A CAPACITANCE METER FOR ESTIMATING FORAGE WEIGHT

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Capacitance methods have been used to determine moisture in such diverse materials as cereal grains, cotton bales, butter, soils, etc. Each of these materials is composed of a matrix, which has a low dielectric constant, and water, which has a high dielectric constant. By simply determining the dielectric constant of the mixture, its composition with respect to water may be determined. The dielectric constant is the ratio of the capacitance with the unknown material between the condenser plates to its capacitance with air between them.

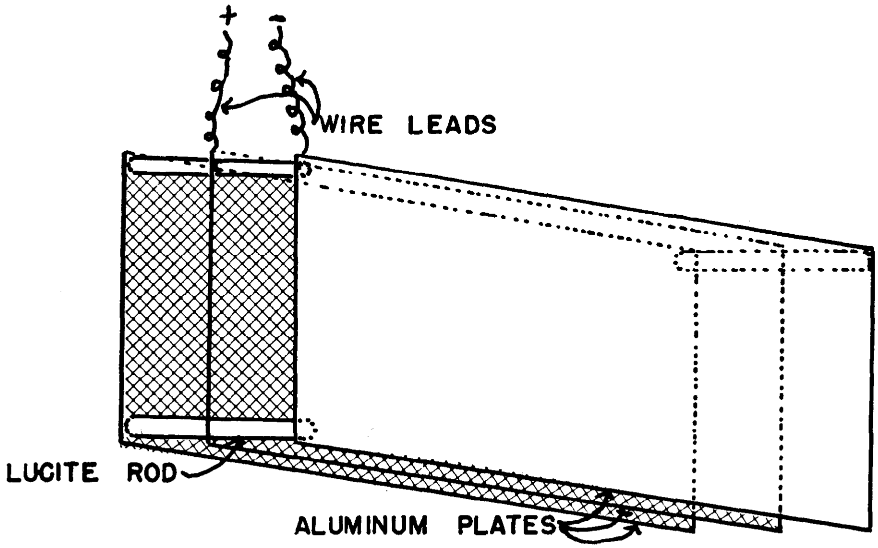

FIGURE 2. Special condenser used with the capacitance meter for measuring forage. Plates consist of ⅛ inch aluminum sheeting, 10 x 20 inches, spaced 6 inches apart with 1 inch lucite rod on three corners.

In the present method, the low-dielectric-constant matrix consists of air and the high dielectric constant material is forage. The circuit used for measuring capacitance is the same as that used by Fletcher (1939) for measuring soil moisture, Figure 1. The equipment is completed by the addition of a special condenser, Figure 2.

Calibration of the equipment is carried out by taking a capacitance reading at a site and clipping, drying and weighing the forage from between the condenser plates. This operation is repeated for a number of sites. The capacitance for each site is plotted against the dry weight of forage from that site.

Readings have been taken on a wide variety of plants under conditions ranging from dry, cured grasses to soggy, wet sedges (*Carex* spp.) in swamp land and from dry, cured forbs to alfalfa (*Medicago sativa*) growing in mud. Study of the data indicated that they fell into two natural groups which could be readily recognized in the field in advance of a measurement. Dry to moderately wet grasses fell into one group while the other group was composed of soggy wet grasses and all green forbs. The separate curves for each group may be seen in Figure 3. These calibration curves need only be made once for each group of material encountered. It is advisable,

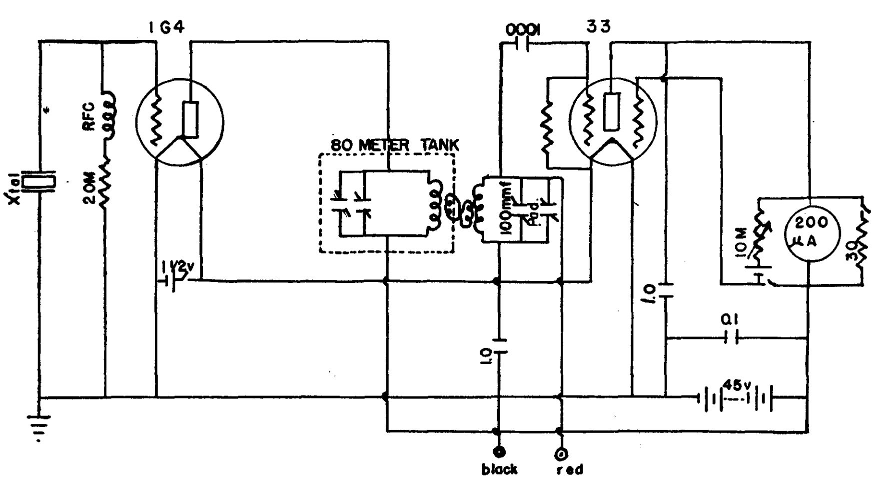

FIGURE 1. Circuit diagram of the capacitance meter used in the determination of forage.

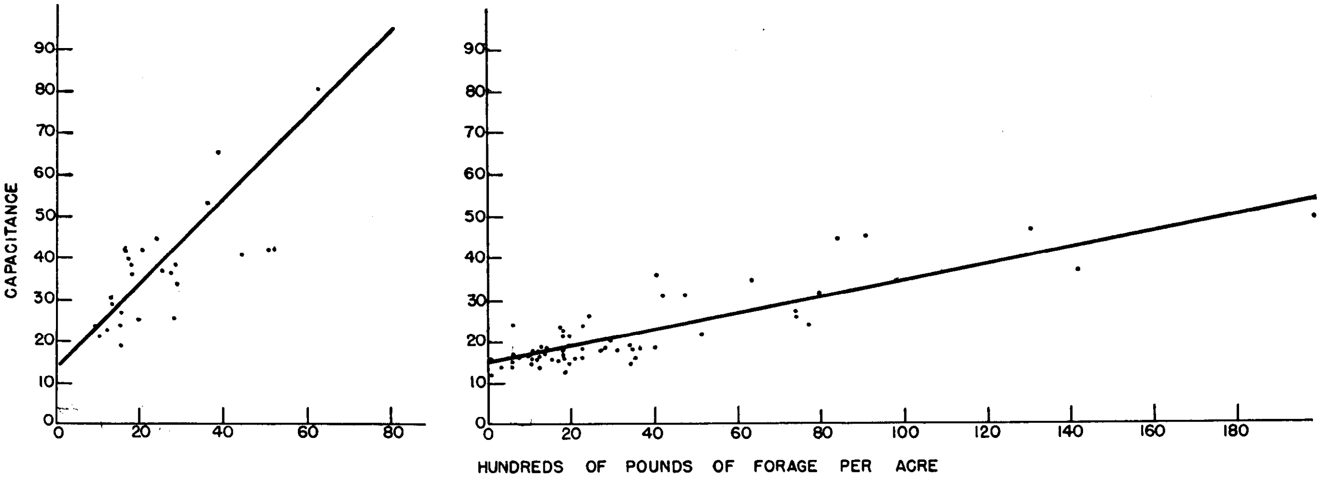

FIGURE 3. Capacitance in relation to dry weight of forage (air dry in hundreds of pounds per acre): *Left.* Forbs or wet grasses. *Right.* All grasses except soggy wet.

however, to take a few check points whenever a new assortment of forage is encountered.

It is unfortunate that, at this point in the development of the capacitance method, it is not known whether the spread in the pattern of points around these curves is due either to the variability in the clipping or in the capacitance readings or both.

The question arises as to the effect of moisture differences in the vegetation itself on this determination. Figure 4 shows the relation between capacitance per 100 gms. field weight, of forage and percent moisture, air dry basis, in the clipped forage. The small increase in capacitance may be explained by the decrease in the dielectric constant of the juices as water is absorbed.

From the results obtained in these experiments it appears that the forage production of an area may be more accurately characterized by the capacitance method, in practice, than by clipping. The rapidity of the method—less than one minute per determination—makes possible a more complete sampling of an area. Thus, the slight decrease in precision per determination is more than offset by the reduction in sampling error.

Another advantage of the capacitance method is that it leaves the vegetation in a relatively undisturbed state following a determination. This advantage is especially important when working with small plots wherein clipping would mean complete destruction.

Summary

A capacitance method for determining forage is proposed. The true precision of the method is not known at present. Indications are, however, that areas are more truly characterized by the capacitance method than by clipping due to the more complete sampling made possible by the rapidity of the method. The method is unique for small plots in that the forage remains relatively undisturbed even after repeated determinations.

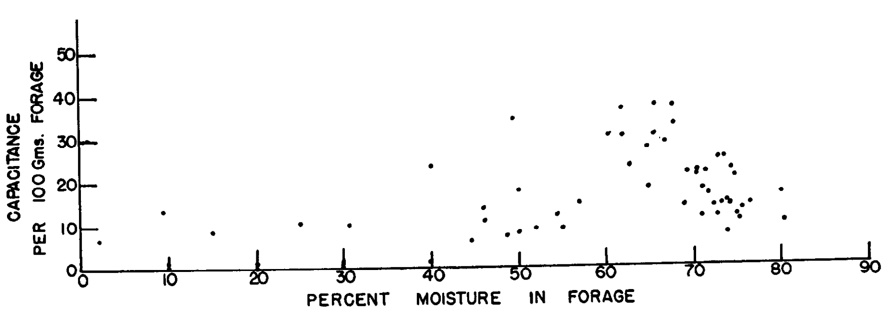

FIGURE 4. Capacitance per 100 grams of field weight of forage in relation to percent of air-dry moisture in forage.

LITERATURE CITED

FLETCHER, JOEL E. 1939. A dielectric method for determining soil moisture. Soil Sci. Soc. Amer. Proc. 4: 84-88.

PANICUM TURGIDUM IN THE HASHEMITE KINGDOM OF JORDAN

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Panicum turgidum (Forsk.) is a grass with glabrous, glaucescent stems thickened and branching at the nodes forming tangled bushes. Leaves of forks reduced to lanceolate, leafless sheaths imbricated at nodes. Panicle terminal branches stiff; spikelets short-pedicelled, erect, ovate, inflated, white; glumes concave, nearly of equal length; pales of staminate flowers alike; fertile floret elliptical, acute, coriaceous, white, glossy. Ripe seed was collected in Wadi Araba on June 6.

In Jordan this remarkable grass grows in the arid sandy and rocky waste places. It is well distributed in the area adjacent to the Dead