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Research Article

Medium Effect Analysis of Rice Technology Innovation Diffusion-with the Spread of Single Harvesting in Zhejiang Province for Example

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Abstract: This study studies the effect of selecting rice as media analysis object, to mention the empirical case of technology diffusion as an example, mainly analyzes the characteristics of S type curve of diffusion of innovation from the perspective of technology diffusion. Firstly, In order to improve the effect of technology diffusion, must first grasp the multi-stage features of the technology diffusion in the field of journalism and communication, emphasize innovation diffusion of "opinion leaders", speed up the technology spread; Secondly, stick to the objectivity of the news reports, reduce uncertainty, eliminate technology diffusion noise; Third, emphasizing the teaching experience, reporting for the grassroots level to improve farmers' comprehensive quality; Fourth, setting up reasonable agenda, adhere to the public opinion guidance, increase reporting of agricultural science and technology information.

Keywords: Communication means, effect of medium, innovation diffusion, rice technology

INTRODUCTION

The Report to the Eighteenth National Congress of the Communist Party of China points out: "Scientific and technological innovation provides strategic support for raising the productive forces and boosting the overall national strength and we must give it top priority in overall national development." At present, China is on an important stage of making response to the international financial crisis and maintaining stable and rapid economic development and also at a critical stage of breaking the key to urban-rural dual structure and promoting the integration of urban and rural development. Strengthening the dissemination of agricultural science and technology information is the key to develop the modern agriculture, construct a new socialist countryside and realize the integration of urban and rural areas in order to break the dual challenges. There are a lot of factors that affect the dissemination of science and technology information in rural areas. From the current situation, these factors can be mainly summarized as poor service awareness, the primitive means of communication, slow flow of information, technology market disorders and other problems, so it is of very important significance to facilitate the development and utilization of the agricultural science and technology information, to achieve the exchange and sharing of agricultural science and technology information and to promote the development of rural areas and even the entire national economy.

Usually, the media also can implement communication activities by providing information or attempting to influence the motivation and attitude to change behaviors, such as mass media, advertising media or promotional material, the official promotion institutions, informal social contact and so on. China has a history of propagandizing science and technology by various media. On the one hand, the media should increase timely reports on the latest information in the field of agricultural science and technology and shoulder the responsibility as a social instrument; on the other hand, the media must uphold the principles of objective reporting and pay more attention to the social impacts which news reports may bring on the technology diffusion.

MATERIALS AND METHODS

General trajectory of technological innovation diffusion: In the information age, the audience's understanding of the objective reality is from the pseudo-environment constructed by various media and is increasingly dependent on media perception and understanding of social changes and then they will make the appropriate behavior. For the agricultural technology dissemination system, rice technology information is mainly constructed by the communications media of newspapers, radio, the Internet, advertising and the agricultural technique extension system. Different media have different

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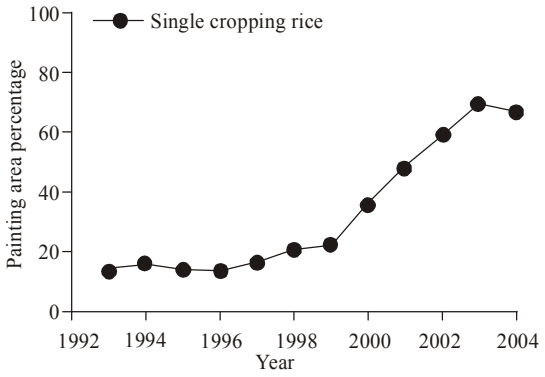

Fig. 1: The form of an S-shaped curve

properties and play different roles in technology dissemination system, which will produce different propagation effects. However, the technological innovation diffusions spread under different media show some common law, that the spread of a technology changing over time is in the form of an S-shaped curve (Severin and Tankard, 2006). For example, the technology diffusion curve shown by the growing area of single cropping rice in Zhejiang Province changing over time is consistent with the above characteristic. In early 1990s, the rice production of Zhejiang Province was based more on continuous cropping rice. But with the agricultural production structure adjustment, single cropping rice is gradually replacing the continuous cropping one and makes major changes in rice production (Zhu *et al*., 2007) Shown in Fig. 1.

From the perspective of technology dissemination, only a few people are "adopters" or "knower's" in the early technology diffusion process. As shown in the figure, during the five years from 1992 to 1997, the cumulative curve of the adoption was in a slow growth first and then began to accelerate the rise. But the land area in a given period is fixed, when approaching the saturation point, the growth slowed gently down and the new adopters became fewer and fewer in each unit time (Mcquail and Windahl, 1993). In terms of the communication process, it is a slow and gradual social process to realize the diffusion of technology, rather than immediately showing large-scale diffusion after the emergence of innovation. Western researchers divide the process of diffusion into five stages: the awareness stage, the showing interest satge, the evaluation stage, the experimental stage and the adoption stage (Wilbur, 2010). In the first stage, people begin to hear about new ideas or practices, but know little about the specific details. At this time it is the mass media that undertake the main task to provide information. It can be understood as that those who first adopt the technology tend to get information from newspapers, radio, television or other communication materials. The media plays an important role in the early stage of the audience perception and the proliferation of information. In the second stage, the audiences begin to show personal interest in this innovation and seek more information. During the stages of evaluation and experiment, the audiences will consider the relationship between those new ideas and their own needs and resources and on this basis to decide whether to try and further determine whether it is suitable for their own situations. The last stage is the adaptation. The audience will make the large-scale adoption of new ideas and intend to keep on this. In general, the impact of mass media in the early adoption process is relatively large and becomes less in the latter period.

Innovation diffusion of technology is a special communicational phenomenon in that the communication object changes from the information that the auduiences are concerned about to new ideas or new technologies. In order to produce rice with high yield, quality and efficiency, technological innovation is the foundation and the source of and innovation diffusion is the key to implement the new technology and make success. Francis Bacon, British philosopher and known as the ancestor of modern experimental science, once said, the power of knowledge not only depends on its own value, but depends on whether it is spread and the breadth and depth of the spread. It is estimated that only about 50% of China's agricultural scientific and technological achievements are transformed, well below the level of 70% of the United States and European counbtries. At the present stage, the status quo of agricultural development in our country is that innovation is surplus while the diffusion and application of scientific and technological achievements are far behind. Therefore, speeding up the diffusion of scientific and technological achievements is urgently required.

RESULTS AND DISCUSSION

Analysis of common media of rice technology innovation diffusion: The advents of distant hybridization and bilinear hybrid rice in China have made the yield of rice per hectare increase from 6000 kg to about 7500 and 9000 kg and the initial breakthrough in China's super rice research created a new miracle in high yield. So it becomes an important part for agricultural development to establish accordingly a more complete technology extension system. It is also significant to promote the use of technology in news coverage, consolidate information by various media and push forward the diffusion and application of good rice seeds, thereby to satisfy the needs of social production and living to the utmost extent. In this process, the commonly used media are mainly:

Agriculture press: The study of the development of ancient and modern publishing industry at home and abroad shows that the essential attribute of the publication is its communicability, which is determined by the law of the development of the publishing industry and is true in any social form. The communicability refers to that certain information is widely disseminated in society by copying. And in turn, the communicability of the publication determines that it has a strong character of tools. Agriculture Press under the leadership of the Ministry of Agriculture is to make it become a tool to propagandize the lines, guidelines and policies of the party and government in agriculture and to introduce domestic and international agricultural science theory and the application of science and technology. Since its establishment in 1958, the press has published a lot of achievements covering the agricultural science and technology, but also published some books related to agricultural history and agricultural economy. The targeted readers of this press are very wide, mainly including the People's commune, state farms to agricultural researchers and teaching staff to cadres of agricultural authorities and workers in rural areas (China Agriculture Yearbook, 1980a). Thanks to the feature of acrossing time and space of the publications as vehicles, books published by Agriculture Press provide a good opportunity for all the cadres and common people in rural remote areas to perceive technological information and an access to gain knowledge of the farming operation mode of scientific management by scientific and technological progress in a given period.

Newsreels: Film is the image carrier of the macrocosm and microcosm and the hub of information, but also the dissemination machine of science and technology. Before the emergence of television news, newsreels have been around for a long time in our country. The newsreels mainly report domestic and foreign affairs and dynamic in politics, economy, culture, military and other aspects. The introduction of rice technology in the economic field was once one of the main reports in films and newsreels at a time. As the combination of information and entertainment produced the news in a new form, the technology of film shooting conbined with disseminating rice technology promoted the production of news videos with the nature of agricultural science. In the 90s of the last century, Guangxi Film Studio shot a newsreel on rice shell pests to describe the pests' habits and the methods of prevention and treatment. The films during this epoch are often related to many common problems in the people's daily life, such as the introduction of natural enemies of rice pests, to encourage people to take advantage of the interdependence and mutual checks and balances between major rice pests and their natural enemies, as well as several research achievements (China Agriculture Yearbook, 1980b). As for the reflected levels, films ask the reproduction of life in an artistic manner, while newsreels show a real environment through the lens in the field, giving a true immersive experience. What's more, a movie can be copied into a number of copies and be shown at the same time all over the country. Once these inherent advantages are associated with science and technology, it will become a magnifying glass of technology demonstration effect.

Satellite TV column: TV transmission is by far the most the popular medium, absorbing the elements in all media. It not just relies on language signs to disseminate information, but also has impacts on the audience through nonverbal symbolic information. In the 1990s, the CCTV (China Central Television) program "Oriental Horizon" managed to make many satellite televisions copy the success of its columns. The CCTV 2 set up a satellite TV column "Agricultural Education, Science and Technology", whose purpose is through the television to popularize agricultural science and technology, to deliver agricultural information and to carry out agricultural education. This column has also started such programs as "Experience of Being Rich", "Information Window", "Fine Breed Park" and others which are still fresh in the memory of the common people. The cooperation of TV presenter and TV program column and new present methods such as hotline and live broadcast make a step beyond the one-way radio and television transmission to achieve the effect of two-way communication. In 1991, the chief editor's office of CCTV made an investigation in Anhui, Jiangsu, Zhejiang and Jiangxi provinces, which showed that the audience rating of this column in rural areas ranked only second to that of CCTV News, which always tops the organization's ratings all over the country (China Agriculture Yearbook, 1992).

Agricultural information network: In the early and middle 20th century, as the carrier of printed text and information, newspapers could be read repeatedly and kept for a long time as materials, which made them easy to disseminate new products and technologies. The role and status of newspaper were difficult to be matched by other media at that time. However, after entering the new century, the characteristics of high-speed, convenience and high-capacity of the internet make it have a distinct advantage in terms of dissemination of information, which is unmatched by other media. Since the opening of China Agricultural Information Network in 1996, more than 2200 various agricultural information website have been built in five years. Many agricultural information services have been set up in 206 of 333 prefecture-level cities throughout the country. Besides, 315 of over 2800 counties have established local area networks and 460

have established international internet stations, some of which can directly provide service for farmers (Liu, 2002). Currently, the Internet has become an important means of transfering science and technology information, popularizing scientific knowledge and promoting scientific and technological achievements in China's rual areas.

Communication strategies to improve agricultural technology innovation diffusion: The development of the media does not mean that information can be effectively transferred. Clearly, mass media have their inherent flaws: On the one hand, the press release is a special form of information dissemination, especially for newspapers, television and the Internet Little news released by the media "intentionally" spread the information and they are usually "short-lived". Therefore, it is rather difficult for news reports to bring systematic and accumulative learning; on the other hand, in the process of media reports, the communicating effects are inevitably affected by such factors as the disturbance of social and political environment, the prejudice of media agenda setting, as well as the limitations of reporters' and others. In order to help farmers as the main target audience to understand fully and timely information on agricultural science and technology and thus improve business decisions and to improve the dissemination effects, the media system must do the following:

First, the media should grasp the multi-stage features of the technology diffusion in the field of journalism and communication, emphasize innovation diffusion of "opinion leaders" and speed up the technology spread.

After citing many cases, Rogers (1995) held that combining the mass media with interpersonal communication is the most effective way for the dissemination of new ideas and convincing people to take advantage of these innovative methods. One of the main functions of the mass media is to inform and interpersonal channels play a more important role in persuading. In order to diffuse and apply the information on new technologies which have been perceived by the audience, we need to take full advantage of the two properties of the two communication channels, find information to relevant media perception and the group where there are more social ties to provide useful information of "opinion leaders" for members of the community. The audiences who have a lot of contact with some mainstream media information, especially agricultural information, often have a higher level of knowledge and a certain prestige in farmer groups. And then these people become the opinion leaders in the process of news flow. Some researchers have found through some empirical investigation, those advanced characters such as "technical genius", "progressive farmers" and "self-learners" play an active and obvious role in getting information via media reports and promoting information in China's rural areas and even play the "spokesperson" role as agricultural science and technology personnels (Zhou, 2005). Because of their long-term life and work together with farmers in rural areas, the farmers are willing to learn new technologies and methods from them, so they also have the objective conditions of becoming opinion leaders. The media cover the experience of these advanced people and analyze success stories through news, which provide others with a way to observe and learn. For example, in 1997 *Zhejiang Daily* opened up two columns of "rice seeds travel a thousand miles in 1997" and "'two shift' winning harvest" in the front page of the newspaper to highlight the report of the experience and leading role of those who planted rice on a major scale, to repeatedly publicize the significance and role of developing agriculture through science and education and to promote the local farmers' awareness of emphasizing science and technology.

Second, the media should stick to the objectivity of the news reports, reduce uncertainty and eliminate technology diffusion noise.

News refers to the reports of the facts which happen newly. The report is a way to confirm the statement and should be excluded from the author's subjective reasoning and judgment. All elements of news, including time, place, people and events should be objective and be visible hard things. Moreover, as Chen Lidan, a famous news scholar, said, some intangible and unseen things also affect objective reporting and many news reports themselves reflect the view of certain positions. For instance, there is a tendency of media in the report of the media on "GM golden rice". This event was entitled as "*China's CDC Makes Apologizes for 25 Hunan Children Tasting GM Rice*" by people.com.cn. After analyzing the content of the news report, we can know that many details were objective facts which can be verified, such as the responsible person allowed 25 children to unknowingly taste GM rice and failed to declare this to related departments and China's CDC apologized. However, the association between GM rice and the CDC's apology forces people easily to hold that there is something wrong with the genetically modified rice. Besides, China Radio Network gave such a title of the same event as "*Golden Rice Survey Results Announced and the Responsible Person was Dismissed*". From the title, we can see the golden rice is associated with some illegal behaviors. The media reports seem to judge the case as it stands, safeguard the children personal security interests and the nature of the event is doing an illegal experiment. But they ignore the biggest fact, as the "father of the Green Revolution" and Nobel Peace Prize winner Norman Broughton Georgia said, that today there is no convincing scientific evidence that

transgenic crops are harmful and there is no record that the application of transgenic technology can cause hazards. A simple illegal test event will inevitably impact the audience's views on genetically modified crops through the media's over-exaggerated reports.

Indeed, some media reports restore the truth, but also increase the uncertanity and the GM technology diffusion noise. Deng Xiaoping once said, the future of agriculture will ultimately be resolved by bioengineering and rely on cutting-edge technology. One major breakthrough of bioengineering is the break of DNA structure, which can help to understand the operation of the nature from the molecular level. With the help of recombinant DNA technology, breeders can select and transfer a single useful gene from other taxa, such as pest resistance, disease resistance and herbicide. With the growing population and dwindling arable lands over the country, China has to further increase grain yield. Clearly, in the future the increase of grain yield mainly rely on the technologies which have been developed, but not been fully utilized. Media reports should be to provide comprehensive and objective information and increase people's understanding of new technologies and products. More often, the media as a social instrument should have a more tolerant attitude. Any new things will cause people's anxiety to a certain extent because of the uncertainty and the media should follow the rules of scientific development, make cautious verification and prudent judgment. If the media exclude blindly the new technology, it will become a victim of vocal opposition and then the coordinated and healthy development of society is bound to be obstructed.

Third, the media should emphasize the teaching experience and report for the grassroots level to improve farmers' comprehensive quality.

The media reporters hope their audiences pay attention to their information, understand it and can change their ideas properly, or make some behavioral responses the communicators have expected. However, whether the information is valid cannot be uncontrolled by the communicators' subjective will, but be determined by the audience's past experience in judging the value of the information. When farmers accept the thing around them in an subconscious manner, they do not select at random among the mass of information, but make reasonable choice according to their own purposes and past experience which comes from their accumulation and learning in the past. On the one hand, if the new technology reported by the media is consistent with farmers' experience and their own knowledge structure, they will be more inclined to adopt new technologies and the information beomes efficient, resulting in a good dissemination. On the contrary, when the information differs greatly from farmers' own knowledge, they will take a wait-an-see attitude or even refuse because farmers do not understand something new and the uncertainty. At that time, the media coverage does not relatively achieve the desired value. Therefore, farmers' own quality is critical for them to accept the new technology. And education is an important means to improve the overall quality of farmers. By inspecting the agricultural developments between the Unitetd States and China, we can find that although the comprehensive construction of agricultural universities, research institutions and the promotion of the agricultural system has been attached some importance, the quality education for the farmers still does not get enough attention, In the early 19th century, the United States had set up about 700 community colleges to provide the opportunity for on-the-job agricultural labors and rural residents to pursue further studies. However, to the early 21st century, China had more than 900 million rural populations and 90% of them only received educations lower than junior middle school (including junior middle school), among which 13.3% were illiterate. Obviously, solving the problems of the development of modern agriculture or the promotion of high-quality rice in rural areas and others, in the final analysis, is inextricably linked with farmers' quality. If the media ignore the actual situation that the overall quality of the farmers is lower and blindly report, it will be rather difficult to promote new technologies and make no progress.

The media is not a textbook. But the knowledge that it spread is closely linked with people's life and production and become the necessity of life to meet the needs of the audience. Media coverage of agricultural science and technology information should take into account the cultural level of farmers and media literacy. During the reporting of new technologies, on the one hand, the narrative language of news should be as close to the farmers' living and their agricultural production reality. It is difficult for a farmer who never receives a higher education to understand the research and development knowledge, such as rice starch synthase gene and its promoter etc. What can really attract their interest are the benefits of new technologies compared to the old ones. On the other hand, media reports should focus on the use of technology, rather than talking at length about how many breakthroughs the technology has made in some way. Any scientific research must be tested in practice and only in practice, the research can realize its value.

Fourth, the media should set up a reasonable agenda, adhere to the public opinion guidance and increase reporting of agricultural science and technology information.

In the era of mass media, one of the functions of media coverage is to improve the importance of one issue in the minds of the audience through the repetitive news report. Thus once a rice variety is concerned about the mass media, the farmers will be able to

perceive changes in the external scientific and technical information. The media agenda and the audience seem to perceive a seamless link, but in fact there is a huge gap separated by the reality. Media information is always delivered in a particular service as its own target audience. For example, readers of Metropolitan Daily, morning papers and evening papers are mostly urban residents and professional newspaper audiences are classified more clearly in order to serve professionals with a higher level of knowledge. Currently, there is so few media really targeting farmers as their audience and only relatively limited information is provided. In terms of content, it mainly focuses on the achievements of agricultural science and technology, rarely involving the special report of the technology itself; from the reporting media perspective, the Communist Party-owned newspaper is a major public position of dissemination of scientific information in rural areas, such as *Anhui Daily (rural edition), Farmer's Daily* and *China County Times* and so on. The lack of agriculture reports shows that in the market economy, considering their own economic interests, the media which have implemented the enterprise management and operation have to give up some social responsibility which they should have taken. Agriculture has always been the foundation of the national economy and the food is the foundation of the foundation. History has proved many times that if there is no adequate supply of food, it will be difficult to sustain social stability, social development will stagnate and the people cannot live happily. When the media pay attention to agricultural science and technology, in fact, it is to safeguard the interests of society and to protect their own interests in the long run.

CONCLUSION

Agriculture is the foundation of the national economy and the development of agriculture, in the final analysis, relies on scientific and technological innovation. Ultimately technology innovation diffusion is still an ideal model which borrows lots of foreign practical experience and makes use of various research results. Perhaps, the theory itself may contain a number of assumptions and not always coincide with the actual situation. For instance, the media sometimes have a direct effect on the audience, rather than through opinions leaders with strong personal influence. However, the model is not used to explain almost everything, but to provide a description of the general trajectory of technology diffusion for people to learn and think. Technology diffusion must pay attention to non-media channels, such as the group role of opinion leaders in interpersonal communication.

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REFERENCES

China Agriculture Yearbook, 1980a. Agriculture Press, pp: 459.

China Agriculture Yearbook, 1980b. Agriculture Press, pp: 469.

China Agriculture Yearbook, 1992. Agriculture Press, pp: 585.

Liu, J., 2002. China's Agricultural Development Strategy at the Beginning of the 21st Century. China Agriculture Press, China.

Mcquail, D. and S. Windahl, 1993. Communication Models for the Study of Mass Communication. Longman, London.

Rogers, E.M., 1995. Diffusion of Innovations. 4th Edn., Free Press, New York.

Severin, W.J. and J.W. Tankard, 2006. Communication Theories. China University of Communication Press, China, pp: 179.

Wilbur, S., 2010. Introduction to Communication. China Renmin University Press, China, pp: 200.

Zhou, H., 2005. Empirical studies on the extension of new technology in quality rice-a case study from Fengshan town, Bobai County, Guangxi Zhuang Autonomous Region. China Agricultural University, Beijing, pp: 1-12.

Zhu, D.F., C. Huizhe, Z. Xiufu, L. Xianqing, Z. Yuping *et al*., 2007. Evolvement of rice cropping system and planting zonation in Zhejiang province. Acta Agr. Zhejiangensis, 19(6): 423-426.