

1.6. Irrigation regime and of lucerne water consumption norms

Within the register on irrigation and drainage over the plots 1.01.Kaz., 1.02.Kaz., and 1.03.Kaz there is information on irrigation regime and norms of lucerne water consumption as secondary crop of rice crop rotation. Mentioned plots are located in lower reaches of SyrDarya river. Climatic, geomorphological-hydrological and reclamation conditions of the plots are identical to conditions of rice irrigation schemes. Irrigation regime and norm of water consumption on the plot 1.012.Kaz was studied in two variants of limit field capacity: 80x80x80 and 90x90x90 with 1 year and 2 year sowing. Lucerne irrigation regime on the plot 1.02. Kaz was studied with variants of various pre-irrigation moisture: 1 without irrigation, 60x60x60, 70x70x70 and 80x80x80, on the plot 1.03.Kaz depths of irrigations are: (1) variant $M_{actual} = M_{calculated}$ under pre-irrigation 80x80x80; (2) $M_{actual} = 1.5 M_{calculated}$ 2 ; and (3) $M_{actual} = 2.0 M_{calculated}$. Special attention was given to salt regime formation depending on irrigation norm.

It was determined that, irrigation regime under pre-irrigation moisture 75x80x75 and 80x80x80 for half-automorphous and automorphous soils and 90x90x80 for hydromorphous soils is optimal variant. Under mentioned irrigation regime lowest depth of irrigation and irrigation norms are occurred. Over Toguzken (1.01.Kaz) and Kzilkum (1.02.Kaz) massifs pre-irrigation moistures under lucerne irrigation were 80x80x80 and 90x90x90 of full field water capacity and irrigation norms were 1950 (table 1.6.1.) and 1600 m³/ha respectively.

At the same time in control variants irrigation norm over Toguzken massif was 3750, and Kzilkum-1800 m³/ha. Depth of irrigation under optimal pre-irrigation moisture varied within the limits 1400-1540 and 800 m³/ha, and in control variants varied within the limits of 1950, 1670 and 800 m³/ha (table 1.6.1) respectively.

Both water saving and crop yield dry mass increase were achieved over the plots under optimal variants of lucerne irrigation regime application. Over Toguzken massif water saving was 1800-2060 (48-36%) m³/ha under crop yield 16 (20%) c/ha, Kzilkum-300 (14%) under crop yield 10 c/ha (14%) against control variants.

Table 1.6.1

Irrigation water expenses assessment per lucerne yield unit

Index of pilot plot	Soil-climatic zone	Genesis of soil profile groundwater level, m	water allowance rayon	Compaction degree	Salinity degree	Agricultural crop	Information type	Efficiency %	Irrigation depth m ³ /ha	Irrigation norm, m ³ /ha		Achieved reduction of irrigation water use, m ³ /ha (%)	Yield	Yield increment, c/ha (%)	Water expenses per production unit, m ³ /c	
										net	gross				net	gross
1.01. Kz.	Ц-I-A	hydro-morph . 0,5-2,5 m	IV	H	medium saline	Lucerne	OBPO 80x80 K	-	1400	1950	-	1800 (48)	76,6	+16 (20)	25,5	
			IV	H					1950	3750	60,6		61,9			
1.01 Kz.	Ц-I-A	hydro-morph . 0,5-2,5 m	IV	H	medium saline	Lucerne of the 2 nd year	OBPO 80x80 K	-	1540	4620	-	2060 (31)	144		31,1	-
				H					1670	6680						
1.02. Kz.	C-II-A	hydro-morph . 1-2,5 m	VI	H	slightly-saline	Lucerne	OBPO K	0,75	800	1600	2100	300 (14,2)	159	+10 (14,2)	10,0	13,2
				0,75				600-800	1800	2400						
KKNIIZ	C-II-A	half-hydro-morph	IV	H	medium saline	Lucerne of the 2 nd year	field experiment	0,7	1090	6789	9700	-	168,3	-	40,3	57,6

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										net	gross				net	gross
		1-3 m														
KKNIIZ	C-II-A	half-hydromorph 1-3 m	VII	H	medium saline	Lucerne of the 2 nd year 80x80	field experiment	0,72	600-680	5623	7810	-	153,0	-	36,7	51,8
collective farm Pakhtaaraal	II-II-B	half-auto-morph	IV	H	slightly saline	Lucerne of the 2 nd year	OBPO 90x90x90 K	0,83	700-900	6500	7927	609,5 (10)	250	+74	26,0	31,7
								0,83	800-1000	7000	8536		176		39,8	48,5
Khorezm UZNIHL	C-II-A	hydromorph. 1,5-2,0 m	IV	H	medium saline	Lucerne of the 2 nd year	field experiment	0,8	750-810	5184	-		1775	-	49,0	-
			IV	H				0,8	400-450	2400	-		49,0			
Khorezm UZNIHL	C-II-A	hydromorph. 1,5-2,0 m	IV	H	medium saline	Lucerne of the 2 nd year	field experiment	0,8	520-710	4560	-	-	198,6	-	23,0	-

Highest lucerne yield over massifs was 159 and 168,8 c/ha respectively. Water expenses for yield unit fluctuated from 10 m³/c (1.02.Kaz) to 21-31 m³/c, and in the control variant from 40 to 60 m/c. Highest indices of lucerne effective cultivation under the optimal irrigation regime with pre-irrigation moisture 80x80x80 and 90x90x90 on half-automorphous and hydromorphous soils were achieved on the pilot plots of UzNIHl of the Republic of Karakalpakstan, Khorezm and in “PakhtaaraI” collective farm (table 1.6.1). However, irrigation norms on mentioned sites were 2-3 times higher, then on the pilot plots in Kazakhstan (table 1.6.1).

Under above mentioned irrigation norms over massifs the water-salt balance is found as positive, Salt accumulation intensity depends on values of depth of irrigation, irrigation norms, groundwater level and mineralization. In Toguzken massif under lucerne growing without irrigation intensive salt restoration up to 2,3-3,0% is occurred, with irrigation- up to 1,3-1,4% against 0,6-0,8 after rice. The same is observed for Kzilkum massif. Under irrigation by depth of irrigation equal to moisture deficit (60%- irrigation norm 1450 m³/ha and 70%- depth of irrigation 2100 m³/ha) annual salts accumulation is 6-10 tn/ha, and under irrigation norm 2400m³/ha -3-5 tn/ha.

Salts accumulation due to evaporation from slightly saline groundwaters (2-3 g/l) which is used on hydromorphous soils with groundwater table 1,5-2,0 m achieves up to 45-60% of total water consumption 3-5,5 th.m³/ha.

Water-salt balances over the pilot plots of KKNIIZ, Khorezm branch of UNIIH and “PakhtaaraI” collective farm are found as negative, i.e. slow soils desalinization with salt removal from aeration zone 5-10 tn/ha per year and ground waters mineralization reduction.