THE IMPORTANCE OF AGRICULTURAL MECHANISATION IN AGRICULTURE

Introduction

In recent years, the Mechanisation Division of the Agricultural Research Council - Institute for Agricultural Engineering (ARC-IAE) has focused its research efforts in the following areas: (i) development of a prototype mobile distillation unit, (ii) Conservation Agriculture research, (iii) Mechanised cassava production, and (iv) Testing of National Assets of the Tractor Drawbar testing and Engine Dynamometer testing.

(i) Essential Oil Distillation Unit

Agricultural Research Council - Institute for Agricultural Engineering (ARC-IAE) has developed a prototype mobile distillation unit (Fig. 1) to perform essential oil extraction from herbaceous grasses (Fig. 2). The unit has been put to some preliminary tests at the ARC-IAE premises and at end-users environment with the clients to evaluate performance. High yield and very positive results were obtained from field tests done. According to client’s estimation the units profitability is viable. The equipment in its present form consists of two major subunits loaded on two separate trailers It is recommended for better mobility to combine the two subunits to be loaded unto one trailer. More field tests are planned to gather sufficient data that will inform any modifications before final release for mass production.
(ii) Conservation Agriculture

The vast majority of arable soils in South Africa area have been exposed to many years of conventional soil tillage methods that have resulted in degraded soils with low quality status. Application of conventional soil tillage methods for many years, with a mouldboard plough as the most commonly-used implement, is a fundamental cause of soil degradation. Rigorous manipulation of soil destroys soil structure and
results in the decline of soil fertility and beneficial soil organisms, and reduced soil-water-holding capacity. The challenge is to restore these soils to be more fertile, biologically balanced, healthy and productive.

As conventional production methods have negative effects on all the components of soil quality, the search for an alternative system that will ensure better sustainability of the land has become a high priority. In addition, most of the production systems are characterised by mono-cropping at the expense of more sustainable practices. In this context conservation agriculture (CA), which thrives on three major pillars of minimum or no-tillage, permanent soil cover and crop rotation, is seen as the alternative which can significantly, not only improve soil quality, but also contribute to more sustainable and economically viable farming units as opposed to the conventional system.

The Institute for Agricultural Engineering has competent researchers that provide technical expertise in all aspects of CA mechanisation especially in the areas of development, testing and calibration of CA planters and sprayers. Additionally, the Division supports the training of farmer's regarding sprayer pre-check, calibration and operation methodology, of the equipment before use, some basic environmental principles awareness, cleaning of the sprayer and safe handling of chemicals. Planter operation and calibration training consist of pre-check of the planter before planting, some basic planting principles, field setting and calibration methodology, and planter maintenance are taught to farmers (Figs 3& 4). The Division has collaborated with colleagues especially, Phoonie du Toit and his team from ARC-GCI, Potchefstroom.
Mechanised cassava plantation development

The Division is involved in the mechanisation technology transfer training for emerging farmers, with focus on mechanised cassava plantation development in South Africa. Cassava is a lesser-known climate resilient crop in this country. Farmers are trained on mechanised production techniques in the sub-tropical areas, where there is comparative advantages for the growth of cassava and root and tuber crops. Experimental plots on pilot basis have been established at Empangeni in KwaZulu Natal, Nelspruit at Mpumalanga and University of Venda in Limpopo provinces. Seedbed have been prepared and cassava planted on ridges to comply with mechanical harvesting at crop maturity especially during the dry season, when the ground is hard. Local planting materials have been sourced from farmers. Extension officers were trained on correct planting of the cassava cuttings to avoid node reversal at planting. Drudgery evaluation in all the activities from crop establishment through farm sanitation and crop care to harvesting are being monitored and evaluated. It is planned to introduce mechanical cassava harvester developed in Ghana to demonstrate mechanised harvesting to reduce drudgery and encourage commercial cassava production. Figure 5 shows a view of the cassava plantation three months after planting at the School of Agriculture Farm, University of Venda, Limpopo Province. Figure 6, shows mechanical cassava harvesting demonstration, a technology that will be introduced at cassava maturity stage.
(iv) National asset and mechanisation technology transfer training
The Tractor National asset has been used to collect field data relating to mechanisation technology transfer training of farmers, extension staff and students. Figure 7. Shows the use of laser beam technology to measure surface profiles of a field ploughed with mouldboard plough in Empangeni, KwaZulu Natal Province.
Fig. 7. Measurement of surface profile with a laser beam technology.