

# Optimal Rates of Watering and Fertilizers for Growing Cabbage

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**Annotation** The effect of irrigation and fertilizer rates on productivity in the cultivation of cabbage in re-sowing has been studied. In the experiment, the average mass of cabbage in all variants was in the range of 3.26-2.70 kg. Productivity: On average 65.6 t/ha when mineral fertilizers are applied at 70-70% control irrigation regime ( $N_{150}P_{150}K_{100}$  kg/ha) in the Saratoni variety at 80-80% irrigation regime and ( $N_{250}P_{150}K_{100}$  kg/ha) (81.1 t/ha) was 23.6% higher than the control, and 113.0 and 126.7% higher than the control in the hybrid W61-19 F1 at 80-80% irrigation regime in both fertilization rates. In increasing the yield, the importance of irrigation was stronger than that of mineral fertilizers. Profitability was 37.8-51.4% for the Saratoni variety and 45.7-61.6% for the W61-19 F1 hybrid.

**Keywords:** irrigation, fertilizer, productivity, cabbage, profitability.

## Optimum watering and fertilizing standards for growing cabbage.

To ensure the implementation of the priority tasks set by the President of the Republic of Uzbekistan in the "2020-2030 strategy for the development of agriculture of the Republic of Uzbekistan" in terms of providing employment, effective use of arable land, satisfying the population's demand for food products, ensuring the stability of prices for agricultural products, export volume increase, as well as special tasks were set to plant repeated crops in the fields that will be freed from grain and tomorrow's crops in 2022, carry out agrotechnical activities, supply the required material resources, and timely harvest, process, stockpile and export the cultivated crop .

Ensuring food security and efficient use of existing irrigated areas, using effective agrotechnologies in growing white cabbage as a repeat crop requires increasing the yield and gross output of this crop. There are 2.82 million white cabbages in the world. is grown on an area of more than one hectare. The average yield is 29.4 tons per hectare and the total yield is 82.8 million. is 1 ton.

In this regard, the introduction of scientifically based technologies into production will ensure the increase of product volume and yield, effective use of irrigated areas, and high economic efficiency indicators obtained from repeated crops.

In order to meet the demand for white cabbage, it is important for agricultural producers to improve the technology of growing this crop as a repeated crop, in which research on determining the optimal planting period, the area of plant nutrition, fertilization and irrigation standards, as well as the selection of high-quality and high-yielding varieties and hybrids is relevant.

For many years, by researchers on the issues of improving the technologies of growing white cabbage in different soil and climatic conditions: A.S. Bolotskih, M.S. Grigorov, M.V. Damkov, M.A. Likhomanova, V.M. Zhidkov, A. A. Nazarenko, L. E. Soloveva, V. M. Pivovarov, N. N. Chernysheva, R. D. Almasker, S. V. Koroleva, S. V. Sitkinov, L. K. Gurkina, T. V. .Lizgunova, V.A. Denisov, R.D. Almasker, I.D. Rajabli, N.B. Petrov, O.N. Vishnevskaya, L.I. Uralets, M.N. Shapturenko, V.N. Lukyanets , G.A. Kostenko, A.D. Dzhakhangirov, V.P. Kuzmishchev, G.F. Monakhos; scientific researches were carried out in our republic by V.I.Zuev, O.Kadirhojaev, B.J.Azimov, A.M.Abbasov, M.Kh.Aramov, S.S.Lapasov, and many other scientists.

Based on the above, we have conducted research on irrigation and nutrition of promising varieties and hybrids for repeated cultivation of white cabbage in areas freed from grain crops.

We conducted special complex experiments in 2012-2015, incorporating the varieties, feeding and watering norms that were found to be promising in our research conducted in 2007-2011. This experiment is

three-factorial, in which factor A is a variety and a hybrid; Factor V was irrigation regime, factor C was fertilization rates. In factor A, the variety Cancer of white cabbage and the hybrid W61-19 F1; Soil moisture before irrigation was 70-70 (control) and 80-80% compared to field moisture capacity limited by factor V (ChDNSN); Fertilization rates of factor C were applied at N150P150K100 kg/ha as control recommendations and nitrogen fertilizer was applied as pure N250P150K100 kg/ha per additional hectare compared to control.

In conducting research, B.J. Azimov and B.B. Azimov's "Methodology of conducting experiments in vegetable, vegetable and potato growing", V.F. Belik's "Metodika opytnogo dela v ovoshchevodstve i bakchevodstve", "Metodicheskie ukazaniya po ekologicheskomu ispytaniyu ovoshchnyx kultur" as well as N. The methods of I. Savvinov and V. E. Kabaev were used. The statistical analysis of the research results was carried out using the "Metodika polevogo opyta" dispersion method of B.A. Dospehov in "Excel 2010" and "Statistica 7.0 for Windows" computer programs, with a confidence interval of 0.95%.

In the experiment, the seedling is 70 cm. It was planted between the trees, and 6 rows, 30 meters long, were planted in 4 turns. One option area is 126 m<sup>2</sup> and one return area is 1008 m<sup>2</sup>. The total area of experiment 2 is 4032 m<sup>2</sup>.

In our experiments, the variety, hybrid, watering procedure and fertilization rates also had an effect on the size of the cabbage (height, width of the cabbage and outer core). Correlation coefficient between cabbage height and cabbage width was strong ( $r=0.84\pm 0.22$ ) and reliable  $r$  was 3.8 times in the used variety and hybrid, irrigation regime and fertilization rates.

Cabbage weight fluctuated between 2.82-1.99 kg and the four-year average was 2.30 kg when the recommended fertilization rate was applied in the control option ChDNSN 70-70% pre-irrigation soil moisture ChDNSN.

**Table 1**  
**Effect of cultivar, irrigation method and fertilization rates on cabbage weight (2012-2015)**

Variety	Irrigation procedure, %	Fertilization rate, kg/ha	Cabbage weight, kg				Average	
			2012	2013	2014	2015	$\bar{x}$	o control relative to
Cancer	70-70 control	N <sub>150</sub> P <sub>150</sub> K <sub>100</sub>	2,82	2,13	2,27	1,99	2,30	100,0
		Φ <sub>OH+</sub> N <sub>250</sub>	2,96	2,36	2,41	2,08	2,46	100,0
	80-80	N <sub>150</sub> P <sub>150</sub> K <sub>100</sub>	3,34	2,43	2,50	2,15	2,60	113,0
		Φ <sub>OH+</sub> N <sub>250</sub>	3,68	2,61	2,68	2,42	2,85	115,9
W61-19 F <sub>1</sub>	70-70 control	N <sub>150</sub> P <sub>150</sub> K <sub>100</sub>	2,99	2,40	2,64	2,12	2,54	100,0
		Φ <sub>OH+</sub> N <sub>250</sub>	3,14	2,71	2,81	2,44	2,77	100,0
	80-80 control	N <sub>150</sub> P <sub>150</sub> K <sub>100</sub>	3,32	2,85	2,79	2,51	2,87	113,0
		Φ <sub>OH+</sub> N <sub>250</sub>	3,86	3,09	3,04	2,86	3,21	115,9
$\bar{x}$			3,26	2,57	2,64	2,32	2,70	

The pre-irrigation soil moisture ChDNSN was 70-70%, and when the increased (N250) nitrogen rate was applied, the cabbage weight in years ranged from 2.96-2.08 kg, with an average of 2.46 kg and 7.0% greater than the recommended option. has been Cabbage weight was in the range of 3.34-2.15 kg in the recommended option (N150) in the 80-80% irrigation regime of Saratoni variety, with an average of 2.60 kg. Cabbage weight averaged 2.85 kg when increased (N250) nitrogen fertilizer was applied in this irrigation regime. These figures were 13.0 and 15.9% higher in fertilization rates than in the previous irrigation regime.

When W61-19 F1 hybrid was used in 70-70% irrigation system (N150P150K100 kg/ha), the average weight of cabbage was 2.54 kg. Nitrogen fertilizer in the option increased to 250 kg/h was on average 2.77 kg, which was higher (109.1%) compared to the recommended option.

Cabbage weight averaged 2.87 kg when applying the recommended fertilizer rate of 80-80% pre-irrigation soil moisture, and 3.21 kg when using the increased nitrogen (N250) rate, respectively, according to

the options with respect to the 70-70% irrigation regime. 13.0 and 15.9% more.

The experiment is a complex 3-factor, factor A - variety and hybrid; Factor V was served by 70-70% and 80-80% irrigation regimes, and factor C by fertilization rates. According to the yield of 2012, EKMT05 in factors A and V was 1.2 t and S and EKMT05 in factors AS, VS and AVS were 1.2 t. The accuracy of the experiment was 1.2% higher.

In 2013, when the statistical analysis of the effect of irrigation regime and fertilizing standards on productivity, the factor index of EKMT05 A and V was 2.5 tons, the indicator of EKMT05 S and AS, VS and AVS factors was 2.5 tons, and the experimental accuracy S was 3.3% reliable.

In 2014, in the statistical analysis of the effect of irrigation procedure and fertilization standards on the yield of varieties and hybrids, the yield difference between the options for factors A and V EKMT05 – 2.3 t.; According to S and AS, VS and AVS factors, EKMT05 was 2.3 t. The accuracy of the experiment was 2.9% higher.

**Table 2**

*The effect of watering procedure and fertilization rates on the productivity of varieties (2012-2015)*

Irrigation procedure, % (V factor)	Fertilization rate, kg/ha (C factor)	Productivity, t/ha				Average	
		2012	2013	2014	2015	$\bar{X}$	to control relative to
<b>The type of cancer</b>							
70-70 control	N <sub>150</sub> P <sub>150</sub> K <sub>100</sub>	80,3	60,7	64,7	56,6	65,6	100,0
	ФОН+ N <sub>250</sub>	84,5	67,4	68,8	59,4	70,0	106,7
80-80	N <sub>150</sub> P <sub>150</sub> K <sub>100</sub>	95,1	69,3	71,2	61,2	74,2	113,1
	ФОН+ N <sub>250</sub>	104,8	74,5	76,3	68,9	81,1	123,6
<b>W61-19 F<sub>1</sub> дургайи</b>							
70-70 control	N <sub>150</sub> P <sub>150</sub> K <sub>100</sub>	85,3	68,4	75,2	60,3	72,3	100,0
	ФОН+N <sub>250</sub>	89,4	77,1	80,1	69,5	79,0	109,3
80-80	N <sub>150</sub> P <sub>150</sub> K <sub>100</sub>	94,6	81,3	79,4	71,4	81,7	113,0
	ФОН+N <sub>250</sub>	110,1	88,1	86,6	81,4	91,6	126,7
<i>ЭКМТ<sub>05</sub>A ва B factors</i>		1,2	2,5	2,3	1,9		
<i>ЭКМТ<sub>05</sub>C ва AC, BC ва ABC factors</i>		1,2	2,5	2,3	1,9		
<i>Accuracy of experience, S<math>\bar{X}</math> %</i>		1,2	2,3	2,9	2,7		

In the experiment in 2015, regardless of the variety and hybrid, with the increase of soil moisture before irrigation to 80-80%, the yield increased in parallel when the nitrogen rate was increased to N250 kg/. The average yield for variants is convincingly higher than EKMT05, 1.9 t for EKMT05 factors A and V. and 1.9 t for EKMT05 S and AS, VS and AVS factors. and the accuracy of the experiment was 2.7% higher.

In the experiments, the average yield of the variants was convincingly higher than the individual averages. The 4-year average yield of hybrid W61-19 F1 was 72.3 t/ha with 70-70% irrigation and recommended fertilization, and 79.0 t/ha with increased (N250 kg/ha) nitrogen fertilizer, 9. 3% higher. When applied with 80-80% irrigation regime (N150P150K100 kg/ha), the yield was 81.7 t/ha, 13.0% higher than the control, and when increased nitrogen (N250 kg/ha) was applied, it was 91.6 t/ha, higher than the control option. 26.7% higher. At 70-70% and 80-80% different irrigation regimes, when the same rate of mineral fertilizer was used, the yield was 13.0 and 15.9% higher in the 80-80% irrigation option. In increasing the yield of white cabbage, the importance of irrigation was stronger than that of mineral fertilizers.

Irrigation regimes and fertilization rates have had an impact on economic efficiency as well as increasing productivity. The rate of yield in the cancer variety is 37.8 and 45.9%, in the W61-19 F1 hybrid, it is 45.7 and 61.6%, in both varieties, in the 80-80% irrigation regime, nitrogen fertilizer fon+250 kg/ was higher in the options applied to .

### Conclusion.

In 2012-2015, when the influence of irrigation method and fertilization rates on yield was studied in the cultivation of white cabbage in the repeated crop, the average weight of cabbage in all options was in the range

of 3.26-2.70 kg, and the difference was 120.7%. Productivity: Saratoni variety in 70-70% control irrigation regime and recommended (N250P150K100 kg/ha) mineral fertilizers fluctuated between 80.3-56.6 tons and averaged 65.6 t/ha. The yield (81.1 t/ha) was 23.6% higher than the control when the nitrogen rate was increased to 80-80% (N250 kg/ha). In the W61-19 F1 hybrid, the yield was 113.0 and 126.7% compared to the control in both fertilization rates under 80-80% irrigation regime.

With the increase in productivity, the cost of 1 ton of products decreased by 16.8% for all options. Profitability according to variants: 37.8-51.4% in Saratoni variety and 45.7-61.6% in W61-19 F1 hybrid. In the experiment, EKMT05 for factors A and V is between 1.2-2.5 t; EKMT05 1.2-2.5 t for factors S and AS, VS and AVS. between; the accuracy of the experiment was 1.2-3.3% higher. In increasing productivity, the importance of irrigation was stronger than that of mineral fertilizers.

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