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Weighing Cum Grain Moisture Meter

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ABSTRACT:Due to the high moisture of grain intake in the farmer's committee, large amount of grain is spoiled and form fungus creation on grain. So in this project, a method for measuring the moisture content of grain was presented based on single chip microcomputer and capacitive sensor. The working principle of measuring moisture content is introduced and a concentric cylinder type of capacitive sensor is designed, the signal processing circuits of system are described in details. With the help of Nano Arduino board, it is programmed to identify the moisture level of the grain by dipping the moisture sensor device into any of the grain. Mainly in this device we calculate the moisture level of pre - harvesting and post - harvesting of crops. From this method we can easily identify the high moisture grain to resist the effects of well dried grain. Also by this method the farmer can directly know the quality of the grain and wellness of grain without the help of any experts. It's our prototype, in large scale it is fully designed with Raspberry pi board with help of Artificial Intelligence (AI). It is more accuracy and wireless communication. The main motto of this project is to totally avoid the corruption of grain.

KEYWORDS:Grain moisture rate, percentage of dryness and wetness, pre - harvesting, post – harvesting, corruption of grain.

I. INTRODUCTION

Moisture meters are used to measure the percentage of water in a given substance. This information can be used to determine if the material is ready for use, unexpectedly wet or dry, or otherwise in need of further inspection. Wood and paper products are very sensitive to their moisture content. Physical properties are strongly affected by moisture content and high moisture content for a period of time may progressively degrade a material. Water is a good insulator. Insulators have tightly bound electrons and can store electrical charges. A dielectric or electrical insulator is a material that is highly resistant to the flow of electrical current. Capacitance is a measure of the amount of electric charge stored (or separated) for a given electric potential. Capacitance exists between two conductors insulated from one another. A dielectric constant can be determined by measuring the capacitance of a capacitor (two conductors or plates) with air between the plates, then measuring the capacitance with a dielectric material between the plates. The ratio of these measurements is used to determine the dielectric constant. The dielectric (capacitance) technology used in many grain moisture meters is based on the principle that a functional relationship exists between the moisture content of grain and its dielectric constant. As grain increases in moisture content (water), its dielectric constant increases. The rate at which the dielectric constant increases as grain moisture increases is not the same for all grain types; therefore, a unique calibration equation must be developed for each grain type to be measured. Moisture meters based on the dielectric principle typically incorporate a test cell in the form of an electrical capacitor, that is, two conductors separated by an insulator. When the cell is empty, only air separates the two conductors, and the insulator is air.

When a grain sample to be measured is placed between the conducting surfaces of the test cell, the grain displaces most of the air. By sensing the change in the electrical characteristics of the capacitor due to the dielectric properties of the grain sample, the meter can predict the moisture content of the sample. Because the bulk density and the temperature of the grain sample also affect the electrical characteristics of the grain-filled test cell, the meter must measure these parameters and apply the necessary corrections. Some instruments using this method also have the capability to correct for surface moisture (conductance) effects. From the above lines commonly they all use dielectric and capacitive sensor. But we use moisture sensor it easily measures the moisture level of grain when the grain is dropped into the container as well as the weight of the grains also monitored. By the help of this device we can totally avoid the illegal activities while intake of grain. It is the best and easiest way to determine the moisture level and weight the goods at actual manner. It does not need any expert to determine the values, as it is normal way like already existing method so it most useful device for the agriculture sector.



II. RELATED WORK

W. C. Wang and L. Wang entitled as (2012) DESIGN OF MOISTURE CONTENT DETECTION SYSTEM [1] said that The moisture content plays an important role in grain storage and food processing, So, the detection of moisture has great significance and it is the inevitable steps in the grain production, transportation, storage, and so on. In recent years, with the development of detection technology, many moisture detection methods have been proposed. Generally, they can be divided into two categories: direct method and indirect method. The direct method is detecting the absolute moisture content in grain through drying methods and chemical methods directly; it has high precision, but time-consuming, and not suitable for online and on-site testing. The indirect method is to measure the water of substance through detecting the water-related physical quantities such as material conductivity, dielectric constant, etc.

Mahmoud Soltani, Reza Alimardani (2011) entitled as DESIGN, DEVELOPMENT AND CALIBRATION OF A PORTABLE CAPACITIVE MOISTURE METER [2] said that Today, the dielectric property of agricultural products is one of the subjects of researches and studies. The dielectric properties are mainly used in microwave heating, prediction of fruit ripeness estimation of the fruit and vegetable volume quality measurement of eggs and monitoring bees passing. One of the most important applications of dielectric properties is measuring the moisture content of grain and seeds. Many scientists studied the correlation between moisture content and dielectric properties of grain and seeds. Casada and Armstrong (2008) measured the moisture content of wheat with a fringing field capacitive sensor. They extracted the linear calibration equations over a temperature range of 10 °C to 30 °C. Das et al. (2010) used dielectric constant of soybean at 2.45 GHz and 24 °C to predict its moisture content. They extracted a quadratic equation between moisture content and dielectric constant of soybean. Sacilik and Colak (2010) determined the dielectric properties of corn seeds as functions of moisture content, bulk density and frequency.

S. O. Nelson, S. Trabelsi (2012) entitled as CENTURY OF GRAIN AND SEED MOISTURE MEASUREMENT BY SENSING ELECTRICAL PROPERTIES[3] said that the importance of moisture measurement in grain and seed is discussed, and a brief history of the development of electrical moisture sensing instruments, based on sensing the electrical properties of these materials, is presented. Data are presented graphically on the permittivities or dielectric properties of grain and seed, showing their variation with frequency, moisture content, temperature, and bulk density, and references are cited for further information. More recent developments in higher frequency and microwave measurements for moisture content and bulk density sensing are briefly described, and numerous studies are cited providing sources of information on these newer techniques. Keywords. Cereal grain, Density, Dielectric properties, Electrical properties, Moisture content, Moisture sensing, Oilseed, Permittivity. Moisture content of cereal grain and oil seed determines suitability for harvest and storage, and it is usually measured whenever grain and seed are traded. Because standard and reference methods for determining moisture content in grain and seed involve tedious laboratory procedures and long oven-drying periods, rapid methods for moisture measurement have been essential in the grain and seed trade.

III. METHODOLOGY

These are the samples which we taken for the determining the moisture content, these inputs are induced into the micro controller which can automatically detect the moisture content and indicate whether it is suitable or not for storage purposes. The raw grain directly from the field by the farmers are collected by the farmers committee. So now the grain from the farmers are dropped into the container placed on the weight machine. The container consist of moisture sensor which can detect the moisture content of the grain and displayed on the LED display. By this technique the good quality of grain are accurately detected and the poor quality and wet grain are eliminated easily and the quantity of the grain evaluated simultaneously. The sample kept on the container the quantity of the grain be evaluated at a time and then the data are collected. By this automatic method the excess intake of grain are avoided.

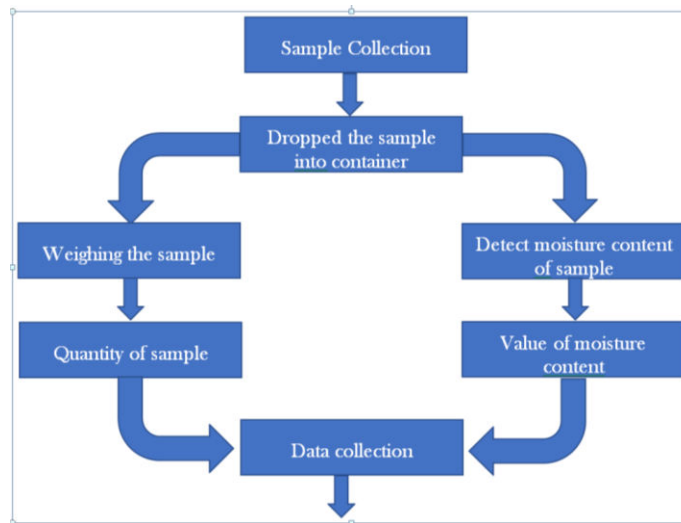


Figure.1 Methodology flow chart

Then the original value of grain must be rated. After the grain dropped into the container the quantity of the grain can be evaluated and the quantity of grain will be displayed on the display. Then the displayed weight of the grain be monitored and stored. When the grain dropped into the container, the moisture content of the grain be detected and the value of moisture content can be stored. By this method the good quality of the grain can be identified easily and poor wet quality of grain are eliminated. After the grain dropped into the container the value of moisture content can be detected, displayed and stored. The data of the weighing machine and the moisture sensor are collected. By the use of collected data the true value of the grain are estimated easily and the illegal estimation and forgeries are also avoided. The actual rate of goods of the farmers are awarded

IV. EXPERIMENTAL RESULTS

The working principle of moisture sensor is to calculate the moisture content of the substance which we provided as a sample. (i.e., samples like as soil, etc.) In this the dielectric permittivity is surrounding the medium. Like that the moisture sensor is fixed to the transparent container with wireless medium, the container is placed on the weight machine and then the grain is dropped into the container, after that the sensor automatically detect the value of moisture and simultaneously the quantity of the grain also be displayed. The inputs of the samples are already inbuilt to the micro controller, when the sample is dropped, the moisture sensor detect the values of grain and then the LED lights are fixed which can indicates whether the sample is suitable or not for the storage purpose (If green light emits it is suitable for further process, if red light emits it is not suitable for storage purposes). Totally the whole setup is operated by the 12 V adapter with power supply. Now the values of the weight and moisture content of the grain are stored accordingly.

From this device, we are testing some samples for getting result purpose. In that we get some answers with real time percentage. These are more or less equal to the other existing models, but device cost is too low and more accuracy. Really this is very much useful for the agriculture sector for avoiding the illegal activities and forgeries. By the way we testing our device with following records. The below given records are tested by the "weighing cum grain moisture meter".



Figure.2 Good Quality of Paddy



Figure.3 Bad Quality of Paddy

V. CONCLUSION

From the result, it can be concluded that the moisture rate of the grain is easily find out by this device. The efficiency is more or less equal to other moisture meter. It is work on the simple construction and it like mobile where ever we go, it is easily lifted to many places. Also in this device we can easily eliminated the over moistures grain, avoid forgeries by intake of non-qualified grain, avoid intake of excess of grain more than net weight. It does not need more technical knowledgeable person to operate, common illiterate people also may use this easily. Then the cost of this kit is too low compared to all other moisture meters. Also it is suitable for all grain and it is most useful for agriculture sector for avoid the illegal activities and forgeries. Atlast the right price of the goods are easily and directly given to the farmers.

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