RICE DISEASE PREVENTION USING IOT – A REVIEW

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ABSTRACT:
It is very important to increase the productivity of agricultural techniques to improve yields and cost reduction in today's era. Internet of things can make efficient agricultural and farming industry processes by overcoming human involvement in a particular task through automation. Rice is stable food for Pakistan and main exports to national and international market. For the production of high quality rice, there are many factors that affects. Environmental factors like temperature, rainfall, humidity etc are important for the productivity of best quality crops. In this paper we will present IoT based techniques for rice disease prevention. We will present some well-known rice diseases along with their solutions. IoT techniques in soil science, crop protection and prevention are very important for agriculture.Furthermore, we will tabularize the IoT based efforts that are taken for rice disease prevention.

INTRODUCTION

Agriculture is known to be the most important economic activity. Millions of people throughout the globe depend upon agriculture sector for their living purposes. Agriculture is basically growing of plants for the quality production of food and other resources which are used on daily purposes.Pakistan's agricultural sector plays a vital role in the economy. It contributes 19% to GDP and 43% to Pakistan's labor force. Rice is the stable food for Pakistan and it is exported to many different international countries. Basmati rice is the best crop of Pakistan which is exported throughout the world[1] . Every

industrial sector find better ways of doing different tasks so that they can improve efficiency of their product, minimize yield, and lower possible risks which can occur. IOT is used for the analysis and collection of data in a continuous manner then the data is being processed and sent to central hub. Many researchers are using this technology for analyzing soil environment, weather data and extracting information about these things which would prove to be beneficial for future. This can increase the crop yields by 70% and reduce the prices nearly in half by 2050.

The rice fields may be influenced by soil, humidity, temperature, and rainfall. Sometimes the wrong use of fertilizers can lead to the diseases to occur.[2]Various strength of soil can grow rice crop. High strength of soil can cause smaller stomata conductance. It is necessary for the crops to receive good amount of nutrients from the soil, because it largely affects the growth of crop.Temperature is either very cold or very warm. Increase in temperature at extreme level will stretch the effective growing period. High temperature creates effect of pole ward change of the thermal limits to agriculture. This change is very much important for the crop.The amount of water vapors in the air is known as humidity. Leaf development totally relies on the process of photosynthesis and cell development. Leaf development is high in humid areas. But high humidity can also cause insect attack over the crop.Heavy rainfall can trigger extreme disastrous climatic events such as floods, which has adverse effects over rice fields. And less rainfall can cause drought which damages rice crops on a very large scale. Rice fields are sometimes badly affected by the common rice diseases which may occur due to several reasons. Those reasons are already mentioned above. If one crop is infected by any of the disease, soon it will spread like a rapid fire and will destroy the other fields as well. So there is a need of advance systems for agriculture so that it would become better and would increase productivity. The common rice diseases include Brown spots, Sheath rots, sheath blights, false smuts, grain discoloration (commonly known as fungal complex) and leaf streak.[3]
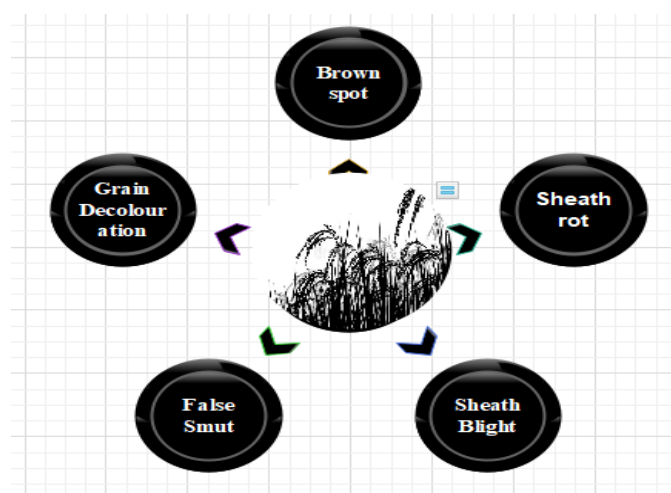
Figure 1. Rice Diseases

Many scientists put forward the treatments for rice diseases. They developed wireless water conductor which was used to analyze water in the rice fields. They even invented some IOT based sensors to detect the ratio of sunlight,

temperature and humidity[4].They even invented ways in which it warns the farmer about the crop having any disease and tells the farmer about some prevention for that disease[5].

Remaining paper is categorized as follwing, Section 2 extensively reviews the literature to find out the work done for agricultural sector in rice disease prevention. Section 3 explains rice diseases in detail. Section-IV includes the rice diseases along with their available solutions in tabular form. Section 5 finally concludes the research work.

LITERATURE REVIEW

S.J Yelapure and Kulkarni both discussed the need of expert systems and also reviewed them. As the result of this many countries step forward to develop some expert systems.[6]The author D. Yan-e et al proposed the concept of MIS (management information system). He designed the brilliant architecture to examine and analyze the features of agricultural data and the proposed system gives the information about the rice production. [7]M. K. Gayatri et al proposed how internet of things is applied to agriculture and how it makes rice crops agriculture efficient. The author A.Tuli et al developed cloud deployment model i.e. 'Agri-Assistance' which provides agriculture related information to farmers living in rural areas who were facing financial constraints.[8]Xian-Yichen and Zhi-Gang Jin both proposed digital approach to agriculture on IoT automation for example Electronic Product Code technology, Wireless Sensor Network technology and RFID technology. These are widely used in digital agriculture, disaster monitoring in rice fields and biomedical etc.[9] Qing Yao, Zexin Guan, Yingfeng Zhou presented an application of image processing techniques and Support Vector Machine for the detection of rice diseases. In this rice disease spots were segmented and their shape and texture was extracted. SVM could efficiently and effectively detect and classify disease spots on rice plant.[10]Taohidul Islam, Manish Sah,SudiptoBaral and Rudra Roy presents a technique known as "Image Processing technique" which detect and classify the disease based on percentage of RGB value of the affected part in the rice plant using image processing. It is done taking and examining a very small sample of a leaf rather than examining a whole plant.[11]SantanuPhadikar and Jaya Sil presented a software prototype system for rice disease detection. In this pictures are taken from digital camera and then processed by image segmentation and image growing techniques to detect infected parts in rice plant.[12]WANG Guo-wei a, Sun Yuband Niu Tai-yangc presented early warning systems for rice disease. This was based on the realization of the rice growth environment data real-time acquisition or skills, transmission, processing and rice diseases SMS (text) warning function.[13]

RICE DISEASES

Rice diseases can greatly reduce the yield. They are basically caused by fungi, bacteria or virus. Following are some of the common rice diseases which affect the crop at severe level.

Brown Spot

It is a fungal disease of rice which affects the leaves, branches and coleoptiles of a rice plant. It is visible as hugs brown spots over the leaf responsible for its

destruction. When infection occurs in the seed, discolored and unfulfilled grains are formed. Wet leaves are attacked by this disease. It is common in unflooded areas and nutrient-deficient soil. This kind of disease can last up to 4 years and transfers from one plant leaf to another through air. This disease affects the quality as well as the quantity of leaf.

Rot Sheath

This disease reduces and damages the yield by retarding seed emergence. In this panicles are rotted and the grains become discolored. This disease is prevalent in wet season as it attacks a wet plant. It attacks the uppermost leaf sheath causing the abnormal emergence of immature panicles which are not to be emerged at that time. It occurs in the area where there is high amount of nitrogen fertilizer and high humidity. It is a seed-borne disease so it can be prevented using healthy seeds.

Sheath Blight

It is a fungal disease which occurs in the lower part of the plant. It reduces the leaf area of the canopy. Usually the infected leaves dry out. It occurs where there is high level of nitrogen fertilizer in soil and relatively high humidity. In this disease young tillers are destroyed very rapidly.

False Smut

This disease is only visible after panicle exertion. It occurs usually at flowering stage causing chalkiness of a plant which reduces the weight of the crop. Rain, humidity and soil with high nitrogen are the factors for this disease. False smut destroys the ovary of a plant and when spikelet reaches to the maturity stage. This can be reduced by keeping the field clean.

Grain Discoloration

It is a complex disease of rice crop which is developed by micro-organisms. It is an emerging threat which destroys the grain texture and its quality. This occurs due to climatic changes throughout. Grain discoloration causes the change in shape and size of the grain. This leads to the reduction of production of rice crop. The after effects of this disease is that it affects the post-harvest processing of rice fields and reduces the cooking quality because of the reduction of weight of grain.

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Table1.Approaches for Rice Disease Detection and Prevention

Sr#	Year	Author	Title	Outcome
1.	2008	Santanu et al.	Rice Disease Identification using Pattern Recognition Techniques	They presented a software prototype system for rice disease detection and prevention. With the help of digital pictures infected parts in plant are detected. This resembles image processing technique but it involves image growing technique as well.[12]
2.	2009	Qing et al.	Application of support vector machine for detecting rice diseases using shape and color texture features.	These authors presented an application of image processing techniques and Support Vector Machine for the detection of rice diseases which could detect disease spots and can give solutions.[10]
3.	2011	D. Yan et al.		He proposed the concept of MIS (Management information system) which gives the report of rice production.[7]
4.	2012	Xian-Yichen et al.		They both proposed digital approach to agriculture on IoT automation.[9]
5.	2014	A Tuli et all		He provided cloud deployment model i.e. 'Agri-Assistance' for informing rural farmers about specific disease that is nearly to attack a rice, to minimize destruction level of crop.[8]
6.	2015	WANG Guo-wei a et all	Study on early warning system of rice disease based on IOT	They presented early warning systems for the ease of farmers to prevent the crops from certain diseases at early stages.[14]
7.	2018	Taohidul et all	A FASTER TECHNIQUE ON RICE DISEASE DETECTION USING IMAGE PROCESSING OF AFFECTED AREA IN AGRO-FIELD	They presents a technique known as "Image Processing technique" which detect the disease based on percentage of RGB value to know the severity of disease and to take preventive measures against it..[11]
8.	2019	Wen-Ching Chen et all		They presented new biofungicide formulations against rice blast disease. In this a rice hull mixture and liquid medium is mixed with Bacillus subtilis 5, B. cereus 3S5, and Pseudomonas fluorecens 10S2

				bacterial formulas and then they are tested separately on the rice cultivator UPLRi-5 after infection by disease. .[15]

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CONCLUSION
Rice is a staple food across the world. There are several common rice diseases that are widely affecting rice crops on daily basis. For some diseases scientists have proposed some aesthetic technologies in order to overcome the issues that are concerned with rice diseases and some are in process. In all the above mentioned sections we have clearly defined all the techniques that have been presented by renowned scientist for rice disease prevention using IoT. They all presented their techniques in order to increase the productivity of rice crop which is a staple food across the nation. Section IV clearly defines all the contributions of scientists till now related to the prevention of rice diseases. Also they presented some techniques and technologies to overcome some major rice diseases issues related to the production of ricecrops. Scientists are still working on finding some more better and convenient techniques for prevention of rice diseases keeping IoT as their domain.

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