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Agrometeorological Analysis and Meteorological Disaster Monitoring Technology

Yan Liu*, Lianxi Wang

Nanjing University of Information Science & Technology, Zibo 255022, China. E-mail: 294911884@qq.com

Abstract: Carrying out agrometeorological disaster prediction and monitoring can ensure the safety of agricultural production to a great extent, so as to reduce unnecessary losses and create more economic benefits for agricultural production. Therefore, it is necessary to do a good job in monitoring and forecasting meteorological disasters and strengthen the assessment and prevention of meteorological conditions, so that the harm caused by agrometeorological disasters can be minimized, and the efficiency of agricultural production can be maximized. Based on the author's learning and practical experience, this article first summarizes the agrometeorological disaster monitoring and prediction technology as well as its development status. Besides, the authors discuss the main problems existing in agrometeorological disaster monitoring in China and the prevention strategy of agrometeorological disasters, and look forward to the future research direction.

Keywords: Agrometeorological Disaster; Remote Sensing; Monitoring; Prospect Forecast

1. Introduction

The essence of the agrometeorological disaster forecast is the forecast of disastrous and critical weather, which fully combines the fertility of crops. At the same time, agrometeorological disaster monitoring can be used to formulate more rational decision-making programs for crop growth environment. The most important aspect of agrometeorological disaster monitoring is ground monitoring, which is the basis and key of the whole agrometeorological monitoring technology. It has become the core of the whole monitoring technology with its advantages of strong real-time and high accuracy. Combined with the popular application of Internet of things technology, the Internet technology can be used to create a separate ecological environment monitoring network for agrometeorological disaster monitoring, and carry out real-time monitoring on this system, so as to take preventive measures[1]. At the same time, the agrometeorological disaster detection technology can also do remote data processing, and realize the remote heating control in one technical method, bringing a lot of convenience to the agricultural construction. In addition, it also includes basic research on agrometeorological disasters. For more and more severe urban flood disasters in recent years, the meteorological forecast value is large, such as once in 50 years, and it can be predicted by numerical simulation and risk assessment, so as to play the role of disaster prevention and mitigation.

2. Agrometeorological disaster monitoring and prediction technology and its development status

From the main meteorological disaster types, agrometeorological disaster monitoring and prediction technology includes drought meteorological disaster prediction, flood meteorological disaster prediction, low temperature frost meteorological disaster prediction, hail disaster prevention technology and so on. It is beneficial to carry out drought meteorological disaster prediction technology in agricultural planting based on principle that prevention

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is more important than resistance. At the same time, in addition to improving the drought resistance of the land through increasing equipment from the source, it can also carry out periodic water-saving planting according to the characteristics of crop planting. Similarly, flood prediction technology also needs to modify water conservancy, achieve water conservation through strengthening reservoir construction, or actively change the production conditions of crops, and arrange the planting area reasonably, so as to improve the ecological environment of the land and enhance the flood resistance of crops. The low temperature frost prediction technology should be carried out from several aspects, such as frost avoidance, frost resistance, frost reduction and so on. After monitoring the disaster weather, the catalytic growth of crops should be strengthened, and the removal supplies of ice nucleating bacteria, such as anti-frost bacteria and anti-frost preparations, should be used to reduce the damage of frost to crops and improve the frost resistance of crops[2]. In addition, dividing the hail disaster areas reasonably can also effectively reduce the impact of hail on crop production. Planting areas should actively improve the local geomorphological environment, destroy the conditions for hail formation as far as possible and reduce hail disaster weather, such as increasing forest area through planting trees and forage grass, expanding green areas, properly optimizing crop cultivation in some high-risk areas, minimizing the production of high-stalk crops such as corn and sorghum, and planting large areas of resistant crops like sweet potatoes and soybeans. The prediction technology of disaster meteorology provides many control measures for crop management, which is worth further studying and discussing.

3. Main problems in the agrometeorological disasters monitoring in China

3.1 Poor construction of agrometeorological monitoring system

In the current agrometeorological monitoring work in China, the backward construction mode is an unavoidable problem, which is manifested in the lag of instruments and equipment, ideas and methods, especially in the collection and processing of agrometeorological information. Since the relevant instruments and equipment are relatively old and backward, some work still depends on manual processing, and it is difficult to ensure the efficiency and quality of agrometeorological disaster monitoring.

3.2 Unjustified allocation of resources

In the construction of agrometeorological disaster monitoring system, the total amount of resources needed is increased, and the meteorological department is only the main executive department and the technical management department, but the overall operation of the specific work requires the participation of the local government, the competent agricultural department, the disaster prevention department, the water conservancy department and the communication department. It is important to grasp the accurate meteorological disaster information in time and to publish and communicate to the farmers. In some remote and backward areas, the resource allocation of agrometeorological disasters is limited, and the coordination function of relevant departments is difficult to play, which is one of the important problems affecting the construction of the whole system.

3.3 Outdated related technology

Agrometeorological disaster monitoring is a systematic, professional and accurate work. At present, the basic meteorological monitoring stations in China generally lack good technical support, for example, the number of professional and technical personnel is insufficient, the comprehensive quality of technical personnel is not high, the technical operation standard is lacking, and the technical treatment means are backward, so it is difficult to guarantee the accuracy and precision of the information of agrometeorological disaster. After the recognition of agrometeorological disasters, it is difficult to put forward an effective response plan in the first time, and cannot provide the necessary technical support for the relevant government departments, which is a serious impact on the actual agricultural disaster prevention and mitigation work.

4. Prevention strategies of the agrometeorological disaster

4.1 Improving early warning system for the agrometeorological disaster

In the monitoring of agrometeorological disasters, it should focus on improving the detection techniques in terms

of drought, high temperature and heat damage, low temperature and cold damage, and realize the operationalization, systematization and intelligence of early warning system. The construction of agrometeorological disaster early warning system should be based on RS, GPS, GIS and other high and new technologies, and complete computer and network systems, so as to form a comprehensive agrometeorological disaster early warning system that meets the actual needs. At the same time, in the prevention of agrometeorological disasters, it is necessary to use the remote sensing technology to carry out specific evaluation, provide the necessary professional guidance services for the government and relevant functional departments, and put forward reasonable and feasible suggestions for agrometeorological disaster prevention and mitigation.

4.2 Enhancing departmental collaboration and rational use of resources

In the work of agrometeorological disaster prevention, it is necessary to combine the key tasks and objectives of meteorological departments at all levels, rationally use all aspects of resources and construction funds, so as to make the construction of agrometeorological disaster prevention system more efficient and orderly. As the technical subject of agrometeorological monitoring, meteorological departments should formulate strict agrometeorological monitoring management system and information processing regulations, strictly carry out the collation of all kinds of technical information and data, and ensure the accurate assessment and forecast of agrometeorological disasters[3]. After discovering agrometeorological disasters, it is necessary to communicate with local governments and agriculture-related departments in a timely manner, such as water conservancy industry, industry and information industry, so as to strengthen the ability of good among relevant organizations, and formulate effective defense strategies quickly.

4.3 Enhancing the intervention of agrometeorological disasters by using science and technology

In agrometeorological disaster prevention, meteorological departments should not only achieve accurate and scientific monitoring, but also make scientific use of technical means to assist relevant departments to enhance effective intervention in related disasters. This requires the meteorological department to be equipped with high-quality professional and technical personnel, who have good meteorological professional operational ability, and understand the relevant knowledge of agricultural disaster prevention and mitigation, so as to propose effective intervention measures. For example, in the dry season, meteorological staff should closely observe the changes in the local meteorological cloud map, that is, to determine the best.

5. Future research directions

5.1 Research on comprehensive indicators of agrometeorological disasters

The formation of agrometeorological disasters and their degree of impact (hazard grade) are often the result of a combination of multiple factors. For example, drought is not only related to soil moisture status, but also to air temperature and humidity, which to some extent can change crop transpiration and soil evaporation, and also to crop coverage (growth period). Under the same temperature condition, the radiation condition will also lead to the difference of crop response. Therefore, how to increase the auxiliary index on the basis of the leading index is of great significance to improve the index of agrometeorological disaster.

5.2 Strengthening research on the prediction of agrometeorological disasters

It is necessary to pay attention to the formation process of agrometeorological disaster chain, pay attention to the study of the mechanism and law of disaster occurrence, and strengthen the scientific and technological support capacity building in early identification, prediction and risk assessment.

5.3 Constructing a real-time early warning technology system for agrometeorological disasters

A seamless real-time warning system for agrometeorological disasters should be developed based on crop growth model, regional climate model, 3S technology and numerical weather prediction products.

5.4 Constructing a three-dimensional and dynamic monitoring system for agrometeorological disasters

The research and development of agrometeorological disaster stereoscopic monitoring technology should be strengthened based on space-based and ground-based multivariate information, and a three-dimensional and dynamic monitoring technology system should be developed based on the combination of ground observation, satellite remote sensing and crop models.

5.5 Research on risk change assessment of agrometeorological disasters in the context of climate change

Global climate change, characterized by warming, has had a significant impact on the occurrence and regularity of agrometeorological disasters, including disaster inducing environment, disaster factors, disaster bearing, disaster prevention and mitigation capacity[4]. Addressing the change of agrometeorological disaster risk in the context of climate change has become a new direction of agrometeorological disaster monitoring, prediction, early warning and disaster management.

5.6 Research on the application of meteorological or climate prediction information in the prediction of agrometeorological disasters

Meteorological or climate forecasting is the main operational product of the meteorological sector, but is currently rarely used directly in the monitoring and prediction of agrometeorological disasters. This aspect depends on the reliability of meteorological and climate prediction information, on the other hand, it reflects the disconnect between meteorology, climate and agrometeorology. How to strengthen the organic combination of different professional directions and improve the application degree of meteorological and climate prediction information in the field of agrometeorology specialty is the key scientific problem to be solved in the future.

6. Summary

The monitoring of agrometeorological disasters is of great practical significance to ensure agricultural production. The meteorological departments should do a good job of all-round meteorological services, truly achieve meteorological services for agriculture, and assist relevant departments to provide reasonable defense strategies to maximize the role of meteorological departments in real agricultural production. In the work of agrometeorological disaster monitoring, it is necessary to pay attention to the scientific construction of defense system, the rational application of advanced technical means, and effective disaster intervention, so as to minimize the agricultural economic losses caused by natural disasters.

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