Research Article

Research on Agricultural Modernisation and Use of Informatisation in Hebei Province China

Abdur Rehman[1]*, Iqbal Javed[2], Zhang Nannan[3], Muhammad Niamatullah[1], Raheel Saqib[4] and Allah Bakhsh[5]

[1]Department of Agricultural Economics, Faculty of Agriculture, Gomal University Dera Ismail Khan, Pakistan, [2]Department of Economics, University of Lahore, Sargodha Campus, Pakistan; [3]The Central Institute for Correctional Police, Baoding, Hebei, China; [4]Department of Agricultural Extension, Education and Communication, the University of Agriculture Peshawar, Khyber Pakhtunkhwa, Pakistan; [5]University Agriculture Faisalabad, Sub Campus Toba Tek Singh, Punjab, Pakistan.

Abstract | This study focuses on the perspective of information to explore the development of agricultural modernisation and to provide the theoretical reference for the development of agricultural informatisation in Hebei province China. The relevant literature and the results of the research have been collected to understand the agricultural informatisation in Hebei province and adopted the system analysis method to focus on the existing problems and to put forward the significant and the specific guidelines. The results showed that the Lang fang city is located between Beijing and Tianjin stands first in the comprehensive level of ranking for the development of agricultural informatisation and remained first in the ranked of index popularisation and application of agricultural informatisation. The Tangshan city ranked first for the infrastructure of agricultural information, the capital city Shijiazhuang in Hebei province as ranked first in the agricultural informatisation and human resources index. The Hengshui city ranked first in the agricultural informatisation subject to environmental index. Recently the Park in Hebei province, although more modern and high standard basic farmland and so on the basis of the modern agriculture construction, but still incomplete for the system of information service, large capital needs, information service supply and demand contradiction and the lack of high-quality agricultural information personnel. The concept of informatisation can be incorporated into the construction of agricultural modernisation, improve the agricultural information services software and hardware facilities, improve practically the agricultural information service, build a perfect agricultural information guarantee mechanism, the construction of specialised agricultural information service team, to enhance the quality of agricultural informatisation workers, comprehensively promote the development of Hebei province and even the national agricultural modernisation.

Received | January 04, 2019; **Accepted** | March 15, 2019; **Published** | May 20, 2019
***Correspondence** | Abdur Rehman, Department of Agricultural Economics, Faculty of Agriculture, Gomal University Dera Ismail Khan, Pakistan; **Email:** drrehmanagec@gu.edu.pk
Citation | Rehman, A., I. Javed, Z. Nannan, M. Niamatullah, R. Saqib and A. Bakhsh. 2019. Research on agricultural modernisation and use of informatisation in Hebei Province China. *Sarhad Journal of Agriculture,* 35(2): 610-617.
DOI | http://dx.doi.org/10.17582/journal.sja/2019/35.2.610.617
Keywords | Agricultural modernisation, Hebei province, Information development, Problem, Agricultural development

Introduction

Under the new normal conditions, vigorous development of agricultural modernisation will provide new impetus for China's stable economic growth, and agricultural industrialisation is the basis and support of agricultural modernisation. Agriculture is the basic industry to support the construction and development of national economy, and modern agriculture is the emerging stage of agricultural development in China, which is also the main mode of agricultural development in China. Through the rational allocation and full utilisation of land, labour and other factors of production, agricultural production can achieve the best economic returns. It can maximise the income of agricultural labour force and form diversified forms of agricultural industry and multi-functional forms of agricultural management. China as the largest agricultural country, the large rural population determines the status of agriculture in the entire national economy. At the same time, it was also decided that agricultural modernisation must be realised and first be achieved. The Third Plenary Session of the 15th CPC Central Committee pointed out that without the modernisation of agriculture, there would be no modernisation of the entire national economy, emphasising the importance of agricultural modernisation (Rongtian, 2015). The development of information technology is to accelerate the construction of agricultural modernisation, to improve the level of agricultural informatisation and to promote innovation in traditional agriculture. It is important to improve the efficiency of agricultural production and productivity by using modern information technology, guide agriculture and farmers to the market, accelerate the process of agricultural modernisation (Wei, 2014; Lin et al., 2015; Zhiwei et al., 2016). In view of the important position of agricultural modernisation, the sixth party congress of Hebei Province proposed to strive for a strategic deployment of agricultural modernisation after 10 or 20 years of efforts conditionally. In recent years, with the continuous development of information technology, the agricultural sector is responsive to the needs of the modern agricultural market, accelerate the pace of information management services, integrate technical indicators such as pest control, strategy of farmland management and soil resource characteristics into the agricultural information technology database and provide modern technical support for agricultural production. At present, the promotion and application of information technology in the agricultural field has fully penetrated agricultural production and the development of agro-ecological tourism with the support of information technology, agricultural and secondary products marketing, agricultural product technology upgrades, etc. promoted the upgrading and innovation of agricultural modernisation (Huaijun et al., 2014).

With the rapid development of China's economy and society, agricultural modernisation has aroused great concern from all walks of life. Many scholars have conducted in-depth discussions on this topic from different angles. A research was conducted in depth on the coordinated development of new urbanisation and agricultural modernisation as an entry point (Junjie and Liu Lijuan, 2014). The mother shoaling made a profound exposition from the problems and countermeasures in the coordinated development of agricultural mechanisation and agricultural modernisation in mountainous areas (Shaolong, 2016). Zhang Hongzhen conducted scientific research from the perspective of the coordinated development of Xinjiang's agricultural modernisation and new urbanisation (Hongzhen, 2016). Jingxin proposed that informatisation has changed the status quo of large-scale, scattered and difficult management of traditional agricultural production; moreover, the informatisation has become the key to the development of modern agriculture (Jingxin, 2015). On the basis of previous studies, Xing (2015) analysed the agricultural informatisation level and the promotion of agricultural total factor productivity and agricultural structural efficiency from the theoretical perspective. Under this background, the development of agricultural modernisation faces a rare opportunity for development and many problems that restrict the development of agricultural modernisation are expected to be solved to a large extent. Therefore, based on the informational perspective, the article takes Hebei Province, a primarily agricultural province, as an example of analysing the development of agricultural informatisation in depth, in order to provide necessary reference and reference for the development of agricultural informatisation in China (Xing, 2015). The main objective of the research paper is to focus on the improvement and development of Agriculture through various techniques in various cities of Hebei province China.

Materials and Methods

Description of the research area

Hebei Province is located at 36°05′42°40′ north latitude and 113°27′119°50′ east longitude. It is located in the north of North China and Weihe River, east of Bohai Sea, west of Taihang Mountain, north of Yanshan Mountain, Inner Ring of Beijing and Tianjin. With a total area of 188,500 hm^2, it administers 11 prefecture-level cities and the provincial capital Shijiazhuang. Hebei Province has a continental monsoon climate with four distinct seasons. In China's important grain and cotton production areas, crops in most areas are twice a year, and the area planted with grain accounts for more than 80% of the total area of cultivated land. In 2015, the value of total production reached 2.98 trillion Yuan, which was 1.31% higher than 2014, ranked 7th among the 31 provinces in the country, of which agriculture and related economies accounted for a large proportion. In recent years, with the country and the government attaches great importance to the three rural issues as well as the rapid development of industrialisation, urbanisation and informatisation, the process of agricultural modernisation in Hebei Province has been accelerated.

Research methods

Through the literature review method, the related literature are collected and compiled, and the achievements of the related research about agricultural informatisation in Hebei Province are understood. The system analysis method is adopted for the existing problems, and the specific suggestions and recommendations are put forward. The relevant data are taken from Hebei Province Rural Statistical Yearbook.

Results and Discussion

Application analysis of informatisation in agricultural modernisation of Hebei Province

In recent years, Hebei Province has implemented the "114 Project" of agricultural informatisation i.e. one provincial agricultural data center, one Hebei agricultural information website group and four platforms. The province's agricultural video command, agricultural government, agricultural technology services and agricultural market information platform, through the comprehensive application of various modern information techniques such as Internet of things, cloud computing and 3S in the agricultural field as well as the construction of platforms, systems and applications with the series of measures, agriculture has gradually shifted to smart agriculture, effectively promoting the development of agricultural modernisation. Currently, the agricultural information of Hebei Province service system is perfect, 70% of townships and towns have the institutions of agricultural information services. The information network broadband covers 2,000 townships, 50,000 administrative villages and 40 large and medium-sized agricultural product wholesale markets. Hebei Agricultural Information Network has integrated 12 agriculture-related departments, established a three-level shared database of agricultural economics, agricultural conditions and agricultural prices, and established nearly 10,000 service columns. For example, Qinhuangdao has reduced the occurrence of disasters by sending information, announcements and disasters to fishermen. Shijiazhuang, Tangshan, Chengde, Hengshui and other cities have improved the objectives and scientific supervision through networked remote video surveillance of milk stations effectiveness. Baoding Green Luster Modern Agricultural Park applied advanced technology equipment such as mechanical spraying, drone and micro-drip irrigation system to the park to enhance the intelligent management level and work efficiency of the park. Lang Fang city actively develops one village and one product and adjusts the structure of the modern agricultural industry. Currently, there are 184 professional villages with a good economic benefit and a total economic income of 8.93 billion Yuan collectively. The rapid development of e-commerce has led to the establishment of 8 Taobao Towns, 91 Taobao villages and 23 National e-commerce comprehensive demonstration Counties in Hebei Province, especially expanding the sales of fresh agricultural products. The terminologies like informatisation development, agricultural information infrastructure, popularisation and application of agricultural information, agricultural information human resources and agricultural information subject to the environmental index were used to know the ranking and position level of agricultural development in various cities of Hebei province China. The map of Hebei province including the names of cities is shown in Figure 1. At present, the development level of agricultural informatisation in various cities of Hebei Province is shown in Table 1.

It can be seen from Table 1 that Lang fang city located between Beijing and Tianjin, ranks first in the comprehensive level of agricultural informatisation and

Table 1: *Ranking the Development level of Agricultural İnformatisation in Hebei Province.*

	İnformatisation development	Agricultural information infrastructure	Popularization and application of agricultural information	Agricultural Information Human Resources	Agricultural information subject to environment
	Comprehensive level ranking	Index ranking	Index ranking	Index ranking	Index ranking
Lang Fang City	1	3	1	2	9
Tangshan City	2	1	2	5	8
Shijiazhuang City	3	2	5	1	4
Zhangjiakou City	4	4	10	4	10
Handan	5	5	8	11	5
Chengde City	6	6	7	10	11
Qinhuangdao City	7	10	3	8	2
Baoding City	8	7	9	7	3
Quzhou City	9	9	4	3	7
Hengshui City	10	11	6	9	1
Xingtai city	11	8	11	6	6

Source: *The evaluation report of the development level of agricultural informatisation in Hebei province.*

Table 2: *Construction and information development of modern agricultural parks in Hebei Province from 2011 to 2015.*

Time Period	Modern agricultural park	Modern agricultural park investment	The annual gross output value of the park	Rural communication industry investment	Rural citizens	Agricultural technology level
	(a)	(100 million) yuan)	(100 million) yuan)	(100 million) yuan)	%	%
2011-2015	1251	148.6	1147	>2	37.1	70.2

Source: *Author's Research.*

popularization and application of agricultural information index ranking followed by Tangshan city, Tangshan city ranking first in the ranking of agricultural information infrastructure followed by Shijiazhuang city, Shijiazhuang as the provincial capital of Hebei Province, ranks first in the ranking of agricultural informatisation human resources index followed by Lang fang city and the agricultural informatisation main environmental index ranks first in Hengshui city followed by Qinhuangdao city.

Analysis of modern agricultural construction and informatisation development in Hebei Province China

As a key target for the expansion of agricultural and rural investment in Hebei Province, the modern park has invested 14.86 billion Yuan in Hebei Province and built 1251 modern parks with an annual output value of 114.7 billion Yuan, which has accelerated the process of agricultural and rural modernisation. Informatisation as the basic condition for rural modernisation construction, Hebei Province accelerated the construction of rural communications, invested more than 200 million Yuan, comprehensively improved its communication capacity level and laid a good foundation for rural modernisation. At the same time, the information network system developed rapidly. From 2011 to 2015, the number of rural citizens in Hebei Province reached 12.5 million, accounting for 37.1% of all citizens, higher than the national average of 27.8% as shown in Table 2.

Strengthening the construction of high standard basic farmland is an important foundation for the development of modern agriculture. The construction of high-standard farmland in Hebei Province from 2011 to 2015 is shown in Table 3. The completion rate is 75.6%, of which the completion rate of Lang fang city and Chengde city is over 90%. The lowest rate is Baoding city that is only 59.5%.

Insufficient information in the construction of agricultural modernisation

The function of an information services system is incomplete: The coverage of agricultural information services system in Hebei Province varies by region. Hebei Province is affected by the topographical features of landforms, and the development of agricultural information services system is uneven.

For example, Tangshan, Shijiazhuang and Lang fang have developed economically. The development of urban areas and information infrastructure is relatively good. The mobile network and the system of communication equipment services are relatively complete. The construction of urban information infrastructure of Hengshui is poor; the personal level and quality of information services still need to be improved as shown in Table 1.

Table 3: *Construction of High Standard Basic Farmland in Various Cities of Hebei Province from 2011 to 2015.*

Area	Planning area (10,000 hm²)	Completed area (10,000 hm²)	Completion rate (%)
Lang Fang City	4.1	3.8	92.7
Tangshan City	4.47	3.14	70.2
Shijiazhuang City	6.38	4.21	65.9
Zhangjiakou City	4.07	3.28	80.5
Handan	5.58	4.11	73.7
Chengde City	2.64	2.46	93.2
Qinhuangdao City	1.28	1.15	89.7
Baoding City	7.56	4.50	59.5
Quzhou City	5.79	5.11	88.2
Hengshui City	5.94	4.18	70.4
Xingtai city	6.48	5.11	78.8
total	54.29	41.25	75.6

Source: *Hebei Province Rural Statistical Yearbook.*

Contradiction between supply and demand of rural information services: In theory, the development of agricultural production and informatisation must be closely related. Only in this way we can fully reflect the important supporting role of informatisation in agricultural development. However, as far as the current development status is concerned, the demand for rural information services in Hebei Province is at a high level. Farmer's requirements for information services quality such as service time, service scope and service content are difficult to be met, and the agricultural information services are not in line with the local agriculture. The actual demand for production, the lack of effectiveness and the forward-looking of agricultural information services led to many agricultural information services, only staying at the theoretical value, but the service and guidance value of agricultural production cannot be fully reflected (Yan and Suying, 2013). In addition, existing agricultural information construction lacks effectiveness and standardised supervision. In the open network environment, the source of some agricultural information is undetectable, and the authenticity of information is difficult to be guaranteed. This means that the resources of the agricultural information service system are wasted and the actual demand of agricultural production cannot be solved from reality (Xinli et al., 2014).

Insufficient capital investment in network construction: Due to the large agricultural population and the large scale of farmland in Hebei province, the number of agricultural information networks has also increased, which puts higher requirements on capital investment and other aspects (Wenli, 2015). Adequate capital investment as the basic condition for the rapid development of information technology, lack of necessary infrastructure support funds will inevitably lead to the construction of agricultural information services lags behind the rapid development of modern agricultural production. According to the current situation in Hebei Province, 87% of farmers in Hebei Province have an annual income of less than 5,000 Yuan, which limits the way of farmers to access information. Therefore the agricultural information services network is built in the network research, development and the purchases of facility etc.

Lack of high-quality agricultural information talents: The development of agricultural informatisation is inseparable from the support of high-quality talents. At present, the development of agricultural informatisation in Hebei Province is also prominent in this respect. The overall quality of the existing agricultural information services personnel is not high, and the cultural and business level of individual information workers is very low, especially the lack of those professional composite technicians. In the grassroots level of towns and villages, agricultural information services personnel are also served by other personnel. They cannot master the information base and scientific knowledge such as the internet and computers, and work efficiency and quality are difficult to grasp (Li, 2014; Xiaoying, 2016). In addition, the loss of rural youth labor is also one of the key factors that cause the lack of talents in information services construction in rural areas. At present, the agricultural production is mainly for people with lower levels of teaching, lacking the necessary information equipment application technology and still using the traditional agricultural production and management concept resulting in the

inability of many information services facilities to be used to the maximum extent.

Figure 1: *Regional distribution map of various cities in Hebei Province China.*

Conclusions and Recommendations

Conclusion

The results of the study concluded that with the continuous development of information network technology and the real needs of agricultural modernisation, the forthcoming development of agricultural informatisation is very important. The government departments should actively play a leading and demonstrating role, unite relevant functional departments, do scientific planning's, actively deployed agricultural information services organisations, rely on special financial funds and social diversified funding channels, improve information services infrastructure construction and then escalating the agriculture. The coverage of information services in the country, universities and colleges of agricultural sciences give full play to their unique advantages, provide scientific and technological support and resource guarantee for the development of agricultural informatisation, increase the talents of agricultural information technology, while continuously exporting agricultural information technology. The innovation and exploration efforts to continuously improve the scientific and technological content of agricultural information services in China, the majority of agricultural information workers must continuously improve their personal business capabilities and professional quality, continuously improve their personal services awareness and promote the construction of agricultural information in China to achieve the faster and better development.

Suggestions on informatisation to promote agricultural modernization

Improve the software and hardware facilities of agricultural information services and strengthen the multi-functional advantages of services system: The popularisation of agricultural information services infrastructure directly determines the coverage of China's agricultural information services system in the country. Therefore in line with the market development needs, combined with the government's macro guidance, it is essential to realise the diversified function of the agricultural information services system especially Hengshui city. Qinhuangdao city and Changzhou city, the focus is from the following three aspects. First, we must highlight the leading role of the government. It is necessary to comprehensively consider and scientifically grasp the construction and development of the agricultural information services system. It is necessary to coordinate with relevant departments to analyse the current situation of China's agricultural informatisation development, the distribution of the agricultural population and the regional characteristics of agricultural production. Moreover, fully based on the results of research analysis, develop a general plan and guidance that is in line with the development of China's agricultural information. Secondly, we must give play attention to the role of the service of social carriers such as research institutes and agricultural universities. Based on the unique advantages of agricultural research institutes and agricultural colleges in information services, through academic research, discussion and exchange of network resources, based on the actual development of agricultural informatisation in various regions, we will continue to strengthen theoretical research and practical exploration of agricultural informatisation development. These academic achievements are feedback to the farmers through newspapers, magazines, websites, service stations and other carriers so that farmers can effectively use information resources scientifically. Third, we must give full pay to agricultural cooperatives and other agricultural cooperatives and industry associations, and through questionnaires and analysis, we will collect agricultural information that is of interest to farmers and urgently needed, and then target them

through various forms such as media, rural radio stations, and networks, guided by to achieve the development of agricultural information.

Improve the practicality of agricultural information services and ensure that Informatisation falls in agricultural production: The agricultural information service management department should comprehensively analyse the market demand and planting characteristics based on local agricultural production, planting structure and climatic conditions, and then provide targeted information services and guidance to farmers to ensure agricultural information. The practicality of the service will focus on strengthening the construction of cities such as Xingtai, Zhangjiakou and Baoding. In addition, compared with the developed countries such as the United States, Japan and the United Kingdom, China's current agricultural modernisation process, the scientific and technological content of the information services system is not high, directly affecting the problems of farmers' increased production and sustainable agricultural development. Therefore, in the process of information services, the agricultural information services department should pay attention to improving the scientific and technological content of information resources and strive to solve the practical problems of farmers in agricultural production through information services, to abandon the backward traditions that restrict the development of modern agriculture and to highlight the agricultural informatisation. The true value of the services to ensure the landing of information technology in agricultural production.

Expand agricultural information financing channels and build a sound agricultural information security mechanism: In terms of capital investment in agricultural informatisation construction, it is necessary to strengthen the investment and financing mechanism of government-led and social participation, enrich the funding channels and enhance the sustainability of capital investment. Government departments at all levels should attach great importance to the construction of agricultural informatisation, set up special funds for agricultural informatisation development and include special funds in the financial budget at the beginning of the year to ensure the earmarking of funds, apply financial funds to farmer's information quality education, strengthens farmers' information and awareness of agricultural production. At the same time, in the composition of agricultural informatisation construction, we must pay attention to absorbing the input of social capital, obtain the advertising revenue through the exclusive title of information services network, continuously enrich the source of funds and inject financial power for the development of agricultural informatisation to realise agriculture. Information network construction has a win-win situation in society and economic benefits.

Building a specialised agricultural information service team to improve the quality of agricultural information workers: In view of the quality construction of the agricultural information services team, it is necessary to strengthen the establishment of agricultural informatisation thinking and transform the traditional work concept from the ideological level and to strengthen the practical application ability of workers to information and computer technology from the technical, operational level. Strengthen its agricultural information service skills, especially in cities such as Handan, Chengde and Hengshui. First strengthen the quality training of existing agricultural informatisation workers, optimise the ideological awareness, knowledge structure and professional skills, etc. of information workers and further to develop thinking and improve services capabilities through knowledge lectures, intensive training and outings. In particular, it strengthens the ability to apply network information technology. Secondly it is equipped with specialised grassroots agricultural informants and through scientific human resource management, establishes a comprehensive reward and incentive system to stimulate grassroots agricultural information workers to engage in information services. Consciousness and enthusiasm; the third are to strengthen the selection and attractiveness of professional high-end talents and establish a comprehensive salary guarantee system and incentive reward system through large-scale professional recruitment fairs to attract high-end talents in the development of agricultural informatisation. The region has developed and settled. It is also possible to establish in-depth cooperative relations with agricultural professional colleges and to cultivate professional technical talents in agricultural informatisation in the region through entrusted training, etc., to provide talent support for local agricultural informatisation development.

Author's Contribution

Abdur Rehman designed the study, wrote the protocol and prepared the first draft of the manuscript. Iqbal Javed did the data analysis, model modification and rectification. Zhang Nannan helped us in giving his useful suggestion about the model usage and data analysis. Muhammad Niamatullah helped in typing of the manuscript and data editing. Raheel Saqib assist in data collection and data analysis. Allah Bakhsh also helped in collecting review of literature. All authors read and approved the manuscript.

References

Hongzhen, Z. 2016. Research on the coordinated development of agricultural modernization and new urbanisation in xinjiang and countermeasures. West Leather. (20): pp. 93

Huaijun, Q., F. Wenjie, T. Yan. 2014. Empirical research on agricultural information construction. Taking shandong province as an example. Chin. Agric. Sci.. 47(20): pp. 4117-4127.

Jingxin, H. 2015. The role of agricultural informatisation in promoting agricultural modernization and new rural construction. Beijing Agric. (17): pp. 232.

Junjie, C., L. and Lijuan. 2014. Research on the coordinated development of new urbanisation and agricultural modernization and countermeasures. Econ. Aspect. (10): pp. 12-15.

Li, L. 2014. Accelerating the cultivation of new type of professional peasants supporting the construction of modern agriculture. Mod. Rural Sci. Technol. (19): pp. 77-78.

Lin, Z., S. Guanghe and Z. Qiang. 2015. Research on the coordinated development of agricultural modernization and industrialization, informatisation and urbanisation. Rural Econ. (08): pp. 89-93.

Rongtian, Z. 2015. Evaluation of agricultural modernization and spatial differentiation in the yangtze river Delta. China Agric. Res. Reg. Plan. 36(02): pp.111-117.

Shaolong, M. 2016. Problems and countermeasures in the coordinated development of agricultural mechanization and agricultural modernization in mountain areas. China Agric. Resour. Reg. Plan. (06): pp. 22-27.

Wei, L.C. 2014. Agricultural informatisation research in agricultural modernization process. Chengdu: Southwest. Unive. Finance Econ.

Wenli, W. 2015. Research on the impact of financial investment on the social benefits of agricultural industrialization projects in Hebei Province. Baoding: Hebei Agric. Univ.

Xiaoying, W. 2016. Exploring the promotion effect of "Internet+" on agricultural industry upgrading. China Agric. Resour. Reg. Plann. 37(05): pp. 208-212.

Xing, Z. 2015. Analysis of the impact of agricultural informatisation on agricultural production performance. Nanchang: Jiangxi Univ. Finance Econ.

Xinli, W., Q. Rongfeng and D. Jingfang. 2014. Analysis of the balance of agricultural information service development in hebei province. SME Manage. Technol. (Mid-term), (10): pp. 159-160.

Yan, H. and W. Suying. 2013. Analysis of the supply and demand of rural information services in Hebei province. Econ. Res. Guide. (04): pp. 45-46.

Zhiwei, D., Z. Gasu and W. Fazeng. 2016. Progress and reflection on the coordinated evaluation of "five chemical" industrialization, urbanisation, agricultural modernization, informatisation and greening. Prog. Geogr. 35(01): pp. 4-13.