DRAFT TANZANIA STANDARD

Draft for comments only **CDC 6 (5016) P3**

Water for Irrigation –- Specification

TANZANIA BUREAU OF STANDARDS

0. Foreword

This Draft Tanzania Standard is being prepared by the Water Quality Technical Committee, under the supervision of Chemicals Divisional Standards Committee and it is in accordance with the procedures of the Bureau.

This Draft Tanzania Standard is being prepared in order to control the quality of water used for irrigation purposes. Within the growing agriculture industry in Tanzania, it is accepted that good quality water is needed for maintaining viable production. This draft standard has been prepared In order to maintain the quality of required water for use by relevant stakeholders in the irrigation purposes.

For the purpose of deciding whether a particular requirement of this Draft Tanzania Standard is complied with, the final value observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with TZS 4.

In the preparation of this Draft Tanzania Standard assistance was drawn from the following;

Inputs for water quality standards for irrigation established by Ministry of Water and Irrigation, Tanzania, 2015.

RS 188:2013: Water quality- Irrigation water-Tolerance limits (First Edition) -Published by Rwanda Bureau of Standards

IS 11624: 2009 Guideline for quality of irrigation water published by Indian Bureau of Standards

1. Scope

This Draft Tanzania Standard specifies the requirements, sampling and methods of test of water for irrigation purposes.

2. Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

2.1 ISO 5667-4: Water quality -- Sampling -- Part 4: Guidance on sampling from lakes, natural and man-made.

2.2 ISO 5667-6: Water quality -- Sampling -- Part 6: Guidance on sampling of rivers and streams.

2.3 ISO 5667-9: Water quality -- Sampling -- Part 9: Guidance on sampling from marine waters.

2.4 FTZS 1844:2016, Water quality -- Determination of pH.

2.5 ASTM D 5907: Standard test methods for filterable matter (total dissolved solids) and non-filterable matter (total suspended solids) in water.

2.6 FTZS 1849:2016: Water quality -- Determination of aluminium — Atomic absorption spectrometric methods.

2.7 FTZS 1846:2016: Water quality -- Determination of ammonium nitrogen -- Method by flow analysis (CFA and FIA) and spectrometric detection.

2.8 FTZS 1859:2016: Water quality -- Determination of nitrate -- Part 3: Spectrometric method using sulfosalicylic acid.

2.9 FTZS 1848:2016: Water quality -- Determination of arsenic -- Atomic absorption spectrometric method (hydride technique).

2.10 FTZS 1863:2016: Water quality -- Determination of cobalt, nickel, copper, zinc, cadmium and lead -- Flame atomic absorption spectrometric methods.

2.11 FTZS 1858:2016: Water quality -- Determination of electrical conductivity.

2.12 FTZS 1865:2016: Water quality -- Determination of chloride — Silver nitrate titration with chromate indicator (Mohr's method).

2.13 FTZS 1847:2016,: Water quality -- Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES).

2.14 FTZS 1864:2016: Water quality -- Determination of chromium -- Atomic absorption spectrometric methods.

2.15 FTZS 1843:2016: Water quality -- Determination of fluoride.

2.16 ISO 6332, Water quality — Determination of iron-spectrometric method using 1, 10-phenanthroline.

2.17 FTZS 1852:2016: Water quality -- Determination of dissolved Li+, Na+, NH4+, K+, Mn2+, Ca2+, Mg2+, Sr2+ and Ba2+ using ion chromatography -- Method for water and waste water.

2.18 FTZS 1839:2016: Water quality -- Determination of manganese -- Formaldoxime spectrometric method.

2.19 ISO/TS 17379-1: Water quality -- Determination of selenium -- Part 1: Method using hydride generation atomic fluorescence spectrometry (HG-AFS).

2.20 ISO 9964-1: Water quality -- Determination of sodium and potassium -- Part 1: Determination of sodium by atomic absorption spectrometry.

2.21 ISO 9963-1: Water quality -- Determination of alkalinity -- Part 1: Determination of total and composite alkalinity.

2.22 ISO 11885: Water quality -- Determination of selected elements by inductively coupled plasma optical emission spectrometry (ICP-OES).

3 Terms and definitions

For the purposes of this Draft Tanzania Standard, the following terms and definitions apply;

3.1
Sodium Adsorption Ratio (SAR)
ratio between soluble sodium and soluble divalent cations (calcium and magnesium) in water or soil extracts that can be used to predict the relative activity of sodium ions in exchange reactions with soil

3.2
Salinity
total quantity of salts in the irrigation water that is high enough to accumulate in the crop root zone to the extent that yields are affected

3.3
Electrical Conductivity (EC),
amount of total dissolved salts, or the total amount of dissolved ions in the water.

4.0 Requirements

The degree of restriction of Water for irrigation shall comply with the requirements given in table 1 and 2. For guidance on use of these tables refer to specialists in irrigation.

Table 1: Major Parameters of water for irrigation

Parameters	Degree of restriction of use			Test methods
	No Problem	Increasing problem	Severe problem	
Salinity (*affects crop water availability)*				
Electrical Conductivity (mmhos/cm) mS/cm?	<0.75	0.75 - 3.0	>3.0	FTZS 1858:2016
Total Dissolved Solids (mg/l)	<450	450 - 2000	>2000	ASTM D 5907
Permeability/Filtration (affects infiltration rate into soil) Electrical Conductivity (mmhos/cm)	>0.5	0.2 – 0.5	< 0.2	
Specific ion toxicity (affects sensitive crops)				
Sodium Adsorption Rate (SAR)[1]	< 3	3-9	> 9	ISO 9964/FTZS 1852:2016
Chloride (Cl) (mg/l)[1]	<142	142-355	>355	FTZS 1865:2016
Boron (B) (mg/l)	< 0.75	0.75-2.0	>2.0	FTZS 1847:2016
Miscellaneous effects (affects susceptible crops)				

NO_3-N (or)NH_4-N (mg/l)[2]	< 5	5-30	>30	FTZS 1846:2016
HCO_3 (mg/l) [overhead sprinkling]	< 91.5	91.5-518.5	> 518.5	ISO 9963
pH	<6.5	6.5-8.4	>8.4	FTZS 1844:2016

Note 1: Most tree crops and woody ornamentals are sensitive to sodium and chloride sensitive crops.

Note 2: NO_3 -N means nitrate nitrogen reported in terms of elemental nitrogen (NH4 -N and Organic-N should be included when wastewater is being tested.

Table 2: Maximum concentrations of trace elements in water for irrigation

Parameters	Long term use (mg/l)	Short term use (mg/l)	Methods
Aluminum (Al)	5.0	20	FTZS 1849:2016
Arsenic (As)	0.10	2.0	FTZS 1848:2016
Beryllium (Be)	0.10	0.5	ISO 11885:2007
Cadmium (Cd)	0.01	0.05	FTZS 1863:2016
Chromium (Cr)	0.1	1.0	FTZS 1864:2016
Cobalt (Co)	0.05	5.0	FTZS 1863:2016
Copper (Cu)	0.2	5.0	FTZS 1863:2016
Fluoride (F–)	1.0	15.0	FTZS 1843:2016
Iron (Fe)	5.0	20.0	ISO 6332
Lead (Pb)	5.0	10.0	FTZS 1863:2016
Lithium (Li)	2.5	2.5	FTZS 1852:2016
Manganese (Mg)	0.2	10.0	FTZS 1839:2016
Molybdenum (Mo)	0.01	0.05	ISO 11885:
Nickel (Ni)	0.2	2.0	FTZS 1863:2016
Selenium (Se)	0.02	0.02	ISO 17379-1:
Vanadium (V)	0.1	1.0	ISO 11885:
Zinc (Zn)	2.0	10.0	FTZS 1863:2016

Note: The maximum concentration is based on a water application rate which is consistent with good irrigation practices (10,000 m^3 per hectare per year). If the water application rate greatly exceeds this, the maximum concentrations should be adjusted downward accordingly. No adjustment should be made for application rates less than 10,000 m^3 per hectare per year. The values given are for water used on a continuous basis at one site.

5. Sampling

The sample of water taken for testing shall represent the water proposed to be used for Irrigation. Sampling procedure shall be as per ISO 5667-4, ISO 5667-6 and ISO 5667-9.