SOIL MOISTURE MEASUREMENT USING CAPACITANCE TECHNIQUES

by

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Certificate

This is to certify that the thesis entitled **"*Soil Moisture Measurement Using Capacitance Techniques*"** submitted by S.Khaja Syed Shahul Hameed for the award of the degree of the **Doctor of Philosophy** to the Indian Institute of Technology, Delhi, is a record of the bonafide research work he has carried out under my supervision. The results contained in this thesis have not been submitted to any other University or Institute for the award of a degree or diploma.

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ABSTRACT

The total volume of water on the earth is vast at approximately equal to 1.4 billion km^3 but fresh accessible water is less than 1% at approximately 11 million km^3[1]. India, with a share of 2.3% of world's land area, and only 4.2% of the water resources supports 16.9% of world population. Therefore, the fresh water resources in India are under stress. In India, nearly 57% of the total land area is under agriculture against the world average of just 11.5%, with a net sown area above140 million ha and the forest cover of 22.8% against a desirable level of 33% [4]. The slowdown in agriculture is mainly attributed to depletion and deterioration of natural resources like soils and water, improper fertilizer and chemical application, uncontrolled irrigation, water logging and salinization resulting in lack of biological activity in soils. With the existing methodologies, water use efficiency rarely exceeds 40% and the available estimates indicate that by 10% increase in water use efficiency, India can gain more than 50 million tons of food grains from the existing irrigated area. Inefficient use of water also leads to inefficiency of all other inputs such as fertilizer, and chemicals, leading to increase in the cost of production and degradation of fertile soils. Poor use of energy specifically fossil energy increases cost of production, global warming and burden on exchequer, apart from abiotic and biotic stresses aggravate the agriculture sector and hence ideal farming approach shall aim for increase in agricultural production, conservation of soils and improving the productivity of water.

Hence water can no longer be considered as a cheap and plentiful resource; rather it's a scarce resource with an economic value. It is necessary to improve the efficiency of water utilization as most available agricultural methods utilise only about 1/3rd of available water to grow plants.

Demand based irrigation scheduling has not so far been implemented at individual farmer level. However, the availability of reliable and cheaper soil moisture sensors could make this possible. Hence in this work an attempt has been made to make an affordable, easy to operate, handy, low cost and durable soil moisture sensor for use by marginal farmers of India.

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