

Biogeosystem technique as a base of Sustainable Irrigated Agriculture

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The world water strategy is to be changed because the current imitational gravitational frontal isotropic-continual paradigm of irrigation is not sustainable. This paradigm causes excessive consumption of fresh water – global deficit – up to 4-15 times, adverse effects on soils and landscapes. Current methods of irrigation does not control the water spread throughout the soil continuum. The preferable downward fluxes of irrigation water are forming, up to 70% and more of water supply loses into vadose zone. The moisture of irrigated soil is high, soil loses structure in the process of granulometric fractions flotation decomposition, the stomatal apparatus of plant leaf is fully open, transpiration rate is maximal.

We propose the Biogeosystem technique – the transcendental, uncommon and non-imitating methods for Sustainable Natural Resources Management. New paradigm of irrigation is based on the intra-soil pulse discrete method of water supply into the soil continuum by injection in small discrete portions. Individual volume of water is supplied as a vertical cylinder of soil preliminary watering. The cylinder position in soil is at depth from 10 to 30 cm. Diameter of cylinder is 1-2 cm. Within 5-10 min after injection the water spreads from the cylinder of preliminary watering into surrounding soil by capillary, film and vapor transfer. Small amount of water is transferred gravitationally to the depth of 35-40 cm. The soil watering cylinder position in soil profile is at depth of 5-50 cm, diameter of the cylinder is 2-4 cm. Lateral distance between next cylinders along the plant row is 10-15 cm. The soil carcass which is surrounding the cylinder of non-watered soil remains relatively dry and mechanically stable. After water injection the structure of soil in cylinder restores quickly because of no compression from the stable adjoining volume of soil and soil structure memory. The mean soil thermodynamic water potential of watered zone is -0.2 MPa. At this potential the stomatal apparatus of leaf regulate the water flow through plant, transpiration rate is reduced, soil solution concentration increases, plant nutrition supply rate becomes higher than at a stage of water field capacity. The rate of plant biomass growth is highest at water thermodynamic potential of -0.2-0.4 MPa. No excessive irrigation intra-soil mass transfer, nor excessive transpiration, evaporation and seepage.

New intra-soil pulse discrete paradigm of irrigation optimizes the plant organogenesis, reduces consumption of water per unit of biological product. The biological productivity increases. Fresh water saving is up to 20 times. The new sustainable world strategy of Ecosystem Maintaining Productivity is to be based on the Biogeosystem Technique, it suits well the robotic nowadays noosphere technological platform and implements the principals of Geoethics in technologies of Biosphere.

Key words: Paradigm, Biogeosystem technique, intra-soil pulse discrete watering.

SSS8.1 Restoration and rehabilitation of degraded lands in arid, semi-arid and Mediterranean environments

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