Exploration and Practice of Customized Agricultural Meteorological Service Based on Short Message Service

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Abstract On the basis of the analysis of main problems existing in current agricultural meteorological service in China, for the purpose of exploring a solution to the "last kilometer" problem in rural meteorological service, this article designed four short message service products with the business brand name "meteorology for agricultural condition", including "weather prediction for farming season", "weather forecast for farming", "weather alert", and "meteorological hazards of agriculture". By taking advantage of telecom operators' market, these products have been spread to more than 1 million rural mobile phone users and widely welcomed. They also contributed enormously to disaster prevention and peasants' income growth, and achieved good social and economic benefits.

Key words Short message service, Agriculture, Individualization, Meteorological service, Exploration and practice

The problems of agriculture, rural areas and farmers are always major problems concerning our economic and social development. Agriculture is the industry greatly influenced by weather and climate, and so is agricultural production. Various kinds of meteorological disasters have posed serious threats to the farmers' production, daily life, property safety and social stability in rural areas [1-2]. According to the statistics of China Meteorological Bureau, the farmland areas hit by various meteorological disasters reach 50 million hectares per year in China, and the fluctuation of grain output of single variety is up to 20%, reaching more than 30% when the disaster is much more severe. The number of people affected by the major meteorological disaster amounts to 400 million, economic losses resulted amounting to an average of about 200 billion yuan, equivalent to 1% to 3% of GDP, while 80% of the casualties caused by meteorological disasters happened in rural places [3]. Therefore, it is of great practical and far-reaching historic significance to put forward countermeasures to improve the weak points of current agricultural meteorological services, and is also significant to prevent and reduce the losses caused by agricultural meteorological disasters, as well as help farmers to increase their income.

1 Main problems existing in current agricultural meteorological services

1.1 Meteorological service products hardly meet the needs of agricultural production The meteorological service is of single variety, lack of weather forecast service products targeting at the actual demands in rural areas. Meteorological services provided to high-quality agricultural products, about sowing period of economic crops, growth period, the picking period are of poor pertinence, as well as services about agricultural meteorological disasters, disastrous weather forecasts what that really need are not provided timely enough. Farmers expect the accuracy of forecast products predicting low temperature freezing, high temperature drought, typhoon rainstorm weather to be further improved, and their timeliness needs to be further prolonged [4].

1.2 Few quick and effective means for meteorological information sending At present, rural access to meteorological information channels are mainly broadcast, television, mobile phone, text messages, meteorological telephone, and Internet. But the survey shows farmers who take the initiative to get weather information from the media are still minorities, and the penetration rate of meteorological knowledge in rural areas is still very low. Wired broadcasting speakers are good means of communication, but they have basically disappeared in the countryside. Constrained by economic and cultural factors, the Internet has been far from being popular in the countryside. And the farmers are often still working in the fields when the television broadcasts weather forecast, and the voice service charges so much that few farmers take it [5]. Only the meteorological short message is the best means to spread meteorological information, but their products are often aimed at the general public, lack of pertinence, directly affecting farmers' use.

1.3 The low-level scientific and technological content in agricultural meteorology services At present, the fact that agricultural meteorological services lack objective, applicable technical methods and application software has caused that the level of products' quantification and objectivity is not so high, lack in scientific and technological content. Meteorological services for the traditional agriculture products such as grain, cotton and oil are relatively good, while the meteorological service technology and service system for the facility agriculture, sightseeing agriculture and high-quality agriculture are scarce, causing that the agricultural meteorological service are in low level, and the service areas is hardly to expand.

1.4 Serious shortage of agricultural meteorological professionals Over the years, the overall agricultural meteorological

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team members in our country have been developed relatively slowly, restricting the development of agricultural meteorological services. Agricultural meteorological team members can't meet the requirement of developing meteorological services of modern agriculture in personnel, subject and knowledge structures, and there are few academic leader with higher and broader-level knowledge, and the professional qualities of personnel observing, forecasting and serving for agricultural meteorology in the basic stations are not high, even without the professional and systematic technical training, leaving that the overall level of agricultural meteorological service is not high.

2 Designing of short message service products for agricultural meteorology

As a large agricultural province, Hubei Province has a rural population of more than 40 million, and the number of mobile phone users in its rural places reaches more than 20 million. For how to effectively solve the "last kilometer" problem in rural meteorological services, considering the portability, convenience, popularity and many other advantages of mobile phones after wide investigation, we have finally chosen mobile phone short message services as the best means to solve it in rural meteorological service[6]. What we have to do is to find farmers' needs for agricultural meteorology services and design short message service products [7] to meet their real demands on the basis of agricultural meteorology services, as well as enable them to use their desired agricultural meteorological service products, by taking advantages of the powerful promotion channel of telecom operators. In the design of short message service products for agricultural meteorology, we pay particular attention to establishing service brands, and identifying the products as "agricultural meteorology" business brands exclusively to serve for farmers, with its main products including "weather prediction for farming season", "meteorology for agricultural condition", "weather alert", and "meteorological hazards of agriculture" [8-9], and the contents and sending time of specific services are as follows:

(i) Farming season weather forecast: short messages mainly providing weather forecast, arrangements opinions and suggestions for farming season and agricultural condition are sent once at 16:00 on 1st, 11th, 21st of every month on time.

(ii) Agricultural condition weather forecast: short messages mainly providing weather forecast for today, tomorrow and the day after tomorrow three days, and providing opinions and suggestions of farming in time are sent once at 10:00 every morning.

(iii) Weather alert: short messages mainly providing weather forecast and prevention measures for emergency, disaster, turning weather are sent at any time according to the weather condition.

(iv) Meteorological hazards of agriculture: short messages mainly providing monitoring situation for agricultural meteorological disaster, development trend and countermeasures are sent at any time according to the situation of agricultural meteorological disasters.

3 Technology support for short messages about "meteorology for agricultural condition"

3.1 The establishment of agricultural meteorological centers

In order to speed up the development of modern agricultural meteorological services, it was as early as in 2006 on the basis of original agricultural meteorological services that Hubei Provincial Meteorological Bureau expanded its service areas downward and established four agricultural meteorological centers in the east, southwest and northwest of Hubei Province respectively, as well as Jianghan Plain according to the agricultural climate divisions.

Agricultural meteorological center of the east of Hubei Province for facilities agriculture, agriculture for sightseeing, fisheries, Chinese herbs, dairy farming development; Jianghan Plain agricultural meteorological center for rice, rapeseed, cotton, aquaculture, aquatic vegetables and Xianhong new rural construction experimental zone; Agricultural meteorological center of the northwest of Hubei Province for wheat, low mountain vegetables, edible fungus, bee products, tobacco; Agricultural meteorological center of the southwest of Hubei Province for tangerines, tea, tobacco, vegetables, and stereo agriculture, and all the centers are attached to Bureaus of meteorology in Wuhan City, Jingzhou City, Xiangyang City, and Yichang City respectively, and the implementation of agencies, funds and personnel is guaranteed. Among the four centers, the agricultural meteorological centers are responsible for producing agricultural meteorological service products in their cities, while the non-agricultural meteorological centers carry out their services on the basis of products of agricultural meteorological centers, and conducting forecast, knowing the crop growth diseases and pests incidences, as well as providing on-the-spot guidance service thorough field place when necessary. Fach each department should innovate the service modes and contents, provide "agriculture, rural areas and farmers" with high quality meteorological services and make contributions to reduce agricultural disaster and increase farmers' income.

3.2 Improving the modern agricultural meteorological observation network As the saying goes "one can't make bricks without straw", to provide good agricultural meteorological services, it is important to begin with improving the construction of agricultural meteorological observing station, increasing observing equipments and contents. Meteorological Bureau of Hubei Province have constantly strengthened the construction to monitor meteorological disasters, and constructed 28 agricultural meteorological observation stations, 21 soil moisture observation station, as well as established three-dimensional network monitoring disastrous weather, on the basis of the constructed 11 weather radars, 16 lightning observation stations, 1 238 (rainfall) rural township automatic weather stations, and 15 satellite receiving stations, which have greatly enhanced rural places' ability to monitor disastrous weather.

3.3 Newly increased agricultural meteorological observation equipments and content Based on traditional agricultural meteorological equipments, equipments such as artificial climate bo-

xes, plant canopy analyzers, chlorophyll analyzer, soil pH analyzer and other new observation equipments are increased. Meanwhile, the observation contents are also increased, including newly increased demands for grain, and observing grain, cotton and oil-bearing crops; Increasing middle-season rice, rape and maize observations respectively in Tianmen, place producing high quality rice in Jianghan Plain, Jinzhou, place producing "two low" rapes and Yunxi, place producing maize widely; increasing greenhouse vegetable observation at Wuhan Agrometeorological experiment station; increasing tea plants observation in Yingshan, which is located in the agricultural products base; increasing fish farming meteorological observation in Wuhan and Jinzhou City, which produce high quality aquatic products; and as well as increasing tobacco observation in Lichuan, Hubei's largest area producing tobacco.

3.4 Arranging special person responsible for editing short message service of "meteorology for agricultural condition" The agricultural meteorological forecast service products produced by agricultural meteorological centers can't serve the farmers directly, and the meteorological forecast products should be turned to meteorological service products after being edit by person responsible for editing "agricultural meteorology short message services" when provided to farmers. And the editing is not just a simple package, but should reflect the weather situation, provide scientific guidance combined with the current farming season and agriculture condition, as well as help and conduct farmers to strengthen its advantage and avoid the hazards, according to the weather condition, with the understanding of current weather and climate, the weather changing trend, farming season and agriculture conditions. This job requires personnel with higher comprehensive quality, farmers' experiences, certain knowledge of literature, as well as serious, meticulous work habits, and the information edit should be scientific and accurate. It has been proved by practice that it is successful experience to arrange special person to edit short message for "meteorology for agricultural condition ".

4 The promotion of short message services of "meteorology for agricultural condition"

4.1 Entering into the market and becoming the most popular program in Hubei mobile "nongxintong" When "agricultural meteorology" message services are planned is between the end of 2006 and the beginning of 2007 when Hubei mobile is planning to open "nongxintong" business. "nongxintong" is the information service program launched by China Mobile, with aims to assist in the built of the socialist new rural areas, and serve for agriculture, rural areas and farmers, and it provides farmers with policies and regulations, news letters, agricultural science and technologies, the market supply and demand, prices and other agricultural information by means of short messages, multimedia messages, voice messages, mobile phone internet service, and internet. It was suggested to the relevant departments of Hubei mobile that the they should incorporate the "meteorology for agricultural condition " into its business section, which was hit off by them immediately and it has become the business model of China Mobile's "nongxintong". Taking the strong advantages of Hubei mobile's market, 400 000 farmers in Hubei areas have used their dream short message services of "meteorology for agricultural condition" to May 2007, and it has become the most popular program in "nongxintong" service. By the end of 2007, the number of rural mobile users in Hubei Province taking the message service of "meteorology for agricultural condition" is 670 000.

4.2 Joining Unicom's "Agricultural New Space", covering all the rural mobile phone users "Meteorology for agricultural condition" short message service has been welcomed by most farmers, the moment it was launched. To enable more farmers to use the service in a short time, we have actively conferred with Hubei Unicom Company to launch the short message service of "meteorology for agricultural condition", and gained quick response from it, and it has incorporated "meteorology for agricultural condition" into the agriculture service project "Agricultural New Space" for promotion. "Agricultural New Space" is also an exclusive program designed for farmers, containing services such as supply and demand information of agricultural products, agricultural technologies, and experts remind. With the adding of "meteorology for agricultural condition", "Agricultural New Space" has also considerably. As of the end of 2007, the number of short message users of Hubei Unicom "meteorology for agricultural condition" reached 360 000.

4.3 Hubei mobile phone newspaper favorable for farmers has initiatively taken "meteorology for agricultural condition" as its main program "Hubei mobile phone newspaper favorable for farmers" launched by Hubei Mobile Company and Hubei daily media group made its trial online test on November 4, 2011, including agricultural meteorology, information for agriculture, rural areas and farmers, market information, transaction information, knowledgebase about how to be rich, the voice of rural areas, to be health and keep fit, rural romance more than 10 programs, covering various areas related closely with agricultural producing and agricultural life. Under the dedicated cooperation of Hubei telecom industry and Hubei media industry two giants, short message services of "meteorology for agricultural condition" will definitely make greater development, and we sincerely hope that more and more farmers can use it.

5 Typical cases for "Agricultural meteorology" short message service

5.1 "Meteorology for agricultural condition" provides considerate and convenient services "Every time when harvesting the rice and soybean, I have to pay attention to the weather forecast to check whether it will be sunny or rainy the next day." When it comes to the inconvenience of gaining information in rural areas, Li Gang in Hong'an County of Huanggang City sighed with emotion. "It is all right now, since I signed for short message service of 'meteorology for agricultural condition', the daily weather report and suggestions for agriculture have been sent to my mo-

bile phone directly, and it is so considerate and convenient to use, saving me much trouble."

5.2 "Meteorology for agricultural condition" is a good help to farmers "My mobile phone have received messages of 'meteorology for agricultural condition' sent from Meteorological Bureau at different time since last May, this kind of short message service costs less with much advantages, and is well targeted, so we can have a correct knowledge of agricultural condition and farming, and engage in agriculture production. It is a good helper to farmers. And the Meteorological Bureau really has done good deeds to farmers."

5.3 Eel raising is inseparable from the "meteorology for agricultural condition" Liantan Village in Xiantao City, the trial area to build new rural areas of Xianhong, takes raising eels as its main farming way, and the whole raising area reaches 1350 acres. Weihua Lu the secretary of party branch in the village told us, "Meteorology is one of the main reasons influencing raising eels, and in July each year when is releasing eel breeding in the field, any change in climate will directly affect the eel's survival rate." At the early stage of releasing fishes, meteorological technical personnel are sent stationing in Liantan Village by Xiantao Meteorological Bureau to provide on-spot guidance to help farmers arrange producing, as well as providing scientific and efficient meteorological services to the raising farmers by short messages of "meteorology for agricultural condition".

5.4 "Meteorology for agricultural condition" boosts the greenhouse vegetable production In Wuhan City where is an important base for greenhouse vegetable production, short message of "Meteorology for agricultural condition" conducts farmers to control climate in the green house, and take preventive measures before disasters to reduce losses and improve efficiency. According to the advantages and disadvantages provided by "Meteorology for agricultural condition" in the freezing rain and snow disaster in 2008, the vegetable growers produce vegetables increasing by 7% -10%, as well as the output value increased by 5% -7%, and created a miracle that there is no disaster in year with major calamity.

5.5 "Meteorology for agricultural condition" conducted farmers to save themselves and fight against drought Hubei Province was hit by the most severe drought since 62 years from the birth of the People's Republic from the autumn in 2010 to the summer in 2011, and the "Meteorology for agricultural condition" message service has tracked the drought and provided farmers with services. It sent the latest drought and weather information, some information to fight against drought, helped the farmers to understand the weather change trends, conducted them to save themselves and fight against drought. It constantly sent weather warning information to more than 13 million households in severely drought-stricken areas, just between the beginning of May and middle of July the most severe month, and provided farmers with timely and effective service to fight against drought.

6 Conclusions

To some extent, the wide use of "Meteorology for agricultural condition" has changed the history of "harvest depending on the weather". "Meteorology for agricultural condition" is just like a green umbrella and brought some hope and warmth to the broad farmers. In current construction of agricultural meteorology service systems and the agricultural meteorology defending system against disasters pushed vigorously by our country, there is much work to do about providing meteorology services targeted at agriculture, rural places and farmers, but we believe that with the strong support of all-level government and the efforts of relevant departments, the meteorological service work will definitely play a much more important part in reducing disasters and increasing farmers' income such important issue that leaders of the Central Party Committee and the State Council have paid great attention to.

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(From page 122)

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