Drip irrigation offers high tea yields for small-scale plantation farmers in Tanzania

The Challenge
Tanzania is the fourth-largest tea producer in Africa, with a total production in the 2009/10 season of 33,000 tonnes. Many small-scale farmers rely on tea production for their livelihoods. However, more than 80% of Tanzania’s total tea area depends entirely on rainfall to deliver its water needs, while 19% is irrigated by overhead sprinklers. Low yields, due to recurrent droughts, are therefore a common problem that jeopardises the livelihood of many small-scale farmers. The challenge is therefore to develop and implement efficient irrigation systems that have high water use efficiency and that are affordable to these farmers.

The Project
Through an IAEA technical cooperation project, the Tea Research Institute of Tanzania (TRIT) assessed the water requirements of tea crops, with the aim of developing and evaluating low-cost drip irrigation systems with high water use efficiency. Drip irrigation was compared with overhead sprinklers and with non-irrigated rain-fed production, using the soil moisture neutron probe (SMNP) to measure soil water content and hence determine the optimal irrigation rates and schedules required to ensure a high yield. Tea yields under rain-fed, sprinkler and drip irrigation were 500, 4200 and 8500 kg/ha, respectively. To achieve such high yields with sprinkler and drip irrigation systems, water applied was 1200 and 600 mm, respectively. Comparing the levels of water applied and the yield obtained, drip irrigation was four times more efficient in the use of the applied water compared with sprinklers.

As part of the project, farmers’ field days were organised to enhance the transfer of the drip irrigation technology to local smallholder tea growers, as part of the overall strategy to improve water use efficiency, yields and farmer livelihoods.

The Technology
Drip irrigation technology increases water use efficiency by applying water directly to the immediate vicinity of the plant roots through a network of pipes and water emitters. This results in a reduction both in soil water evaporation and in excess water draining away from the roots, so that much less irrigation water is needed. This technology can be easily adapted for small-scale plots using low-cost materials such as buckets, drum kits, etc., or for use in large-scale fields allowing for automation of the irrigation process. It can also be easily adapted for the simultaneous application of water-soluble fertilisers, such as nitrogen.
The soil moisture neutron probe (SMNP) is an instrument that measures soil water content for crop production. During the measuring process, the probe emits neutrons that collide with hydrogen atoms in soil water. This collision slows down the speed of the neutrons. The change in the speed of the neutrons is detected by the probe and provides a reading that corresponds to the soil water content. The SMNP is currently the most suitable instrument to accurately measure soil moisture under saline conditions. It is also widely used to calibrate other moisture sensors for direct use in farmers’ fields.

The Impact

The use of drip irrigation provided a tea yield that was 17 times higher than rainfed, non-irrigated tea. The drip irrigation technology will therefore be extremely valuable on the 80% of lands currently depending entirely on rainfall and suffering from recurrent droughts. Compared with sprinklers, drip irrigation achieved twice the yield with only half the water.

The opportunity to generate such an increase in the yield of tea is likely to have major impacts on the potential export revenue of Tanzania as well as on the sustainability of small-scale farmer incomes. Furthermore, a commercial company has donated 12 extra drip kits to extend the work of this project to other climatic regions in the south of Tanzania (Tukuyu, Rungwe, Mbeya), indicating that these low-cost drip irrigation systems will also hold a commercial potential.

“Small-scale drip irrigation technology is drawing overwhelming attention from farmers and numerous enquiries for installation on their tea farms and other high-value crops out there”.

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For further information, please visit:
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RAF/5/058 on “Enhancing the productivity of high value crops and income generation with small scale irrigation technologies”, 2009-2014.