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Understanding and applying drip irrigation for sustainable agriculture

Compréhension et application de l'irrigation goutte à goutte pour l'agriculture durable

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

International Workshop Agreement IWA 20 was approved at a workshop hosted by the Swedish Standards Institute (SIS), in association with the Standards Institution of Israel (SII), held in Stockholm, Sweden, in August/September 2016.

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Introduction

Dwindling vital natural resources, such as land and water, and rising world population pose a constant threat that could develop into a future food and water crisis. Given the limited availability of water and land resources, the amount of food grown today needs to be increased to meet the demands of tomorrow. Reduction of available water for human consumption needs be addressed. As direct consumption of fresh water by populations cannot be decreased, the amount of water consumed by agricultural uses needs to be reduced and allocated for domestic or industrial use.

Drip irrigation addresses water scarcity and other environmental considerations. Its use can save large amounts of water (over 50 % of water can be saved for certain crop types), and can increase yields.

Drip irrigation not only addresses the need to reduce water consumption and increase yield, but also requires less labour and energy for operation, leading to lower costs to farmers due to reduced usage of labour, fertilizers and other chemicals.

Drip irrigation relates to sustainability agriculture issues, and can be used in dry areas, in saline soil with saline water, and in steep-sloped topographies, where other irrigation methods cannot be practiced.

Drip irrigation is easy to handle and operate once installed. It is suited for automation and remote operation by computer or mobile phone. The system's simplicity makes it easy to install, operate, maintain and repair.

Other than irrigation, the drip irrigation method is used as a delivery system for fertilizers and other agrochemicals. Drip's advantage as a delivery system is its ability to optimize fertilizer usage, and distribute it exactly where needed, in the root zone, while minimizing its release to the environment.

Adoption of drip irrigation can help achieve sufficient fresh water availability for domestic use and sufficient food quantity and quality for reasonable pricing, while increasing farmers' income with yield increment and cost reduction, and ensuring food security.

The purpose of this document is to review the benefits of the drip irrigation method in relation to other practiced irrigation methods, and to outline a future standardization roadmap.

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Understanding and applying drip irrigation for sustainable agriculture

1 Scope

This document reviews drip irrigation in comparison to major irrigation methods available and practiced today by farmers worldwide. This document reviews the benefits of drip irrigation, such as increased yield, reduced water consumption, reduced energy consumption, lower environmental impact, reduced contamination of groundwater and surface water, reduced greenhouse gas emissions and reduced labour.

This document also reviews some of the limitations of drip irrigation.

This document does not provide a technical specification for the implementation of drip irrigation.

The qualities of drip irrigation referred to in this document apply to systems manufactured in accordance with ISO 9261 or equivalent standard.

This document is intended to be used by agricultural policymakers, infrastructure providers, water supply regulatory bodies and authorities, and food chain and farmer cooperatives interested in developing agricultural policies to preserve natural resources and funds. This document is also intended to be used by farmers and smallholders interested in applying an economic agricultural method.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
application efficiency
ratio between the amount of water consumed by the plant and the amount of water applied in the field

Note 1 to entry: Application efficiency units are normally presented as the percentage of water consumed by the plant in relation to the amount of water applied.

3.2
chemigation
injection of agrochemicals, such as pesticides, herbicides or other growth-enhancement products, to the irrigation system, together with irrigated water

3.3
drip irrigation
irrigation method whereby drippers are installed along a polyethylene (PE) pipe of between 10 cm and 1 m, from which water is released at a given capacity (e.g. 1 l/h)

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3.4
evaporation
type of vaporization of a liquid that occurs at its surface and goes into a gaseous phase that is not saturated with the evaporating substance

3.5
evapotranspiration
combination of the water transpirated through the plant and the water evaporated through the soil surface

3.6
fertigation
injection of soluble fertilizers into the irrigation system together with water

3.7
irrigation efficiency
amount of productivity (yield) in relation to the amount of water applied

Note 1 to entry: Irrigation efficiency units are normally presented as the weight of yield per volume of water applied.

3.8
sprinkler irrigation
method of applying irrigation water that is similar to natural rainfall

Note 1 to entry: In sprinkler irrigation, water is distributed through a system of pipes, usually by pumping, and then sprayed into the air through sprinklers so that it breaks up into small water drops that fall to the ground.

Note 2 to entry: Sprinkler irrigation is also referred to as overhead irrigation.

3.9
surface irrigation
group of application techniques, such as flood irrigation and furrow irrigation, in which water is applied and distributed over the soil surface by gravity

Note 1 to entry: Surface irrigation is the most common form of irrigation throughout the world. It has been practiced in many areas, and has remained virtually unchanged for thousands of years.

3.10
transpiration
process of water movement through a plant and its *evaporation* (3.4) from aerial parts such as leaves, stems and flowers

Note 1 to entry: In transpiration, water is necessary for plants, but only a small amount of water is taken up by the roots used for growth and metabolism.

4 Global environmental changes

4.1 Water scarcity

Climate changes on a global scale over the past years have led to extreme conditions such as strong storms with heavy precipitation on the one hand and long and dry periods of elevated temperatures on the other. One major consequence of these changes is the constant reduction of available fresh water worldwide. Water scarcity already affects every continent around the world. Approximately 1,2 billion people, almost one-fifth of the world's population, live in areas with physical water scarcity, and 500 million people are approaching this situation. Another 1,6 billion people, almost one quarter of the world's population, face economic water shortages (where countries lack the necessary infrastructure to take water from rivers and aquifers). Water scarcity is among the main problems that many societies and the world will be facing throughout this century. Water use has been growing at more than twice

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