

REGISTER OF RESEARCH ON IRRIGATION AND DRAINAGE

QUESTIONNAIRE

A	Project title: Drip irrigation efficiency definition for stony soils. Drip irrigation system productivity assessment.
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B	Topic n° : 1	Sub-topic n°: 0.1
1)		Technical field n°: 4
2)	Category n°: 01	

C	Project location		
	Country: Republic of Uzbekistan	Area: 5 ha	
	Fergana province, Fergana district, collective farm «Yesh Leninchi»		

D	Duration of the project:		
	Year in which the project was started: 1993	Project completed: 1996	
		Dates of Expertise: 1994, 1995, 1996	

E	Organizations and technical staff involved			
1	Supervisor/project coordinator: Usmanov Abbas Organization: SANIIRI Address: 11, Karasu-4, Tashkent telephone: 65 09 55 E-mail:	fax:		% Staff resources 20
	Other counterparts:	Organizations	Surname	First name
1		Ganiyev Agdam		40 %
2		Mukhamedjanov Shukhrat, SANIIRI		40 %
3				%
4				%
	Other collaborators:		man-years	

F	Funding agencies	
	Full name or acronym	Percentage of project finance provided
1	State Committee for Science and Technique	100%
2		%
3		%

G	Summary of research project
<p>1 <i>Objective and technical fields:</i> Irrigation water losses decrease, energy expenses reduction, ecological situation improvement.</p>	
<p>2 <i>Scientific and technical approaches:</i> Irrigation optimal regime establishing under drip irrigation; - comparison of crops water consumption under drip and furrow irrigation; - Drip irrigation indices definition on the base of existing wells; - Drip irrigation economic evaluation; Investigation meaning: recommendations on high frequency irrigations under drip irrigation.</p>	
<p>3. <i>Environment characteristics</i> Climate - sharply continental. Average annual air temperature is 13.8 -14.1 ° C, average perennial temperature 13.2 ° C, in July - 27 ° C, in January -February - 1.0 ° C. Annual precipitation is 160-200 mm. Relative air humidity is 58 -66 %. Relief: strongly corrugated, quaternary sediments; slope 0.02 -0.05. Lithology: light loam 0.3 -0.5 m is underlaid by pebbles (100m) with permeability coefficient 15 -26 m/day. Volumetric mass of loam is 1.32-1.42, maximum hydrosopy is 1.3 -1.7, field moisture capacity is 17.7; total porosity is 42 -45 %. Groundwater level is 70-100m. Soils are non-salinized (0.08 - 0.138 g/l for solid residue; 0.004 -0.014 for chlorine). Sulfate, calcium and hydrocarbonates prevail. Groundwater salinity is 0.5 -0.8 g/l, well's discharge is 40 -70 l/sec.</p>	
<p>4. <i>Parameters of Pilot Projects and Technical Solutions:</i> Pilot site's area is 5 ha; length is 210 m., width is 210 m. Irrigation network: drip irrigation system of native production. Plastic hoses with drippers «Vario-Drin» (interval 0.9 m) are laid in each second furrow. Irrigation source -borehole with yield 45 l/sec. Due to good drainability drainage network is absent. Land use efficiency is 0.98. Control site: furrow irrigation from Shakhimardan river. Crops: cotton-1993; tomato -1994-1995; carrot -1996.</p>	
<p>5 <i>Methodology:</i> For experiment fulfillment pilot site is divided on the versions of different moisture before irrigation. Within the control site moisture regime is 70-70-60 %. Water -physical properties of soils were determined. For dripper discharge regularity definition certain drippers located at the beginning, middle and end of pipeline were selected. Discharges were determined by volumetric method. Phenological observations were carried out according to plant germination phases. Moisture dynamics under drippers was defined by soil sampling and thermostat -weigh method. Water discharge measurement was made by water-meter at the system's head and pressure -by manometer.</p>	
<p>6 Results: First productive experiments were carried out in 1993 -1996 on cotton and vegetables drip irrigation with use of residue head of vertical wells for irrigation. Within the pilot site in 1993 cotton drip irrigation 3 versions were studied under moisture value 70,80,85 -90 % of FFMC and control version of test 17,23,33 irrigations were performed with interval 4,3,2 days and irrigation norms 5967, 6084, 6493 cu.m/ha. Tests showed that most effective was version in 1993, with moisture 85 %. Irrigation interval was about 2 days, duration of watering was 12 -12.8 hours. Irrigation duty was 175 -185 cu.m/ha. Irrigation norm of 33 irrigations was 6490 cu.m/ha. Tomato and carrot irrigation duration was 8-15 hours, interval was 3-4 days.</p>	

Irrigation norm was 170-564 cu.m/ha. During growing period 15 -20 waterings were performed under irrigation norm 6120 -7820 cu.m/ha. Under furrow irrigation in 1993 five waterings were performed; in 1994 - seven; in 1995 - six; in 1996 - five. Within the control field irrigation norm (net) was 8410 -12240 cu.m/ha, water depth was 1190 - 2212 cu.m/ha; water duty was 10534 -13 460 cu.m/ha. Irrigation water forced release was 11-17 % of water duty. Evapotranspiration is 5500 -5600 cu.m/ha. Effective rainfall was 200 cu.m/ha. Under furrow irrigation infiltration and lateral outflow were totally 2.5 - 4.0 th. cu. m/ha.

Water discharge from head system (under pressure 1 ata.) varied within 19.6 -26.8 cu.m/hour/ha. Drippers' discharge was 0.5 -2.7 l/hour. Under one dripper average yield 2.1 l/h moistening along the furrow was 70 -80 cm., across the furrow -50 -60 cm, in depth 30-40 cm.

Irrigation calculated regularity coefficient was 0.79 -0.81. Soil moistening regularity coefficient was 0.82 -0.89. The best moistening was within the version of tomato irrigation in 1995. Water expense was 1.5 %/day within the lower horizons and 2.5 %/day on soil surface. Under soil pre-irrigation moisture 70 % supported was found, that in July - August this moisture value was observed on 4th -5th day after irrigation. In June and September this value is observed on 5th -6th day after irrigation. Under version of 80 % moisture this value is observed on 3th -4th day after irrigation. Under version 85 -90 % moisture is between 15 -15.9 %. This value is observed on 2-nd day after irrigation.

Cotton yield was (t/ha): under moisture of 70 % - 2.1; 80 % - 2.6; 85 -90 % - 2.8. Within the control field it was 1.7. Water saving under cotton, tomato and carrot was 4041 -6000 cu.m/ha or 38 -48.5 %. Water consumption coefficient was lower to compare with furrow irrigation: for cotton - 56 %, tomato - 46 - 50 %, carrot - 30 %.

Electric energy consumption under drip irrigation was 909 kwt./h, under furrow irrigation - 1500 kwt./h. Energy saving was 40 %, moreover almost all energy was used by vertical wells for irrigation. Drip irrigation with moisture support at level of 75 - 90 % of FFMC helps to plants to avoid water and temperature stress and allows it to develop regularly and sustainable way which promotes yield increase for cotton to 40 %, for tomato - to 4.0 %, for carrot - to 25 %. Number of cultivations and tillages decreases from 6 7 to 2 -3 during growing period.

Natively produced DIS are suitable to use for cotton and vegetables. Main disadvantage is lower quality (25 % accidents). DIS operation during 4 years (1993 -1996) proved its productivity and permitted to solve certain problems: 1) irrigation water supply; 2) its conveyance; 3) irrigation water settling; 4) needed heads creation. Within Fergana valley about 35 -40 th.ha can be irrigated by existing DIS.

H	Suggested key-words		
1	Drip irrigation system	4	Groundwater
2	Irrigation regime	5	Soil productivity
3	Design peculiarities	6	Water saving

I	Most recent publications (maximum 3)			
1	Author(s): Sh. Mukhamedjanov, A. Usmanov			
	Title: DIS application under small soil thickness for cotton growing.			
	Publication details: Field investigations results on cotton irrigation by DIS. Its design elements were assessed. Main parameters of DIS irrigation regime were established.			
	Year of publication: 1995	free access <input checked="" type="checkbox"/>	restricted <input type="checkbox"/>	confidential <input type="checkbox"/>
2	Author(s):			

Title:			
Publication details:			
Year of publication:	free access <input type="checkbox"/>	restricted <input type="checkbox"/>	confidential <input type="checkbox"/>