BUREAU OF INDIAN STANDARDS
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भारतीय मानक मसौदा

नदी घाटी परियोजना संबंधी परिभाषिक शब्दावली
भाग 1 सिंचाई पद्धतियाँ

[4410 (Part 1) *का दूसरा पुनरीक्षण*]

Draft Indian Standard

GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS
PART 1 IRRIGATION PRACTICES

[*Second Revision of IS* 4410 (Part 1)]

ICS 93.010

Water Resources Planning, Management and Evaluation Sectional Committee, WRD 06

Last date for Comments: **2/11/2025**

FOREWORD

(*Formal clauses of the foreword will be added later*)

A large number of Indian Standards have already been published covering various aspects of river valley projects and some more similar standards are in the process of formulation. These standards include technical terms and precise definitions for such terms are required for avoiding ambiguity in their interpretation. To achieve this aim, the Sectional Committee is bringing out the Indian Standards Glossary of Terms Relating to River Valley Projects (IS 4410); being published in parts. This standard (Part 1) covers definitions of terms commonly occurring in the limited field of irrigation practice, for example, types of crops, areas and water requirements.

In the formulation of this standard, due weightage was given to international coordination among standards and practices, prevailing in different countries in addition to relating it to the practice in the field in the country. While development of this standard, considerable assistance was taken from multilingual technical dictionary on irrigation and drainage published by the International Commission on Irrigation and Drainage (ICID) among many other sources.

This standard was first published in 1967 and subsequently revised in 1991 in light of the experience gained during the use of this standard and technological

advancements. This revision (second revision) has been brought out to bring the standard in the latest style and format of the Indian Standards. In addition, definitions as given in clause 4.9, 4.13, 4.14, 4.16, 4.21, 4.22, 4.25, 4.32, 4.43, 4.48, 4.52, 4.58, 4.78 and 4.80 have been modified and the definition of 'reservoir filling efficiency' has been newly added.

For the purpose of deciding whether a particular requirement of this 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 IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Draft Indian Standard

GLOSSARY OF TERMS RELATING TO RIVER VALLEY PROJECTS PART 1 IRRIGATION PRACTICES

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Last date for Comments: **2/11/2025**

1 SCOPE

This standard (Part 1) covers definition of terms commonly occurring in the field of irrigation practice, for example, type of crops, areas and water requirements.

2 GENERAL TERMS

2.1 Closure Period

The period when the canal is closed for regular maintenance, repairs and other purposes.

2.2 Cropping Intensity

The percentage of the total crop area during a crop year or season to the culturable command area.

2.3 Crop Rotation

The sequence during a year or period of years in which different crops are grown (or planned) in the same land.

2.4 Cropping Pattern

Yearly sequence and spacious arrangement of the crops in a given area.

3 TERMS RELATING TO TYPES OF CROPS

3.1 Annual Crops

Crops which complete their life cycle from seed to seed within one year.

3.2 Canal Irrigated Crop

A crop which is raised predominantly on canal irrigation.

3.3 Cash Crop

A high-value marketable crop such as sugarcane, jute, spices, fruits, tobacco and plantation crop.

3.4 Dryland Crops

Those crops which do not normally require irrigation because the prevailing quantity and incidence of the local rainfall is suitable and sufficient for cultivation.

3.5 Kharif Crops

Those crops which are cultivated in the monsoon season. The following are the principal kharif crops: Maize, rice, small millets, peas, groundnut, cotton, tobacco, sesame and sann-hemp.

3.6 Mixed Crop

Where more than one crop is raised on the same field in the same season simultaneously, without any definite row arrangement such as gram and wheat.

3.7 Monocropping

It is the practice of raising a single crop in an area in a crop year or period.

3.8 Multiple Cropping

It is the practice of growing more than one crop in an area in a crop year.

3.9 Overlapping

An old crop which is harvested or removed after sowing of the new crop.

3.10 Perennial Crops

Crops which last several crop years like plantation or orchard crops.

3.11 Rabi Crops

Those crops which are cultivated in the winter season. The following are the principal Rabi crops: Wheat, barley, gram, peas, potatoes, mustard, tobacco and linseed.

3.12 Relay Cropping

Seeding/planting of the succeeding crop after flowering and before the harvest of the standing crop.

3.13 Single Crop

Raising of only one crop in one season.

3.14 Summer (Zaid) Crop

An intermediate (third) crop between the Rabi and Kharif crops.

3.15 Well Irrigated Crop

A crop which is raised by well irrigation.

3.16 Wetland Crop

Crop which grows in standing water during most part of its life cycle.

4 TERMS RELATING TO IRRIGATION

4.1 Actual Evapotranspiration

Evapotranspiration from a particular crop under the given moisture and climate conditions.

4.2 Alkali Soil

A soil that contains sufficient exchangeable sodium to interfere with the growth of most of crop plants. The ESP is generally more than 15 and ECF less than 4 decisiemens per metre. The soil pH is higher than 8.2 except in systems with chloride and sulphate anions.

4.3 Alkaline Soil

Any soil having pH greater than 7.

4.4 Application Efficiency (AE)

It is the ratio of the average depth of the irrigation water stored in the root zone to the average depth of irrigation water applied.

4.5 Application Efficiency of Low Quarter (AELQ)

It is the ratio of the average low quarter depth of irrigation water infiltrated and stored in the root zone to the average depth of irrigation water applied. The average low quarter depth infiltrated is the average of the lowest one-fourth of the measured or estimated values and the soil m each value represents an equal area of the field.

4.6 Area Assessed

The area irrigated on which water rate have been levied.

4.7 Available Soil Moisture (ASM)

It is the difference at any given time between the actual moisture content in the root zone soil and the wilting point.

4.8 Available Soil Moisture Capacity

Total amount of available soil moisture in the crop root zone that can be held by a soil for use by plants. Usually considered to be the moisture held between field capacity and wilting canal point.

4.9 Base Period

The number of days over which duty of water is reckoned. determined or measured. Base period equals the period between first and last irrigation to raise a crop. Generally base period equals crop period.

4.10 Border Strip Irrigation Method

It is controlled surface flooding irrigation method where the field to be irrigated is divided into narrow strips by long parallel low bunds strips by long parallel low bunds or levees along the general slope of land which shall normally be sufficiently gentle and each strip of land is irrigated by admitting a stream of water at the upper end.

4.11 Check Basin Method

The method consists of applying water to an area which is prepared level or nearly level and divided into basins or compartment, usually of rectangular shape with bunds. A supply channel is aligned on the upper edge of the area, and the laterals are dug in between two check basins.

4.12 Coefficient of Uniformity (UC)

It is the ratio of average depth of irrigation water infiltrated into the soil minus the average deviation from this average depth divided by the average infiltrated water.

4.13 Consumptive Use, Consumptive Water Use

The quantity of water used by the vegetative growth of a given area in transpiration and building of plant tissue and that evaporated from the adjacent soil **or** from intercepted precipitation on the area in any specific time. It is expressed in water depth units or depth area units per unit area and for specified periods such as days, months and seasons, also called Consumptive Water Use or Evapotranspiration.

4.14 Consumptive Use Efficiency

The ratio of consumptive water use by the crop of an irrigated farm or project and the irrigation water stored in the root zone of the soil on the farm or the project area.

4.15 Conveyance

The movement of water from its source through the main or secondary canals or conduits to the tertiary or distributory offtakes.

4.16 Conveyance Losses or Transmission Losses

Losses of irrigation water in transit from the source of supply to the point of service in canals, distributaries, water courses or field ditches. They comprise evaporation from

the water surface, seepage, and incidental transpiration by vegetation growing in the water or along the banks of natural channels, canals or water courses.

4.17 Crop Water Requirement

The total water needed for evapotranspiration from planting to harvest for a given crop in a specific climate regime, when adequate soil water is maintained, by rainfall and /or irrigation so that it does not limit plant growth or crop yield.

4.18 Culturable Command Area

The gross commanded area less the non-culturable land.

4.19 Culturable Irrigable Area

The culturable command area less the area not available for irrigation due to high relief or other reasons.

4.20 Culturable Lift Irrigation Area

The culturable command area that can be irrigated only by lift irrigation.

4.21 Curve of Demand

A graph showing the amount of water needed for irrigation at various times during a crop season, based on elements of time and quantity.

4.22 Curve of Supply

A graph showing the water available based on elements of time and quantity.

4.23 Daily Consumptive Use

It is the consumptive use of water by a crop in a day.

4.24 Deep Percolation Loss

It is the amount of water that percolates downward below the crop root zone.

4.25 Delta

a) An expression used in irrigation practice to mean the depth of water that would result over a given area from a given discharge for a certain length of time. Alternatively, the delta may be defined as the total volume of water delivered, divided by the area over which it has been spread; and

b) A term equivalent to duty of water when the latter is expressed in water-depth units and refers to irrigation projects under operation. It is stated with reference to the place at which it is measured, that is, delta at farm; delta at head of water course or lateral head; delta at distributory head; delta at head of main canal.

4.26 Design Duty of Water

Duty of water assumed in an irrigation project for designing capacities of channels.

4.27 Distribution Efficiency

It is the measure of uniformity of irrigation water distribution over a field.

4.28 Distributary or Tertiary

Canal or conduit taking water from the conveyance system and supply it to one tertiary unit.

4.29 Diversion Structure

The structure that diverts water from the water sources and supplies it to the irrigation system.

4.30 Division Structure

A structure in the conveyance system that divides the flow into two or more canals of conducts, or both.

4.31 Drip/Trickle Irrigation

It comprises the application of water in drops close to the plant. The entire space between the plants is not watered.

4.32 Duty or Duty of Water

The relation between the area irrigated, or to be irrigated, and the quantity of water used, or required to irrigate it for the purpose of maturing its crop. Duty is stated with reference to a base period and the place of its reckoning or measurement. It is expressed as area per unit rate of flow or per unit volume of water.

4.33 Duty of a Well

The average annual area of land irrigated by well for maturing a crop.

4.34 Effective Rainfall

The portion of rainfall that replenishes the water availability in the crop root zone.

4.35 Estimated Evapotranspiration

An estimate of evapotranspiration by means of standard formulae using climatic factors.

4.36 Evapotranspiration — *See* **4.13.**

4.37 Evaporation

Evaporation is the physical process by which a liquid is transformed into a gaseous state. In agriculture, it is the total water vapour loss from a given area over a given time period. It may be expressed as the total or the mean rate in units of depth or volume per unit area, for the period concerned.

4.38 Farm Irrigation Efficiency

The percentage of the water consumed by crops in a farm to the water made available at the farm gate.

4.38 Farm Irrigation Efficiency

The percentage of the water consumed by crops in a farm to the water made available at the farm gate.

4.39 Farm Losses

Losses of water on the farm due to uneven distribution, evaporation and percolation into the subsoil due to over irrigation. These include to surface run-off and deep percolation.

4.40 Farm Field Inlet

A structure which supplies water to a farm field.

4.41 Field Application

The application of water from the field inlet to the field.

4.42 Field Application Efficiency

The field application efficiency is made up of two parts (1) the efficiency of water transport system in the field and (2) the efficiency with which the water is applied. It is, by definition, the relation between the quantity of water furnished at the field inlet and the quantity of water needed to maintain the soil moisture above some target level required for the crop.

4.43 Field Capacity (FC)

The amount of water held in the soil after the excess gravitational water has drained away and after the rate of downward movement of water has materially decreased, provided there is no water table within capillary reach of the root zone.

4.44 Field Channel

Channel usually taking water from the watercourse and supplying it to one or more forms or fields.

4.45 Field Irrigation Requirements

The requirements of irrigation water for crops at the diversion point of supply channel.

4.46 Flow Irrigated Area

Area which can be irrigated from the source of water, by flow under gravity alone.

4.47 Furrow Irrigation

It is a method of applying water to crops sown in rows through furrows.

4.48 Gross Command Area (GCA)

The area of the command up to the farthest point in a command that can be supplied water. It includes unculturable area, ponds, house, barren lands, etc.

4.49 Hydraulic Conductivity

The rate of flow of water in litres/day through unit cross-section of soil under unit hydraulic gradient at a specified temperature.

4.50 Infiltration

The downward entry of water from the surface into the soil.

4.51 Infiltration Rate

The rate at which a soil, in a given condition at 4.63 Lift Irrigation a given time can take in water.

4.52 Intensity of Irrigation

Ratio of the total irrigated area of each crop season to culturable command area (CCA) in an irrigation year.

$$\text{Annual Irrigated Area} = \text{Intensity of irrigation X CCA}$$

4.53 Irrigation

The supply of water by artificial means for raising crops.

4.54 Irrigated Area

The area to which irrigation water has been applied.

4.55 Irrigation Method

The manner in which irrigation water is applied to the land for raising a crop.

4.56 Irrigation Return Flow

It is the leakage of seepage or both of water from irrigation works, namely, canals and dams or regenerated flow from fields which could be used for irrigation areas downstream.

4.57 Irrigation System

It includes storage and diversion structure, main canal. Distributory minors, water courses, field channels and allied structures including head regulator, cross drainage works and control structures.

4.58 Irrigation Water Requirement

Irrigation requirement refers to the depth of water required to be applied for successful growth of crops, in a given time, exclusive of rainfall, groundwater contribution and other natural resources. This, in other words, can be stated as net irrigation requirement plus other economically unavoidable losses.

4.59 Irrigation Works

The works related to storage, diversion, conveyance and delivery of irrigation supplies to the project command.

4**.60 Leaching**

The process of removal of soluble salts in the soil by the passing water through it.

4.61 Leaching Requirements

A fraction of the water entering the soil that must pass through the root zone in order to prevent soil salinity from exceeding a specified value. Leaching requirement is used primarily under steady state or long time average conditions.

4.62 Lift Irrigated Area

That area where the level is too high to allow irrigation by gravity flow, but which can be irrigated by lifting water to the necessary level at some point in the supply system.

4.63 Lift Irrigation

It is the method of irrigation in which the water is lifted with mechanical or manual means.

4.64 Main Canal

Principal canal for the conveyance of water supplied to the branch canal/distributor.

4.65 Management Allowed Deficit (MAD)

It is the desired soil moisture deficit at the time of irrigation.

4.66 Mulching

Covering the soil with any material such as straw, plant residues or plastic film to reduce the evaporation from the soil surface and/or to protect plant roots from extremely low or high temperatures.

4.67 Net Water Requirement

The consumptive use requirements of crops minus the effective rainfall.

4.68 Nominal Duty or Normal Duty

The duty sanctioned as per the schedule of an irrigation department.

4.69 Non-beneficial Consumptive Use

The water consumed by native non-crop vegetation, evaporated from bare and ideal land surfaces and from water surfaces.

4.70 Non-perennial Area

The area which does not receive perennial irrigation.

4.71 Outlet Command Area.

The area, in irrigation practice, for distribution of water from an outlet. It is the areas that can be served by an individual outlet.

4.72 Outlet or Turnout

A structure that supplies water to a block in which different farmers use the flow in rotation.

4.73 Overall Irrigation Efficiency of the System

It is the ratio of the average depth of irrigation water which is beneficially used to the average depth of irrigation water supplied from the headwork.

4.74 Panchnama

A written statement executed by canal authority in presence of and witnessed by the irrigators or members of water committee of the concerned canal system against an offender found misusing, wasting or taking water unauthorizedly.

4.75 Peak Period Consumptive Use

It is the average daily water used during the period of highest consumptive use.

4.76 Perennial Irrigated Area

The area served by a perennial canal.

4.77 Potential Application Efficiency of Low Quarter (PELQ)

It is the low quarter application efficiency (PELQ) obtainable with a given irrigation system when the depth of irrigation water infiltrated in the quarter of the area receiving the least water equals some predetermined value of the soil moisture deficit (SMD).

4.78 Potential Evapotranspiration.

The amount of water evaporated in unit time and transpired by a short uniform crop, growing actively and covering an extended surface and never short of water.

4.79 Potential Evaporation

The evaporation from a given surface when all surface atmospheric interfaces are wet (saturated), so that there is no restriction due to either biological control or soil water content on the water vapour loss from the surface area. Its magnitude will depend primarily on atmospheric conditions and surface albedo, but it will also vary with the geometric characteristics of the surface. These characteristic structure and density) are governed by the type of vegetation present, its health and stage of growth.

4.80 Potential Transpiration

The amount of water transpired by a green crop of about the same colour as green grass, which completely covers the ground, and which has an adequate supply of water.

4.81 Pre-Sowing Irrigation

Water application to a field before sowing of a crop to provide the required moisture in the soil for germination of the seed.

4.82 Reference Crop Evapotranspiration

The evapotranspiration from a given well-adopted crop selected for comparative purposes under given weather conditions and with adequate fetch (sufficient to make boundary effects relatively unimportant) and for a standardized watering regime appropriate for this crop and the region concerned.

4.83 Reservoir Storage Efficiency (E_s)

It is the ratio of the volume of water released from the reservoir for irrigation, to the volume of water received in the storage reservoir (surface or underground) for irrigation.

4.84 Reservoir Filling Efficiency

It is the ratio of maximum live storage attained in the reservoir in a particular year to the designed live storage of the reservoir. This indicator serves to evaluate the adequacy of the original storage design by highlighting deviations in the hydrological regime or shortcomings in the hydrological assessments.

4.85 Ring/Basin Method of Irrigation

It consists of applying water in level basins either of rectangular or circular shape, generally made around each tree or group of trees.

4.86 Rostering of Channels

It is the sequencing of water delivery in different channels as a part of regulation.

4.87 Rotational Distribution Water Supply (Varabandi, Osrabandi)

It is a timetable of water supply to individual fields from a particular outlet during one rotation.

4.88 Saline Alkali Soil

A Soil containing sufficient exchangeable sodium and soluble salts to interfere with the growth of most crop plant and containing appreciable quantities of soluble salts. The ESP is more than 15, ECE is more than 4 Mhos/ds and soil pH may or may not be 8.2.

4.89 Saline Soil

A non-alkali soil containing such large proportion of chloride and sulphate anions as may interfere with the growth of plants. The ECE Is more than 4 Mhos/ds, ESP is less than 15 and soil pH less than 8.2.

4.90 Soil Moisture

It is the water occurring in the voids of soil mantle.

4.91 Soil Moisture Content

It is usually defined as the quantity of water presenting the soil, expressed either as the weight of water per unit weight of dry soil or the volume of water per unit volume of bulk soil.

4.92 Soil Moisture Deficit (SMD)

It is the difference between the field capacity and the actual soil moisture in the root zone soil at any given time. It is the amount of water required to bring the soil in the root zone to field capacity.

4.93 Sprinkler Irrigation

The method of applying water over the land by spraying it under pressure. This is often done by rotating sprinkler heads with one or more nozzles or by using perforated pipes.

4.94 Sub-Surface Irrigation

This is the method of applying water to crops below the ground surface through porous tiles or similar other material. This can also be done through low level open ditches. It is generally applicable to layered soil.

4.95 Surface Irrigation

Method of irrigation where the water flows on to the field surface by gravity from the head to the tailend.

4.96 Surface Irrigation Method

It is the application of water by surface method such as wild flooding, border strip, check basis, and furrows for raising crops.

4.97 Transpiration

It is the process of release of water vapour to the atmosphere from aerial organs of the plant mainly through deep stomats.

4.98 Unit Irrigation Efficiency (E_u)

It is the ratio of the volume of irrigation water evapotranspiration irrigated area, plus that necessary to maintain a favourable salt concentration in the soil solution, to the volume of water delivered to the area.

4.99 Water Conveyance Efficiency (E_c)

It is the ratio of the volume of water delivered by an open or closed conveyance system to the volume of water delivered to the conveyance system at the supply source.

4.100 Water Use Efficiency (WUE)

It is defined as the marketable crop produced per unit of water consumed in evapotranspiration.

4.101 Wild Flooding

It is a method of irrigation by uncontrolled flooding of the area.

4.102 Wilting Point (WP)

It is the moisture content of the soil below which plants can no longer extract moisture at a rate sufficient for its growth.

5 TERMS RELATING TO CLIMATE INFLUENCING IRRIGATION

5.1 Arid

Climate or regions having not enough rainfall (usually less than 250 mm) to support vegetation.

5.2 Agricultural Drought

Continuous (period of) dry weather causing serious moisture deficits, for crop growth.