



## New generation of portable moisture meters

Testing crop moisture content and adjusting it is easier than ever

March 24, 2021 at 8:30 am CDT

VILLA PARK, Calif. — After all the hard work of tilling, planting and tending throughout the year, farmers need an accurate moisture meter to help them optimize the fall harvest, whether it involves wheat, barley, soybeans, rice or other agricultural products.

For farmers, quickly measuring samples in fields to determine which are ready to harvest reduces uncertainty and saves time. It also reduces the risk of buyer rejection due to improper moisture content and maximizes the sales price by enabling the optimum amount of moisture to be counted toward product weight or volume. Measuring moisture content also is essential to prepare and store grains to preserve quality and longevity while deterring spoilage.

While monitoring rainfall, irrigation and temperature is necessary, it is not sufficient to determine the best time to harvest in order to achieve ideal water content. Inevitably, there is always some variation in water content within crops that farmers cannot estimate with any certainty.

Not only do rainfall, temperature and weather vary from year to year and season to season, but also water content varies within the crop itself. On a large farm, rice paddy, or orchard, one crop on an adjacent lot can always be ready to harvest before another.

“Without periodic testing within various fields or plots, farmers will miss out on optimizing both quality and yield — which produces the payday that they must survive on, or ideally thrive on, for the rest of the year,” said John Bogart, managing director of Kett, a manufacturer of a full range of moisture and organic composition analyzers.



Fortunately, a wide range of accurate, portable and easy to use yet durable moisture meters are now available to farmers that will enable them to harvest at exactly the right time, as well as adjust moisture content as necessary to maximize profit.

### **Easing Moisture Measurement**

For farmers requiring quick moisture measurement in the field, traditional equipment has been too slow and cumbersome for frequent spot checks. One conventional test, Loss on Drying, measures the total material weight change after drying.

The test involves taking a sample to an air oven for manual testing — weigh, oven dry, weigh — which can take two to 48 hours to complete depending on the standard. Alternately, if an automated moisture balance — an integrated weighing and heating unit — is used, testing can take up to 15 minutes. Either way, such testing can be too slow when more immediate measurements, or a high quantity of measurements are required.

As a result, secondary test methods have typically been used to deliver faster results. This type of test uses an indirect method and a single conversion to achieve accurate results.

If there is a disadvantage, it is that the secondary instrument must first be calibrated to ensure accuracy. In some cases, calibration can only be performed by trained staff familiar with the equipment.

In response, many agricultural moisture meters have simplified the process, using capacitance technology. Capacitance is a measure of an electric charge separated from a given electric potential; it exists between two conductors insulated from each other.

The dielectric capacitance technology commonly used in grain moisture meters is based on the relationship between a grain's moisture content and its dielectric constant.

As its moisture content increases, its dielectric constant increases. Since the rate at which the dielectric constant increases is different for individual grain types, a unique calibration is necessary for each grain type.

## Moisture Testing: From Single Grains to Anything

To get the best price after harvest when growing rice and grains such as barley and wheat, farmers often need to optimize for grain quality and consistency. This entails measuring the moisture of individual grains in different fields until the ideal statistical distribution is reached.

Today, transportable single grain moisture testers can quickly measure the moisture within each grain of rice, barley and wheat, allowing farmers to determine the moisture content of individual seeds within a sample with the results displayed on an LCD screen. This is achieved in minutes without sample preparation.

“The number of kernels tested, the average moisture and a histogram detailing the distribution of moisture values are displayed,” Bogart said.

“This allows farmers to make immediate decisions regarding product quality and homogeneity to maximize the sale price.”

“When farmers reach what they consider the optimal moisture level using a single grain moisture tester, that is the time to harvest in order to get the most consistent rice or other grain with the best yield,” he added.

According to Bogart, such devices are simple to use. With advanced models like those from Kett, farmers select the calibration, pour a sample into a hopper and press the “measure” button.

Such models are factory-calibrated for wheat, brown, polished and paddy rice, as well as naked and standard barley. The devices are versatile, capable of measuring from 10 to 1,000 kernels in each batch, at 150 kernels per minute.

When farmers need to test a wider range of agricultural products, some advanced portable grain and seed moisture meters using capacitance technology offer instant measurement and over 150 calibrations of the most common grain and seed types.

While some agricultural devices may require grain husking and grinding, no sample preparation is required with the latest generation of portable, battery powered devices.

Tests are simple. Pour the sample into the machine and the moisture

content and density are instantly displayed. Automatic averaging enables quick spot check measurement of samples in bulk containers. To document such tests, such units offer digital output to a computer or optional printer.

In terms of accuracy, however, Bogart offers a word of caution when selecting such a unit.

“While many moisture meters using the dielectric principle claim to provide accuracy to +/- 0.5%, to achieve such accuracy it is important to look for a unit that provides automatic density and temperature compensation. This is because changes in ambient, sample, or device temperature will otherwise degrade measurement reliability,” he said.

When greater accuracy is needed across the widest range of grain, seed, or other agricultural product types, the most advanced moisture meters utilize near-infrared light, a highly accurate, non-contact, secondary measurement method that can deliver immediate laboratory quality moisture readings.

“NIR moisture meters follow the principle that water absorbs certain wavelengths of light,” Bogart said. “The meter reflects light off the sample, measures how much light has been absorbed, and the result is automatically converted into a moisture content reading.”

According to Bogart, such meters allow very accurate instant measurement of any agricultural product without contact or sample preparation, so there is no contamination in handheld and online models.

“Once the meter has been calibrated against the lab or production standard, the calibration is stored in the device so no calibration is required in the field,” he said.

Unlike air ovens or even moisture balances, portable NIR equipment is designed for ease of use. With the most advanced units, the user simply points the instrument at the grains, seeds, or agricultural product. The moisture content is instantly shown on a digital display, with results accurate to 0.01% in a 0% to 100% measurement range.

Such units, which are about the size of a camcorder and operated via user-friendly menu commands, are designed for frequent spot checks

wherever necessary, on both stationary and moving — that is, conveyed into silo storage — products. Moisture measurement data can be stored in the instrument, downloaded continuously, or manually recorded.

“The goal is for farmers to be able to successfully use a moisture meter wherever and whenever it is needed. Whether out in the fields or elsewhere on the farm, this can help them determine the best time to harvest for maximum quality, consistency, yield and storage life,” Bogart said.



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