengthen the awareness of share; practical technical guidelines: build a sustainable system to strengthen the existing structure, facilitate the promotion and use of all available media; the sustainability of costs and finance: evaluate the appropriate information infrastructure and content and provide funds to them, especially in remote areas.

farmers in the needed cultural foundation and to achieve a certain operating capacity, help them use information networks to open up horizons and seek for new business opportunities.

Sixth, establish and improve systems related to the rural information work by standardizing its operations and ensure its continuity. Propose that "it is commanded by leaders and is responsible by some certain people; we should carry out long-term assessment and establish corresponding security systems". The rural informatization in China is relatively long-term, and its effectiveness is potential and profound, so it is particularly important to build up a long-standing mechanism.

Seventh, support the development of the "universal computer" for about 1,000 yuan. According to the relative study, the time is ripe to develop such a "universal computer" in China. At present, we only need to achieve a breakthrough in low-cost monitors, and if we can develop it by our independent innovation and meet to the market demand in the future, hundreds of millions of farmers will be able to enjoy digital civilization, which will have a tremendous effect in promoting consumption of the whole country.

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