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REASONS FOR THE LOSS OF WINTER CROPS AND THEIR SOWING DATES IN REGIONS OF POVOLZHE (REGIONS ALONG THE VOLGA)

Following is the translation of an article by A. I. Stepanov, Associate Professor of Economic Sciences, published in the Russian-language periodical 1 Doklady TSANL (Reports from the Moscow Order of Lenin Agricultural Academy imeni K. S. Timiryazeva), No 93, 1963, pages 13-23.

The harvest of winter crops depends to a considerable degree on the quality of sowing, i.e., on the presowing preparation of the soil, previous crops, periods of sowing, use of variety seeds of regionalized varieties, application of fertilization, etc. One of the most important agrochemical measures in this is observation of optimum periods of planting, which is especially necessary in regions where the falls are usually dry periods.

Due to the fall dry period winter crops in the regions of Povolzhe were reseeded over a considerable area in 1945, 1947, 1950, 1954, 1956, and 1960.

In 1962/63 extremely unfavorable weather conditions for winter crops came together. Over large areas young crops of winter wheat and rye died or were in such a state that the additional sowing of spring crops was required. (Table 1).

Table 1

Sown areas and loss of winter crops in individual oblasts of Povolzhe in 1962/63

(a) Область, республика	Площадь посева озимых, тыс. га (b)	Полностью погибло (c)	
		тыс. га (d)	%
e Куйбышевская	739,3	23,3	3,1
f Пензенская	796,7	136,1	17,0
g Саратовская	1509,7	358,5	23,7
h Ульяновская	448,2	23,3	5,1
i Татарская АССР	952,5	40,0	4,1

Key: (a) Oblast, Republic; (b) Area of winter plantings, thousands of hectares; (c) Total loss; (d) thousand hectares; (e) Kuybyshevskaya; (f) Penzenskaya; (g) Saratovskaya; (h) Ulyanovskaya; (i) Tatarskaya ASSR.

In Povolzhe in 1962 in almost the entire planted area (more than 90%) winter crops were sown over the non-fallow predecessors and occupied fallow. Such plantings were more demanding for fall wetting. In addition to that the last half of the summer and the fall of 1962 in many regions of Povolzhe, particularly in Saratovskaya and Volgogradskaya Oblasts, turned out to be very arid. In connection with this a large area did not receive normal shoots, which is apparent from Table 2 where data are cited from Saratovskaya Oblast.

Table 2

Condition of winter crops at the end of fall vegetation in 1962 on farms in the Saratovskaya Oblast (in hectares)

a Культура	b Вся площадь посевов	c В т. ч. посевы, находящиеся в состоянии				h Площадь, подлежащая к пере-сею и подсею
		d хорошем	e удовлетворительном	f плохом и частью поврежден	g всходов не было	
i Всё озимое в т. ч. оз. рожь оз. пшеница	185621	291801	779981	380242	80511	429115
	824066	141547	431182	204482	46355	235770
	711558	153307	348802	175760	33689	193345

Key: (a) Crop; (b) Entire area of planting; (c) including sowings found in a condition of; (d) good; (e) satisfactory; (f) poor and partially dead; (g) no shoots; (h) Area designated for re-seeding and undersowing with spring crops; (i) Total winter crops, including; (j) winter rye; (k) winter wheat.

In Volgogradskaya Oblast, based on data from a fall investigation, around 25% of the sowings were cut back or did not sprout and died. [One sentence illegible; probable translation: Due to a deficiency of fall rains the soil in the majority of the regions of Saratovskaya and Volgogradskaya oblasts fell under winter in a dry condition.] Samples of winter crops, taken by tapping during the winter, showed a good level of preservation of plants in almost the entire area with the exception of the western regions on the right bank in Saratovskaya Oblast and the southern transvolga regions of Volgogradskaya Oblast, where under the influence of a winter thaw the snow melted and on the young winter crops a solid ground ice crust was formed. Under these conditions with the lowering of air temperature (in the beginning of March) to 24-30°, at the depth of occurrence of the tillering node of winter crops it dropped to 15-18°, which led to the death of winter crops

not only in plantings over nonfallow predecessors but also in plantings over clean fallow.

The prolonged winter cold in this year was replaced by a sharp spring warming up without the usual gradual transition from winter to summer. In a number of regions warm, sometimes hot, weather set in, there was no precipitation, and humidity was low. Thus conditions were created which were typical for the early spring dry period. Transition to more humid and cooler weather set in only in the end of May and the beginning of June. The winter crops, weakened by the fall dry period, developed poorly in the spring, in addition they did not form shrubs and they did not form new crown roots.

Plantings of winter wheat and rye were damaged severely by the frit fly and the Hessian fly, and in a number of regions by the harmful shield bug. In many cases up until the stage of ear formation mainly secondary stalks developed. These yielded a sparse grassy stand of spike-like stalks with a weakly developed spike.

In the Kuybyshevskaya and Ulyanovskaya oblasts and the Tatar ASSR the conditions for fall development and overwintering of winter crops were more favorable and the area where young crops were destroyed completely did not exceed 3-5%.

The loss of winter crops in Penzinskaya Oblast reached 17%, but it was caused by different reasons than in the other regions. The conditions for fall development and the overwintering of winter crops here differed from the conditions in other regions of Povolzhe.

In the middle of October, 1962 after a drop in temperature which caused the cessation of vegetation of winter crops, the plants were found in a state of relative dormancy for a period of two weeks, and beginning with 28 October in connection with a sharp warming up they started the vegetative stage. Here the period from 10 through 16 October was favorable for passing through the second phase of hardening of the plants (partial desiccation of tissues). From 16 November again a condition of dormancy was noted.

Thawing and rain in December caused the formation of a thick ground ice crust. The thickness of the snow cover in Penzinskaya Oblast was less than the mean annual, especially in the southern regions, and the frosts ran to 30°. Under such conditions the ice crust was one of the main reasons for the loss of winter crops. Strong damage to winter crops by the Hessian fly was noted. It damaged primarily the earlier plantings.

Just as in the other oblasts, spring set in late, but with a sharp warming up. In winter crops, which were rapidly being rid of the snow covering, with such a rise in temperature the active processes of assimilation began earlier than the soil was able to thaw out (freezing through was very deep - down to 160-170 cm). Therefore the phenomena of physiological drought was observed. This led to a sparseness of young crops as a result of the falling out of individual plants and the dying off of secondary shoots. A great deal of damage was inflicted on winter crops by the May dry period.

The high percentage of loss of winter crops and their weak development are explained not only by unfavorable meteorological conditions, but in many cases by a disruption of agricultural practices for their cultivation. Planting was permitted in improperly prepared soil, in particular plantings of winter wheat on freshly plowed unpacked soil, on poor predecessors (spring grains); there were reduced seeding norms, shallow embedding of seeds, planting in dry soil, and late sowing periods. For example, in Penzenskaya Oblast after 10 September winter crops were sown on an area of 140 thousand hectares (17.5%). Here 54% of the rice crop and 36% of the winter wheat were placed on poor predecessors.

In the more humid regions of Povolzhe, as experience shows, it is necessary to make wide use of planting winter crops on superficially treated soil. Nevertheless a large part of the plantings of winter crops here were carried out on freshly plowed soil, as a result of which the seeds were embedded non-uniformly, their field germination rate was lowered, seedlings were non-uniform, breaks in the root system were observed as well as the uncovering of tillering nodes and the death of plants.

There are many points of view on the problem of periods for planting of winter crops in Povolzhe with the arid fall. The Volgogradskaya Agricultural Test Station, leaning on the experience of the kolkhozes and sovkhoszes in the oblast, recommends that winter crops be planted in the usual periods regardless of the degree of dampness of the soil. Associates at the Scientific Research Institute Yugo-Vostoka, based on many years of experience in cultivation in the most arid regions of Povolzhe, consider that planting of winter crops in years with a dry fall, even on pure fallow, leads to the mass destruction of plants and to a sharp lowering of harvest in plantings which are preserved.

In the fall of 1944 in the eastern regions of the Saratovskiy Zavolzhe as a result of the dry weather 77% of all the winter crops planted did not produce shoots in the fall and died, and on 13% of the area the shoots, though they appeared, were very

sparse and irregular. In 1948 during the late fall inspection of winter crops in Saratovskaya Oblast 67% of all the area of the plantings turned out to be in a satisfactory condition, 20% was made up by sparse crops, 12% did not germinate, and 1% germinated after mild rain and then dried up. In the eastern regions of Zavolzhe there were no sprouts of winter crops on 60% of the planted area. In 1949 in Saratovskaya Oblast shoots were extremely sparse on 100 thousand hectares and the plants entered the winter season in poor condition, on 277 thousand hectares winter crops did not germinate at all, and on 9 thousand hectares they germinated in the fall after mild rain and then died from drying up. In 1953 in a number of regions of Povolzhe the fall was also dry. Based on the materials from a fall inspection in Volgogradskaya Oblast 26% of the winter crops were in a very poor condition; there were no shoots or they died. In Saratovskaya Oblast such crops occupied 29% of the entire area of winter rice and 32% of the entire area of winter wheat. In 1956 and 1960 winter crops were resown over a considerable area.

Usually in such years the best preserved part of the winter crops is not resown with spring cultures and remains until harvest. But in the overwhelming majority the harvest of even the best part of the winter crops is lower than the harvest of spring grain crops, in particular spring wheat and especially barley.

This can be seen in an example of the sovkhoz "Yershovskiy" (at present the industrial-test farm for the Scientific Research Institute Yugo-Vostoka), in which out of the last 27 years 11 of them were with an arid August and September and the planting of winter crops even on fallow was carried out in dry earth.

Out of these 11 years only twice was the harvest of winter rice insignificantly higher than the harvest of spring wheat. But in both cases a comparatively small amount of precipitation fell in the seeding period in the form of heavy rains, which made it possible to obtain relatively satisfactory shoots in the fallow. In all the remaining years the harvest of spring wheat considerably exceeded the harvest of winter rice (sometimes by 2-3.5 times).

Together with this it is necessary to note that even in Zavolzhe with more favorable conditions of fall moisture the harvest of winter rice was considerably higher than the harvest of spring wheat (table 4). Thus in the same "Yershovskiy" sovkhoz for the last 27 years 8 were with a sufficient amount of precipitation in the fall planting period.

Resting on these data, the Scientific Research Institute Yugo-Vostoka recommends to the kolkhozes and sovkhozes in the

driest regions of Povolzhe in years with very dry weather in August and September to refrain from the planting of winter crops in the dry soil and leave these lands under plantings of spring grain crops next year, and in years with favorable conditions of fall moisture - expand in every possible way the plantings of winter crops. We consider that this recommendation is correct.

Table 3

Harvest of winter rice on fallow and spring crops of fall-plowed fields at the "Yershovskiy" sovkhov in Saratovskaya Oblast (in centners/hectare)

(a) Год	(b) Оз. рожь	(c) Яр. пшеница	(d) Ячмень	(e) Сумма осадков за август и сентябрь, мм
1958/59	10.0	8.2	9.1	44
1957/58	11.8	18.6	23.5	43
1955/56	3.3	11.5	13.5	42
1951/52	3.3	8.2	13.3	31
1949/50	2.9	6.1	9.4	34
1946/47	3.9	7.1	6.9	29
1944/45	4.9	4.8	8.4	15
1942/43	1.9	3.8	5.2	28
1940/41	11.4	9.5	9.1	29
1939/40	6.7	11.8	19.7	34
1938/39	1.0	1.4	2.0	22
(f) Среднее . . .	5.5	8.3	10.9	32

Key: (a) Year; (b) Winter rice; (c) Spring wheat; (d) Barley; (e) Total precipitation for August and September, mm; (f) Average.

In the fall of 1957 in connection with unfavorable conditions for the planting of winter crops in the regions of Zavolzhe, their area in Saratovskaya Oblast was reduced by 350 thousand hectares against the plan, or almost in half. In the spring of 1955 here they planted spring wheat, the harvest of which considerably exceeded the harvest of winter crops. As a result the kolkhozes and sovkhovs of the oblast received additionally no less than 6 million poods (pood - 36 pounds) of grain.

In 1956 during favorable conditions of moisture in the fall many farms in the Saratovskaya Oblast planted winter crops over greater areas than called for in the plan. This completely justified itself. In the dry year of 1959 the average harvest of winter crops on the kolkhozes and sovkhovs of the oblast was 2 times higher than the harvest of spring wheat.

Table 4

Harvest of grains in the "Kershovskiy" sovkhos in years with sufficient fall moisture (in centners/hectare)

(a) Год	(b) Оз. рожь	(c) Яр. пшеница	(d) Ячмень	(e) Сумма осадков за август и сентябрь, мм
1961/62	18,7	16,0	21,1	82
1959/60	12,8	5,0	6,9	56
1954/55	9,0	3,6	3,3	61
1953/54	6,1	3,4	7,0	57
1950/51	8,5	5,8	0,2	76
1948/49	9,9	4,6	9,0	82
1945/46	7,4	3,4	4,5	133
(f) Среднее	10,3	6,0	8,4	84

Key: (a) Year; (b) Winter rice; (c) Spring wheat; (d) Barley; (e) Total precipitation for August and September, mm; (f) Control.

In recent years in Povolzhe winter crops are being sown on occupied fallow and nonfallow predecessors. This without a doubt is a correct progressive trend in cultivation. With favorable weather conditions and a high level of agricultural practice plantings of winter crops on occupied fallow and nonfallow predecessors ensures a high reaping of grain.

The best fallow-occupying crops in the southern steppes and the southeastern regions of Povolzhe are peas and corn, gathered in silage, and in the northern forest-steppe regions - seed legumes. In the forest-steppe regions corn can be used as a fallow-occupying crop under conditions where it's harvested early for green fodder or for silage. In the southern regions favorable predecessors may be peavine, chick pea, and also mustard and others.

In the northern forest-steppe regions as fallow-occupying crops it is also possible to recommend clover for single-annual use, early potatoes, and a vetch-oak mixture for hay or green fodder.

An important condition for obtaining a high harvest of winter grain crops is the guaranteeing of the good fall development of the plants. Therefore the entire complex of agrrotechnical measures should be directed mainly for guaranteeing this main condition.

Most important in the complex of agrotechnical measures is the preparation of the soil under the plantings of winter crops. In fields which have been set aside for the planting of winter crops the fallow-occupying or preceding crop should be gathered first and in a very brief time and the soil tilled immediately after the harvest. The method of tilling depends on the type and condition of the soil and the weather conditions which are building up.

In the forest-steppe zone of Povolzhe on leached chernozem and on grey forest soils good results are given by tilling the soil with disc tillers in two directions to a depth of 8-10 cm. At the same time the field is packed. It is necessary, however, to consider that surface tilling is effective only on fields which are free of weeds and under the condition that the soil gives way to hoeing to a depth of no less than 8-10 cm. On fields which are infested with weeds, particularly rootstock and offset, it is necessary to carry out plowing.

In forest steppes, which have less of a guarantee of moisture, the main type of soil tilling after the gathering of fallow-occupying or preceding crops should be plowing. And even in these regions by discing in two directions to a depth of no less than 8-10 cm it is possible to be limited only to the cultivation of clear fields. It is necessary to keep in mind that with a more prolonged break between the harvesting of the preceding crop and the planting of the winter crops it will be useful to make use of plowing at a normal depth with subsequent tilling with a cultivator according to the appearance of weeds. In all cases immediately after plowing or scuffling the fields should immediately be harrowed and packed.

The yield of winter grain crops also depends on the periods of planting. In the forest-steppe zone of Povolzhe (Tatar ASSR and Ulyanovskaya Oblast) the best period for planting winter rice is the first half of August (in Penzenskaya - 15-25 August), and winter wheat - the last ten days of August, and in the right bank regions of Saratovskaya and Volgogradskaya oblasts - correspondingly the second and third 10 days of August.

In the southern Zavolzhe regions of Saratovskaya Oblast the optimum period for planting winter rice is 15-20 August, and winter wheat - 25-30 August; in Volgogradskaya Oblast - correspondingly 15-20 August and from 20 August through 5 September.

The best methods for sowing winter grains are crossed and narrow-row. Sowing norms in the forest-steppe and steppe chernozems are 5-6 million, in the steppes on chestnut soils - 4-4.5 million, and on light chestnut soils - 3.5-4 million germinating shoots per hectare. With insufficient soil moisture the norms of sowing should be increased by 5-10%.

For improving the overwintering of plants and also increasing the field germination rate it is necessary to embed the seeds in the moist layer of the soil at a depth of no less than 6-7 cm, and in dried soils - to a depth of 8-9 cm.

An important means for increasing the harvest of winter crops which had been sown on occupied fallow and non-fallow predecessors is the use of fertilizers. Therefore when sowing winter crops on non-pod-bearing predecessors and unfertilized corn it is necessary to apply under the main soil cultivation for each 1 hectare 10-15 t of well rotted manure (or fine manure), or manure-soil compost, or 5-6 t of organic and mineral mixture consisting of well rotted manure (or fine manure) and superphosphate (1.5-2 centners/hectare) or nitrogenous-phosphorous fertilizers (nitrogenous - with a calculation of 20-30 kg and phosphorous - with a calculation of 30-40 kg of active substance per 1 hectare). Granulated superphosphate is applied during sowing in the rows together with the seeds on the basis of 10-15 kg of active substance per hectare. When planting winter crops after leguminous grains it is expedient to apply phosphoric-potassium fertilizers. Instead of the early spring liquid fertilization of winter crops, in the late fall period after the cessation of growth of winter crops it is necessary to carry out liquid fertilization with nitrogen and phosphorous fertilizers on the basis of 20-30 kg of active substance per hectare.

Obtaining of high and persistent harvests is determined to a considerable degree by the variety. The best varieties of winter rice in the forest-steppe zone are the Saratovskaya coarse-grained, Volzhanka, and Zakanskaya, and in the arid steppe regions - Volzhanka and also Kharkovskaya 194. Of the varieties of winter wheat for Ulyanovskaya and Kuybyshevskaya oblasts and the Tatar ASSR the best variety is Ulyanovskaya; in Penzenskaya Oblast - Petrovskaya 7 and Chervonnaya, and in Saratovskaya and Volgogradskaya oblasts - Lyutetsens 230. In Volgogradskaya Oblast good results are given by Odesskaya 3. On several farms in this oblast Saratovskaya 3 has been sown with success. Thus, on the "Demin-skiy" kolkhoz over large areas (2,373-1,723 hectares) in 1960 through 1962 quite high and persistent harvests of Saratovskaya 3 were obtained - 26.5; 21.4; and 23.8, while the harvest of Lyutes-tsens 230, though high in individual years, was less persistent - correspondingly 33.9 (for 646 hectares), 14.2 (for 693 hectares), and 20.61 (for 429 hectares).

In the arid steppe regions, particularly in the southern and left-bank regions, in order to create a persistent and stable system of seed production it is advisable to distribute seed-growing crops on the kolkhozes and sovkhozes and the stock crops of seed-growing farms on clean and bare fallow.

In places where the winter crops are given the required attention and the proper farm practices are observed, high harvests are always obtained.

As an example we would like to cite a number of farms in the Novo-Annenskiy Rayon of the Volgogradskaya Oblast, where, as a result of the correct approach to the cultivation of winter crops steady harvests are obtained.

Table 5

Harvest of grain crops on farms of the former "Dominskaya" MTS in 1931-1960 (since 1953 it has been the "Dominskiy" kollekhz)

Годы	Зерновыс без кукурузы		Оз. пшеница		Яр. пшеница	
	ц/га	%	ц/га	%	ц/га	%
	1931-1935	4,8	100,0	3,9	100,0	4,8
1936-1940	7,2	150,0	10,1	260,0	6,3	144,8
1941-1945	7,8	161,7	10,7	373,3	6,9	148,9
1946-1950	7,9	164,1	11,1	284,1	6,7	143,5
1951-1955	10,7	225,0	14,8	380,0	8,1	173,8
1956-1960	14,5	302,0	17,5	448,4	10,3	220,0
В т. ч. в 1960	21,3	443,7	26,0	667,0	17,0	361,7

Key: (a) Years; (b) Grains without corn; (c) centners/hectare; (d) Winter wheat; (e) centners/hectare; (f) Spring wheat; (g) centners/hectare; (h) Including 1960.

In the first years (1931-1935) of cultivation of winter wheat in the region, as a result of little experience in growing it, and lack of developed and approved agricultural practice, the harvest of this crop was low and therefore the sowing areas were insignificant. At the same time the main winter crop was rice, which yielded a higher harvest in comparison with winter wheat (table 5).

In the course of a number of years on the farms of the region specific agricultural practice was gained in the growing of winter wheat during the cultivator system of agriculture. Wheat is planted primarily on bare fallow with deep tillage and deep embedding of seeds in a solid bed in optimum periods. In loose fallow packing is carried out before and after planting. In recent years there has been an increase in the seed sowing rate (190-220 kg as opposed to 140-170 kg of seeds in previous years). The experience of many farms shows that even without clean fallow if the proper agrotechnique is applied it is possible to grow high harvests of winter wheat.

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... with the modernization of agricultural practice there has been considerable expansion of area which is under winter wheat (from 1957 to 1962 - by almost 2 times, which comprised 50% of the area of grain plantings).

... "Dobryi" kollekt of the Novo-Annenskiy industrial district. The plantings of it occupied 20.3%, and at "Patriot" - 10.0%.

... "Dobryi" kollekt, thanks to the high culture of the crop, the harvests of winter wheat are resistant, steady, and they average them in the far of Novo-Annenskiy rayon. If in 1950 in the region the harvest of this crop was 10 centners, then at the "Dobryi" kollekt it was 17.6; in 1959 it was correspondingly 17 and 19.3; in 1960 - 18.2 and 26; in 1961 - 17.6 and 20 centners. A great deal of work in implementing the production of winter wheat and increasing its yield has been carried out by the chief agronomist of the kollekt I. N. Rodin. He has worked at this farm for around 10 years.

... in the former Novo-Annenskiy Rayon in 1962 from the entire harvest area of winter wheat they collected 23.7 centners from 1 hectare with an average yield of grains of 20.5, winter wheat - 10.1, and spring wheat - 15.9 centners from 1 hectare. At the kollekt "Patriot" from 2,168 hectares they collected 27.1 centners, at the sovkhos Vilyamsa - 27 centners each from an area of 1148 hectares, and at the kollekt "Pobeda" - 23.1 centners from each of 1,695 hectares. Several combined brigades achieved still higher results. Thus, at the kollekt "Dobryi" brigade leader Ye. I. Anikeyev and agronomist A. I. Korovin grew, on an area of 221 hectares, 31 centners of winter wheat of the Lyutets variety from a hectare. Here the winter crops were planted on bare fallow. In the fall of 1961 superphosphate was applied - 1 centner for 1 hectare. The seeding norm was 220 kg (more than 600 plants per 1 m²). In spring the winter crops were sown in two tracks.

... at the 4th section on the sovkhos Lenini Vilyamsa the agronomist I. M. Lamin, on an area of 150 hectares, obtained 30 centners of winter wheat of the Lyutets variety from each hectare.

... as an example of obtaining high harvests of winter wheat on occupied fallow it is possible to cite the sovkhos No. 6, where in the fall of 1961 they planted 361 hectares of winter wheat of the Lyutets variety on fallow which was occupied with corn and silage. After the corn was harvested the field was disked twice. Seeding was carried out by the narrow-rowed method with the subsequent compulsory packing of soil with ring rollers. Here they obtained 27.9 centners from a hectare, while the average yield of winter wheat on the whole for the farm comprised 22.5 centners per hectare.

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The testing of various predecessors under winter conditions, which was conducted at this sovhoz in the fall of 1951, showed that the best predecessors under these conditions are feed beans and corn, after which they obtained 80.3 centners of grain from 1 hectare, and on timothy - all told 10/centners per hectare.

Thus, a study of data from many years concerning the yields of winter crops in regions of levellike and comparing them with data about weather conditions and the level of farming practice on the farms showed that in spite of the frequent winter droughts the advanced farms obtain high and resistant harvests if optimum periods of planting are observed and they carry out the complete complex of agricultural practices. However, mass plantings of winter crops in years with fall droughts should not be carried out and the soil should be left under plantings of spring crops.