



2013 4th International Conference on Agriculture and Animal Science (CAAS 2013)  
2013 3rd International Conference on Asia Agriculture and Animal (ICAAA 2013)

## A Study on Soil Compaction Management in Tobacco Cultivation in Mysore Region of India

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### Abstract

Soil is a dynamic medium in which the physical, chemical and biological processes are changing all the time under the influences of man and nature. The rate at which soil changes under the influence of man's activities are so fast and often negative that this degradation needs urgent attention. Healthy soil includes not only the physical particles making up the soil, but also adequate pore space between the particles for the movement and storage of air and water. This is necessary for plant growth and for a favourable environment for soil organisms to live. Compaction occurs when soil particles are pressed together, thereby reducing the amount of pore space. Most farmers are aware of compaction problems, but the significance is often underestimated. Compaction effects on crop yield can be a significant factor in today's farm economy with a specific reference to tobacco. Thus in order to understand the causes, effects and impacts of soil compaction, ITC limited - Agri Business Division –ILTD undertook a comprehensive study in Mysore region (India) to diagnose the extent of soil compaction in farms and evaluate the impact of subsoiling in breaking the compaction layers.

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Selection and peer review under responsibility of Asia-Pacific Chemical, Biological & Environmental Engineering Society

*Keywords:* Soil Compaction, Mysore, ITC Limited, Tobacco

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### 1. Introduction

Subsoil compaction is the physical consolidation of the soil by an applied force that destroys structure,

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reduces porosity, limits, water and air infiltration, increases resistance to root penetration and often results in reduced crop yield. In many regions, poor soil management has led to a very hard and impermeable hard pan, which is detrimental to root growth and soil drainage. Severe soil compaction induces root deformation, stunted shoot growth, late germination, low germination rate, and high mortality rate. Soil compaction decreases soil biodiversity by decreasing microbial biomass, enzymatic activity, soil fauna, and ground flora. Where compaction is suspected because of plant or soil symptoms, there are several techniques that can be used to determine the extent and severity of compaction [1].

## 2. Compaction Diagnosis Scope and Sampling

A standardized diagnosis procedure is evolved for the first time to identify the extent of soil compaction in crop growing regions of Mysore. The data obtained from this procedure is analyzed and used for evaluating sub-soiling recommendations for all the farmers in the region. A cluster sampling method is followed for the data collection process. The soil compaction data is captured at fields of 1 to 2 acre size located in 3 villages of every cluster across 100, 00 Hectares in Mysore Region.

### 2.1. Diagnosis Tool and Methodology

Soil Compaction Tester is a Penetrometer which measures the compaction of soil and is based on the ASAE S313.3 standard. The tool helps to determine if sub soiling experiment will be beneficial and in what depth the sub soiler should be ploughed in the soil. A Penetrometer consists of a 30 degree circular stainless steel cone with a driving shaft and a pressure gauge. The Penetrometer usually comes with 2 cones – one with a base diameter of 0.798(3/4) inches for soft soils and the other with a base diameter of 0.505 (1/2) inches for hard soils. The tip is slightly wider than the driving shaft to limit friction of the shaft with the soil. The driving shaft is usually graded every 3 inches to allow the determination of depth of compaction. The dial has two scales one for each tip that are calibrated in Pounds per Square Inch of the base area of the cone shaped tip. The Dial is colour coded for reference and the gauge is engineered to have a positive load such that the needle does not always contact the pin on the low end of the green scale [2].



Fig. 1. Penetrometer- Data Collection

### 2.2. Estimation of Compaction Zone

The penetrometer rod should be driven at a rate of 1 inch per second. As the penetrometer is pushed into the soil, the depth at which the 300 PSI level is exceeded is recorded using the gradients on the penetrometer rod. This level is the top of the compacted zone. Then again it is continuously pressed down and the depth at

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