CONSTRUCTION OF AN ECO-AGRICULTURAL TOURISM ATTRACTIONS MANAGEMENT SYSTEM BASED ON THE CONCEPT OF CIRCULAR ECONOMY

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Based on the design concept of the Internet of Things, this paper combines the current development status of agro-ecological parks to apply the Internet, big data, cloud computing and image recognition and other cutting-edge mainstream technologies to establish an intelligent integrated management system for modern agro-ecological parks based on the Internet of Things. Agritourism gives tourists with experiences them to straight recognise the characteristics of local food even while integrating the social component of local food, suggesting that there are family members and small farms behind local food. Agritourism also encourages more people to spend a lot more money on local foods. Users can log in to the cloud platform directly through a computer or view the status of the park through an APP designed and developed for mobile devices such as mobile phones and tablets, and manage the entire park. The specific structure of the entire system is shown in Figure 1. Figure 1 illustrates the process of adaptive irrigation system where the information is collected in the next 3–5 days then it is feed into irrigation programming system for identifying the weather forecast and actual weather. Then it performs the irrigation process.

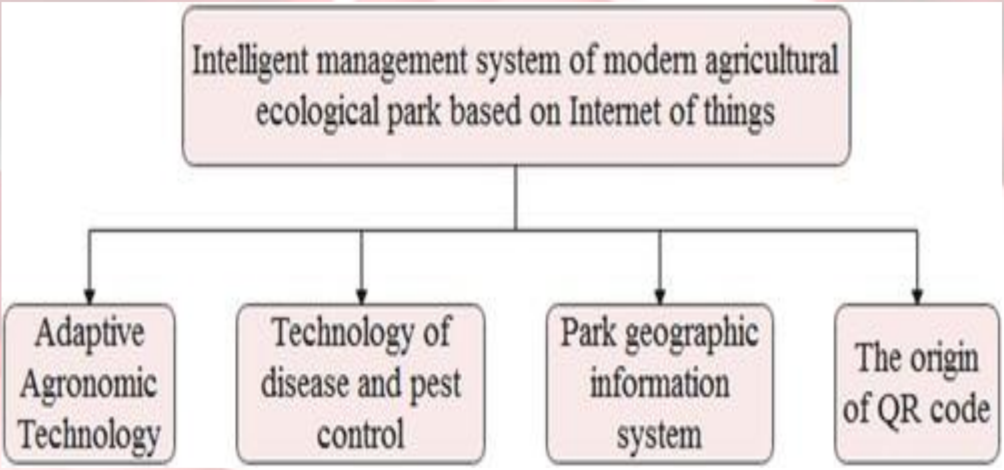

Figure 1. The overall structure of the agricultural tourism management system.

Adaptive agronomy technologies include smart irrigation and automatic mulching. That is, through the comprehensive park crop growth, soil moisture, park environment, etc., Agriculture agronomy is focused on producing plants with greater nutritional value and greater crop yields underneath a wide range of environmental conditions. Crops could be specially bred to achieve. Crop adaptation mainly refers to relationships between significant environmental factors and agricultural plant response. This life science branch, which really is mainly eco-friendly in environment, could be assumed of as a synthesising of important aspects of geographic location, physiology, genetic factors, atmospheric science, and agronomy. Smart irrigation technology determines the landscape's irrigation requires using weather information or soil moisture data. Smart irrigation technology consists of the three products, these products optimise irrigation productivity by minimising wastage of water while preserving plant health and the quality. Mulching is the process or practicing of trying to cover the ground in terms of improving plant life, advancement, and agricultural production effectiveness. Mulch is a technological term that means soil covering. automatic irrigation and automatic mulching management of crops are realised, as shown in Figure 2. At the same time, the weather forecast is incorporated into the irrigation and mulching control, so that corresponding decisions can be made in advance according to future weather changes (Adat et al. 2017; Vangala et al. 2020).

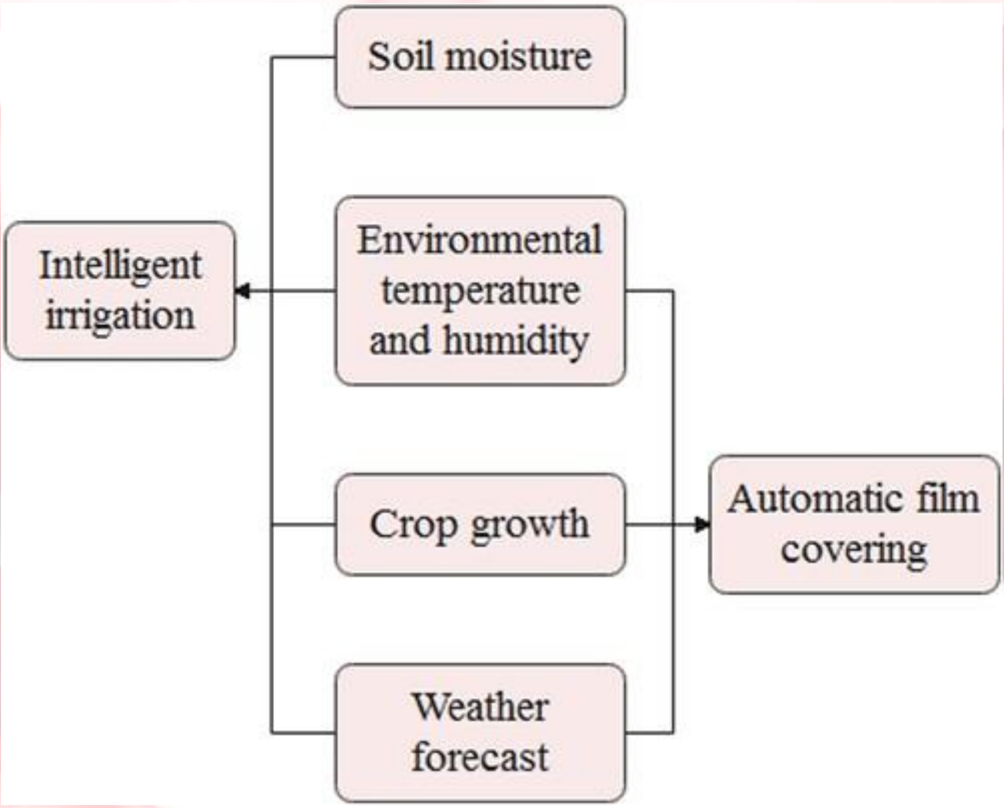

Figure 2. Adaptive agronomy technology.

The entire adaptive irrigation system integrates weather forecast data obtained from authoritative weather stations into the system on the basis of existing automatic irrigation. In addition to making real-time irrigation decisions based on soil moisture, crop growth, and real-time environmental conditions, the system can also integrate future weather changes, automatically adjust irrigation procedures, and make irrigation plans in the next few days in advance. When the actual weather conditions are quite different from the forecasted weather, the system will make corresponding adjustments to the preset irrigation programme. The specific process is shown in Figure 3 (Tong et al. 2019).

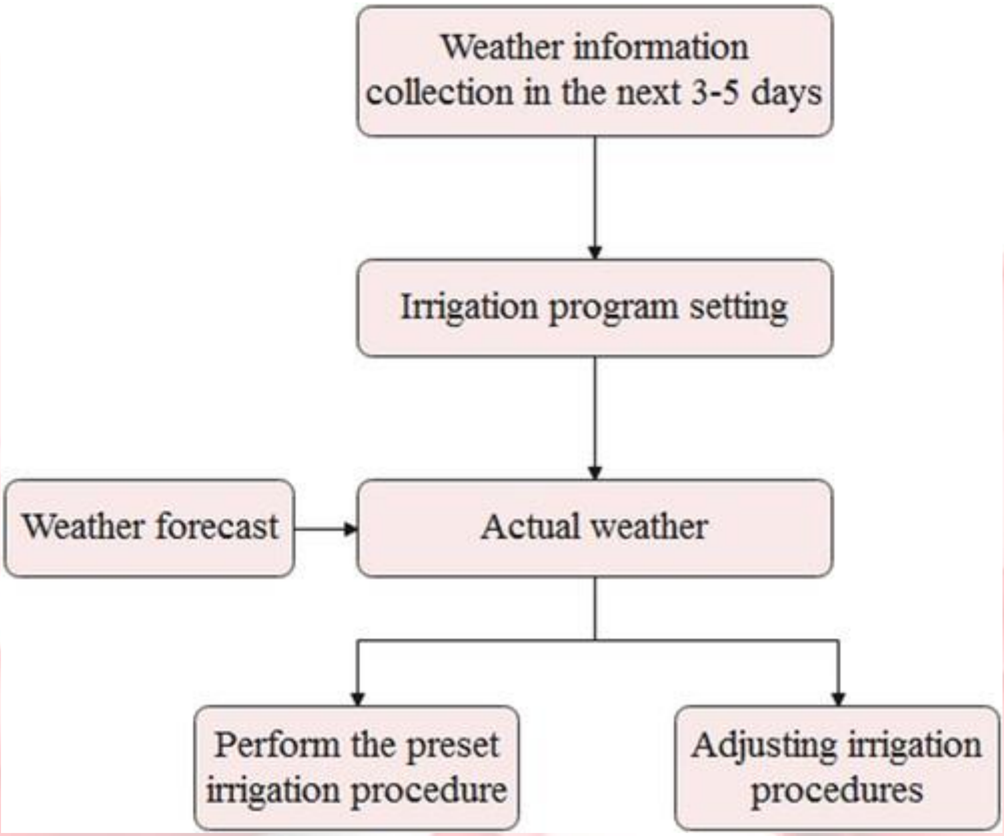

Figure 3. Process of adaptive irrigation system.

As shown in Figure 4, the automation exhibition hall (management room) and the on-site remote communication relay module realise wireless data transmission and control through GPRS. The expansion of GPRS is General Packet Radio Service. General Packet Radio Service is a packet-oriented cellular data requirement used on the universal mobile telecommunications communication systems of 2G as well as 34 g cellular networks. One of the primary goals of GPRS is to make things easier to communicate a mobile phone to certain other packet-switched channels, which opens a door to the internet world. With the emergence of packet mode, mobile communications and the Internet combined to create mobile Broadband technology. The on-site remote communication relay module transfers the data collected by the short-distance wireless data transmission module through the radio frequency short wave. The gate valve well substation in the pilot area is installed at the branch pipe. Remote communication refers to the communication and through digital communication, convention telephone, teleconference, the web, or any other implies by which individuals who are just not present physically in the same place can interact with others considerably all at the same. According to the different requirements of sprinkler irrigation and drip irrigation, high-performance micro-power solenoid valves are installed separately to implement segmented control and hierarchical management, which is scientific and reasonable. The requirements used in sprinkler irrigation are sprinkler heads, pipes, valves and time controller. Among these time controllers is equipped in modern sprinkler. The components involved in drip irrigation system are control valves, fertiliser tanks and mains. The pilot area collects information such as flow rate, pressure, soil temperature, soil moisture and soil nutrients at branch pipes, and implements automatic irrigation. The self-adaptive substation of the pump house and the substation of the high-level pool realise the automatic start and stop of the water pump, the automatic transmission and distribution of water in the pipe network, and the automatic adjustment of the pressure of the pipe network. The remote network video sub-stations are set up in multiple channels, installed in different sub-zones as needed, to monitor crop growth, water pump operation and auxiliary park daily management work in real time (Krčmářová 2020).

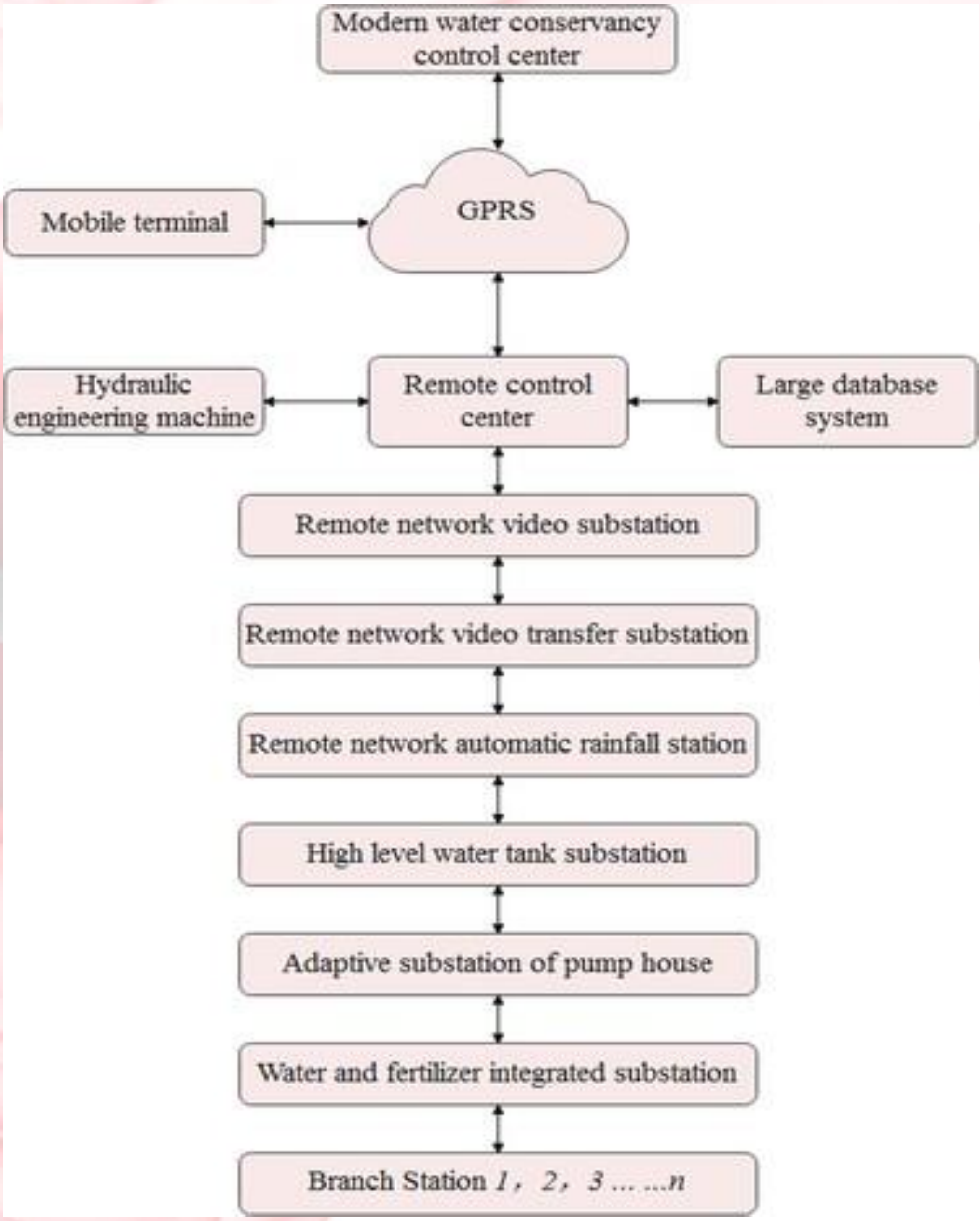

Figure 4. Automated irrigation.

The adaptive film mulching technology accurately analyses the future environmental weather, and then adjusts and arranges the corresponding film mulching procedures in the next few days according to the growth conditions of different crops in the park, which fully guarantees the demand for crop growth. In the cold season, the mulching film starts acting as a warm air and cooler insulating material; mulch helps to prevent land from quickly freezing, and that in the summer, it helps maintain soil temperature. Mulching acts as a barrier between both the land and droplets, trying to slow the coastal erosion (Gupta et al. 2021). Among them, the growth status of crops is mainly determined by image recognition technology and data collected by other terminals in the park. The specific process is shown in Figure 5 (Easterly III and Myers 2017).

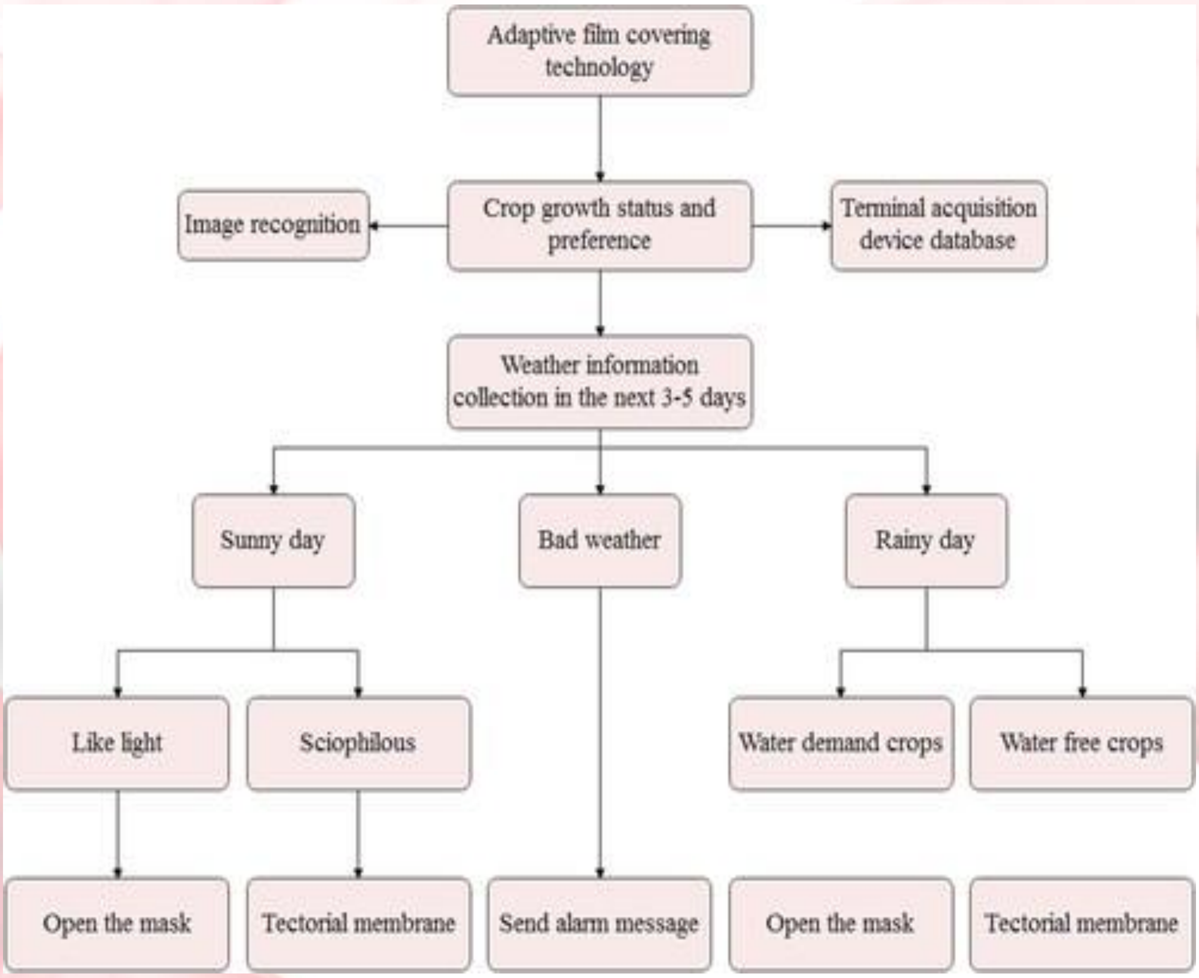

Figure 5. Adaptive film technology.

In the park, observation points are set up for each crop planting area, and each observation point includes trapping equipment such as video monitors, pest inducing boards, and insecticidal lamps. Under normal circumstances, the monitor is used to collect the growth of plants in the area and the working conditions of automated equipment. At regular intervals, the monitor monitors and captures the pest induction equipment at fixed points, and transmits the collected field information to the pest monitoring and early warning system after being processed by the controller. The system calculates the occurrence rate and occurrence index of various diseases and insects, and displays the survey statistics in real time on the GIS map, which intuitively reflects the damage degree of the diseases and insects in each region. Incidence rate and occurrence index refer to the incidence rate and disease index for diseases, and the occurrence rate and insect situation index for pests. Users can view the corresponding early warning information through smart agriculture APP software on mobile devices such as mobile phones and tablets. If no one takes measures to eliminate pests within a certain period of time, the system will take corresponding measures to control the occurrence of pests and diseases and ensure the healthy growth of crops. The specific implementation process is shown in Figure 6.

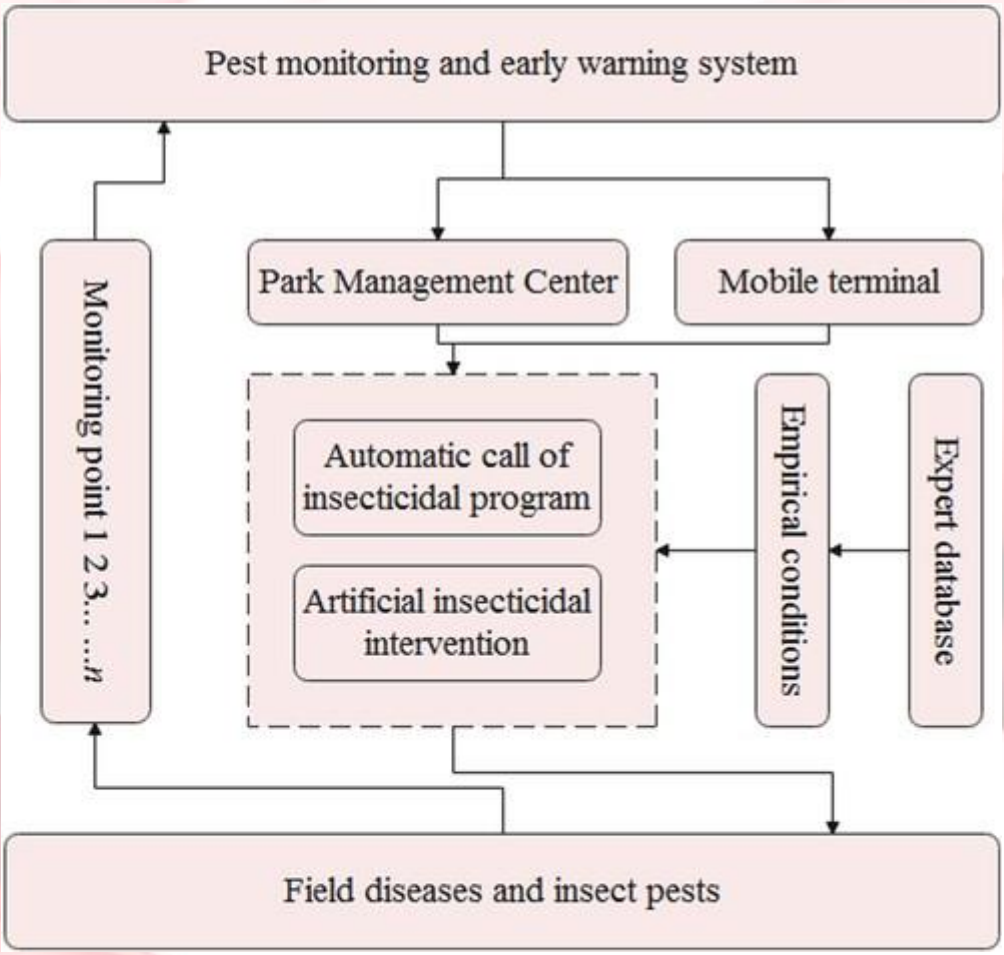

Figure 6. The specific process of pest prevention and control.