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Sandovich, S. P. Quarantined weeds and diseases of agricultural crops. In Kholkhoznaia proizvodstvennaia entsiklopediia [Encyclopedia of Collective Farm Production]. 1949. v.1, pp. 299-302. 30.1 K83

Translated in part by
S. N. Monson

QUARANTINED WEEDS AND DISEASES OF AGRICULTURAL CROPS

The purpose of the quarantine of plants introduced in the Soviet Union in 1934 is:

1) the protection of the territory of the USSR from brought in and distributed agricultural and forest parasites, plant diseases and harmful weeds, of the kind absent in the USSR(external quarantine);

2) the prevention of a further spread of the parasites, diseases and harmful weeds having a limited distribution in the Soviet Union, as well as their control, (domestic quarantine).

The putting into effect of plant quarantine measures is the duty of government quarantine inspection agencies operating under the Department of Agriculture of the USSR.

Among the parasites and diseases of plants under "domestic quarantine" the following are found on Ukrainian fields: Phylloxera, San Jose scale, potato cancer, and bacterial cancer of tomatoes.

Illustration, p. 300 - Phylloxera and damage of grapevine roots by phylloxera. Phylloxera belongs to the aphid family; it damages the roots and leaves of the grapevine. The young roots develop swellings as a result of the sucking of the root form by phylloxerae, while on more mature grapevines they form lumps (nodule). Bacteria penetrate into the crevices and sores which produce rot and cause the roots to die. This leads

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eventually to the destruction of the European and Asiatic varieties of vines and of several hybrids of direct producers. The roots of some stock varieties, resistant to phylloxera, are immune. The leaf variety of phylloxera affects only the leaves of phylloxera-resistant stock varieties and of hybrids of direct producers, forming a growth of tissue on the leaves (gallae?).

One of the methods of controlling phylloxera in the areas of its widest distribution is the grafting of varieties of grapevines to stock varieties resistant to phylloxera. The territory cultivating grapevines in the Ukraine is therefore divided into: 1) the zone of "self-rooting" viniculture, free from phylloxera; 2) zone of grafted viniculture, infected with phylloxera (see viniculture), and the protected zone between the two, wherein the planting of grapevines in prohibited.

Methods of Control: the prohibition to transfer the sowing material of vines from the zone of grafted viniculture into the zone of "self-rooted" plants. Within the zones the transfer of sowing material is permitted once the latter is disinfected with hot water or hydrogen cyanide, in addition to being given a certificate of quarantine inspection. (Illustration of grapevine leaf infected by the leaf form of phylloxera, p. 300).

San Jose scale belongs to the sucking insects; the females are immobile, with round bodies, covered with a brown-grey scale, of 1.5-2 mm in diameter; they are viviparus. The San Jose scale damages almost all garden crops; attacks the surface parts of the plants. The damage consists in the plants appearing depressed which frequently leads to their perishing. The scale is distributed by means of sowing material and the fruits themselves.

Methods of Control: Prohibition of importation of the sowing and grafted material from infected areas, as well as of fruits from the southern orchard regions. The use of agro-technical practices designed to create favorable conditions for the growth of plants; the spraying of orchards in early spring, prior to budding, with a four percent emulsion of mineral oils, and in the summer, during the mass cleaning of germs, with a one percent emulsion.

Potato Cancer: the most dangerous of potato diseases." The typical characteristic of this disease, caused by a fungi, is the appearance of small lumpy growths on the tubers, on the stolons, and occasionally on the stems and leaves of potatoes. The growth may be of various shape; their size frequently exceeds that of the tubers. The color of the growth on the leaves is at first green, on the tubers white, later gradually changing into dark brown. They rot in the fall, change into a slimy mass and fall apart infecting the soils with the spores of the fungus. The spores remain in the soil from 15-20 years and may infect potatoes whenever planted on an infected lot. Tubers do not form on infected stolons. (Illustration-Potato tubers suffering from potato cancer).

Methods of Control: the prohibition of the export of potatoes and root-crops from infected regions and from those adjoining - into sections free from potato cancer. The examination of potatoes and, ff cancer is found, the inaccessibility to the foci of infection by outsiders and animals. The infected tubers and leaves are dug into the soil one m. deep and are covered with naphtha. Advanced agricultural methods and the change to varieties resistant to cancer (see Potatoes) are the principal methods in controlling potato cancer.

Bacterial Cancer of Tomatoes (BRT) affects tomatoes in all phases of their development. When diseased the young plants fade and frequently perish. The stems of mature plants show sores and crevices, and their fruits - brown spots bordered with white tissue. The source of infection is in the infected residue of plants and seeds.

Methods of Control: the prohibition of sowing seeds gathered from infected lots, the treatment of seeds with mercuric chloride (1 gr. to 3 liters of water), the destruction of the residue of plants, the disinfection of hothouses.

Among the parasites, for the control of which an external quarantine has been set up, the most dangerous is the Colorado Potato Beetle. It is found in Hungary, Czechslovakia and Poland. Its length is from 9-11 mm, its width - 6-7 mm. Color - yellow, the upper wings have 10 black lengthy stripes, the breast - 11 black spots, one large one on the head. The larvae has a strong, thick red belly, with two rows of black warts along the sides. The larvae of orange-yellow color resembles the beetle in shape. The beetles and especially their larvae are very greedy; they feed on the leaves and stems of the potato, weakening them and frequently destroying the entire harvest. The beetles disperse, fly from place to place, and may also be introduced by various transportation facilities.

In order to prevent the appearance of the Colorado beetle in the USSR, it is necessary to conform strictly to quarantine measures, to examine the potato plantings systematically, as well as those of other Solanaceae. When a beetle is discovered, the Quarantine Inspection Agency

Sandovich, S. P.
Quarantined weeds and diseases....

has to be notified immediately, and the handpicking of beetles and larvae, the spraying and dusting with poisonous chemicals, and the fumigation of the soil of the infected area are to be organized at once.

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End of article.

37a

Tamman, A.I.
Agrotekhnika kartofelia
(Culture of potatoes). Moskva,
1945. 38 p. 75 T15A

Translated from the Russian by
S. N. Monson

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Clean the seed plot, ridding it of mixtures of other varieties and diseased plants.

Select healthy and plants of best yield from your plots

Watering of potatoes

Utilize healthy leaves for silo

Dry and sort potatoes prior to storing

End

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R-67

Tamman, A.
In Selskokhoziaistvennaia entsiklopediia
[Agricultural Encyclopedia]. vol. 3
Moskva, 1934.

Translated in part by
S. N. Monson

SOCIALIST RECONSTRUCTION OF POTATO GROWING AND THE

STRUGGLE FOR HIGHER YIELDS (p. 23-24)

Planted potato areas in the USSR reached 6.1 million hectares in 1932, as compared to 3.1 million hectares in 1913. The distribution of sowed areas of potatoes and the changes that have taken place between 1928 and 1933 are presented in Table I (p. 24).

The world's crop of potatoes (outside of the USSR) amounted in 1930 to over 1.6 billions of centners (according to the records of the League of Nations). Of these 470 million centners belonged to Germany, 309 million centners to Poland, 160 million centners to France, 113 million centners to the USA, etc. The yields of potato crops in the USSR varied from 431 to 494 million centners (for 1930-32). The USSR occupies first place in area of potato plantings, but in yield it stands almost last. In individual sections of the USSR, where all agricultural practices with regard to sowing and care of plants are applied, the potato yields amount to up to 160 to 180 centners per hectare. The vastness of the USSR territory and the variety of its climatic conditions also exert an influence upon the reduction of the average yield of the potato per hectare. In order to increase the potato yield radically it is necessary to introduce into practice all available agricultural methods, to increase the amount of fertilizers (organic and mineral) and to engage in widely

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developed work in seed growing and selection, with the view of replacing the potato varieties of lesser yield with those of higher yields, possessing a larger percentage of starch and a better resistance to diseases. An adequate organization for protecting potatoes from disease and their storage represent important methods in increasing the potential resources of the potato.

Table I. Sowing Area of Potatoes (in thousands of hectares)

Republics, Territories and Oblasts	1928	1935
Northern Territory	54.2	64.6
Karelian ASSR	3.9	5.7
Leningrad Oblast	160.3	198.0
Western Oblast	465.4	563.0
Moscow Oblast	560.8	671.0
Ivanovsk Oblast	199.5	240.2
Gorki Territory	301.5	421.3
Ural Oblast	93.4	210.8
Bashkir ASSR	80.5	95.3
Tartar ASSR	131.8	149.6
Central-Volga Territory	356.0	325.4
TSCHO	828.8	626.7
Lower Volga Territory	140.8	58.5
Northern-Caucasian Territory	132.3	124.5
Crimean ASSR	1.9	4.3
Kazakh ASSR	55.2	41.8
Kara-Kalpaksk ASSR	-	0.4

Tamman, A.
Socialist Reconstruction....

Table I. Sowing Area of Potatoes (in thousands of hectares)

Republics, Territories and Oblasts	1928	1933
Kirghiz ASSR	4.6	7.3
West-Siberian Territory	203.9*	245.2
East-Siberian Territory		41.9
DVK (Dalni Vostok-Far East)	39.2	30.8
Yakutsk ASSR	-	1.2
Ukrainian SSR	1351.0	796.0
Belo- Russian SSR	477.0	630.2
ZSFSR	32.1	38.8
Central Asiatic Soviet Republics	3.5	9.4
Total in the USSR	5 677.6	5 601.9

*Total for West-and East-Siberian Territories.

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End of article.

Mosolov, V. P.
Agrotekhnika [Agricultural Practices].
Moscow, 1948 351 p. 64 M85A

Trans. 39: Agronomy

Trans. in part by

S. N. Monson

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POTATOES

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FORAGE CROPS

PERENNIAL GRASSES

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RLM July 26, 1951

U.S.S.R. Glavnoe Upravlenie Sakharnoi Promyshlennosti.
Ezhegodnik po sakharnoi promyshlennosti, proizvodstvo 1937/38 (Yearbook for the sugar industry, production during 1937/38). Moskva, 1940. 467 p.

Translated in part from the Russian by R. G. Dembo.

Table of Contents (p. 463-467)

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Sushkov, P.F. Experiment of integrated mechanization of potato culture. Moskov. Ordena Lenina Sel'skokhoz. Akad. im. K. A. Timiriazeva. Dok. 12:131-133. 1950. 20 M875

Transl. 41: Potatoes.

Translated from the Russian by S. N. Monson.

The scientific staff of the plant manufacturing the agricultural machines TSKHA conducted an experiment on integrated mechanization of potato crops at Kashir region, Moscow oblast'. Manual processing served as control in the experiment. The following production processes were involved: Planting, harrowing, first and second hilling, and digging of potatoes.

Plowing and introduction of fertilizers were the same in both manual and mechanized methods.

The preparation of potato seed stock was limited to sorting by hand. The largest tubers were cut. Manual planting with horse ploughs was performed by one brigade, mechanized planting by another. Two laborers were assigned in the first brigade to cutting furrows and ten men for planting; two horses and two single ploughs were used. This brigade managed to plant two hectares in ten hours.

The second brigade, using links of two 2-row potato seeders, following the tractor STZ, was managed by one tractor driver, two men on the linking end and two to pour seed into the planting machine. The output was ten hectares in ten hours. Harrows on manually planted potato plots went in "zigzag" on a vehicle driven by two horses. The mechanized method also harrowed in "zigzag" form using the tractor STZ.

A single-row horse driven hiller was used for the first hilling of potatoes planted by hand. One man led the horse, another operated the hiller. During the second hilling, when ~~the~~ a horse was no longer needed, only one worker was employed.

The daily output from manual and horse driven hilling amounted to 2.5 hectares in ten hours. On plots operated by mechanized means a 4-row hiller and the tractor STZ were used. One tractor driver and one worker operating

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the cultivator handled the work. 12 hectares were hilled in the course of ten hours. On manually operated plots, potatoes were gathered by a digger operated by one laborer; the daily output in 10 hours amounted to 2 hectares, for a yield of 10 tons per hectare. 25 people sorted every hectare of potatoes.

Table 1.

COMPARATIVE EVALUATION OF RESULTS

Indicators	Methods of Planting		Remarks
	Manual	Machine	
No.of clumps per 100 p.m.	236	256	Experiments were conducted at coll. farm "Obraztsovyi Trud", Barabanovskii Village Council, Sept. 22-23, 1948
No.of omissions per 100 p.m.(spots free from clumps)	33	30	
Height of foliage in cm.	43	40	
Yield in tons per hectare	8.6	9.9	

Table 2.

EXPENDITURE OF LABOR PER HECTARE

Kind of Work	In manual work		Mechanized work	
	Men hours	Horse hours	Men hours	Tractor hours
Planting	70	10	5	15
Harrowing	1	2	0.3	2.5
1st hilling	8	4	1.7	12.5
2nd hilling	4	4	1.7	12.5
Harvesting	255	10	163	28
Total	338	30	171.17	56.5

All mechanized harvesting was performed by the potato digger TEK-2 and tractor STZ. The unit was serviced by one driver and one laborer on linkage. In 10 hours the unit harvested 5.4 hectares. 16 men harvested one hectare on yield of 10 tons per hectare.

This demonstrates the advantages of mechanized work in potato production. Improved methods are further required, particularly improvements in the application of potato harvesting machinery.

AMF
August 29, 1951.

End of Paper

Materialy Vsesoiuznogo soveshchania nauchnoissledovatel'skikh uchrezhdenii po sel'skomu khoziaistvu (1945 g.). Data of the All-Union Conference of Scientific Research Institutions of Agriculture. Moskva, 1948. 274 p. 106 Un33.

Translated in part by S. E. Monson.

INTRODUCTION (p. 3-4)

Pre-revolutionary agriculture in Russia was one of the most outdated branches of the national economy. It was limited entirely to private property and operated at the expense of the labor of many millions of small peasant households. The methods used were extremely primitive, and the implements primarily wooden.

Manual labor predominated.

Agriculture in this state could not place serious demands upon agricultural science. Speed of scientific development and speed in production was extremely slow. It was collectivization which opened the opportunity for a revolutionary transformation in agriculture, ensuring the rapid change from "small, backward and dispersed peasant households to joined, large communal farms, equipped with machinery and scientific information and capable of producing the greatest amount of commercial ("tovarny") bread." (I. Stalin).

With the change to vast agricultural production, provided with modern methods of operation, the creation of real wealth depended not only upon the time and expenditure of labor but upon the use of scientific achievements in production.

The introduction of the latter, along with the continued development of scientific research in this field represent the most important task confronting all agricultural organizations, including the scientific-research agricultural institutions.

The February (1947) Plenum of the Central Committee of the VKP(b) (All-Union

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Communist Party), in dealing with the subject of scientific research in agriculture placed the following principal tasks before the All-Union Academy of Agricultural Sciences, imeni V. I. Lenina and other scientific institutions:

" a). the introduction of measures pertaining to individual agricultural zones of the USSR which would ensure high and resistant yields of grain, oil, technical and vegetable crops, potatoes and perennial grasses; measures to reconstruct and increase the fertility of the soil; the production of varieties of agricultural crops of high yields, resistant to drought, frosts, diseases and pests; measures to raise the general level of agriculture.

b). the introduction of measures to raise livestock industry, improve races of domestic animals and increase their productivity.

c). the intensification of scientific research in the field of economics and the organization of agriculture with particular reference towards the development of communal households of collective farms, and the strengthening of the economics of state farms and MTS (Machine Tractor Stations)."

The Plenum of the Central Committee of the VKP(b) also directed that... "the Ministry of Agriculture of the USSR and the Ministry of State Farms of the USSR, and local party and soviet organizations arrange for the most rapid introduction of the achievements of agricultural science into production, regarding this work as the most important condition for raising the general agricultural level of the country."

In bringing to the attention of our readers this book which lists the results of the first post-war conference of scientific research institutions and the achievements of the Ministry of Agriculture of the USSR, our aim is to aid in solving the above tasks with respect to the development of scientific research and the introduction of its achievements into production.

Professor T. '. Fasiuk

End of Introduction

3/12/51

Science in the Service of Agricultural Production
By T. L. Basiuk. (p. 5-20, in part) Moscow, 1948.

Translated in part by
S. N. Monson.

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During the years of Soviet rule a wide network of scientific research institutions was established for agriculture in the USSR.

The total number of scientific research agricultural institutions operating in the Soviet Union is 892, of which 101 are institutes, 423 experiment and selection stations and central laboratories, 80 experimental fields and 265 experimental bases. These take in all fields of agricultural activity. 735 scientific institutions are engaged in the different branches of plant industry; 119 in animal husbandry, 38 in veterinary studies.

These institutions engage in large scale work of considerable importance. Even in the war years research was not interrupted for one day, although it is true that the subject matter experienced significant changes. In 1941 the scientific research institutions of the Glav-nauka of the Narkomsem had dealt in 397 subject matters. In 1942, this number was reduced 37 percent, compared to the preceding years because of the evacuation of many institutes and the draft of scientific workers. The content of scientific work also underwent a radical change. In connection with the temporary military occupation of many areas several agricultural crops were transferred into eastern regions and the role of food crops in irrigated agricultural sections given preference. The greater part of the work of scientific research institutions shifted to developing agricultural techniques for crops in the new regions of their production. In research the field method was generally applied. On the other hand, scientific research institutions continued to introduce formerly obtained scientific data to aid the volume of production.

The above referred to curtailment in subject matter was effected primarily at the expense of agricultural chemistry, biology, physiology, microbiology and citology. Beginning 1943 the scope of scientific research work was resumed and in 1945 it reached its pre-war level in the number of subject matter under study.

Our Scientific Research Institutes of Grain Industry reached their vast theoretical and productive goals.

THE INSTITUTE OF GRAIN INDUSTRY OF THE SOUTH-EAST did not curtail its work on theoretical subjects during the war years. It conducted studies on the climate of the south-east and the biology of weeds for the purpose of developing the most effective methods for the control of the latter.

This Institute succeeded in successfully combining theoretical research with the development of methods for meeting the prevailing practical needs of the respective zones. The development of a system of scientific agriculture for the South-East occupied first place in its research.

The Institute achieved outstanding results in creating new varieties of different agricultural crops of high yields.

THE INSTITUTE OF GRAIN INDUSTRY OF THE NON-CHERNOZEM BELT concentrated its activity on problems of distant hybridization of plants. The outstanding achievements of the Academician N. V. Tsitsin, director of this Institute, are indisputable in this field and their theoretical research has already led to the production of a series of promising hybrids of couch grass - wheat.

THE ALL-UNION SCIENTIFIC RESEARCH INSTITUTE OF OIL CROPS is engaged in increasing the yield of oil plants and improving raw material. It conducts large scale experiments on selection, to introduce into production new crops and varieties of oil plants; develops agricultural techniques and studies mechanization for processing oil crops.

Varieties selected by the Institute are supplying seeds for over two million hectares, i.e. 50 percent of the entire sowing area of oil crops of the Soviet Union, while Krasnodar and Stavropol Territories and Rostov oblast have their needs covered 100 percent. The Institute produced varieties of oil bearing sunflower of an oil content 9 percent above that of available varieties.

It contributed to the introduction of new valuable oil crops, such as arachis, sesame, perilla, etc. Its selection produced varieties of Ricinus communis, that do not crack(?) and are suitable for harvesting with combines and early varieties of arachis (peanuts) of high yield, which made it possible to introduce this most valuable crop into northern regions. It developed the principal agricultural methods for oil crops. The proposed mechanized burrowing through of sunflower plants, Ricinus communis and corn reduced manual labor 10 to 15 percent, and cut the time for completing the work, and improved the quality. The method of cross-care(?) of cultivated oil crops developed by the Institute is widely adapted in production; this method reduces the amount of manual labor two to three times, compared to the usual mechanized care.

ALL ACHIEVEMENTS OF THE SOVIET COTTON GROWING INDUSTRY are closely connected with the work of scientific institutes engaged in the study of the cotton plant. Our institutes on selection and seed growing of cotton have greatly contributed to this work.

The entire cotton area in pre-revolutionary days was planted with non-generic industrial mixtures of American cotton and local "guza"(?) of unopening bolls. The cotton was of poor yield and its fiber quality not high. At present the entire area planted with cotton, in irrigated as well as non-irrigated regions, is sowed with cotton varieties of Soviet selection of high quality.

SOUIZ NIKHI refuted the claim concerning the impossibility of producing long fiber cotton plants of the Egyptian type in the irrigated regions of our country. At present the entire demand of the Soviet Union for cotton of long fiber varieties is met by domestic yields.

SOUIZ NIKHI has produced and forced the propagation of new cotton varieties of high yield, of still higher quality of fiber, resistant to wilt diseases, such as the Nos. S-460, 18819, 108-f, etc. It has produced and successfully propagated varieties of colored fiber and coarse woolly fiber. It conducts manifold research in the field of watered(irrigated) cotton growing and has reached definite practical results in this field.

Important contributions have been made by scientific research institutions to the study of flax, under the leadership of the All-Union Flax Institute. These are vividly illustrated by the increase in the fiber content of flax- "dolgunets"(?) in the process of selection. Professor F. D. Matveev in one of his works has submitted data indicating that the percentage of fibrous elements of the best selected numbers was raised from 21.2 in 1928 to 36.2 in 1944. This testifies to the fact that flax-"dolgunets," an old cultivated plant, has increased its fiber content within a short period more than one and a half times, as compared with the fibrousness of the best original specimens.

A vast amount of work is done by the URAL ZONAL FLAX EXPERIMENT STATION in the field of agricultural practices. It was of particular value since it conducted complex work designed to increase the fertility of the soil in field grass crop rotation. The Institute of Flax Industry also engages in processing flax in its primary stages.

The Institute faces the important task of reconstructing its experimental network and extending the scope of its work to its pre-war level.

Important scientific work has been done on COARSE STEMMED BAST FIBER CROPS. The ALL-Union Institute of Hemp Industry has studied the different local "block"(?) forms of Central Russian hemp, has produced varieties of southern hemp which ripen for seeding in the central zone of hemp production, and studied the biological peculiarities of this crop with regard to its demands for water, nutrients, warmth, and other conditions necessary for its development. The Institute developed selection and rational agricultural standards essential for high yield hemp production.

The All-Union Institute of new bast fiber crops has also imported various forms of southern hemp from abroad and studied their conduct in the different zones of the Soviet Union; engaged in seed growing with the view of improving varieties of southern hemp, developed agricultural practices for high and resistant yields.

Substitutes for jute, gambo hemp(?), (Hibiscus cannabinus) and the Chinese bell flower (Abutilon) were introduced into production. Jute and ramie (Boehmeria tenacissima) are in the process of introduction. The Institute produced varieties and studied the biology of these crops, as well as methods to obtain high yields of good resistance. In April, 1944, the above two institutes were combined into the All-Union Institute of Bast Fiber Crops. The original two institutes suffered more than any other in the war. They lost more than one half of their scientific personnel, their libraries, archives of scientific reports and drawings, laboratory and production equipment, shops and testing machinery.

At present the Institute of Bast Fiber Crops is reconstructed and has resumed scientific research on problems of selection, agricultural practices and technology. The principal achievement of SUBTROPICAL SCIENTIFIC INSTITUTIONS lies in the introduction of a series of new valuable crops into northern subtropics, i.e. tung tree, grapefruit, cinchona and the date palm. The possibilities for growing subtropical crops in new regions have been extensively studied.

The potentialities of the mountain regions of Krasnodar Territory, several regions of Azerbaijan and Central Asia have been ascertained and the regions accepted as new subtropical areas of the Soviet Union. Particularly wide possibilities were opened in subtropical Central Asia, where it was established that olives, sugar cane, batata, and many subtropical fruit crops, such as pomegranate, persimmon and figs may be grown, along with valuable rubber plants, guayule rubber and krym-saghyz. Much work was performed in studying varieties by testing citrus and other subtropical fruit crops, as a result of which the best among them were recommended for production. Selection is also done in this connection. New varieties of tangerines of high quality are being produced of which the fruits ripen 10 to 15 days earlier than the Japanese tangerine Unshiu and are distinguished by their higher sugar content and vitamin C. A new variety of orange "Pervenets" of improved taste has been developed, as well as potential hybrids of the tunga tree, distinguished by the high yield and oil content of their fruits.

The original and effective method of two-story culture of citrus crops is in the process of introduction. It consists in grafting more delicate crops, such as lemons, grapefruit and oranges onto the crown of a tangerine, a procedure which speeds fruit bearing considerably. Plants thus grafted begin to bear fruit in the second and third year and in the fifth year produce an abundant yield. Lemons grafted onto the crown of a tangerine acquire increased frost resistance and do not require any covering in the winter. The use of this method results in a considerable saving in the establishment of plantations.

Citrus crops under conditions of northern subtropics are located at the extreme northern boundary of their distribution and are frequently subjected to the harmful influence of low temperatures.

Soviet science has developed effective methods for the protection of delicate citrus plants from frost. The most effective of these is the method of individual covering of citrus plants with three layers of gauze. This simultaneously ensures a proper light regime, the complete preservation of the foliage, buds, flowers and ovaries. Because of the proper light regime subsequent physiological processes proceed normally within the plant. This method of covering is also least expensive. Important work has been accomplished by scientific-research institutions in pomology and viniculture. Based on Michurin methods a series of new valuable genera of fruit, berry and grape crops have been produced which ensure a considerable increase in standard assortments of these crops and contribute to the introduction of viniculture into new areas. Measures have been developed to acclimatize wild growing fruit and berry crops and to create forest-gardens in the Caucasus.

The Scientific Research Institute, imeni V. I. Michurina, has in addition to widely distributing Michurin varieties, developed measures to restore gardens that suffered from frosts.

Along with measures on restoring vineyards, the Institute of Viniculture and Wine Industry developed methods to preserve them from frosts. It constructed machinery which mechanizes soil cultivation, intra-row cultivation, winter coverings, the spraying of vineyards, restores plantings, facilitated the digging of seedlings.

The achievements of the Gribov Vegetable Selection Station deserve particular mention in the field of Vegetable Crops. The station was organized in 1920 and was the first to place selection and seed growing of leguminous crops on a scientific basis. 152 varieties were produced and 29 crops are under examination at present. Agricultural methods developed by the station are applied throughout the RSFSR. The station supplies 50 to 70 percent of elite seeds of vegetable crops used in the RSFSR; seeds are distributed by other farms from varieties produced at the Gribov Experiment Station.

Many scientific institutions developed agricultural methods for field grass sowings which deserve wide introduction. The most important ones are summer plantings of alfalfa for seed (according to the Lysenke method) for the steppe regions of the Ukraine, oblasts and territories of Northern Caucasus and the right shore of the Lower Volga; fall sowings of perennial grasses, Phleum L. ("timofeevka"), Festuca L., Agropyrum, American couch grass, etc. Important work is done by the All-Union Scientific Institute of Forage Crops. In pre-war years its work was intended to serve as a guide in production; it proposed methods for improving the productivity (fertility) of natural pastures and hay cutting areas, the cultivation of forage crops and the production and propagation of new and old valuable varieties; contributed to their effective utilization, suggested methods on ensilage and the processing of forage crops. In the war years the Institute continued its research on the biology of perennial meadow grasses. It reached conclusions on material and utilized the experience obtained in practical production on "driving-pasture keeping of livestock; the introduction of alfalfa and other forage crops into new regions, and proposed many suggestions on this subject. In the war years the Institute produced new varieties of Phleum L., clover, alfalfa, northern ensilage sunflower, and other forage crops. It also developed a simple accessible method for obtaining an albumen vitamin concentrate from green plants which proved of great significance to livestock. (Omitted 15 lines, p. 12, re - domestic animals).

Among the engineering scientific research institutions the oldest is the Central Asiatic SCIENTIFIC RESEARCH INSTITUTE OF IRRIGATION, which conducts large scale work in hydraulic engineering. (Omitted part of p. 12 and pages 13 and 14.)

IN THE FIELD OF PLANT INDUSTRY

The increase in the yields of all crops by introducing a complex of agricultural measures according to zones.

The development and solidifying of the Williams grass field system applicable to local conditions. The development of the system of soil cultivation in grass field crop rotation to increase the fertility of the soil and eliminate weeds in fields. The regionalizing of species and varieties of perennial grasses according to soil-climatic zones. The study of proper correlation between legumes and perennial grasses in grass mixtures. The development of agricultural methods to obtain seeds of high yields and hay of perennial grasses in the different areas of the Union. The development of a system of fertilization in grass field crop rotation. Speed in propagating seeds of lupine and other legumes for use as green fertilizers. The introduction within the Soviet Union of new species and best varieties of foreign selection and their testing along with the best domestic varieties. (Omitted balance of p. 15, pages 16 - 19).

POPULARIZATION OF SCIENTIFIC ACHIEVEMENTS

Every product is generally tested by the consumer who evaluates its quality. Scientific data should be published annually, since this is the most effective form of social control over the work of scientific institutions and also the best method of informing wide agricultural circles about scientific achievements.

A system for publishing articles in newspapers should be devised, concerning results in scientific research, and scientific news and reviews printed in daily papers and periodicals.

If planned systematically, this will serve as the main stimulus for spreading scientific knowledge and raising its (theoretical) level.

SCIENTIFIC PERSONNEL

In order to improve the Training of new scientific personnel it is necessary to restore the status of probationers and set up stricter requirements in the selection of candidates, in addition to a systematic control over the training of candidates.

Particular attention should be devoted to the raising of qualifications of young scientific laboratory personnel. and technicians of scientific institutions and experimental fields and stations.

Short term courses for laboratory and technical personnel should be organized for the purpose. Seminars conducted on problems of agricultural practices, selection, etc.; provisions made for special assignments to institutes, having well equipped laboratories and highly qualified scientific personnel.

The directors of scientific research institutes and experiment stations are required to transform, within the next two or three years, their institutes and stations into advanced scientific-production agricultural enterprises which would serve the local collective and state farms as examples in advanced agriculture.

End of Article.

3/13/51

Translated in part by
S. N. Monson.

Utilization of World Vegetative Resources in USSR Agriculture, by I. G. Eikhfel'd, director, All-Union Institute of Plant Industry. (p. 23-38).

The All-Union Institute of Plant Industry suffered extreme hardships during the siege of Leningrad. Despite enormous difficulties, the world collection of cultivated plants was, nevertheless, preserved for the most part. This does not mean that everything went well with the collection. Seeds contained in packages and boxes had been kept for four successive winters in unheated quarters, which resulted in a loss or decrease of their capacity to germinate. It is true that these losses were smaller than anticipated. We were, nevertheless, facing a great and urgent task, that of restoring the collection by re-seeding, a task which cannot be accomplished within one year.

The first limited sowings of the collection material were made in the city of Pushkino in 1944. Here one was obliged to deal with neglected soils, over-grown with weeds, dug up trenches and ground full of holes caused by shells and bombs.

Part of the collection had also been preserved at our experiment stations. At the Maikop station the records of the collection of vegetable crops were lost and a considerable part of the collection had, therefore, become valueless.

Plantings of fruits taken from the collection suffered for lack of care during the period of occupation. The fruit crops at the experiment station "Krasny Pakhar'" near Leningrad, were particularly damaged, those at the Maikop station to a lesser degree. The Germans had moved out a large quantity of valuable hybrid plants of fruit crops from the experiment station "Krasny Pakhar'"; the collection of strawberries had been almost totally destroyed. On the plot where the world collection of strawberries had been planted, the Germans maintained cavalry exercises. Restoration was achieved by painstaking digging for the remainders of cultivated plants found among weeds, and the best standard varieties and most valuable hybrids were thus preserved.

The Institute first restored plants from the collection that were of major importance to the country and those where loss of germination was particularly feared.

Beginning 1942, the Institute and its stations planted over 63,000 specimens from the world collection for purposes of study and in order to restore their capacity for germination.

The blocade put an end to the operations of the main part of the Institute with respect to supplying our experiment stations with stock material. Some stations managed to continue the work. From the day the blocade was lifted and parcel post service restored, selection stations and other scientific institutions were once more supplied with material from the collection. Stations which had suffered most from the invasion and other Western oblasts and republics were supplied first. During the war years a total of close to 65,000 packages of specimens were mailed.

During the blocade of Leningrad every precaution was taken to prevent the loss of the collection by accident. Seven scientific staff members were left in Leningrad to take charge of laboratory equipment and scientific records. During the blocade a large assortment of varieties of potatoes was kept on suburban state farms near Leningrad. In addition, a quantity of seed stock of valuable canker resistant potato varieties was preserved upon the suggestion of the Institute. These varieties were propagated and used between 1944 and 1945 to establish a stock of canker resistant potato varieties for the Leningrad oblast.

In addition to preserving the world collection of cultivated plants, the scientific staff members at Leningrad rendered invaluable aid to suburban agriculture, particularly vegetable and potato fields, during the years of the blocade. Under the leadership of the scientific staff members of the Institute, comrades Voskresenskaia and Lekhnovich, 20 million cuttings of potatoes were planted on seed plots. This provided the inhabitants of the city with several thousand tons in additional production.

THE PRODUCTION OF NEW VARIETIES AND GROWING OF ELITE SEEDS. Considerable attention was devoted to the selection of best varieties and the propagation of valuable varietal material, primarily the regionalized varieties. The Institute and its stations grew 10,900 centners of elite and pure varietal seed stock during the war years, including particularly valuable crops and those of which there was a shortage, i.e. legumes, cereal and technical crops, as well as a large quantity of canker resistant potato varieties. 84 new varieties of different crops were selected and produced and 118 varieties forwarded to the Government Varietal Test Station. 230 new potential varieties were segregated, which are still in the stage of testing at experiment stations of the Institute.

The Institute grew elite seeds from all produced varieties and provided seed farms and the government network of varietal testing within its capacity. The latter work was poorly organized because of difficult working conditions at some stations, inadequate mail service, occasionally a lack of necessary packaging material (tare). At the experiment farm of "Krasny Pakhar'", the northern fruit station of the Institute, they succeeded in 1945, to select new valuable varieties of fruit crops, especially Prunus avium L. (mazzard cherry), which up to that time did not grow in the Leningrad oblast. This farm also produced hybrid varieties of plums, strawberries, currants and other crops. Their Mazzard cherries and strawberries received a high rating when tasted for quality at the Academy of Science, imeni Lenina.

WORK OF INSTITUTE ON THE URAL. The conditions and demands of the war years compelled the Institute to change its methods radically. Much of the work done in peace time and then considered valuable lost its appeal under war conditions. Considerable labor was required to aid the country, and the staff members of the Institute did their utmost to fulfill the tasks required of them.

The oldest staff members of our Institute, Dr. S. M. Bukasov, A. I. Mordvinkina, V. F. Antropova, E. S. Kuznetsova, and others, who had worked in peace time on the world collection, did not spare their strength in bringing maximal aid to collective and state farms in war years.

The main part of the Institute operated on the Ural. Prior to the war, Ural agriculture was dealt with as any steppe cereal farm. Over 80 percent of the sowing area was under cereal crops. In order to feed the increased population of the Ural during the war years with local vegetables and potatoes it was necessary to increase sowing plots and raise the yield of these crops.

The main problems facing the Institute on the Ural were the development of seed potatoes and legumes, the reconstruction of clover seed production, and weed control. The staff of the Institute was small, it consisted only of 20 members.

In addition to the above problems, the staff also sowed specimens from the collection and grew elite seeds of vegetable crops and potatoes in order to restore varietal seed growing in the Leningrad oblast.

The Institute succeeded in obtaining satisfactory results on the Ural and we attribute our success to the fact that our staff managed to establish close contacts with experienced agricultural workers and local scientific institutions and enjoyed considerable support from oblast and regional organizations.

The principal achievements of the work of the Institute on the Ural consisted in the following: THE FIRST PROBLEM which the Institute undertook to solve was the changing of varieties of potatoes. The knowledge of varietal resources of potatoes and the conditions of their production in the northern zone contributed much to this work. Up to that time Early Rose had been chiefly produced in this oblast, a variety known to be susceptible to phytophthora. There were few other varieties and harvests were frequently lost because of diseases. Nominally, about 11 percent of varietal potato was grown, actually, however, this material represented a mixture of varieties that resembled Early Rose and degenerated to a large extent. Seed plots at collective farms were not organized. At present all collective farms of the Sverdlovsk oblast have their own seed plots. If the collective farms of Sverdlovsk oblast will succeed in preserving their seed stock, all potato plots of the oblast will be planted with varietal sowings in the next year or two.

THE SECOND PROBLEM concerned the development of vegetable growing. Before the war vegetable crops on the Ural occupied only an insignificant area and during the war it became necessary to widen the sowing areas of vegetable crops. Compared to pre-war years the area under vegetable crops increased three times in 1944, in spite of a shortage in labor and mechanical implements. The yield of vegetable crops was also increased considerably and vegetable seed growing developed successfully.

THE THIRD PROBLEM was the sowing of clover. In the past years the situation with regard to clover had been most unsatisfactory on the Ural. The famous Ural clover was no longer to be found in many regions. The reason was in the wrong approach to clover seed growing. Clover was treated in the same manner as were cereal crops, with respect to methods of selection and seed growing. No one on the Ural dealt seriously with the problem.

Staff members of the Institute carefully studied the situation with respect to clover sowing at the Sverdlovsk and Molotov oblasts and we believe we succeeded in paving the way to a proper organization in selection and seed growing of this crop. (Omitted p. 28, re - clover).

THE FOURTH PROBLEM that faced the Institute of Plant Industry on the Ural was weed control. Some believed that Avenae fatua L. could be controlled only in fallow fields, while botanical literature cautioned to renounce all attempts at cultivating cereal crops on heavily infested fields asserting that without fallows it is impossible to get rid of wild oats. Upon Lysenko's direction the Institute began limited studies in the winter of 1942-43 on the biology of

Avenae fatua L., with particular attention devoted to the germination of the weed's seeds. The tests showed that by spring the predominating part of seeds of the weed had maintained the capacity to germinate. In early spring in tests made under field conditions, it was confirmed that by timely and proper breaking up of the stubble ("lushchevka") in the spring it was possible to destroy the weed completely. In conducting the experiment in the spring in the most weed infested regions of Sverdlovsk oblast, we were able to prove that our proposals were right. Towards the end of 1943 there was no longer any doubt about the truth of the methods proposed by the Institute. In the past years a pre-sowing "lushchevka" was practiced in Sverdlovsk oblast on a wide scale to encourage germination of Avenae Fatua L. with the view of destroying it. In 1945, during a cold and late spring, the weed developed poorly and it was not possible to eliminate it before the cereals were planted. Breaking up the planting was tried and excellent results obtained and observed in July, 1945 in the Pokrov region of Sverdlovsk oblast.

WORK OF EXPERIMENT STATIONS OF THE INSTITUTE

Let us dwell upon several examples of the Institute's work which relate to a biological foundation in agricultural technical methods. The most vivid example may be seen in the tests made at the Kuban Station of the Institute on continuous row planting of corn. This work is of great interest since it serves as an example of the correct solution by plant growers well oriented in biological problems of an individual problem of a given crop in agricultural practice.

On the other hand, the work of the Kuban Station is indicative of a successful combined effort made jointly by a scientific institution and a practical organization to solve new problems. The station could never have succeeded in solving this problem as rapidly without the necessary wide experimental plot. Nor did it possess adequate mechanical means. Tests were conducted on a plot of over 1,000 hectares under the supervision of the Supervisor of Kuban Station, I. V. Kozhukhov, aided by the director of state farm No. 2, D. I. Dimitriev. Comrade Kozhukhov proved that the Kuban corn yield is determined primarily by conditions under which the corn plant develops in the first 30 - 40 days after sowing; if in that time corn is given a normal nutrition area, it will produce a high yield under subsequent satisfactory care. If, however, during that period corn sowings are kept in dense plantings, the corn will develop only a short cob and no matter what other measures may later be attempted the yield will not be adequate. The accepted method in agricultural practice is to sow corn thickly and then to thin it. Even in peace time the latter procedure was delayed, but during the war with a shortage in labor and mechanical implements, this delay became the rule and corn yields fell catastrophically. Recommended methods used during the war years proved unsuitable and failed to improve the situation. Planting was usually thick because at low rates of planting the existing seeding machines did not obtain regular stands. Kozhukhov and Dmitriev succeeded in introducing several simple constructive changes in the seeder (making the ploughshare penetrate deeply and evenly and preventing it from jumping in a vertical and horizontal direction), which led to the placement of seeds at an adequate depth, into moist soil, thereby ensuring the normal stand of plants. This eliminated the necessity of manual thinning and also stopped the harmful factor referred to above.

In 1945 the method was improved and the system of furrow, unbroken sowing proposed. For this purpose small ploughshares were placed in front of the seeder's discs which made furrows 10-12 cm. deep. In back of the discs were built small rollers ("katochki"). With the aid of these improvements a normal density of the stand of corn was obtained which eliminated thinning and placed seeds at a depth where the moisture of the soil ensured their fast germination. The matter of controlling weeds in rows was also lightened. Corn roots were lying deeper as a result of this method of sowing, making cultivation possible at a depth of 10-12 cm, which in turn permitted to control weeds and preserve moisture.

During the second loosening of the soil within rows all seeds of weeds were destroyed in the furrows and covered with soil.

As a result, manual labor on corn fields may be drastically reduced. The authors of this method consider that in observing correctly all recommended methods work on a hectare of planted corn will not require more than 2 to 3 people. The supervisor of one of the plots at State Farm No. 2 claimed that he intended to assign six people to every 400 hectares of planted corn area. It is believed that the method of furrow, unbroken sowing may be successfully used also for other plowed crops, particularly millet, sorghum and sunflower.

The effectiveness of the furrow, unbroken sowing method is exceptionally great. At sessions of the Academy of Agricultural Sciences, imeni Lenina, it was frequently remarked that the Institute of Plant Industry should not engage in agricultural technical problems.

The work referred to above does not represent only an agricultural technical problem but deals with the biological foundation of proper agricultural practices and it should be among the tasks of the personnel of the Institute of Plant Industry. Whenever any method having a biological basis meets difficulty in actual production, the biologist is called upon to take part in the technical research. There is hardly a researcher who would refuse to aid in the realization of his ideas, even if he would have to shift from purely biological research to practical experimentation in order to see his ideas successfully fulfilled.

Other experiment stations were during the war also compelled to deal with complex problems of a technical nature. At the Central Asiatic Station problems were being developed on introducing technical crops on arid soil, specifically the valuable technical crop lallemantia. At the same station problems of selection and practices of stubble crops in conditions of irrigated lands were dealt in. Satisfactory results were obtained in this connection in the case of phaseolus, millet, Phaseolus mungo, and vigna (cowpea).

Maikop and Kuban Experiment Station have cooperated in growing healthy seed material of potatoes by means of summer planting, using the method of growing seed stock from seeds of varieties which form the largest number of berries and produce a relatively uniform seed progeny. The Maikop station worked on the problem of overcoming wilt of solanaceous crops, such as pepper and eggplants, as well as potatoes. It is true that lately the territorial press published an article by one of the members of the expedition of the Academy of Science of the USSR telling that the development of wilt disease in solanaceae is caused by a small insect, cicada, which by its bites infects the plant and carries the disease from one plant to another. This appears too simple an explanation for a complicated biological factor.

Experiments and observations proved that wilt diseases are primarily of an ecological nature. On unified chernozem the soil is strongly packed and when the temperature is high the root system of plants appears to choke and is destroyed. When directly infected, healthy plants did not show the transmission of disease as easily. On the contrary, when diseased plants were transplanted into favorable conditions with regard to temperature and soil, they rapidly improved. This testifies to the fact that infection is not the cause of the disease. A significant positive effect was also obtained in improving the physical condition of the soil by the introduction of organic fertilizers. This may equally lead some to claim that the Institute of Plant Industry shows enthusiasm in technical matters, there was nevertheless no other way to solve the urgent tasks that confronted production. It was necessary to search for agricultural "backgrounds" that would aid in eliminating wilt.

The Institute devoted much attention to legume crops. The Kuban and Central Asiatic Stations are most active and successful in this field. V. B. Enken, candidate in agricultural science, succeeded in producing a group of varieties of chick peas of high yield, among which those resistant to ascihitose(?) were of particular value. The Problem of enlarging the area of sowings of chick peas is getting urgent. The plant does not present excessive demands for moisture and produces high yields in places where peas do not succeed, and leading organizations should recognize the objectives proposed by the Institute of Plant Industry.

Extensive work of practical significance is conducted at the Maikop Experiment Station on seed growing of vegetable crops and pomology. The station is one of the largest engaged in fruit growing. Here a multitude of species and varieties of fruits and berries have been assembled, exceeded only by the largest station of this kind overseas, that of New York State. The Maikop Station of the Maikop Experiment Station, a cultivated forest-orchard in the tenth year of its life may yield 25 to 40 tons of fruits per hectare. I personally have been present in 1945 at harvests in these forest-orchards. The yield from several outstanding 10 year old trees, subjected to grafting, amounted to 280 kg apples or 200 kg splendid pears per tree.

The creation of forest-orchards in the Northern Caucasus is a problem of major importance and should command our attention in the near future.

The Pre-Aral Experiment Station introduced supplementary agricultural aid to industrial centers and livestock collective farms in the deserts of the Pre-Aral and Pre-Caspian areas.

Here original methods for producing vegetable crops in trenches were attempted. This method permits to utilize the lens(?) of fresh waters in sands lying at depths of 1 to 1.5 m.

The station obtains high yields of vegetables and potatoes by using the trench method. The Pre-Aral Station worked also on increasing the yield of millet. The highest yields of this crop in the Soviet Union were obtained in the past years at Irghiz region, Aktubinsk oblast, at the collective farm Jean Kurlys Ashambaev who worked under the direction of the chief of Pre-Aral Station, E. A. Maluigin. On well fertilized irrigated plots the unit leader Ashambaev obtained in 1943 204 c/h of millet.

The above facts complete our review of the varied labors of the Institute and its stations during the war years.

BIOLOGICAL RESEARCH

The accusation is frequently made that the Institute of Plant Industry does not engage in problems of applied botany. There existed even a project to create an institute in applied botany at the Academy of Science of the USSR. Nevertheless, the question is not whether the Institute of Plant Industry engages or does not engage in studies of applied botany but in what is understood under the term "applied botany".

If one lists work on general problems of genetics, citology and anatomy under applied botany without pursuing concrete applied aims then the Institute of Plant Industry has not been preoccupied with "applied botany". The Institute concerned itself with problems of biology when closely connected with the solution of practical problems under the difficult conditions of war years and developed a series of methods pertaining to selection and seed growing. It is true that the volume of these works is not large since there both environment and time were lacking, and only the most necessary tasks were accomplished. I shall refer to several accomplishments in the field of biological research:

1). research on increasing sowing qualities of seeds which contributed to many hundreds of thousands of centners of seeds suitable for sowing (F. A. Kuznetsova).

2). study of the biology of weeds which resulted in an increase of harvests in many regions of the Ural, as well as other research on the biological nature of agricultural technical methods of controlling weed vegetation. (I. G. Eikhfeld, V. F. Antropova, S. A. Kott).

3). research on the biology of clover which opened new ways in the field of selection and seed growing (N. G. Khoroshailov, N. A. Miniaev).

4). biological research in support of technical methods used in corn growing. (I. V. Kozhukhov).

5). Research of methods of selection of cereal and leguminous crops. (V. B. Enken).

6). development of methods of limited pollination of cotton and other crops which led to the transformation of varieties into populations and the extraction of new more valuable forms than the original material. The production of distant hybrids of cotton by utilizing vegetative rapprochement, etc. (D. V. Ter-Avanesian).

7). research in the field of distant hybridization of fruit crops, as a result of which fertile hybrids were obtained from crossings of almond and the Vladimir cherry; hybrids from the bird-cherry (Cesarus padus) and mazzard cherry (Prunus avium L.). (F. K. Teterev)

8). successful research for obtaining forms of apple trees by vegetative propagation. (E. I. Trebushenko)

9). study of ways to control wilt disease of solanaceae crops in Krasnodar territory. (S. N. Shilova).

This represents a relatively small amount of work but it should be emphasized that the conclusions and results on methods of general problems obtained in the war years are not inferior in sum of total achievements for a similar peace time period, while in theoretical and productive significance they far exceed it. The results obtained continue to find immediate useful application in solving practical production problems.

DIRECTION OF FUTURE SCIENTIFIC RESEARCH WORK

In such a vast country as ours, a country of exceptionally varied natural environmental conditions, there is need for an Institute of Natural Resources or Plant Institute among the group of scientific-research institutions. Actually the institute known as All-Union Institute of Plant Industry has fulfilled this role.

Still it devoted inadequate attention to direct problems of plant growing. In the future, while regarding the work done with the collections of cultivated plants as a primary object, the Institute should also become more closely related to production and throw a bridge across to practical agriculture (or agricultural practice) by means of biological work.

This does not mean that the Institute should engage in individual studies of agricultural technique; but, as a result of an all around study of agricultural crops, the Institute could provide biological bases for developing proper methods of producing various crops in the different zones of the Soviet Union. During the war we had located these bridges. Many of our oldest associates who never before had been connected with agricultural production found ways of solving important production tasks during the war years.

The Institute should restore all destroyed and still not operating, so called "method laboratories" in the town of Pushkin, devoted to physiology, anatomy, citology, etc. These laboratories should turn from abstract university level work to the development of problems intended to aid our deep knowledge of the nature of produced plants, i.e. the better utilization of our vegetative resources.

The personnel of the Institute proposes also to enlarge its herbarium department. From the collection of plants which today occasionally does not include even all primary varieties and botanical variants, it should be transformed into a living institution. The herbarium should accumulate not only specimens of species and forms of varieties but also facts which aid in properly reflecting upon the evolution of cultivated plants and the theoretical problems of selection and seed growing. We should learn much more about the influence of conditions of production upon the principal hereditary qualities of varieties and crops. We should therefore not limit ourselves to geographical tests, as undertaken by the Institute in the past. The latter led only to the accumulation of empirical knowledge on the reaction of cultures and varieties upon external conditions in the course of ONE generation. We should learn the hereditary changes occurring as a result of PROLONGED production of cultures and varieties under definite conditions. In practice a variety is produced over a period of many years and not in one year. Without knowing the influence of the PROLONGED reaction of external factors in a given locality we are unable to form conclusions of practical significance from our plantings.

Biochemical research should also be widely extended. Here too we should not limit ourselves to elementary definite contents of any elements in plants. We should study the PROCESSES OF FORMATION of these elements and find ways of directing them in order to contribute to the accumulation of useful and the eradication of harmful elements. We should learn how to distribute crops properly on the territory of our country in order to obtain an adequate amount of useful vegetative production of a definite nature. We should know the ways in which we can RAISE the content of necessary elements.

Agricultural meteorological research will also be widened by the Institute of Plant Industry. Russia has originated agricultural meteorology and this science should flourish in our country. Not alone should this be so because of scientific traditions but also because this science is extremely useful to us. The question has frequently been raised concerning the creation of a special institute of agricultural meteorology as a scientific center. We support this initiative. Along with it, however, we point out that under no condition should the Institute discontinue its agro-meteorological research. We may not study general climatic research and cartography, but the Institute of Plant Industry should widen its scope to include the study of the influence of climatic factors upon the development of produced plants and evaluate the climate of the territories of the Soviet Union with regard to the demands placed by agricultural crops. Methods for overcoming unfavorable climatic factors for plant growing should also be developed.

On the whole, the personnel of the Institute considers it has met the tasks assigned to it by the Party and the Government honorably and with distinction.

End of Chapter

3/14/51

Translated in part
by S. N. Monson.

Selection and Seed Production of Agricultural Crops
in the South of the Ukrainian S.S.R.

by A. M. OLSHANSKII,

Acting Director of the All-Union Institute of Selection and Genetics, order of Red Labor Banner.
(p. 38-60)

The occupation of Odessa and the Ukraine by German-Rumanian invaders brought enormous damage to the All-Union Institute of Selection and Genetics.

Prior to the war the Institute had gathered a vast amount of experimental data on the individual development of plants, the biology of fertilized plants, vegetative hybridization, directed transformation of the nature of plants.

As is known, this material provided the opportunity to make a series of important theoretical generalizations which changed the views of biologists upon the nature of many living factors and which permitted a change of methods of work in many divisions of agro-biology and particularly selection.

Interesting material was developed in the selection of winter and summer wheats, barley, cotton, potatoes and other crops.

Supplementary cross-pollination of hybrids was applied on hundreds of thousands of hectares. By introducing summer plantings the southern oblasts of the Ukraine met their needs for potatoes among the best and earliest varieties.

The use of chickens in controlling the harmful eurigaster and the sugar beet pest curculionidae brought splendid results.

The Institute was operating in close association with thousands of collective farmers-experimentors who participated in the development of the majority of theoretical problems and thus ensured the introduction of proposals made by the Institute to production.

The war and invasion interrupted the work of the Institute in many departments. Experimental data was lost in the majority of cases; results of years of work, including data on new agricultural methods which before the war had attained wide and practical distribution at collective and state farms, were either destroyed or their application discontinued.

The invaders destroyed the base of the Institute where the material was kept. The fields of the Institute and those used for growing elite seeds were wantonly used by the invaders, resulting in the violation of crop rotations, and the infestation by weeds and pests.

The Institute was evacuated twice. First from Odessa to Stavropol, then from Stavropol to Kuropatkino, Samarkand oblast, from where it was moved to Kibrai, Tashkent oblast. The selection material which in part was moved out from Odessa, could not be utilized for purposes of further selection in altogether different conditions of work. The material was therefore preserved in part and several of the potential varieties produced by the Institute propagated. Thus the varieties of the summer wheat Lucerne 1103 and Odessa 13, the barley Odessa 9, Odessa 14, the winter wheat Odessa 3 and Odessa 12 were propagated. Small quantities of seeds of cotton variety OD-1 were propagated in 1942 in Central Asia.

This part of the work prepared material for the development of selection and seed growing during the period of evacuation, pending the return of the Institute to Odessa. The second part of the work of the Institute accomplished in the period of evacuation, was naturally directed towards solving problems connected with the development of agriculture in the war years. Among these we note two: summer plantings of early potato varieties and specifically the development of the method of planting potatoes with freshly dug tubers, and summer plantings of sugar beet.

In the low lands of Central Asia early potato varieties are practically not planted at all because of their impending rapid degeneration. At the same time healthy seed stock of these varieties produces high yields under early and late plantings and could fill the needs of the population for table varieties of potatoes throughout the entire year.

The use of summer plantings of early varieties in the respective periods guarantees a supply of healthy seed stock. Seed tubers are, however, stored with difficulty in preparation for the necessary periods of summer plantings under conditions prevailing in the hot regions of Central Asia. Summer plantings with freshly dug tubers from spring plantings of the same year are consequently the only possible means for growing at Uzbekistan an annual supply of healthy seed stock of early potato varieties. The Institute engaged primarily in developing methods of growing freshly dug tubers of potatoes and obtained some positive results. The method it developed, while not applicable for large plots, permits every household to grow annually healthy seed stock of early varieties in amounts adequate for plantings of seed plots the following year.

Seed stock obtained for summer plantings from freshly dug tubers may be preserved successfully by using the trench method of storing until the optimal period of summer planting of seed plots (second half of July).

The Institute also extended constant assistance to the Narkomzem of the Uzbekistan republic, state farms, supplementary farms and individual gardeners on all matters pertaining to potato growing.

The culture of sugar beet in Central Asia demands for its spring sowings a large amount of labor and vast supplies of water at the heaviest rainfall period (July-August). High summer temperatures contribute to a fractional yield of beets and irregular moisture and the resulting irregular growth produce a large percentage of tubers with hollow heads. Such roots are affected strongly by caudal(tail) rot and lose much of their sugar content.

The results of the Institute's experiments conducted together with many collective farms permitted to form conclusions on the efficacy of sowing sugar beet under moisture conditions at Uzbekistan during the second part of June, as a secondary crop after harvesting cereals and grain-leguminous crops. The result is a high yield of roots, similar to the yield obtained from spring crops, comparing well with the latter in sugar content. It was established at the same time that the roots of yields of summer sowings are better preserved in "kagates"(?), losing less sugar under those conditions. It was also found that these roots produced a higher yield of seeds of better quality than did roots of spring sowings.

Reconstruction work at Odessa was begun in the spring of 1944 and has advanced considerably to date, compared to the normal standard of work at the Institute. Below we mention its accomplishments, which one may characterize as concrete indications of practical achievements. Simultaneously we review plans of development in the corresponding departments.

WINTER WHEAT, the main crop in five southern oblasts of the Ukrainian SSR, which are served by the Institute; a considerable amount of seeds was transferred to regional seed farms, including the varieties Odessa 3 and Odessa 12, produced by the Institute. We shall devote a few words to these wheat varieties.

OD-3 was produced from the crossing of the variety Kooperatorka with the variety Gostianum 0237. It is a frost and drought-resistant variety, of good baking quality; OD-12, obtained from the crossing of the variety Zemka with Gostianum 0237; has better frost resistance and is very resistant to lodging. Both varieties are superior to those formerly planted here, like the varieties Ukrainka and Gostianum 0237, exceed the two latter considerably in yield (5 - 4 centners), are superior to Ukrainka in frost resistance and resistance to smut disease, and superior to Gostianum 0237 in milling and baking qualities.

Considering the availability of new varieties, the Institute found it advisable to take more radical steps towards replacing the formerly considered satisfactory varieties Ukrainka and Gostianum 0237, and correspondingly planned areas of new varieties at regional seed farms, substituting for those originally scheduled. In 1945 the Institute produced several times more elite seeds of the varieties OD-3 and OD-12 than were required by the original plan.

SUMMER WHEAT. Here the Institute also organized the production of elite seeds, specifically the production of new varieties Lutescens 1163 and Odessa 13. Lutescens 1163 is a much earlier maturing variety than the standard Lutescens 062, exceeding the latter in yield by 2 - 3 centners, while Odessa 13 exceeds the standard variety in yield by 3 - 5 centners and is resistant to damage caused by the Hessen fly.

BARLEY. Seed production was organized and included the new varieties Odessa 9 and Odessa 14 produced by the Institute. These varieties exceed the standard variety in yield by 5 - 6 centners.

The facts stated above with regard to winter wheat apply equally to summer wheat and summer barley. The new varieties should be intensively introduced into production since they already had been sufficiently tested.

The production of seeds of rye, oats, corn, sunflower, poppy, sesame, etc. The Institute fulfilled already in the first year of its reconstruction the tasks laid out by the government on seed production by utilizing the seeds propagated during the evacuation period and by locating some varietal seed stock within the oblast.

In 1945 seed nurseries for super elite seeds of all main varieties were completely reestablished with the view of ensuring from year to year the improvement in quality of elite seeds on seed areas.

Simultaneously a vast amount of work was conducted on the reconstruction of the selection of grain crops: hybrid nurseries of the first, second, third and fourth generations in winter and summer wheats and barley were set up and so were control nurseries and preliminary and principal varietial experimentation.

Among newly developed methods of selection and seed growing we point to the method of producing seeds of regionalized varieties of higher yields obtained through free pollination with a mixture of the pollen of best varieties of domestic and foreign selection.

The experiments conducted in pre-war years by Dr. Dolgushin, specialist of the grain department of the Institute, on intra-varietal crossing of winter wheats, by emasculating plants on the plots devoted to varietal tests, with subsequent natural wind pollination by the pollen of closely planted manifold varieties, produced satisfactory results. Following the severe winter of 1939/40, as well as following artificial freezing of plants, it was established that the frost resistance of the first and second generations secured as a result of selected fertilization was slightly greater than the frost resistance of the original parents. In addition, plants obtained from hybrid seeds differed from the parent forms in their more powerful development. These experiments confirmed once more that the biological resistance of plants is generally increased by selective fertilization.

In utilizing this established regularity, special sowings were arranged in 1944 to obtain corresponding hybrid populations. A mixture of 75 varieties of winter wheat of domestic and foreign selection was taken as pollinators. The mixture of varietal pollinators was sowed with the aid of an eleven row seeder, and after each passing of the seeder one row of the maternal form was sowed, the varieties Odessa 3, Odessa 12, Gostianum 0237 and Ukrainka being selected for the purpose. The stalks were emasculated on the maternal plants and given the opportunity to be pollinated freely by the pollen carried by the wind.

Thus, many hybrid seeds were obtained which will subsequently be propagated artificially and studied with the view of planting a second generation at a comparative varietal testing, and in the event of a positive economical effort to be utilized for purposes of seed growing and planting under conditions of production.

Seed growing of COTTON deserves particular mention.

It is known that before the war the variety Schröder 1306 was planted in the Ukraine. Because of the inadequate yield of seed of this variety preceding frost ("domorozny"), there never was a year in the history of cotton growing in the Ukraine when the entire area was planted with seeds of its own yield. Seeds were annually imported from Central Asia and in some years the entire area was completely planted with foreign seeds. Not a group of seeds was grown in the Ukraine for at least 3 to 4 years. Under those conditions it was not possible to use natural selection in the production of seeds maturing from year to year and to provide for a steady supply of seed stock.

In applying the new method of selection proposed by Lysenko, the Institute produced the cotton variety Odessa 1 which ensures a yearly yield of seed stock and exceeds the var. Schroder 1306 in many other useful economic qualities, such as: general resistance, length of fiber, large size of balls and resistance to gummosis. The following characteristic of this variety is interesting. In 1940, a year unfavorable to cotton, the pre-frost yield of raw material from 8,000 hectares planted with this variety equalled that of a pre-frost yield from 118 thousand hectares, planted with the var. Schröder. And if for the planting of 1941 the seeds of the latter variety were almost entirely imported from Central Asia, the area under Odessa 1 sowed with seeds of domestic yield was increased almost four times.

The very fact that the var. OD-1 will be planted from year to year with domestic seeds will better adapt it to local conditions. In addition, seed growing by systematic selection, begun at elite farms under the guidance of the

Institute, will considerably improve it as time goes on.

Cotton selection will be engaged in by the Institute on location, by increasing speed of maturing through selection, the size of balls, length of fiber and other economically useful traits.

Thus along with the propagation of the variety OD-1 will go its steady improvement by selection and training.

All this will help the cotton industry of the Ukraine stand on its own feet. As was the case before the war, the Institute devoted considerable attention to solving the POTATO problem in the south.

Before the war the Institute directed summer and spring sowings of potatoes at collective and state farms of the southern oblasts of the Ukrainian republic and RSFSR. By setting up summer plantings of regionalized potato varieties as a standard procedure, these oblasts solved their potato problem already in 1939 and provided themselves and their industrial centers with an important food item.

In 1940 the supervision of the Institute was extended into the forest steppe zone of the Polessie of the Ukrainian republic. In February 1941 appeared the decree of the SNK of the Ukrainian Republic and the Central Committee of the Communist Party concerning "Measures to increase the potato yield on collective and state farms of the Ukraine." This decree proposed the organization of adequate seed growing of potatoes based on the corresponding utilization of summer plantings as a principal agricultural measure for increasing yield.

During the period of occupation the greater part of new agricultural methods, including those of summer plantings, were not applied, as a result of which the southern oblasts of the Ukraine almost completely lost their seed stocks of regionalized potato varieties.

The collective and state farms of the Odessa, Nikolaev, Kherson, Zaporozhie, Stalin, and Voroshilovgrad oblasts, as well as the Moldava SSR suffered particularly in this respect.

The restitution of potato seed growing in these oblasts formed the foremost task of the Institute and measures were taken to introduce the original stocks of regionalized varieties from other oblasts of the Soviet Union and make use of the available remainders of the Ukrainian varieties.

The Institute itself planted varieties brought in during the spring of 1945 from Moscow and Voronezh oblasts. These were the var. Courier, planted on 50 hectares, and Lorkh, planted on 8 hectares. The yield from these plots was used to organize seed farms at Odessa, Nikolaev and Kherson oblasts.

In addition to the above, the Institute studied problems of tuber formation with a view of transferring it to a period suitable for man. A method has already been found with the aid of which it is possible to force the potato plant to form tubers 10 to 15 days earlier from spring sowings, and to postpone tuber formation to any late period during spring and summer sowings.

The Institute conducts selection by hybridization and training seedlings under conditions leading to the formation of early maturing, non-degenerated original material.

LUCERNE-ALFALFA is also given considerable attention at the Institute.

During the occupation of the Ukraine the area of perennial grasses was greatly reduced, grasses were not planted and pre-war sowings were not processed and were plowed over without a system. The remaining plantings of grasses proved of little use for seed stock and even for straw because of their sparse growth and weed infestation.

It is known that the yield of seeds is relatively low in other regions of the USSR as well. The reason for this lies in undeveloped agricultural methods at seed nurseries producing alfalfa, as a result of which seed nurseries are partly subjected to drought and on the other hand to a mass propagation of pests which destroy buds, flowers and the ovaries of alfalfa.

Practical experiments conducted by the Institute in 1938, 1939 and 1940 showed that in the steppe regions of the Ukraine the safest way to ensure high yields of hay and especially alfalfa seeds, was achieved through summer planting.

Beginning with 1938 and up to the time of the war a group of collective farms of the Odessa, Nikolaev, Kirovograd, Stalin and Rostov oblasts and Krasnodar territory planted alfalfa during the summer under the supervision of the Institute and obtained good yields of seeds. Thus in 1940, the collective farm "Chervonny Maiak", Tsebrikov region, Odessa oblast, obtained from a plot of 13 hectares of summer sowings a yield of 8.3 c/h of seeds; the collective farm, imeni Rosa Luxemburg of the same region, obtained 3.6 c/h, from a plot of 10 hectares, etc. Similar examples can be cited concerning many other regions throughout the oblast.

Alfalfa planted in the period between July 15 and August 15 on land cultivated in the spring is better provided with moisture, almost not susceptible to pests and less likely to become attacked by weeds since the fields are cleaned of weeds by fallow cultivation before planting and weeds appearing at the end of the summer and in the fall will be destroyed by fall frosts before the seeds have time to form. Reduced weed infestation of summer planted areas permits plantings by broadcast planting and not in wide rows, while the planting of alfalfa nurseries on separate lots, away from the old alfalfa grounds is isolating them from the focuses of propagated pests.

All this in its entirety ensures a relatively high yield of seeds. This led Lysenko to propose in the summer of 1945 to plant at each collective farm from 3 to 5 hectares of alfalfa seed plots in a fallow winter wedge, a circumstance which permitted already in 1946 to obtain a large amount of seeds of alfalfa.

The Institute conducted the necessary work of guiding the summer plantings of alfalfa. Beginning 1945 the Institute assumed work on selection and seed growing of OIL AND VEGETABLE CROPS by organizing the respective department.

Selection of sunflower crops will be conducted for the purpose of obtaining varieties of higher yield, and the development of methods of selection of particular crops. The standard variety Zhdanovskii 8281 in the southern Ukraine was planted in 1946 adjacent to other 5 or 6 varieties of satisfactory yield and high oil content. In addition to natural pollination of the maternal variety 8281, artificial pollination was used with the pollen of the adjacent pollinators.

The hybrid seeds obtained will be planted in 1947 in families and not isolated anymore. Selection will be made from this planting on the basis of such characteristics as yield and oil content, based on samples of separate families and plants. Progenies of the best plants are planted in the following year and identical work performed with them. We consider that in this manner the results will lead to higher yields and oil-content of sunflower varieties. In the process of this work the influence of free repeated pollination ("pereopylenie") of family plantings of sunflower will be studied with respect to yield and oil content.

With regard to LEGUMINOUS crops it is contemplated to produce within the next 2 to 3 years improved seeds of the early cabbage Kaporka odesskaia and early maturing varieties of the melon Frynka odesskaia and Persidskaia.

In the field of GENETIC research the Institute is working on three subject matters.

1. Directed transformation of the nature of plants by training.
2. research on biological regularities of fertilization of cultivated plants.
3. Vegetative hybridization of plants.

The problem of directed transformation of the nature of plants has been experimentally solved in 1936 when Lysenko transformed the winter wheat Cooperatorka into a summer crop. By 1941 the heredity of a series of varieties of winter wheat into summer wheat was already deliberately transformed, of summer into winter crops, of summer barley into winter barley, etc. Many hereditary transformed forms proved interesting for use in practice. Thus, for instance, the summer wheat Eritrospermum 1160, transformed into winter wheat, wintered well in the severe colds of 1939/40. During varietal tests conducted at the Institute in 1940 this wheat produced a yield of 25 c/h, the same as Costianum 0237, and exceeded the yield of the var. Ukrainka by 3 centners.

The winter form of barley obtained from the summer variety Palladium 032 was not in any way inferior to the best winter varieties of barley under severe winter conditions. Experiments conducted along this line proved that in order to transform the heredity of an organism it is necessary to change the nature of the steps or processes of its development. To this end it is essential to give the plant the required conditions for the development it requires at the beginning of a given stage and towards the end of the process to create such conditions for adjustments as will necessarily transform the plant at a given stage of development.

It has been established that the progeny of transformed organisms is less persistant in its demands and easily subjected to further transformation in a required direction (increase of frost resistance, etc.).

In 1945 work proceeded on the reconstruction of pre-war material for transforming soft wheats and barleys, and new experiments were begun on transforming hard summer wheats into winter wheats and summer oats into winter oats. In 1945 the fourth, fifth and sixth generations of 5 varieties of wheats were grown on the fields of the Institute, transformed from winter into summer wheats, of one variety of summer wheat transformed into winter wheat, and of one summer barley transformed into a winter barley. Selection nurseries and stations for testing this material have already been set up.

Experiments begun on transforming summer hard wheats and oats into winter forms are of considerable practical interest. It is known that in the south hard wheats and oats have a somewhat lengthy vegetative period and during drought years the yield of these crops is considerably reduced. The acceleration of maturing by one or one week and a half, which one may expect from winter forms, should reflect upon the yield of these crops.

Biological research on fertilization of plants proceeds in the direction of studying selective fertilization, the establishment of the role of the pollen of the maternal variety when fertilized by the pollen of the other variety, the influence of conditions of fertilization and the subsequent development of hybrids upon the conduct of the progeny (problem of "directed splitting?").

In vegetative hybridization pre-war experimental work is being restored, the nature of inheritance and the transformation of economically valuable characteristics in vegetative hybrids studied, depending upon the selection of wilding to scion and their inter-relationship. The aim of this work is to obtain practical and useful forms.

In this article it is not possible to dwell in detail upon the theoretical significance of all the questions referred to above. Discussions lasting for days were devoted to the solution of these problems, dealing primarily, it is true, to their arrangement.

Many researcher-geneticists proclaimed the impossibility of the very fact of a transformation of the nature of vegetative organisms under the influence of external environments. The very possibility of obtaining vegetative hybrids was being challenged. At the present time the majority of researchers has fully adopted the position taken by Michurin genetics and only a small group of scientists remains upholding the positions maintained by Mendel-Morgan genetics. These scientists deny the presence of the very facts directing the transformation of vegetative organisms under the influence of an external environment.

They resemble in this respect a certain sceptic whose mind would not adopt the idea of the existence of such an animal as a giraffe. In visiting a zoological garden he accidentally came across a giraffe and called out assertatively: This, this is impossible.....and walked away.

I repeat that this group is not numerous; the majority of researchers who work in this field have firmly accepted Michurin's principles.

The Institute continues to develop methods of pest control of agricultural crops. It is known that the use of chickens in eradicating the harmful eurigaster and the beet sugar pest curculionidae has produced astounding results.

Experiments conducted in 1941 and 1945 to eliminate with the aid of young chicks this harmful alfalfa pest, the seed eating "tichius," proved the efficacy of this method. Thus a plot of alfalfa carrying a density of 2,000 specimens per 1 square m. of pests was fully cleaned up by chicks within three days. It was established that one chick eats 1,500 of these beetles in a day. The Institute contemplates to develop a regular method for controlling "tichius" with the aid of chicks and to propose it for mass use in the next few years. The above method will be suggested together with other measures ensuring the efficacy of controlling the above harmful pests of alfalfa.

The Institute continues the development of biological methods for controlling pests of agricultural crops with the aid of Trichogramma and Telenomus.

To draw in farmers of collective and state farms into plans of scientific-research remains and constitutes, however, the inalienable part of all the work of the Institute. The latter directs the systematic training of supervisors of hut-laboratories, calls upon them for the execution of the subject matter and jointly with them develops achievements essential to production.

End of Chapter

3/15/51

Translated in part
by S. N. Monson.

AGRICULTURAL PRACTICES AND SELECTION OF FIELD CROPS IN THE SOUTHEAST OF USSR,

by Ia. I. Riazanov, director

of the Institute of Grain Industry of South-Eastern USSR, order of Red Labor Banner.
(p. 51-73)

In the years of the great Patriotic War the Institute of Grain Industry of the South East of the USSR solved the most important agricultural problems of field crops in the drought regions of the south east, produced new grain and oil crop varieties of high yields and gave systematic aid to collective farm production by introducing agricultural practices under war conditions. Scientific results of great importance were achieved in raising crops of high yields throughout the post war period which proved of benefit to the future development of agronomy.

PROBLEMS OF AGRICULTURAL CLIMATOLOGY (p. 51-52)

It is known that in regions of the south-east natural conditions for cultivating field crops differ considerably from the greater part of other regions in our country. The main feature of the climate of these regions, i.e. drought, prevails here along with an exceptional changeability in weather conditions, which reflects in a specific manner, depending upon the level of agricultural practices, upon the development of cultivated plants and their productivity. The Institute uninterruptedly studied therefore the south-eastern climate, in order to find more effective ways to overcome the unfavorable meteorological factors and to provide for a more correct utilization of the prevailing favorable climatic characteristics. Based on the observations conducted by the candidates in agricultural sciences, P. G. Kabanov and N. V. Bova, the territory of the south east was regionalized into uniform regions according to natural climatic conditions. At the basis of this regionalization, aside from general climatic indicators, were placed certain additional traits of considerable significance for field culture, i.e. the building up (accumulation) of spring temperatures, etc. Spring and summer droughts of the south east of former years were studied, beginning 1891, and the territories of their distribution, their intensity and concurrency ascertained.

The analysis of weather conditions covering the past 60 years, which established the most characteristic types of weather for the south east region, presented radically different conditions for the fall development of winter crops, their wintering capacity and the spring-summer vegetation of winter and summer sowings; the concurrency of the selected types of weather, according to the natural climatic regions of the area, was equally established. The study of types of weather and their influence upon field crops made more specific the climatic possibilities for producing individual crops and led to the acceptance of individual agricultural methods which take into consideration meteorological factors. The differentiated application of certain agricultural technical methods was determined on the basis of established weather conditions that continued to prevail.

In this connection an attempt was made to develop a method for the prognosis of drought. Research conducted in this direction showed that a series of atmospheric factors of the fall-winter period could indicate the possibility of the occurence of spring and summer droughts. The following observations led us to these conclusions: a total influx of sun energy in the fall and early spring, the adequate moisture supply in the fall and winter, the temperature regime of the winter and the movement of air masses observed in the winter. The application of the entire sum of these factors provides the opportunity to give in the spring, before field work begins, a positive prognosis of 90 percent of the possibility of drought in the coming spring-summer season. While not adequate for practical use, this provides preliminary orientation for planning and organizing spring and summer work. The problem of prognosis on drought remains however unsolved in its entirety and requires further investigation in agricultural science.

THE WATER REGIME OF THE SOIL, p. 52-54

Among all factors concerning the growth and development of cultivated plants in the southeast the leading place belongs to problems concerning moisture of the soil, its accumulation, preservation and rational utilization, all problems to which the Institute devotes special scientific research. The work was started back in 1939 and in succeeding years studies of the water regime in fields under grass crop rotation were continued uninterruptedly.

The results of these investigations conducted by the candidate of agricultural sciences A. P. Belyi, showed that there are radically different fields in grass crop rotation according to their respective content of moisture.

In fields of fallow-plowed sections the principal deviations in easily accessible water occurs in the layer of soil at from 0 to 100 to 150 cm. Moisture of the soil below 150 cm of the surface, brought to the limit of field moisture capacity, is not being utilized by crops of this group. In fields of perennial grasses (alfalfa-agropyrum grass mixture) a progressive drying out from above and down to 0 to 300 cm of the layer of the soil takes place in the first and second years of use. The seasonal variations of easily accessible water in these fields affects only 0 to 50 cm of the surface. The black fallow which follows the two summer crops after grasses, does not eliminate fully the drying out of the entire 0 to 300 cm surface layer and only in the next half fallow or the second fallow is the water balance of crop rotation in the field restored. On the greater part of fields under crop rotation unproductive losses of water in fall months represent under our prevailing agricultural practices more than one half of the entire amount of precipitation falling in that period.

Winter precipitation is utilized by soils of different fields under crop rotation in radically different ways. In the course of four years which differed from each other in the fall in degree of moisture, the flow of melted waters varied within the following limits: on a surface layer from 7 to 25 percent, on a plowed unit from 15 to 63 percent; on fields occupied by grasses from 20 to 76 percent.

The surface layer of all fields under crop rotation utilizes winter precipitation best of all, but since grass mixture demands a considerable part of the water which is accessible with difficulty, a much larger amount of water is required here than on fields following annual crops in order to attain a 150 cm layer of the soil to the limit of the field's moisture capacity. Because of improved physical properties of the soil layers, the tendency of its capacity to preserve moisture in the upper layer under spring drought conditions has been observed, which is of exceptional significance for the normal introduction of summer wheat sowed on the stratum (layer). Observations made of the water regime of fields under grass crop rotation, not completed yet for the entire rotation, offer proof for the following preliminary conclusions:

1. In drought regions under grass crop rotation of the south-east it is necessary to introduce active measures to liquidate the drying out of deep layers of soil caused by grasses in order to fully utilize the positive effects of grass

sowings.

2. In order to restore the water balance in grass crop rotation the role of black fallow has to be intensified as a powerful means of accumulating moisture in the soil and preserving it for succeeding crops.

3. Methods of plow cultivation of the stubble and glass layer should be improved to aim at the maximal utilization of late summer and fall precipitations.

4. The distribution of snow in fields under crop rotation should meet the conditions of water provision of each field; the strongest snow cover should be created first on the layer, ("plast").

5. Methods for retaining melted waters should be utilized widely in the plowed link of crop rotation and in fields occupied by grasses.

In subsequent investigations of the water regime particular attention will be devoted to studies of the drying-out of the plowed surface layer, with the view of developing more effective methods to preserve moisture in the upper horizon of the soil. Problems of studying the dynamics of the water regime of fields under crop rotation in other soil-climatic regions, aside from Saratov, will be studied at several oblasts' experiment stations of the south-east, i.e. Krasnokutsk, Astrakhan, etc.

Along with continual work on the water regime, the Institute organized in 1945 studies of the characteristics of individual fields under crop rotation with respect to other elements of soil fertility: nutritional regime, balance of organic elements in the soil, weed infestation of soils, some micro-bacteriological processes, and the conditions for the development of parasites. The results of these observations will permit to establish scientifically the necessity for differentiated agricultural practices and the proper application of fertilizers on various fields under grass crop rotation.

THE BIOLOGY OF WEEDS AND THEIR CONTROL p. 55-57

Of great scientific and practical significance are the Institute's studies directed to the biological characteristics of weeds. It was necessary to establish the "dynamics" of supplies of seeds in the soil and consider their replenishment and destruction by various means for the development of agro-technical methods designed to clean the soil of seed embryos of early weeds. The work begun at the laboratory in weed control conducted under the leadership of Professor L. I. Kosakevich, permitted even in the years 1933 to 1938 to establish a series of facts which were subsequently confirmed by experiments under conditions of production in the years 1938 to 1941 (M. E. Smirnov) and in further more specific (detailed) investigations conducted in 1944 and 1945.

It was established that seed destruction in the soil, at the cost of loss in germination, proceeds constantly but that its role is relatively small. The principal method of cleaning the soil of the seeds of weeds is to force their growth, provided they are steadily destroyed. Simultaneous destruction of all seeds and fruits of weeds in the soil is hampered, first of all, by different biological characteristics of embryos of various species with regard to their demands for warmth and other factors, as well as the age of seeds, conditions of ripening, dormancy, storing, etc. The duration of dormancy in seeds of different species of weeds, accumulated in the soil, varies considerably: from several months to several years. This duration may change on the other hand, depending upon weather conditions, location, and storing of seeds. It was established that a delay in the germination of seeds, while in the period of dormancy, depends not only upon their penetration of the respective layers but (in the beginning) primarily upon the condition of the germ itself.

Observations conducted in 1944 to 1945 proved that among many weeds saltbush, (Altriplex L.), pigweed, knot weed, foxtail, etc., the factor of heterocarpism is widely spread, the main characteristic of which is the fact that seeds which differ in their morphological as well as their biological peculiarities (features) of growth, are formed on the same plant. Of major importance is the fact that heterocarpism was established in wild oats (Avena fatua). The late blooming upper small fruits of the weed ripen earlier and fall off first (in 11 to 20 days), contaminating mainly the soil. The large lower fruits ripen later but are delayed in the panicle much longer when mature and therefore contaminate the grain chiefly during harvesting. The small and large fruits differ radically in length of dormancy: the larger the fruits the briefer is their dormancy.

All these factors (dormancy, heterocarpism, etc.) complicate the process of cleaning the soil of stored seed seeds. On the other hand, the new data discovered by the Institute concerning seed destruction of weeds in the soil provided agricultural workers with a strong fast weapon with which weeds may be destroyed. Observations made in the fields, complete records of seed weeds for entire wedges under crop rotation and specially established tests on grown wild oats, foxtail and cockle and other weeds permitted the establishment of conditions under which it was possible to bring about an enormous destruction of seeds of weeds in the soil.

Up to now it was the accepted view to judge the results of cleaning the soil from stored weed seed by the number of sprouts destroyed by subsequent cultivation.

The latter should be conducted in such manner that seeds of weeds are turned up closer to the surface to make it possible to reach their stalks. It was formerly believed that seeds that did not come up remained non-growing.

To oppose this widely spread conception, the cleaning of the soil of seeds of weeds proceeds in an entirely different manner. Our studies established that seeds of weeds may grow after cultivating throughout the entire friable layer, wherever a favorable combination of the most important necessary factors has been created: moisture, temperature and aeration; within two weeks a mass growth of seeds and fruits of weeds is observed throughout the entire depth of the cultivated soil. In another 2 to three weeks this outbreak is extinguished and entirely stopped when the soil hardens and conditions of growth become less favorable. A part of the developed seeds and fruits, distributed primarily in the upper layer of the soil, may produce plants but within the deeper layers the "unseen" destruction of germs which did not come to the surface takes place throughout. On the whole, the destruction of germs in the soil exceeds many times the number of sprouts appearing on the surface (sometimes 10 to 20 times).

Cleaning of the soil is most effective if the latter is made deeply friable during the spring season and to a lesser degree in the fall. In the summer mass growth of seeds of weeds falls off drastically and stops almost entirely in certain groups of weeds. In order to provoke the growth of seeds by deep cultivation, wide-spread machinery of the Chisel(?) type may be used successfully in addition to plows; the former are particularly effective in drought regions.

Established principles for destroying the accumulation of seeds of weeds permit the development of more efficient methods and systems of cultivation which their seed beds in irrigated and low lands and by applying the necessary ordinary methods to preserve plantings from harmful pests. Under this procedure high yields of seeds, averaging in individual years up to 10 centners per hectare, are obtained on entire plots of irrigated lands. On irrigated and low soils a yield of seeds is derived not only from a first cutting but also from the second cutting (harvesting) whenever the first harvesting has been used for hay early enough. Data of the Valuisk Station covering a period of 8 years indicates that the average yields of seeds obtained from second harvests equal the yields of seeds from the first. This carries considerable significance since in the case of obtaining seeds from a second cutting a farm derives an additional harvest of hay; besides, the harvesting of seed alfalfa takes place during a less hectic period.

Experiments of recent years conducted on the fields of the Institute established the possibility of obtaining greater yields of alfalfa seeds on non-irrigated soils from entire plantings of alfalfa-agropyrum grass mixtures, in which alfalfa (plowed at a reduced norm of seeds of 2 to 3 kg/h) has a less dense grass stand than on usual, regular sowings of grass mixture.

Plantings of these special grass mixtures, when made in the spring under a layer of spring crops or at the end of the summer, after rains on a plowed plot cleaned of weeds, relieve the farmer of hoeing.

Investigations have proved that in the planting of the above grass mixtures the density of alfalfa plants corresponds to the supply of moisture in the soil. The presence of agropyrum along with alfalfa does not result in a dwarfing of the latter by agropyrum which may be explained by the difference in the degree of penetration of the roots of the two indicated crops into the soil, and their claiming moisture on various horizons. In addition, the peculiar characteristic of agropyrum, as a one-harvest crop, permits alfalfa to utilize entirely the remainder of moisture from the first cutting and all of the precipitation following the first harvest. This accounts for yields of alfalfa seeds not alone from the first but also the second cutting, whenever the first harvest was cut early for hay.

In the last four years grass mixtures of alfalfa provided annual yields on fields of the Institute from the first as well as the second cutting in amounts of 50 to 170 kg. per hectare, while on wide-rowed seed plots alfalfa seeds were obtained only in 1944 and 1946 in the course of the last 5 years. Thus as a result of all conducted work it became possible to transfer from methods consuming much labor in producing alfalfa seed to much simpler and less labor consuming methods of obtaining seeds from entire planting areas. The labor saving factor is of particular significance for collective farms of the south-east because of their limited labor force and vast sowing areas.

Experiments established that alfalfa-agropyrum grass mixtures sowed by different methods on the fields of the Institute beginning 1939 under summer wheat produced, as a rule, satisfactory results. Only the drought conditions of the spring of 1943, produced thin shoots of grasses, which required an additional planting of the same plots in the following spring. The success of the summer-fall sowing of alfalfa under cover of winter crops depends upon its growth in years when the pre-sowing and actual showing periods suffer from droughts. Preliminary conclusions permit us to claim that early spring sowing (podsev) of alfalfa by means of a disc seeder among winter rye, sowed simultaneously with agropyrum in alternate rows, produces better results than sowings in other periods and by other means. Nevertheless, even this improved method of sowing is hardly satisfactory. Alfalfa plants discontinue their growth and development at an early stage because of shade under the dense grass stand of winter crops and many perish during the harvesting of the cover crop. The Institute continues its search for a more effective method of sowing alfalfa under cover of winter crops. Diverse periods for sowing alfalfa prior to the planting of winter crops on stubble, immediately following harvesting or in the following spring, are under study. In 1945 alfalfa planted on the stubble of winter rye produced a good grass stand and a yield of 25 c/h of hay in the year of planting.

The Institute developed and recommended for the drier regions of the south-east the alternate row (half-cover) method of sowing grass mixtures, which offers the opportunity to sow grasses simultaneously with the cover crop with the aid of customary tractor grain seeders.

In succeeding work with perennial grasses the Institute devoted much attention to the creation of improved alfalfa-agropyrum grass stands and selection and testing of grass mixtures consisting in other components of leguminous and cereal grasses.

The most widely spread species of perennial grasses, alfalfa and agropyrum, suffer from considerable shortcomings, i.e. irregular fruit bearing and low yields of hay.

Other grasses, such as esparcet, clover, bromus, American couch grass, etc., in which the above shortcomings are expressed in a lesser degree, are in spite of this not distributed adequately in the south-east and not sufficiently tested in compositions of grass mixtures. Not all has also been studied with respect to alfalfa-agropyrum grass mixtures. Under existing norms of sowings of seeds of any complex hybridization, is distinguished by the rapid tempo of the development of germ and node roots, rapid ripening and a particular evenness of the grain. In government varietal testing in the Zavolzhie regions of Saratov and Stalingrad oblasts the variety exceeded standard varieties in average yield over a period of 5 years by 2 to 2.5 c/h. The new variety is a candidate for regionalization in the most drought ridden regions of the south east. In 1945 the variety Albidum 43 was planted on an area of over 500 hectares at many collective farms.

The author of the above varieties of summer wheat is the selector of our Institute, doctor of agricultural sciences A. P. Shekhurdin, who in 1942 was awarded the Stalin premium and in 1945 decorated with the order of Lenin.

At present A. P. Shekhurdin works on the production of varieties which combine the largest number of valuable economic characteristics. Particular attention is devoted to the creation of varieties resistant simultaneously to many species of fungus diseases.

In recent years, several new potential varieties of sunflower have been produced, as a result of the application of new methods in selection, based on the composition of populations from material close in leading characteristics (in selection) but differing in its origin.

The author of the new Saratov varieties of sunflower is the candidate of agricultural sciences V. K. Morozov who was awarded in 1945 the order of the Red Labor Banner. Assistant V. A. Romanov produced a new variety of millet, the Saratov kremovoe 311, distinguished by a high yield.

In executing government assignments for providing elite seeds to regional seed farms of the Saratov oblast, the Institute conducts a vast seed producing campaign in all regionalized and many potential varieties of grain crops and sunflower. The plan for delivering varietal elite seeds to the GOSSORTFOND was fulfilled in 1943-101 percent, in 1944-130 percent.

DISTRIBUTION OF AGRICULTURAL CROPS IN THE SOUTH EAST p. 68-70

The introduction and full adoption in the south east of proper crop rotation will be connected with vast changes in the distribution of agricultural crops. It is necessary to first anticipate and to establish in a planned order the most rational ways and tempo of these changes. The problem arose in this connection of developing scientifically based proposals on the above. The candidate of agricultural sciences A. E. Kaminskaia produced conclusions and made proposals on the basis of data acquired by the Institute and other experiment stations, as well as obtained from her own work, and in addition gathered material on location in the south east oblasts, Tambov, Stalingrad, Penza, Ulianovsk, Kuibishev, Saratov, Stalingrad, Chkalov.

1. The introduction of proper crop rotations on fields of black fallows and sowings of perennial grasses produces favorable potentialities for widening sowing areas of winter wheat at Tambov, Penza, Ulianovsk oblasts, the northern regions of Kuibishev oblast, and the right shore regions of Saratov and Stalingrad oblasts. Here winter wheat by occupying one field during crop rotation under limited agricultural practices (black, well cultivated fallow, timely sowing, and early snow preservation) may ensure a high resistant yield. It is therefore essential to reinstate in these regions sowings of winter wheat on a pre-war scale within the next 2 years.

It is also necessary to widen the production of summer wheat at collective farms of the above zone at the expense of a certain amount of grain-forage crops (oats and barley), the sowings of which should be kept there within amounts that ensured the needs of livestock with concentrated forage.

2. In the Zavolzhie regions part of the planting of summer wheat should be distributed on black fallows (one field in crop rotation). These plantings, if fallow fields are properly cultivated, will act under non-irrigated agriculture as an insurance wedge of summer wheat in drought years. Sowings of barley in the above regions, as the grain crop of greatest yield should be enlarged at the cost of a more complete utilization of lands adopted for plowing.

3. Sowings of plowed crops (wide-row millet and sunflower), demanding at maximal mechanization definite expenditures of manual labor, should occupy plots in the south east that match the labor resources of the respective collective farms. These plots should not exceed those occupied in 1940 by the above crops. (For Chkalov oblast the standard should be the year 1939.)

4. The introduction and application of proper crop rotations is connected with the re-education of the specific weight of grain crops at the expense of increasing plantings of perennial grasses. In order to avoid a radical reduction of plantings of grain crops, it is necessary to attend to the plowing as planned and to adapt all lands suitable for cultivation (plowing). This procedure will permit an expansion of plowing area at collective farms of south-east oblasts. Once proper crop rotations are fully adopted, the total amount of planted areas will be increased significantly. The specific weight of sowings in the cultivated plow land will consist of 85.2 percent as against 78 percent in 1940, while the

specific weight of sowings of perennial grasses will be increased from 3.2 to 22.6 percent.

SEPARATE PROBLEMS p. 70-71

In the past years the Institute engaged in research on many other important problems. A vast amount of work was done in selection, testing, development of agricultural methods, and the introduction of new drought-resistant crops new to the south-east, such as forage and melon fields, African millet, grain sorghum, etc., into the plantings of collective farms.

The method of early production of potatoes was developed, which permits the growing and obtaining of potatoes 30 days ahead of customary dates.

The cluster method in introducing small doses of local fertilizers under potatoes was also developed, ensuring an increase in yield of 15 - 20 percent.

Work on the effectiveness of bacterial fertilizers under south-eastern conditions is being engaged in.

Experiments with green fertilizers on irrigated soil of the Zavolzhie have established their high efficacy on chestnut and saliferous soils; the most suitable plants for the purpose were assembled, and methods for their production and plowing developed.

In order to produce the principal agricultural crops more successfully under conditions of irrigation, the problem of building up proper crop rotations on irrigated soils is being studied, as are a system of fertilization under irrigated crop rotation, and methods preventing lodging of wheat during irrigation. A system of the simplest methods to control pests of seed alfalfa was developed, to increase the resistance of yields of seeds. Methods are studied of cultivating grass layers in order to lighten plowing and to eliminate the possibility of growing alfalfa in plantings of layer crops. Experiments have showed that in dry falls exceptional difficulties are created in plowing a layer, since it requires previous shallow surface plowing.

Plantings of sunflowers at reduced rates of 5 - 6 kg of seeds per hectare were studied, and their wide application ensured for the immediate post-war years. Such plantings reduce the amount of labor spent in thinning sprouts 2 or 3 times, eliminate the work of tractor cultivators, provide economies in the use of seeds at 8-10 kg per hectare. The Institute obtained yields of 10 to 14.3 c/h from such plantings for 3 years (1942 - 1944). Methods were developed to control the millet mosquito; new methods for controlling smut of summer wheat are being studied.

AID TO PRODUCTION p. 71-72

During the years of the Great Patriotic War the Institute, while engaged in scientific research gave practical aid to leading and land organizations, including direct aid to collective and state farms in their struggle to increase bread production and other agricultural products under difficult war conditions.

These observations, based on the material obtained from experiment stations of the south east for the past years, as well as the systematic accumulation of data from practical experience and existing weather conditions, the Institute transmitted to leading and land organizations in the form of concrete proposals concerning necessary practical agricultural measures in south eastern regions.

Many of the Institute's proposals are reflected in government decrees and decisions of leading oblast organizations.

In order to give direct aid to collective and state farms on the practical application of agricultural methods, our scientific personnel regularly visited regions of Saratov and several other oblasts of the south east and participated actively in oblast and regional conferences dealing with agricultural problems. The scientific staff of the Institute conducted a vast propaganda campaign during the war, lectured to agronomists, presidents of collective farms, leading regional laborers, presented reports over the radio, and published vast numbers of articles in newspapers and magazines.

ADMINISTRATION OF EXPERIMENTAL NETWORK p. 72-73

Regions of the south east possess a vast network of scientific research institutions. Here, aside from our Institute, are located three oblast stations of field industry (Astrakhan, Penza, Chkalov); nine government selection stations Petrovsk, Chakinsk, Bezenchuk, Kinel'sk, Novouzensk, Kamyshin, Krasnoutsk, Uralsk, Chkalov), two special stations (Ulianovsk Potato station and the Kuznetsk VIUAA). Three experiment institutions are under the direct supervision of our Institute; they are Valuisk Experiment-Meliorative Station, Balashov Experiment Field, and Ershov Irrigational Experiment Plot.

In pre-war years the Institute provided scientific guidance to oblast experiment stations in conforming to the decree of the Narkomzem of the USSR. This guidance was extended in the following manner:

1. Planning and the reports of specific subjects of stations were reviewed;

2. yearly conferences were called of the personnel of experiment stations to discuss total achievements and plans of work, as well as problems of methods;

3. visits were made by the scientific personnel of the Institute to experiment stations to verify the execution of plans and methods of conducting observations;

4. calls received from staff members of experiment stations at the Institute;

5. consultations by mail on individual problems concerning methods;

6. laboratories of the Institute assisted in the performance of those analyses that could not be made at the experiment stations;

7. printed scientific literature exchanged;

8. the Institute's journal published, etc.

During the war years the bond(connection) between the Institute and the experiment stations, and consequently, the former's guidance were considerably weakened and only reestablished beginning 1944 and 1945.

In 1944 leading scientific workers of the Institute visited ten oblast experiment stations.

In June 1945, the Institute called a scientific conference of the experiment institutions of the south east, to direct attention to further research on the principal problems of drought and to raise the level of scientific standards of the work. Almost all representatives of experiment institutions of the south east attended the conference, except those of Chkalov and Chakin Govt. selection stations.

It is also of primary importance that the Stalingrad Oblast Experiment Station of Field Industry, destroyed by the German invaders be reconstructed.

Collective and state farm production of the south-east oblasts of the Soviet Union will absorb on a wide scale the system developed by experiment institutions and the agro-technical methods already established under the growing economic power(strength) of our country, and will demand new achievements from science in the field of agricultural methods, as well as in improved varieties. Bearing this in mind, the experiment institutions of the south-east should intensify their research, concentrating their attention upon the development of the most pressing, unsolved problems concerning drought.

The Institute of Grain Industry of the South East has during the war years, in spite of many difficulties, not only reduced but on the contrary widened and deepened its scientific research. At present our scientific personnel works with still greater energy on problems designed to lead to new discoveries, in order to advance Soviet agricultural science and aid practical workers in reconstructing the level of south-eastern agriculture as rapidly as possible.

End of article.

3/19/51

Translated in part
by S. N. Monson.

Remote Hybridization of Cultivated Plants,

by Academician N. V. TSITSIN,

director of Zonal Institute of Grain Industry of Non-Black Earth Polt.
(p. 93-110)

In our work on plant selection we are devoting particular attention to problems of distant hybridization. In contrast to other ordinary work, distant hybridization in our particular studies enters new fields, pairs for crossings with cultivated plants being selected from the inexhaustible resources of nature itself, i.e. wild growing flora is being drawn upon for crossings with cultivated plants.

CROSSING OF WHEAT WITH COUCH GRASS (p. 93-99)

We made this decision not by accident.

Wheat has always caused and still causes universal admiration among all peoples of the earth. History tells us that man has worked for four and a half thousand years on this crop. This is a long period of time and it would be appropriate to raise the question whether there is anywhere in the world a variety of wheat, either winter or summer, that may be called ideal, i.e. of a kind that would fully satisfy the demands man expects of this crop?

Our socialist economy has dire need of such a variety of wheat, one that may combine the sum of economically useful characteristics, i.e. would not lodge, provide a good yield, prove adaptable(elastic) to conditions of the external environment, and be resistant to drought, frost, fungus diseases.

Is there anywhere a variety that contains even two thirds of the characteristics

I just enumerated to you?

It is known that man has not yet produced such a variety, and it is natural in speaking of hybridization that we bear in mind the aim we wish to achieve by this most powerful of methods.

Our experience has showed that in crossings a careful selection of the pair is of primary importance in order that a new ideal race of wheat be produced.

While man worked with the same varieties of wheat and engaged in hybridization within the limits of one crop, he was able to pick from one variety its good yield, from the other its high milling and baking qualities, from the third its resistance to unfavorable conditions of development, etc. In this manner satisfactory varieties were created which at present occupy the principal areas of our plantings.

Nevertheless, this represents a complicated method by which an ideal variety of wheat may be produced.

Let us turn to nature. Nature has many plants which astound man by their elasticity, resistance, and many other qualities, totally absent in cultivated plants. All the characteristics available in cultivated plants were produced by man's will. Man wished for the plant to produce what he wanted and cared little about what the plant wished for itself. The result was a cultivated plant created by man, delicate, spoiled by him, placing rather high demands upon external conditions for its growth.

If we take wild growing plants, we note that they had their own evolutionary path. They accumulated themselves for thousands of years characteristics and traits essential to the plant itself, in order that it may better live and propagate.

As a breeder for wheat we decided upon a natural plant, such as couch grass. Agronomic science teaches us how to grow wheat in order to preserve it from drought, frosts, various diseases and agricultural pests, etc. All this teaching is designed to obtain good yields from wheat. Science also teaches us, how and in which manner such plants as couch grass may be controlled, recommending methods of drying, freezing, etc. We know how difficult it is to protect our plantings of wheat from dry winds and frosts, and how difficult it is to destroy couch grass through drying and freezing.

Wheat likes good soil, fertile soils. On poor soils it grows poorly. There are species of couch grass which grow on solonets soils not any poorer than they do on chernozem soils. Another example: there are species and varieties of couch grass which are never attacked by fungi diseases, even if artificially infected, and on the other hand, there are no wheats that are not susceptible to some disease or other.

Let us take other traits, such as yields. If one takes separately a grain of wheat and another of couch grass, there is naturally no comparison between the two. One thousand grains of wheat weigh an average of 30 grams while one thousand grains of couch grass weigh 5 to 6 times less. If one compares however the yield of wheat and that of couch grass obtained from one clump, in number of grain and weight, we note that the role of these plants changes. It is caused by the powerful clump of couch grass and the large number of seeds borne on one stalk.

I shall not cite other comparisons which may prove the many biological advantages possessed by couch grass compared to wheat. The above amply proves that we have actually chosen a peculiar object for hybridization, which radically differs from the cultivated plant we are concerned with on our fields.

In our work on hybridizing wheat with couch grass, we aimed at the following tasks: to create new forms of summer wheat which in their complex of characteristics would approach the ideal to which I have pointed above. To create a form of winter wheat of a type that would resemble couch grass in frost and winter resistance and that, in any event, would be superior to all previously known varieties of winter wheat; to create a new, perennial wheat never yet seen in the world.

Fifteen years have passed since we produced the first hybrid seeds from crossings of wheat with couch grass and one would be justified to ask how these problems were solved?

They were solved in principle. We secured something tangible that may not alone be touched by hand but that may also be observed at experiment stations and seen on collective farm fields.

What were the varieties of hybrids tested on collective farm fields and in which manner do they differ from those of existing wheat varieties?

I shall refer here only to a brief characteristic of several hybrid varieties, such as the summer type hybrid No. 22850.

This variety does not lodge even under preponderantly moist conditions. It does not shatter, has good threshing qualities and its grain has a high albumen and gluten content; while its milling and baking qualities equal those of the best wheats in the world. In addition, this wheat is hardly affected by fungus diseases.

Its yield is fairly high. In 1944 a yield of 54 c/h and in 1945 42 c/h of this wheat was obtained at the collective farm "Red October" of Ruzskii region, Moscow oblast.

Similarly, in another region of Moscow oblast a yield of 30 c/h was gathered from a field of 6 hectares and another farm produced 20 c/h from a 25 hectare plot.

In several regions this wheat produced higher yields than did winter crops.

Thus we have a variety of hybrid summer wheat which possesses characteristics that are interesting and valuable from an economic standpoint.

In 1944 we transferred to the Government Varietal Network a new summer variety FLORA, produced especially for the Non-Black Earth Belt.

We have at present forms of winter wheat that do not freeze under conditions of northern winters and which keep 100 percent from year to year. We recommend the new hybrid variety of winter wheat No. 599 for the Non-Black Earth Belt in place of the old varieties, because the former possesses characteristics which show its exceptional potentialities. It is resistant to a group of diseases, such as smut, leaf and stem rust, does not rot(sweat) or lodge. The technological features of its grain are exceptionally high; the beauty and vigor of the plant caused it to be named "Beauty" by agronomists and farmers. In 1945 the wheat-couch grass hybrid No. 599 produced 60 c/h at a collective farm of the Russk region, Moscow oblast. The vigorous stalk of this hybrid averages from 50 to 100 grains.

At one of the special conferences of the Moscow Grain Institute it was observed that in practice people who have for years been engaged in determining export qualities of grain have seldom come across such remarkable qualities in flour and bread as were obtained from our variety No. 599.

Where did this variety get its multi-graininess and why does each stalk carry so many grains? These characteristics were inherited from couch grass. As established by us, they are transmitted to new hybrids by couch grass. In individual cases we were able to find as many as 90 normal grains in one stalk, an amount never found in an ordinary wheat stalk. And one grain per stalk will average one half centners per hectare of yield. We consequently may not disregard the number of grains in a stalk. I shall not dwell upon the characteristics of other varieties in our collection and shall rather stress the creation of a new crop of perennial wheat.

In 1935 we obtained for the first time a plant which in succeeding years produced 7 to 8 harvests from each stalk over a period of four years. We achieved this by "combined growing," ("kombinirovannoe vyrashchivanie") i.e. in the summer the plants remained in the ground, in the fall they were dug up and brought into nurseries. In the following years, in tests of perennial wheat made directly in the ground, we decided that under Siberian conditions this new form of perennial wheat, No. 34084, will not be of practical use since it had proved non-resistant to cold and frost. From the beginning it regularly froze in Siberia following harvesting.

In 1939 work on this perennial wheat was transferred to Moscow. Under new conditions and after 2 to 3 years of testing it was found that this wheat could be used as an annual but twice-cut crop, i.e. the first harvest produces grain and the second hay. Following the grain harvest the wheat grew well for hay under Moscow conditions but after wintering individual plants were left over.

In 1939 tests of perennial wheat were simultaneously conducted in southern regions of Central Asia where, as is known, the climatic conditions are characterized by short and mild winters. The results of the last years' work showed that under those conditions perennial wheat may produce 2 to 3 and more yields without additional sowing.

On the basis of our tests and those of advanced collective farms it was established that perennial wheat possesses possibilities for producing satisfactory and high yields. The first form of perennial wheat has naturally many shortcomings still. Nevertheless, its production practically solved the problems disputed by the majority of scientists and practical workers concerning the possibility of obtaining perennial wheat. The appearance of this new cultivated plant represents a significant event in Soviet science. What had been considered impossible until now, had taken place, a perennial wheat had been created. Much work is still ahead; we are not stopping at this stage and are persisting in our efforts to create new forms of wheats and to achieve great successes in this direction. The time is not far off when our fields will be covered with the new crop, perennial wheat. One may picture the economic significance offered by perennial wheat once it occupies our principal areas of production. I. V. Michurin wrote in 1934 in one of his letters, when I brought our work on distant hybridization to his attention, that it would "revolutionize agriculture."

CROSSING OF RYE WITH COUCH GRASS (p. 99-101)

In addition to using couch grass for crossings with wheat, we are also using it in crossings with rye. What is our purpose here? I noted already that wheat is the best bread, unsurpassed because its grain contains a special albumen called gluten. Because of the latter, dough prepared from the flour of wheat does not spread but instead keeps any desired form before baking.

Let us take as an example another crop, winter rye. As is known, rye also possesses gluten but in a weaker measure causing the dough not to keep its shape. Other crops, such as millet, oats, peas, corn, etc. do not possess any gluten and their flour may therefore be used only for flat cakes or pancakes.

In studying couch grass and other wild growing grain crops, we established that they almost unvariably had a fairly high content of gluten. The highest gluten content in wheat does not exceed 48 percent, as a rule, in couch grass it is 75 percent. We further learned that the gluten characteristic is hereditary and is transmitted to all hybrid generations in principle. Taking this into consideration, we aimed at creating species or hybrid forms of rye by crossing rye and couch grass. In this manner we planned to produce a strong competitor for winter wheat.

By producing a form of plant possessing entirely new properties we would be able to change all our conceptions concerning the culture of rye. The creation of such form of winter rye would easily solve the problem of winter crops in the east and north of our country.

In the process of our studies, we established some remarkable findings which forced us to give them serious thought. For instance, do all barley and rye-like forms of wild-grown vegetation possess a high content of gluten, that is lacking in cultivated forms of barley and rye? At which stage of his labors did man lose this valuable characteristic? In analyzing this problem, we came upon a most uncomfortable conclusion. It seems that selection had never undertaken to search for the possession of gluten in rye, because, according to established tradition, rye was supposed to lack gluten and was furthermore unable to acquire it.

As to barley, selectors deliberately produced varieties for the beer brewing industry, i.e. varieties having a high content of carbohydrates but not albumen. When we began to examine closer the various specimens of barley and rye, our senior staff member Shibaev soon discovered the presence of gluten in both crops. This discovery is of enormous theoretical and practical significance. It provides selectors with a new guide in their work with barley, rye, as well as other crops, while the possibilities of creating forms of barley of bare seeds and high gluten content open up vast theoretical potentialities before selectors.

In this connection the very meaning of the term "gray breads" will lose its present connotation.

CROSSINGS OF GRAIN SPIKED CROPS WITH ELYMUS p. 101-103

Thirty years ago we became interested in a plant called Elymus. It has many species and we collected some 28 species of these. Among them two species, E. giganteus and E. arenarius commanded our greatest attention and interest.

Elymus is a plant found on all continents of the world. In our country it grows on the Kola peninsula and in the southern latitudes of the Soviet Union. This plant, notwithstanding some of its variants, is interesting in that it serves as a representative of a strictly continental climate.

In 1935, while I was head of the expedition observing Northern Kazakhstan and the south western part of Altai, I discovered places where no plants could seemingly live at all. Nothing but tropical heat, burning sand and air around, but under those conditions grew splendid specimens of Elymus.

Elymus has an enormous stalk which contains up to 1,000 grains. This is a characteristic of fertility which, as we established, is hereditary in hybrid generations. If in our future hybrid plant we could obtain not 1,000 but even 200 to 300 grains, each grain representing 0.5 centners of yield per hectare, as stated above, we could still depend upon obtaining yields of 100-150 c/h. Thus through distant hybridization of cultivated with wild growing plants we could raise incalculably the yield of cereal crops. In addition to this possibility, we clearly visualized our ultimate task, i.e. of securing a form of hybrid produced under conditions of uncultivated, partly desert-zones of the Soviet Union. To solve this problem meant to make use of an enormous area of land, lain waste from century to century and to transform it into flowering cultivated fields, a task exceedingly tempting, upon which we are presently engaged.

What has to-date been produced from the hybridization of Elymus with cultivated plants? In 1942 we obtained seeds for the first time in the history of selection and in 1943 grew our first plants of wheat-Elymus hybrids. Hybrids from crossings of soft wheat with Elymus arenarius were obtained by Professor Pisarev by way of prelimary transplanting of the wheat germ onto the endosperm of Elymus, followed by hybridization between the two. The year 1943 was marked by another development. Our senior Staff member Bakhteev succeeded in obtaining a new hybrid from barley and Elymus giganteus. Another Staff member, Sul'ie, obtained a 3-genera hybrid from a wheat-couch grass hybrid and Elymus giganteus. A triple hybrid was also produced by Prof. Pisarev from a crossing of rye-wheat amphidiploid with Elymus arenarius.

In 1944 our senior Staff member Rogulin obtained a hybrid from the crossing of hard wheat and Elymus arenarius. In the same year another senior staff member Lapchenko secured a hybrid from a crossing of Elymus and couch grass.

Thus our search and persistence in utilizing Elymus for purposes of hybridization with cultivated plants resulted in complete success.

The fact that genuine hybrids were obtained from crossings of Elymus arenarius and Elymus giganteus, on one hand, and wheat, rye and barley on the other, represents a new victory achieved by Soviet scientists in the field of biology.

In addition to hybridization with Elymus, we also engaged in work with other wild growing plants. Our senior Staff member Vinogradova first obtained new hybrids from two wild barleys Gordeum Iodesum and Cretesion ubatum(?) on one hand, and the cultivated barleys of summer and winter types, on the other. In spite of the exceedingly delicate work, since the flowers of the above wildings can hardly be seen by the bare human eye, Vinogradova succeeded in her task through sheer persistence and skill. At present we already have two generations of plants and three of seeds. This will permit the production of early maturing forms of barley and what is more important, of winter forms for the northern zones of the Soviet Union.

Such is the situation which prevails with us at present with regard to hybridization of cultivated and wild growing crops.

CROSSING OF GRASSES WITH WOODY PLANTS p. 103-106

In addition, we also conduct work in other fields on subjects not engaged in abroad. It involves selection for purposes of hybridizing plants differing radically in their manner of living and their evolution.

The number of species of woody plants is constantly growing smaller in the process of evolution. This may be explained, as stated by Professor Palladin, by the considerably reduced capacity of woody genera to absorb carbohydrates and the resulting lack of organic elements, as done by grasses. That this is so is evident from the facts taught by physiology. We should, however, not bypass these facts and are able to interfere with the processes of nature. To change the natural course of evolution from deterioration to enrichment forms one of our coming problems on which selectors will have to work next.

The first timid steps are made in this direction. We propose to establish the affinity between woody plants and grasses and plan to create in this manner an enormous variety of new woody and shrubby forms for both utility and ornamental use.

This work of indirect hybridization has been in process for a number of years; we discovered that it was extremely difficult. Despite enormous failures, we did not discontinue our experiments but decided to make use of the tested Michurin method, that of preliminary vegetative rapprochement. To graft a grass to a woody plant and vice versa proved at first a complicated task. No results were obtained for two years. At present, however, we have developed methods with the use of which grafts produce satisfactory results.

We are at present prepared to demonstrate how grafts of peas, chick peas, lentils, beans, etc. grow, bloom and fruit on yellow and white acacia and willows. Now on a tree-like tomato-cifomandra, ordinary tomatoes, eggplants, beans, peppers, black nightshades, etc., bloom and fruit when grafted to it.

What is the purpose of these graftings?

We know that nutrition is of enormous significance in creating bodies of organisms. The very chemistry of the plant changes radically depending upon the food it is given. To make my illustration simpler and clearer, let me cite an example. If a cow is kept on a pasture growing Artemisium absinthium, its milk will be bitter tasting and smell of absinthium. It follows that depending upon what the animal is fed, will correspondingly transform the chemistry and construction of the body of the organism itself. In grafting peas to yellow acacia we had in mind to provide its cells with those principal chemical elements possessed by acacia, using the latter as the only supplier of nutrition for the pea. We wished to transform the biochemical properties of the flower of the pea, in order that the pollen of the yellow acacia, when placed upon the stigma of the flower of the pea, grafted onto the yellow acacia, would grow and produce a fertilized hybrid seed.

In studying this problem our senior staff member Arnoldi-Poddubnaia established that the pollen of yellow acacia grows very weakly on the stigma of the pea, while the pollen of white acacia grows satisfactorily. The vegetative tube reached the ovule adequately. Considerable attention was in this connection given white acacia in place of yellow acacia. In 1945 the staff of all laboratories of the Institute produced 30,000 crossings of peas with white acacia, which resulted in a yield of close to one hundred seeds. Whether these seeds are genuine hybrids or whether they were produced as a result of natural cross-pollination presents a subject for future studies.

We are in a position to state, however, that the vegetative rapproachement and subsequent crossing of cifomandra with tomatoes produced hybrid fruits.

Upon studying the embriology of crossings of tomatoes with cifomandra it was established that the pollen of the latter grows not only on the stigma of the tomato but that the pollen tubes penetrate into the embryo sac and fertilize it, thereby forming hybrid embryos and endosperms which are, however, considerably retarded in their development, compared to the parent plants. While the embryo and endosperm of a tomato is fully differentiated 58 days following pollination, the germ and endosperm form a totally non-differentiated cell mass in the hybrid tomato obtained from cifomandra. Although the number of cases of formations of hybrid germs and endosperms from crossings of tomatoes onto cifomandra is extremely negligible and the hybrid embryo and endosperm are non-differentiated, the very fact of the existence of such cases indicates that distant crossing of grasses with woody plants may be accomplished on the primary stages of embryonic development.

Since in extremely distant but most interesting crossings we may, in successful cases, obtain very spindly seeds of weakly expressed and non-viable embryos (germs), the problem naturally arose concerning the necessity of dealing with the development of a method for cultivating undeveloped germs in an artificial environment. In order to acquire a method of peculiar training of these embryos in artificial surroundings, we utilized the well developed available method used for cereal plants.

Undeveloped hybrid germs obtained from crossings of hard wheat and soft wheat with Elymus, as well as completely normal and fully differentiated germs of both parents in the above combinations were planted without endosperm onto the nutritional environment Jauma. Under ordinary conditions seeds obtained from the above crossings do not reach the stage of development of normal plants nor do they even germinate. In the artificial environment, however, 35 seeds from among 107 planted hybrid embryos started to germinate, and six of the former reached a mature growth. These six hybrid plants acted well and one of them has at present reached the booting stage.

The method of cultivating undeveloped hybrid embryos in an artificial environment opens wide possibilities for genetic-selection work since it permits in a number of cases to obtain mature plants from these combinations of crossings which under ordinary conditions would not succeed. One could relate much that is of great interest on the subject of distant hybridization; I shall, however, dwell only upon one case.

You may ask me what will this eventually lead to and why should we be preoccupied with this now?

Without going into much detail, I shall tell only in general what we expect to obtain from this work. If we succeed in obtaining even one hybrid grain from a pollinated graft between grasses and woody plants (and if we secure this we shall know how to obtain these hybrid seeds), we shall possess plants which will transform our present conception and knowledge of plants immeasurably. Trees would grow things we were used to see growing on grass and vice versa. It seems to me that the enormous potentialities contained in this field of work are self-evident.

In addition we conduct preliminary surveys on intra-family graftings. We may also report about successes in this direction. We have secured a genuine graft from Gomphocarpus pructicosus, a plant of the family Asclepiadaceae, and the Oleander of the Apocinaceae family. We believe that selection in the non distant future will consist in utilizing for purposes of hybridization plants belonging to different families. The first stage for the accomplishment of this purpose will be work connected with the development of intra-family graftings.

PRACTICAL RESULTS IN SELECTION AND SEED GROWING p. 107

In summarizing the general results of work in selection it is possible to state that during the war years we transferred into the Government Varietal Testing Network the following varieties: of summer wheat - the wheat-couch grass hybrid Flora-5 10H68, 20H68, and the hybrid 48; of winter wheat the wheat couch grass hybrid 509; of cereals the pea Moscow 572 and the pea Nemchinov 1451; of grasses Timofeevka 1480, and of root crops the sugar beet variety Bares and Moscow 1.

Our Institute also engaged in seed growing. The production of elite seeds of cereals, cereal-leguminous crops, grasses and root crops occupied a large place in the work of our Institute.

AGRICULTURAL TECHNIQUES p. 107-108

Here the work of the Institute has not been sufficiently developed. I shall list the most interesting problems being developed in the corresponding fields. Research is conducted on agricultural techniques in connection with new varieties of summer and winter wheats (dates of sowings, norms of sowings and the effects produced by fertilizers).

During the war the application of green fertilizers was studied. It was established that lupine as a green fertilizer is not in any way inferior in efficacy to manure as a fertilizer, if applied directly or in its after-action on the second crop, provided a definite technique is used on heavy soils. Of particular interest is the perennial lupine which is being tested simultaneously and propagated.

Studies of the efficacy of bacterial fertilizers made possible the organization of their production. During the war the output of industrial production of bacterial fertilizers and preparations supplied an area of 875,000 hectares.

Theoretical foundations for additional feedings of agricultural plants were developed. Of particular interest in this connection is the work of Professor Avdonin. The substance of his method consists in the claim that fertilizers, when granulated according to his method at collective farms or industrially can be mixed with seeds and sowed with ordinary non-combined seeders. Field experiments conducted on different soils showed that the introduction of 7 to 10 kg of phosphoric acid of super phosphate in granulated form, among planted rows, ensures a corresponsing increase in yield, equal to 45 to 60 kg of phosphoric acid when introduced by spreading.

The new method of introducing fertilizers increases 4 - 5 times the efficacy of fertilization.

A method was developed of "greening" seed potato after harvesting for purposes of better storing.

I shall not dwell upon the publishing activity of the Institute and its work in lending assistance to collective and state farms and shall mention only that an enormous amount of work was extended in this respect, particularly in the war years.

CONTROL OF AGRICULTURAL PESTS p. 108-110

In conclusion I shall refer to our laboratory of vegetative poisons.

In a brief space of time the laboratory of vegetative poisons performed a vast amount of work of popular economic significance. I shall enumerate their principal activities.

Control of agricultural pests was effected in 30 regions of the Moscow oblast. Over 5,000 hectares of cotton crops at Tadzhik SSR were treated in an experiment with pyrethrum preparations against spider tick.

At the Dagestan A.S.S.R. over 1,500 sheep were saved from mange by the use of pyrethrum. At the Tomilin poultry farm flocks of chickens were treated with the same preparation against different parasites, particularly tick.

At the Luzin hog raising state farm of Omsk oblast 4,000 heads of animals were treated against lice.

Instructions relative to the manufacture of pyrethrum and the agricultural techniques for preparing Dalmatian and Caucasian camomile were developed at the laboratory for the control of parasites of agricultural crops and livestock.

A vast amount of work was performed by the laboratory on anabasine. Thus in the years 1942/43 the laboratory delivered into production a method for preparing in the simplest manner preparations of anabasine, providing directions for their application in controlling agricultural pests, and also developed methods for applying anabasine.

In the period of 1941 to 1945 the laboratory sent out expeditions to different zones of the Soviet Union for the purpose of finding new plants to serve as insecticides. The suburban and half-desert zones of Tadzhikistan, Uzbekistan, Kirghiz, the desert mountainous regions of Kazakhstan, steppe-and forest-steppe zones, as well as the valleys of Siberian rivers, pre-mountain regions of the Ural, and individual regions of Trans-Caucasia and Northern Caucasus were thus explored. The expeditions collected a vast amount of vegetative material which is being tested now.

In the years of the Great Patriotic War we also engaged in considerable research and planned for the introduction into the practice of collective-and state farms new methods to control agricultural pests and external parasites of domestic animals.

As a result of this work we produced for the first time in 1943 a new, highly effective preparation, the so-called woody-tar creolin, developed its formula and technical application. It may be manufactured not only under industrial production but may as easily be produced at any collective and state farm.

What are the properties of wood-tar creolin?

1. Within a short time it completely destroys up to 50 species of agricultural pests which were examined by us. Thus, for instance, the particularly

persistant mange skin tick and its eggs are destroyed within one to two minutes.

2. In contrast to other measures, wood creolin is entirely non-toxic to animals. Of the mass of treated animals not one was poisoned by the application. On the contrary, it was established that it speeds the healing of wounds by stimulating the regenerative processes of the skin.

3. Wood creolin does not burn plants, nor does it injure wool, it is less costly than coal tar creolin, produces an excellent emulsion even on hard waters, etc.

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I shall take this opportunity to state that the staff of our Institute has worked courageously and devotedly throughout the difficult years of our trial, in a manner expected from genuine Soviet people.

This was because our people never lost faith in our final victory. Faith supported us in heavy battles and unlimited laboring, and our people conquered.

End of Chapter.

3/21/51

Translated in part
by S. N. Monson.

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GRASSLAND SYSTEM OF AGRICULTURE IN CHERNOZEM STEPPES OF USSR,

by A. I. Krylov,

director, Institute of Agriculture of Central Chernozem Belt, imeni Professor Dokuchaev. (p. 122-143)

The Bolshevist Party and the Soviet Government aim not only at reconstructing the agriculture of regions liberated from the German invaders, to erase completely the wounds inflicted by war, but wish also to exceed the pre-war level of the productive agricultural capacity of our great country. This historic task may not be solved by an application of separate agricultural measures; what is needed is a system of measures.

It is therefore timely to raise the question of a planned introduction into collective-state farm production of a system of measures known in science as the Dokuchaev-Williams method, i.e. the grass-field system in agriculture.

When I speak of a planned introduction of the Dokuchaev-Williams system, I have in mind, first of all, the enormous expanses of chernozem steppes which represent the granary of our country.

Everyone is familiar with the works of the great authorities in Russian agricultural science, specifically, the classic works of Izmailskii "How Our Steppe Dried Out" and Dokuchaev's "Our Steppes Past and Present." Backed by wide information and deep scientific analysis they proved that because of the destruction of forests and the vigorous grass vegetation covering the virgin steppe, and equally as a result of the uncivilized, wantonly destruction of the steppe in the past, the steppe soil was progressively losing its structure and fertility. Erosion was accelerated and gully and ravine formations increased steadily. The level of ground waters was at the same time sharply and persistently lowered.

In other words, the steppe was drying out and the most urgent problem of steppe agriculture, the supply of water to plants, gradually becoming more critical. Drought and famine knocked more frequently and ominously at the gates of pre-revolutionary Russia, causing enormous destruction in their wake.

I cannot refrain from citing here the tragic words of Izmailskii who, while not fully understanding it, instinctively feared and clearly felt that under conditions of a capitalist regime of economy no planned control of this disastrous national calamity was possible.

"If we, wrote Izamilskii, shall continue to regard carelessly the progressive changes of the surface of our steppes, and along with them the progressive drying-out of steppe waters, there is no doubt that in a relatively short time our steppes will be transformed into unfertile deserts."

Socialist agriculture in the steppe belt is faced with the tremendous task of regulating and firmly administering the water regime of this vast area, in order that once for all and forever one may do away with drought and poor harvests, and create stable improved conditions that would contribute to a continuous increase in yields. Much has already been done in this direction. Government measures on a limited scale have been applied in forests for the purpose of concerving water and preserving zones of rivers. Tree plantings have been introduced, as well proper crop rotations in grass sowings, designed to improve the physical properties of the soil. Deep fallow plowing and snow retention are practiced.

All these and other measures, if applied on high agricultural levels produce positive effects. Drought is no longer a frequent guest with us and if it comes, does not bring such nation-wide calamities as have occurred in the past in pre-revolutionary Russia. Nevertheless, not enough has as yet been accomplished.

In 1937 Williams wrote: "Taking into consideration the entire historical environment, appraising carefully and strictly all available factors connected with the development of soils, agricultural techniques, the development of vegetation and condition of climate in different parts of the USSR, we can no longer doubt that the drying-out process in steppes in the south and the spread of this movement northward is taking place at present."

In our view the time has come to face the problem concerning the final and decisive liquidation of the dreadful processes of unfavorable changes taking place in the steppe, which were fixed 75 years ago. Our socialist structure of agriculture provides the opportunity to solve this problem.

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[Pages 124 - end not translated]

3/22/51

Selemukhin, I. A. (Director of VIZR)
We must rebuild our work. (In Russian)
Zashch. Rast. 1:1-8. 1935 421 P942

43

Translated by S. E. Monson

The decisions of the Council of Peoples Commissars of the Soviet Union (Sovnarkom) concerning the work and plan of activities of the Academy of Agricultural Sciences, imeni Lenina, represent the most important acts determining the direction of the work of all agricultural science.

The severe evaluation of the shortcomings of the work and the concrete tasks placed before agricultural science require that all scientific workers immediately proceed with the reorganization of their work to conform with the decision of the Sovnarkom.

The All-Union Institute of Plant Protection [VIZRa] and its network, which forms a part of the Academy of Agricultural Sciences, imeni Lenina, equally and even to a larger degree suffers from the shortcomings stated in the decisions of the Sovnarkom, with reference to the report of the Academy: VIZRa has not fulfilled the principal tasks which were expected from it by production; the Institute did not proclaim existing shortcomings in the field of Plant Protection; it did not deal adequately with problems of agricultural production; it built its work on the principle of narrow specialization directed to the study of individual pests and diseases and methods of controlling them, instead of placing in the foreground the subject of plant protection in crop rotation; nor did it provide scientific generalizations of the mass experiments made at advanced state farms, MTS [machine tractor stations] and collective farms of VIZR.

VIZRa did not conduct a well defined control against a series of harmful theories in the field of plant protection (theory of biological balance, vitalistic(?) theories, the reduced role of chemistry, agricultural techniques, and aviation in the field of plant protection). Moreover, all attempts to criticize the work of VIZRa were promptly suppressed and stopped in the most unpermissable manner. (See "Zbornik VIZRa, No. 8, 1934, p. 161, concerning ("Harmful Theories and Harmful Criticism").

All this has led to a situation under which the Institute did not provide planned and constant leadership and severed its contacts with production and its "periphery." Production at the Institute itself did not respond in either quality or quantity to the growing demands of agricultural production. The principal course taken by the Institute in the past year was directed towards the study of the biology and ecology of pests and diseases (particularly multi-poisonous), the development of a system of measures intended to control individual multi-poisonous pests and diseases, a broadening of the use of old fungicides, and construction of machinery. The development of the theoretical foundation of the principal divisions in plant protection was accorded inadequate attention. No study was made of the theoretical generalization of their experience and the experience of other scientific-research institutions under VIZRa.

The working plans of the Institute and those of its network were not correlated nor directed upon solving the principal tasks presented by plant protection; the subject matter of the Institute in its content did not match the subject matter of the branch institutes; work of individual laboratories and sectors of the Institute remained un-correlated; the link between the work of experimental laboratories and field research was not preserved.

Experimental tests on phytopathology, methods of research, immunity, plant pathology, the study of biocoenosis (plant assn.), the establishment of biological races of rust and smut were all insufficiently conducted.

Along with the lack of a clear aim and unity with regard to subject matter, the set-up of the Institute did not provide for a normal organization of the work, since up to recently VIZRa had acted as a mechanical union of diverse institutions, which previously had formed a part of VIZRa, such as: the department of entomology GIOA, the phyto-laboratory of Iachevskii, the sector of mechanization of UNIZRa, the Administration of Record Services OBV. These departments still act independently, are located in separate quarters, have a separate administrative-economic staff, their own budget, and are not connected among themselves by either work or subject matter.

This circumstance demands a radical revision on the part of the Institute, first of all, in the direction of a genuine intensification and development of theoretical divisions covering plant protection in its entirety. Among the fundamental problems in the field of plant protection are: regionalization of the Soviet Union from the ecological standpoint with regard to pests and diseases to provide a basis for the planning and organization of operative work; studies of regularity in the development of masses of pests and diseases, the making of long and short term prognoses, engage in studies pertaining to the activities of insecto-fungicides upon insects, fungus and plants and the basis of their resistance to poisons; (this in order not to act blindly when searching for new poisons); the increase of the efficacy and improvement of techniques of applying fungicides with the view of reducing their expenditure; technical and economic evaluation and the establishment of types of machinery for use in various branches of agriculture. The study of virus and bacterial diseases and non-parasitic diseases of plants should be undertaken immediately; along with the study of races of smut and rust; as should the influence of high frequency current upon insects, fungus and bacteria; the application of fungus and bacteria in controlling harmful insects, etc. The development of methods of research to ensure proper maintenance of work at VIZRa itself, as well as at other research institutions on plant protection should be given considerably more attention than heretofore.

Statements concerning the strengthening of theoretical divisions dealing with plant protection should under no circumstances be treated as before when VIZRa was engaged in developing abstract theoretical problems, detached from concrete agricultural tasks of production. On the contrary, the development of all theoretical problems should be based on concrete practical problems. So long as the development of a system of measures designed to control INDIVIDUAL pests and INDIVIDUAL diseases does not ensure the protection of the culture as a whole, the Institute SHOULD DIRECT ITS ACTIVITY TO PROVIDING BASES AND DEVELOPING SYSTEMS OF MEASURES FOR THE PROTECTION OF CROPS IN ROTATION.

This work should proceed in full accord with branch institutes and the lower network stations of the Institute.

The role and significance of laboratory experimental research at scientific-research institutions of plant protection should be raised, while the work of laboratories should be correlated with production branch sectors of VIZRa, branch institutes, and the network of stations of plant protection. The gap existing between laboratories and production sectors, on one hand, and among individual laboratories, on the other, should be immediately liquidated.

The entire work of VIZRa and its network requires systematic and direct coordination with state and collective farms, MTS and cottage-laboratories.

Working programs of the Institute should include problems of experimental studies made at advanced state and collective farms in the field of plant protection and of tests performed at the farms themselves, based on methods developed by the Institute. The Institute should maintain its own group of MTS and state farms upon which it could depend in developing methods and solve practical problems with regard to protecting yields.

The Institute should be required to provide systematic scientific leadership and scientific control over the work performance of its periphery. In addition, it should extend methodical assistance to specialized institutions, particularly those which are not yet sufficiently strong ("okrepli").

Particular attention should be devoted to the improvement of the personnel of scientific-research institutions of plant protection from the standpoint of social composition ("sostav"), as well as scientific qualification, so long as there exists within some units considerable contamination by socially-alien elements, in addition to low qualifications among groups of workers; at the same time full assistance should be extended to old Staff Members (cadres) who devotedly and honestly lend their knowledge for the benefit of socialist construction. It is also essential to accelerate the training and advancement of young personnel, whose work until now has been progressing unsatisfactorily.

The publication division of the Institute should undergo radical transformation. In the past years all publication has been practically abolished and the exchange of experiences between institutions has almost entirely fallen off. It is important to create a situation under which all scientific papers are published no later than 5 to 6 months after the work is put in shape.

The most serious attention should be accorded to the quality of production at research institutions, particularly from the point of ideological consistency. Nothing is being done in this direction and a considerable part of the literature on plant protection is very inadequate in quality. The Institute should organize a careful review of literature on plant protection and introduce a proper procedure for reviewing it.

Scientific criticism and self-criticism in all fields of scientific-research and an increase in literary output on subjects of plant protection should be encouraged, with particular emphasis on work and production at VIZRa, since it, as the main Institute, should serve as an example to other scientific research institutes of plant protection. Such disgraceful methods as the suppression of self-criticism, as was tolerated by the editors of Zbornik VIZRa with regard to comrades Dereviančhenko and Ivanova in their article "Harmful Theories and Harmful Criticism," should be decisively condemned and no longer permitted to take place.

The Central Committee of the Party and the Sovnarkom of the Union devote enormous attention to problems of agricultural science. This places the obligation upon the personnel engaged in plant protection to review fundamentally the trend and content of their work, with the view of effecting the maximal rise in its theoretical level, develop an approach and understanding of the interests and demands placed by agricultural production, and thus reconstruct their entire work, so that "theoretical work may not only catch up with practical work but be ahead of it, and our practitioners may be armed for their struggle to achieve socialist victory." (Stalin's speech at the Conference of Agronomists-Marxists, Dec. 27, 1929, publ. in "Problems of Leninism," p. 299.)

End of Article.

3/22/51

Mosolov, V.P. Brief summaries of the work of the scientific research institutes of the Vsesoiuznaia Akademiia Sel'skokhoziaistvennykh Nauk [All-Union Academy of Agricultural Science] im. V.I.Lenina. Vsesoiuzn. Akad. Sel'skokh. Nauk im. V.I.Lenina. Dok. 1947(11):3-12. 1947. 20 Akl

Translated in part by S. N. Monson

On June 25, 1929, the Council of Peoples Commissars of the USSR issued a decree creating the All-Union Academy of Agricultural Sciences, named after the great teacher and leader of peoples, Vladimir Il'ich Lenin, who had originally planned its establishment. The Academy and its institutes participate most actively in the development of large scope projects introduced by Ministries of the Union and Republics. Soviet advanced science does not "set itself apart from the people, does not shy away from them, but is prepared to render service willingly and provide our people with the accomplishments of science without compulsion" (Stalin). By working in close cooperation with production and listening to the voice of experience, USSR agricultural science has advanced in giant strides.

In this brief article, there is naturally no opportunity to dwell upon the manifold labors of active members of the Academy, the size of the article necessarily limiting the scope of our description; we shall, therefore, touch only briefly upon the work of various institutes of the Academy.

CENTRAL GENETIC LABORATORY IMENI I. V. MICHURINA. (p. 3-4)

In 1918 Lenin signed the decree providing government support for the nursery and gardens of the great transformer of nature, I. V. Michurin, who laid the foundation of the daring work on inter-species and inter-generic hybridization. The method of selecting pairs of plant - breeders, geographically distant from each other, was discovered by Michurin and accepted as a foundation for creating new improved varieties; the method proved exceptionally valuable and simple and brought astounding results.

It is almost impossible to evaluate the heritage left by Michurin, so great and manifold were his accomplishments throughout his long and fruitful life. The Central Genetic Laboratory, imeni Michurina, continues his work of developing fruit and berry plants. Since Michurin's death, 384 new varieties were produced by using his methods: 227 apple varieties, 11 pear, 6 apricots, 24 cherries, 3 chereshnia (Prunus pumila), 12 grape varieties, etc. Many of these were introduced as standard varieties.

The Laboratory has grown and transmitted to collective and state farms and experimental institutions hundreds of thousands of seedlings of seed and kernal species of berry and ornamental plants, cuttings of fruit plants and grape stalks. (374,000 pieces) etc. The Laboratory has developed a method permitting the introduction of grape stalks in regions of the central belt by hybridizing southern varieties of grapes with the Michurin frost-resistant varieties or Amur-and American species. Distant hybrids were obtained from crossings between apples and pears, the American sand cherry (Prunus pumila) and apricot, the American sand cherry (P. pumila) and "felt" cherry, the wild plum tree (Prunus spinosal.) and peach, plums and peaches, currants and gooseberries, strawberries (Fragaria vesca L) and F. moschata Duch., etc.

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THE ALL - UNION SELECTION GENETIC INSTITUTE OF THE ORDER OF THE RED BANNER OF LABOR. (p. 4-5)

The theory of stage development proposed by T. D. Lysenko was accepted as the basis for a large part of work at the institute in the field of selection and seed growing. By influencing factors of the external environment (temperature, light) upon the growth of seeds, Lysenko succeeded in transforming winter varieties into summer varieties, late varieties into earlies. Experiments conducted on a vast world assortment of grain and other crops showed that his method of vernalization offered enormous opportunities to Russian selectors. Many varieties and crops can be transported from southern into northern regions, and from west to east. Vernalization causes plants to develop early, to escape drought and thus to increase yields. Lysenko enriched Soviet selection by such new methods as intra-varietal crossings of self-pollinating plants, the inter-varietal crossing during free fertilization, etc.

In his work "About Heredity and its Adaptations," Lysenko further developed Michurin's theories concerning heredity.

The Institute has under the leadership of T. D. Lysenko established new methods of selection for field crops which permit the production of varieties according to plan and in short periods. The theory of selecting parental pairs on the basis of biological analysis is among them. It led to the production of new varieties of summer wheat in a short space of time. Among these are Lutescens 1163, the early maturing variety Odessa 13 of high yield and resistant to the Hessen fly; the early barley, Odessa 14, and the cotton variety Odessa 1. The Institute has also produced new varieties of winter wheat: Odessa 3 and Odessa 12, which exceed the variety Ukrainka in yield and frost resistance; the high yield summer barley Odessa 9; the variety sesame (Sesamum indicum?) 539; the variety Ricinus communis (Euphorbiaceae) 273, and the tomato varieties Nos. 19 and 71.

The study of "directed" transformation of the heredity of plants by training and vegetative hybridization occupied an important place in the work of the Institute. The Institute proved that in training plants at a definite stage of their development it is possible to transform their nature by planning for specific environmental conditions.

Of significance is the increase in the yield of corn, sunflower seeds, rye, buckwheat, and other agricultural crops derived from the discovery of A. S. Musiiko who proposed and developed a special method of artificial supplemental pollination of these crops.

Of enormous importance is Lysenko's method of summer planting of potatoes. Southern regions have for the first time in their history been given the opportunity of growing their own good, undegenerated seed material of high yield for spring, and summer plantings of the following year.

During the war years Lysenko, realizing the shortage or almost total lack of seed potatoes in many oblasts, proposed to increase the available supplies of seed stock by planting cut tops of potato tubers. This method was applied at collective and state farms and produced hundreds of thousands of tons of additional potatoes during years of drastic shortages in production throughout the country.

SIBERIAN INSTITUTE OF GRAIN INDUSTRY OF THE ORDER OF THE RED BANNER OF LABOR. (p. 5)

This Institute was transferred under the administration of the All-Union Academy of Agricultural Sciences, imeni Lenina, by government decree of 1944, which stated: "To aid the scientific-research work of the Academician T. D. Lysenko on Problems of Winter Crops in Siberia."

The five-year experience of the Siberian Scientific-Research Institute of Grain Industry indicates that winter wheat planted according to Lysenko's method, by using disk tractor sowing machines on stubble on dozens of hextares resulted in a successful wintering of the crop and high yields, which in some years amounted to 27 to 31 c/h. All varieties of the World Collection (over 100 numbers) wintered satisfactorily without marked distinction between varieties, among them the summer wheat Milturum 0321. The Institute engages in important selection of summer wheat, grain and legume crops, potatoes, grasses and oil crops. It produced the summer varieties of wheat Ferrugineum 025843, Cesium 95/14530, Milturum 290/22821, (resistant against lodging and rust) the barley varieties 013709 and Abrek; the millet Stakhanovskii 0896, Komsomolskii 0996, and Omsk 09; the early pea variety Poliarny (Vulgatum 032); and "Shtambovy konservny" (canning). The potato varieties Seedling 36/15 and Sibiriak were produced, the latter exceeding Lorkh in yield. Among perennial grasses the Institute produced Lucerne yellow hybrid #0747, Lucerne variegated hybrid 1661/203; Agropyrum, Sibirskii 4235; American couch grass #PS-117, etc. Many of the varieties selected by the Institute were regionalized.

ALL-UNION INSTITUTE OF PLANT INDUSTRY. (p. 5-6)

The Institute began its work in 1924, on a very modest scale. At the time of this writing, every corner of the Soviet Union has benefitted from its work. The Institute has since its inception collected over 160,000 plant specimens from different parts of the world. On the basis of these collections and the establishment of methods of selection and seed growing the personnel of the Institute has selected and produced 498 varieties of different crops, 247 varieties of which were regionalized and introduced as standard varieties in many republics and oblasts of the Soviet Union.

The Institute is engaged in studying possibilities for providing the Soviet Union with potato varieties of high yield and resistant to canker and phytophthora. Eight canker-resistant and other valuable potato varieties produced by the

Institute are in production at present.

The Institute has enriched the vegetable, fruit and berry industries of the Soviet Union with new valuable varieties suitable for northern cultivation primarily and with varieties adapted for the canning industry.

The Institute of Plant Industry, itself, produced valuable varieties of flax-"dolgunets" (DS-30 and DS-33), oil flax (VIR-1647, 1650, and 1656), which already before the war occupied areas of many tens of thousands of hectares, as well as varieties of arachis and Sesame.

The Institute under the leadership of the active Academy member I. G. Eikhfeld developed basic agricultural directions for pre-polar conditions. It selected and produced for this zone special varieties of oats, potatoes, carrots and cabbage. These varieties aided the successful northward movement of agriculture. The Institute also developed agricultural methods for the steppe zone of Western Kazakhstan, for arid soils, irrigation, as well as a special method of trench (ditch) agriculture. The latter permits the raising of crops by utilizing ground water found at low depths in sandy deserts. The Institute developed the method of sowing corn in furrows, which provides a considerable increase in yield.

The Institute has conducted wide-scale tests of plants to determine the content of vitamins A, B2 and C, and worked out new simplified chemical methods to determine contents of vitamins.

GOVERNMENT NIKITSKII BOTANICAL GARDEN, IMENI MOLOTOVA. (p. 6)

This Botanical Garden engages in both scientific and practical work by introducing southern crops into ornamental horticulture, southern pomology, and the canning, perfumery and pharmaceutical industries.

The Garden introduced for the above purpose 300 new species of woody plants, produced 225 hybrid seedlings of Viburnum Philadelphus, etc.; produced 145 species of varieties of flowers and 130 varieties of roses. In the field of pomology, 50 varieties of kernel plants were selected for canning and table use. Varietal tests were made on these in nurseries occupying an area of 400 hectares. The Michurin methods have aided the production of 3,000 new hybrid forms of peaches, apricots, plums, Prunus pumila ("chereshnia") and intra-species hybrids. Hundreds of thousands of cuttings and seedlings, and thousands of kilograms of different seeds have been distributed among experimental stations and industrial nurseries. The Garden produced 6 varieties of almond plants, 5 varieties of olives, 8 varieties of fig trees. Experimental institutions in Central Asia and Trans-Caucasia received 320,000 hybrid seedlings of fig trees, and seeds of olives and almonds.

A series of oil crops were transferred to the perfumery and pharmaceutical industries. Over one and a half millions of seedlings and cuttings of these crops went into production.

THE ALL-UNION SCIENTIFIC-RESEARCH INSTITUTE OF FERTILIZERS, AGRICULTURAL PRACTICES, AND AGRICULTURAL SOIL STUDY. (p. 6 and 7 omitted.)

THE ALL-UNION INSTITUTE OF AGRICULTURAL MICROBIOLOGY. (p. 7 and 8, omitted.)

THE PHYSIO-AGRONOMIC INSTITUTE (p. 8 omitted).

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THE ALL-UNION INSTITUTE OF PLANT PROTECTION (p. 8 to 9).

Considerable attention is devoted by this Institute to the determination of danger zones infested by pests and infected by common diseases of agricultural crops, to the study of causes of mass appearances and propagation of the latter, and the development of methods of prognosis on the propagation of pests and diseases of agricultural crops. The Institute studies and bio-ecology of basic parasites and diseases of agricultural crops and develops methods for controlling such pests like the corn moth(?), meadow moth(?), the beet curculionidae, locust, mice-like rodents, parasites injuring stored supplies and pests, and diseases of tree shelter belts, smut diseases of grain crops, snow mold, "pupation"(?) of oats, etc.

The Institute worked out a serological method for the quick diagnosis of plant resistance to diseases, which literally reduces the time of producing new varieties resistant to diseases.

The Institute conducts considerable research on improving new infecticides for controlling parasites and diseases of agricultural crops and developing entirely new methods for their application. A practical result of these accomplishments has been the wide application of fluoro-containing insecticides in the Soviet Union (sodium fluoride and sodium silicon fluoride). The introduction of these preparations into production has in large measure contributed to the substitution for the lack in arsenic preparations. The Institute developed pyrethrum preparations; introduced mineral-oil emulsions for practical use in controlling pests of fruit crops; it proposed a method of applying insecticides of increased concentration which represents a saving in the use of poisons.

A method of applying hydrogen sulfide to control storage pests was developed. In the past years a large amount of work has been devoted to tests and the introduction of the preparation DDT (dichlorophenyl trichlorothene). At present studies on a large scale are conducted on potential preparations for the control of an entire group of agricultural pests, specifically such soil pests as wire-worms.

The Institute has developed a method of applying aphicide ("aphelinus"(?)) to control blood aphids, the application of "cryptolenus"(?) for the control of scale insects (Coccidae); it conducts a vast study of entomophaga (Insect eaters) to be used against harmful insects affecting citrus crops.

The Institute has itself constructed and delivered for mass production over twenty machines intended to mechanize methods of controlling insects and diseases of agricultural crops.

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INSTITUTE OF HYBRIDIZATION AND ACCLIMITIZATION OF DOMESTIC ANIMALS, IMENI M. F. IVANOVA (ASKANIA NOVA) (p. 9 omitted).

ALL-UNION INSTITUTE OF MECHANIZATION AND ELECTRIFICATION OF AGRICULTURE. (p. 10). (omitted)

ALL-UNION SCIENTIFIC-RESEARCH INSTITUTE OF HYDRO-TECHNIQUES AND MELIORATION. (p. 10-12 omitted)

End of Article.

3/9/51

B. A. Gerasimov, and P. V. Zaring, joint authors.)
Posobie po bor'be s vrediteliami i bolezniami sel'skokhoziaistvennykh kul'tur
A guide to the control of pests and diseases of agricultural plants.
Moskva, 1948, Ed. 5, 496 p., 464.4 C472

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Briantsev, B.A, and Dobrozrakova, T.L,
"Prot. Pl. from pests & Dis," Ed.2, Moscow 1946
550 Pr. - 464.4 B76

Translated in part
by S. N. Monson

PLANT QUARANTINE IN THE U.S.S.R. p. 160-162

The history of world economy knows many examples when newly introduced disease or parasite have completely destroyed harvests. Thus phytophthora of potatoes has caused enormous damage in the early part of the last century when it first appeared on the European Continent.

Phylloxera of grapes, introduced in Europe with the American vine, destroyed in France over 2 million hectares of vineyards.

The most dangerous pests and diseases of foreign origin affecting a variety of crops are: downy mildew, oidium and phylloxera of grape, American floury dew of gooseberry, phytophthora of potatoes, blood aphid of apple trees, etc.

All these diseases and pests were brought into European countries from America in the past century. They became widespread here, causing enormous damage and at present constitute a constant threat to agricultural crops.

Some diseases have appeared only recently, in the past 10 to 15 years.

Among these are the bacterial canker and brown spot of tomatoes, potato canker, etc. These have to date only a limited area of distribution. Some quarantine objects present now, however, a real threat if introduced into the USSR. Among the most dangerous quarantined pests and diseases are: pink worm, the Colorado beetle, potato canker, "pasmo" of flax, anthracnose cotton ball rot, etc.

The Government Quarantine Service, organized in 1934, has the task of introducing quarantine measures in the USSR under the system of the Ministry of Agriculture of the USSR. The primary duties of this organization are: the establishment (determination) of quarantine objects and regions of their possible distribution, the issuance of special regulations, rules and instructions concerning quarantine. The system of quarantine measures includes measures of three categories:

1. Prophylactic measures, directed for the preservation (protection) of territories from the penetration of quarantine objects. Control and testing of the freight material originating from infected countries or regions, and in cases of their entry their extermination. Systematic examination of crops for purposes of controlling their condition; the introduction of resistant varieties in border zones among the different crops.

2. Radical measures of control for the purpose of liquidating focuses of infection. With the aid of these measures complete cleaning of territories from quarantined pests and diseases are effected. During the liquidation of focuses pests and vegetative parasites are destroyed, as well as infected plants whenever needed.

3. Measures to limit further distribution of quarantined objects. In this case medical and prophylactic measures are conducted along with methods of destruction.

The execution of the system of quarantine measures on location is placed upon quarantine inspectors.

End of Article.

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Arnautov, V., and Novikov, F. Research on potatoes carried on at the Nauchno-Issledovatel'skii Institut Kartofel'nogo Khoziaistva (Scientific Research Institute of the Potato Industry) Kolkhoznoye Proizvodstvo 6(4): 42-45 April 1946.

[V. Arnautov is laureate of the Stalin premium, director of the Institute of Potato Industry. F. Novikov is acting director of the Institute's scientific department.]

Translated from the Russian by
S. N. Monson

The Scientific Research Insitute of Potato Industry is located at the village of Korenevo of the Ukhtomski region, Moscow oblast. It was organized 15 years ago at the station of one of our oldest selection institutes, the Korenev Potato Experiment Station.

The Institute faced the following important problems: the production of new varieties of potatoes; the working out of agro-technical methods for obtaining high and resistant yields, the control of diseases which affect potatoes in the fields and in storage; the construction and testingof new equipment, etc. In solving these problems in the years prior to the war, the Institute accomplished certain aims. The results were demonstrated at the All-Union Agricultural Exhibition.

We are referring in this article to some of the most important tasks recently accomplished by the scientific personnel of the Institute.

In spite of the fact that during the war years selection work was much curtailed, such varieties of potatoes as Nos. 18883, 2086, and 12994 were produced in that time. These varieties have already been delivered to government varietal experiment stations and will be regionalized according to oblasts in the near future. The two first varieties - 18883 and 2086 - are rapid ripening, comparatively resistant to phytophthora, and of higher yield than Epicure and Early Rose, and in several regions they surpass in yield even the standard variety Lorch. The variety 12994, of good yild, high starch content, late ripening is distinguished by an exceptionally high resistance to phytophthora. In addition, two American varieties Varba and Chippeva, early ripening and of good yield, as well as the variety Fruhboat, the latter also distinguished by a resistance to canker, were segregated in the past years, tested and passed on to the varietal experiment network. All these new varieties were propagated on the fields of the Institute and sent out into the different oblasts of the Union. The variety 2086 produced under "productive conditions" 34 tons per hectare, the variety 3398 - 26 tons, while the variety 18883 was among those taking first place at many experimental points in 1945.

Considerable work has been recently done with potato seedlings (senior staff member A. Filippov). Many numbers of seedlings of the first year were kept for further propagation. Among the seedlings of the second year 20 numbers were selected showing resistance to phytophthora and a 14-16 percent higher yield than Lorch. Selected were also 12 numbers of seedlings containing 21.1 to 23.3 percent of starch and producing almost twice as high a yield as the variety Lorch.

Selection work at the Institute is conducted according to Michurin's principles. Parent pairs are prepared for crossing, young seedlings are germinated under conditions that aid the formation of their high yields. Inter-species hybridization is widely used for crossing in connection with the potato wildings "acaule" and "semidemissum". The latter possess a high resistance to frost and phytophthora. Our experi·ent institutions were formerly unable to utilize these wild potato species in selection because of the difficulty they exhibited in crossing with cultivated varieties. On the fields of the Institute elite seeds of the principal potato varieties are grown yearly. In 1945 the Institute transferred to collective farms 150 tons of high quality elites of different varieties of potatoes. The ("collective") staff of the Institute worked out a series of new agro-technical methods. Let us mention the simplified method of vernalizing potatoes (staff member A. Ruchkina). It is known that pre-seeding germination - the vernalization of potatoes - represents the most important method of obtaining early potato crops in suburban regions. It is also known that it constitutes an active method for increasing the yield of all medium to late potato varieties, as well as of early varieties which are produced in the northern, north-eastern and southern regions. The vernalization of potatoes has been insufficiently inculcated into agricultural practice particularly because that it required heated and light quarters wherein potato plants may germinate prior to planting within 40 to 45 days.

The Institute recommended that potatoes be germinated in open trenches in the second half of April when the temperature of the air is favorable as a rule. At night and during frosts the potatoes are covered with straw or mats. There is an adequate amount of outdoor heat to warm the tubers during the day. They grow under these conditions for 20 days, forming strong green sprouts. Tubers may be placed into trenches in three layers.

In vernalizing potatoes by this new method we acquired a considerably increased tuber formation and a certain increase in yield of the early ripening variety Epioure. Last year in evaluating this vernalization method it was established that this simplified method accelerated tuber formation almost as much as in the case of germinating potatoes in a heated place, and that, in addition produced a considerable increase in yield, as compared with tubers vernalized for 45 days. The new method requires less labor, no special quarters and no fuel expense. The control of this method in 1944-45 performed on the var. Lorch at experiment stations and at collective farms of the Moscow oblast produced excellent results. The Institute recommended therefore that collective farms widely apply the simplified methods of potato vernalization in the current year.

In studying methods for obtaining high and resistant yields it was established that whenever methods for germinating potatoes were applied jointly, as a whole, (in "complex") their positive influence was correspondingly increased.

Thus according to data derived from many years of experimention and performed at the Institute the improved seed material (50-60 gram tubers) produced a yield 7 c/h over that of the sowing with 30-40 gram tubers. As a result of improved care (second repeated harrowing and additional cultivating between rows) an increase of 23 centners was obtained. It would soils as well. The average yield of the early variety Epron, grown on peaty soil without fertilization, produced 98.5 centners and when 40 tons of manure were used - 280.6 centners. When mineral fertilizers were added to manure, especially ashes or potassium, the result was 361.8 centners.

The tuber yield taken for seed from the harvest of a non-fertilized peaty plot represented 210.3 centners and when well fertilized, from the same plot, 41.2 centners more. Seed tubers taken for planting from a sandy, non-fertilized soil produced 204.6 centners per hectare and from a fertilized plot - 251.6 centners. In 1944 tubers from a non-fertilized but irrigated plot produced 208.6 centners per hectare, from an irrigated and fertilized plot - 316.5 centners. In this experiment tubers of identical size were compared. All these experiments clearly point to the fact that a good seed potato is one grown in conditions adequately supplied with nutritional elements. Seed plots should therefore be given 30 to 40 tons of manure per hectare, preferably together with mineral fertilizers.

Beginning 1941 the possibilities of utilizing the tops of potato tubers for seed purposes were studied at the Institute. The experiments were conducted on our own fields as well as at collective farms of the different oblasts. One may positively state today that the tops of large, healthy tubers produce yields equalling those of customarily used seed material.

Experiments of the past years indicate that one may expect the tops of tubers to yield as much as entire, large tubers.

A study of the problem of storing tuber tops revealed that the principal cause of losses was interference with the temperature "regime" in storage. The tops have to be in quarters maintaining a temperature of from 2-5 degrees of heat.

The Institute's staff member D. Zhukovsky worked out a simple method of drying potatoes which received a wide application at many collective farms.

The department of mechanization recently constructed and tested the potato sowing machine UKK S-1. This equipment is already produced on a mass scale. It provides a saving in labor of from 3-3.5 in sowing potatoes. The technical staff members engaged in constructing machinery, A. Chirkunov and D. Glukhikh are now completing the construction of a potato harvesting combine which entirely mechanizes harvesting.

At scientific departments and laboratories of the Institute, as well as on experimental fields a series of theoretical problems are being studied designed to improve methods of selection, seed-growing and agricultural technique.

The personnel of the department of economics is engaged in the study of problems connected with the distribution of the production of potatoes throughout the Union.

The staff of the Institute provides direct scientific assistance to collective farms. Its members frequently call at local territorial and oblast agricultural units. The Institute also carries on a vast training program for new cadres of potato growers.

It inculcates new potential potato varieties. Hundreds of parcels of valuable seed material are yearly forwarded by the Institute to scientific institutions and collective farms.

End of Article

1/8/51

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Gern, A. P. Twenty-five years of work with the potato crop. Sad i Ogorod 1948 (9): 10-11. Sept. 1948. 80 SA13

R-38

Translated from the Russian by S. N. Monson

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Twenty-five years have passed since work on potatoes was begun at the Petrovsky Selection Station. Varietal experimenting and seed growing were organized first. As a result, the potato varieties - Early Rose, Snezhinka, Smyslovsky, Lorch, and Woltman were regionalized in the Penza oblast. But while 25 years ago a similar regionalization was considered proper, it has become obsolete today. Only Lorch of all regionalized varieties continues to have an ever wider distribution, excluding all other varieties. The rest of the varieties represent only a useless ballast to be disposed of as quickly as possible.

In 1928 the Experiment Station transmitted to the fields of state and collective farms of the oblast over 25 thousand centners of varietal potatoes. Between 1930 and 1940 the Station yearly delivered an amount of 1,677 centners of varietal potatoes. Beginning 1942 it has delivered a yearly average of 921 centners of elite potatoes, primarily the varieties Lorch and Oktiabrenok. Aside from the Penza oblast, the Petrovsky Station supplies Kazakhstan and the Kuibishev, Moscow, Tula, Rostov, Saratov, Astrakhan and Orlov oblasts.

Selection work on potatoes was begun in 1929 when the first selection of seedlings was made. During these first selections Petrovsky Jubilee, an early and large tuber variety was segregated prior to the war. This variety was regionalized in 1943 at eight oblasts, the South-East territories and the Northern Caucasus. Seed growing of this variety was, nevertheless, never organized in any of these areas and consequently it did not gain wide distribution. The most significant achievement performed at the Station was the production of the variety Oktiabrenok. This is a medium ripening variety, of high starch content, intended for technical purposes, resistant to canker, and considered to have potentialities for the Moscow, Orlov, Briansk, Smolensk, Kalinin, Tula, Penza, Voronezh, Tambov and Saratov oblasts and two autonomous republics, the Bashkir and Chuvash SSR.

Seed growing of the variety Oktiabrenok is primarily conducted at the Petrovsky Station.

During the war years the Petrovsky Selection Station produced a series of new varieties which were propagated and in 1947 transferred for productive testing.

Among the new varieties is the Hybrid-42, a table variety of medium ripening. This variety has white, large tubers. It's tasting qualities are higher than those of the variety Lorch; it has good cooking qualities. According to preliminary investigation the variety proved also resistant to canker. In the Petrovsky Station region the Hybrid-42 proved equally resistant to phytophthora.

The Hybrid-42 surpasses Early Rose in speed of ripening and commercial value. According to information secured from the Station's experiments, its yield over a period of 4 years averaged the amount of 161.2

centners per hectare, which represents 92 percent of the standard variety Lorch. In tests made at the Moscow oblast and the Lithuanian SSR, the Hybrid-42 showed excellent results. In regional testings the yield of the Hybrid-42 varied between 85-95 percent, as compared with the standard variety Lorch.

Of much interest is the new technical variety Promyshlennost, intended by the Station to replace the variety Woltman. The variety Promyshlennost is not inferior to the variety Lordh and frequently surpasses it.

In starch content Promyshlennost usually surpasses that of Lorch by 7 centners per hectare. In varietal testings performed at the Penza oblast, Promyshlennost produced a yield of 291.7 centners per hectare, in starch content - 67.5 c/h; while Woltman produced 206 c/h of tubers and had a starch content of 45.4 c/h at harvesting; the Ost-Poat produced 254. c/h of tubers, starch - 52.4 c/h, thus the var. Promyshlennost produces from 15-22 c/h in starch more than do the rest of the technical varieties.

The third variety worth mentioning is the Leningradsky, a variety of medium ripening, high starch content, of good tasting quality. It is of slightly later ripening than Early Rose but has a considerably higher yield.

According to experimental data provided by the Station, covering a period of 4 years, Leningradsky averaged a yield of 88 percent, the var.

Epron produced 82 percent of that of the Lorch var. The starch content of Leningradsky averages 21 percent, that of Lorch - 19 percent. In tests performed in the Kalinin, Orlov and Tambov oblasts and in the Lithuanian SSR, the variety Leningradsky surpassed Lorch in yield.

The Petrovsky Experiment Station determined the most favorable periods for the vernalization and planting of potatoes.

Under Penza oblast conditions best results were obtained from early planting, on the third to fifth day after sowing of early summer crops (during the first ten days in May). If plantings were retarded the result was a loss in yield; thus if planted in June the yield was 30-40 percent lower than that obtained from a May planting.

The danger of late spring frosts is greatly exaggerated; in ten years of experimenting late spring frosts reduced the yield of early plantings only in the case of one year and even then the yield was still higher than that of late plantings.

In the Penza oblast where early fall frosts occur, the planting with germinated (?) ("prorashchennye") tubers always increases a yield. Especially large gains are obtained from the planting of vernalized potatoes in drought years. The vernalization of potatoes should therefore be evaluated here as a method of obtaining not only an early but also a much larger potato yield.

Summer plantings of potatoes are recommended by the Station for seed plots at State and collective farms of the oblast. The most favorable periods for summer planting are from June 15 to July 5. The yield from summer plaintings is on an average somewhat lower than that of spring sowed potatoes, but in years of late spring frosts the yield from summer plantings is higher than that of spring plantings.

The planting of seed potato of summer reproduction is accompanied by considerable additional yields as compared to the plantings of tubers of spring reproduction.

In the complex of methods essential in summer plantings of potatoes the guiding link is cultivation. Plots assigned to summer plantings of potatoes have to be cultivated as is black fallow.

End of Article

Petrovskaya Selection Station
Penza oblast

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Iashchuk, A. P. In Kolkhoznaia Proizvodstvennaia entsiklopedia [Collective Farm Products Encyclopedia]. vol. 1. p. 309-311. Moskva, 1949.
30.1 K83

Translated from the Russian by
S. N. Monson

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SEED GROWING OF POTATOES

The following system has been established in seed growing of potatoes for the Ukrainian SSR. The elite seed potato is grown by experiment selection stations and scientific-research institutes. From these the elite seeds go for propagation to the collective regional seed nurseries. From the latter the potato is transferred to the improvement nurseries and seed lots of collective and state farms.

Fifteen to twenty percent of an area is assigned to a seed lot on a farm, and ten percent of the area of the seed lot is allocated for the improvement nursery. Both the seed lot and the improvement nursery are given the best part of the potato field. If the farm possesses peat bogs, these have to be utilized for seed lots. It is considered expedient to lay out seed lots of early varieties in river valleys, dried peat bogs and bottom lands.

Organic fertilizers improve the seed qualities of the potato. Manure (in the amount of 30-40 m per hectare) is better introduced for the preceding crop, while peat, peat composts, and all types of mineral fertilizers are used directly for seed potato. Nitrogen mineral fertilizers on seed lots are to be used in conservative amounts (30-45 kg of nitrogen per hectare). Potassium fertilizers containing chlorine (sylvinite, potassium salts) result in a reduced amount of starch in the potato and spoil its seed qualities. In fertilizing seed lots, the above fertilizers should be replaced by potassium sulfate or ashes. Additional feeding is given during budding by introducing manure liquid in the amount of 5-6 m per hectare, or bird manure - in the proportion of 4-5 centners per hectare.

The potato tubers intended for sowing on the seed lot are very carefully selected. They must be typical for their variety in shape and color, and should weigh no less than 50 g. Prior to sowing they are germinated and all those tubers are rejected which did not produce any shoots or only spindling sprouts.

When the shoots appear on seed lots, the latter are cleaned of degenerated and diseased plants and the varietal mixtures and plants retarded in growth are also removed. During the blooming period the cleaning is repeated, and afterwards (if symptoms of ring rot, black leg, gotica(?) and other diseases are noticed), a third cleaning is made. The seed lots are being "approved" during the blooming period. This approval is a government instituted method serving as a control over the purity of a variety and attesting to the quality of seed grown plantings.

It is essential to arrange for yearly selections at improvement nurseries. The following technique is used for this purpose: In harvesting - the yield of every plant is kept separately. All diseased plants and those of which the tubers are non-typical in color are eliminated. In varieties having pink and red tubers plants are eliminated which have a pale pink and whitish color (symptom of degeneration). Next the tubers of plants of highest yield are kept separately.

to be planted in the improvement nurseries, while the tubers of the remaining plants are taken away and kept for seed lots. The yield from the latter is used for sowings on the entire potato field.

In order to stimulate the acceptance of highly productive, cancer-resistant varieties by collective farm economies measures are taken for their speeded propagation. The simplest and most accessible method is the cutting of tubers into parts (on the day of sowing), leaving one or two eyes on each part. Prior to the cutting the tubers are vernalized in the light for 25-30 days, at a temperature of 12-15°. The depth of the planting of these parts into the ground is figured at 2-3 cm less than that of whole tubers. This method calls for an expenditure of 5 to 6 centners per hectare.

The best method for speeding propagation is that done with green shoots. It consists of the following: the tubers are grown in either light or dark; they are then planted in half-heated nursery beds or rows of garden beds at a distance of 2-3 cm from each other and are covered with a layer of soil 3-4 cm in height. When the shoots reach 10-15 cm in length, they are broken off with the tubers and transplanted into the ground as is any vegetable planting; next the tubers are again sowed for a second and third planting. Following the last breaking off, the tubers are left to germinate, are cut into as many parts as there are eyes and are planted into the ground. In this manner it is possible to obtain 20-25 plants or 25-40 kg. of potatoes at an expense per hectare of 2-2.5 centners of seed material.

Iashchuk, A. P.
Seed growing of potatoes.

REGIONALIZED AND RECOMMENDED VARIETIES

Only canker-resistant varieties are regionalized for the Kiev, Vinnitsa, Kamenets-Podolsk, Zhitomir and Chernigov oblasts. The following varieties were selected: "Frumelle", "Cobbler", "Oktiabrenok", "Yubel", "Parnassia", "Carnea" and "Ostboat". The same varieties are recommended for the remaining Western oblasts of the Ukraine. In addition, the varieties "Grentsmark", and "Zarnitsa" are recommended for the Western oblasts. Regionalized for the Odessa, Kherson, Nikolaevsk and Izmailsk oblasts are the varieties: "Courier", "Cobbler", "Oktiabrenok", and "Grentsmark".

For the Kharkov, Sumsk and Poltava oblasts the varieties - "Ella", "Polesski 36", "Woltman", "Stakhanovskii" are regionalized; recommended are the following varieties: "Frumelle", "Oktiabrenok", "Zarnitsa", "Grentsmark", "Carnea".

For the Kirovograd, Dnepropetrovsk, Zaporozhsk, Stalin and Voroshilovgrad oblasts the following varieties were regionalized: "Epicur", "Epron", "Early Rose", "Ella", "Lorkh", "Stakhanovsk", "Courier"; recommended were - "Cobbler", "Oktiabrenok", and "Grentsmark".

From the economic point of view varieties of potatoes are divided into table, technical and universal varieties.

THE INDIVIDUAL CHARACTERISTICS OF THE DIFFERENT VARIETIES

OKTIABRENOK: Early table variety. Yield and starch content are high. "Lying" ("lezhanie") - good. Flowers pale-red-violet. Tubers white. Canker-resistant.

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FRUMELLE: Early table variety. Adapted to early growth and occupied fallows. Yield and starch content are average. "Lying" - good. Flowers and tubers white. Pulp yellow. Canker-resistant.

COBBLER: Early table variety. Yield and starch content are average. Canker-resistant. Non-resistant to ring rot. Flowers red-violet, with white ends. Tubers and pulp white.

YUBEL: Universal variety of medium early growth. Average yield and starch content. "Lying" - good. Canker-resistant. Flowers red-violet with white ends. Tubers white.

PARNASSIA: Medium-late variety; technical. Yield and starch content high. "Lying" - good. Tubers get affected by rust spot. Flowers red-violet. Tubers and pulp white. Canker-resistant.

CARNEA: Late variety, of high yield and starch content. Tasting quality - average. "Lying" - good. Flowers red-violet with white ends. Tubers red. Canker-resistant.

OSTBOAT: High yield and starch content variety, of medium lateness. Flowers blue-violet. Tubers oval, white; pulp yellow. Canker-resistant. "Lying" - good.

COURIER: Universal variety, early, of high yield and starch content. "Lying" - good. Flowers white, tubers round and white. Resistant to canker but affected by phytophthora.

GREINTSMARK: High yield, medium early variety. High starch content. Good taste. Yellow tubers. Canker-resistant.

STAKHANOVSKI: Medium-early variety. High yield; medium starch content. "Lying" - good. Universal. Flowers and tubers white. Non-resistant to canker.

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POLESSKI 36: High yield, table, medium-early variety. "Lying" - good. Flowers white, tubers pink. Non-resistant to canker.

ELLA: Medium-ripening, table variety. High yield; tasty. "Lying" - good. Flowers and tubers white. Non-resistant to canker.

WOLTMAN: Late technical variety of high yield and starch content. "Lying" - good. Flowers red-violet. Tubers red. Non-resistant to canker.

KRASNOSPIRTOVII: Late technical variety of high yield and starch content. Taste good. Flowers red-violet, tubers red, elongated. Non-resistant to canker.

EPICUR: Early table variety. Yield and starch content are average. Flowers and tubers white. Non-resistant to canker.

EARLY ROSE: Early, table variety of high tasting quality. "Lying" - average. Flowers white, tubers pink. Non-resistant to canker.

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End of article.

...., S. I.
Itogi sortoispytaniia kartofelia na Leningradskoi stantsii
Results of potato variety testing at the Leningrad Experiment Station.
Sad i Ogorod 1946 (3): 73-74 Mar. 1946, 80 Sa 13

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R-52

Translated by S.N. Monson

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Meteorological conditions in 1945 were favorable for the development of one of the principal diseases of potatoes, i.e. phytophothora. This helped selectors to segregate and evaluate better new phytophothora-resistant seedlings of potatoes. Tests of early potato varieties were conducted in 1945 at the Leningrad oblast Experiment Station. 38 new seedlings and varieties (chiefly canker and phytophothora resistant) were tested and compared with the standard varieties Berlichingen and Cobbler. One part of the varieties and seedlings was obtained from the All-Union Institute of Plant Industry and the Institute of Potato Industry, the rest from the Leningrad Potato Experiment Station. The planting was done on May 28, 1945, in paddle form(?) under hills, on a nutritional plot of 60 x 20 cm.

The soil of the experimental field consisted of central podzol, lightly clayey; the predecessor was rye. During repeated plowing done on May 15, 1945, the field was fertilized with manure at the rate of 30 tons per hectare. Varietal testing was repeated six times.

The appearance of phytophothora was noted in the period of August 5 to 10. In order to control the disease, spraying with the preparation AF was done on August 20, and on August 24 the foliage of early varieties cut. Harvesting of early varieties took place on September 7, 1945, of late varieties on October 6 to 8, following early frosts. During the summer there was abundant precipitation. The first days of July and August and the last ten days of August and September had particularly much rain. The vegetative period lasted three and a half months. The last spring frost occurred on June 7, the first fall frost on September 15.

According to data obtained by the experiments, the new phytophothora-resistant seedling 18883 of the Institute of Potato Industry took first place in yield (508.3 c.h); producing double the amount of the standard variety Berlichingen (279.1 c.h). In second place in yield stood the Esthonian variety Iogeva 1520 (391.2 c/h). Seedling 18883 also produced the highest starch content (70.1 c.h). Of further importance is the fact that seedling 18883 proved phytophothora-resistant and had good keeping quality.

In conditions prevailing at the experiment station it may be placed in the group of medium early varieties of early tuber formation. The seedling is considered potential for high yields at early dates.

Second place in starch content (64.0 c/h) and fourth place in yield (374.6 c/h) was taken by the seedling BRA No. B/39, which proved phytophothora and canker-resistant.

End of Article.

3/20/51

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R-58

Novakov, P. A. Center of research work on potatoes. Sad i Ogorod 1947 (11): 72-77. Nov. 1947. 84 Sal

Translated from the Russian by
S. N. Monson

The Five-Year plan of restoring and developing the economy of the USSR contemplated the expansion of areas of potato crops in 1950 to 9.6 hectares, the increase of their yield to an average of 124 centners per hectare, envisaged the proper distribution of potato crops in the corresponding zones of the country and the organization of potato-vegetable and livestock stations close to large cities and industrial centers in places where processing industries are located.

The spread of the rational use of agricultural methods in potato growing, the distribution of the best potato varieties, the conduct of a systematic struggle with potato diseases, the improvement of the processes of mechanization in growing this crop - all these aims were considered essential in solving successfully the tasks set by the new Five-Year plan and the decisions of the February Plenum of the CC of the VKP (b) with regard to potato growing.

The network of scientific institutions plays a role of great significance in the successful development of potato growing.

The Scientific-Research Institute of Potato Industry is, as many other institutes, a product of Soviet times. The Institute was created in 1930 at the Korenev Selection Potato Experiment Station and the Polushkin Sand-Potato Experiment Field, both organized in the years 1919-1920.

The Institute is engaged in producing new varieties of potatoes, working out agricultural methods and measures of controlling diseases, studying new ways of potato storing, the constructing and testing of machinery for potato cultivation, the studying of the economics of potato farming, as well as problems concerning the physiology and biochemistry of potatoes.

The Institute considers its most important task to be the transmission of scientific achievements and data to production.

The Korenev Experiment Selection Station began its work by collecting all varietal material available in the country, by identifying and appraising these varieties. This large and painstaking work was completed with the compilation of a Soviet key to all varieties and diseases of potatoes. Over 1000 varieties were examined and submitted to tests; the result was the determination of the best varieties and the beginning of their propagation. The work of selection was simultaneously begun. The Institute first used in selection the frost-resistant and phytophthora-resistant species of the potatoes Solanum acaule and S. semidemissum. Species and varieties of potatoes, resistant to drought and high temperatures were segregated from the collection of South-American forms, permitting the widening of selective work for the purpose of obtaining drought- and heat resistant potato varieties.

In addition to the widely known and distributed varieties Lorkh and Korenevski, the Institute produced and transferred to production the following varieties: Sovietski and Phytophthora-Resistant, and during the war years - the variety Kolkhozni.

The Institute also transferred to the network of Government Experiment Stations the high yielding varieties of potatoes known under the numbers: 3398, 9729, 226, 12994, 2086, 18883. The last two varieties are of the early ripening kind and of higher yield than the standard varieties Epicur and Early Rose, and are distinguished by an exceptionally high resistance to phythophthora. In 1945 the Institute submitted to Government varietal testing the additional new forms known as Nos. 988 and 985. No. 12994 - is another late ripening variety of high yield and starch content, exceptionally resistant to phytophthora. All these will receive varietal names when regionalized and will be widely distributed among collective and state farms.

The potato variety Epron produced at the Leningrad Zonal Station enjoys great popularity. In the war years the following varieties were regionalized: Voronezhski, selected at the Voronezh Zonal Station; Ulianovski, of the Ulianov Station, etc. Aside from the newly produced varieties, the Institute and its network had produced, propagated and transmitted into production the valuable varieties of foreign selection: Varba, Chipeva, Fruboat, etc. There are at present many valuable inter-species hybrids in the Institute's nurseries, outstanding in their yield, starch content, and their resistance to phytophthora and frost. Many of them are early ripening, resistant to phytophthora, of good yield in starch content. The starch content of tubers in some hybrids amounts to 26 percent, and as to yield, the majority exceeds the variety Lorkh by 12-57 percent.

The Institute has developed and transmitted into production methods of growing elite potatoes and the system of seed growing of potatoes. A convenient complex of methods for obtaining high and resistant yields of potatoes for the podzol soil zones and central-black-earth belt on a mass scale, has also been developed. It demonstrated that the effectiveness of applying improved agricultural methods in a complex is greatly increased, exceeding the sum of additional yields, as compared to the effectiveness of individual methods applied separately. In cases where there is no complex set-up the effect of even intensive methods, such as the application of fertilizers and the use of good seed material may be insignificant. The use of the entire complex of agricultural methods at collective farms is likely to increase the potato yield two or three times. A present "agro-complex" methods are being prepared for other zones of the Soviet Union.

Much also has been done in studying methods to obtain early varieties of potatoes. Most important in this group is the method of the pre-seeding germination of potatoes, a process that ensures considerable speed in forming tubers. Research conducted in the past years (beginning 1943) has made possible the recommendation of pre-seeding germination even in central belt areas, near Moscow, Yaroslavl, Ulianovsk, Elets, etc., in open trenches or on platforms protected from northern winds. At night and on cold days the potatoes are covered with straw or mats. This method reduces the period of germination by some 20-25 days. The efficacy of this simple measure, easily adaptable at collective farms, is naturally extremely valuable.

Norms and types of manure fertilizers for potatoes have been established for predecessor crops. During the war and post-war years methods were studied to introduce locally organic fertilizers. The system of applying mineral fertilizers in crop rotations with potatoes under different soil and climatic conditions has been worked out, (i.e. norms and types of mineral fertilizers, periods and methods of their use, etc.).

These methods have found their reflection in agricultural instructions. Methods are studied concerning the irrigation of potato fields in the central zone and the utilization of drainage waters. Dates and amounts of watering have been established, the application of fertilizers, as well as methods for caring for potatoes on irrigated plots have been prescribed. The positive influence of irrigation on the seed and food qualities of potatoes has been substantiated.

In the pre-war and war years the Institute studied methods for the rational utilization of seed material (tops, eyes, cut parts of tubers, etc.) These methods permit an economical use of seed material that will produce yields equalling those derived from whole tubers weighing 50-100 g. Even on a high agricultural "background" "agro-fon" two tops planted into one hole frequently produce higher yields than large whole tubers (100-150 g.).

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The Institute naturally devotes much attention to the study of potato disease. The principal diseases of potatoes have been identified and their distinguishing characteristics determined. So have the areas of their distribution.

A general system of methods for controlling the most harmful diseases has been worked out. Many problems of the etiology of diseases, the biology of the most important "inducers" still remain unexplored, however.

Wintering of phytophthora oospores was discovered in pre-war years, showing how it was possible for this disease to remain in the soil for several years. The possibility of first infection from diseased plants was proved.

New poisons were experimented upon and it was experimentally established that the best results for controlling phytophthora were obtained by using Bordeau mixture and the preparation AB. Technical agricultural methods for controlling phytophthora did not prove sufficiently efficacious. The safest method in controlling this disease was to produce resistant varieties.

In 1947 the Institute discovered strong vegetative poisons for the control of phytophthora. It was established that garlic possessed phytoncidal qualities. (See article by M. V. Bordiukova in No. 9 issue of Sad i Ogorod, 1947.) Work on phytoncides is being continued.

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The inducers of the common potato scab developing on tubers growing in calciferous soils were studied and the variable degree of resistance to this disease among varieties was established.

Methods of evaluating the resistance of varieties and seedlings to common potato scab were worked out in the past years and the most valuable seedlings and varieties of highest yield, resistant to this disease were segregated.

Considerable losses result from the poor organization of potato storing. The Institute worked out the principal methods for potato storing in large special storehouses and mounds. Norms of natural losses were established, the evaluation of various systems of ventilating of temperature regimes and the moisture of the air was completed, the heat-producing quality of the tubers was studied. So were the methods of loading potatoes into storehouses, and rational methods were proposed for the care of potatoes while in storage.

Methods were developed for the (prolonged) storage of seed potatoes intended for summer sowings, and of food potatoes to last until the new harvest. It was recommended to use the snow-in method for potatoes in the central zone and to place the tubers during the period of pre-spring thawing into trenches cooled during the winter. These measures reduce losses in potato storing at the most important spring period which usually results in considerable waste. The method of storing potatoes in frozen trenches was accepted in 1946 for experimental testing. During the war years methods of storing the prepared tops of potato tubers intended for seeding purposes were worked out and recommended. The significance of the formation of an early periderm for the preservation of the tops was established in this connection and the preliminary keeping of the latter in warm quarters after cutting for 10-14 days was recommended. The exceptionally harmful action of the over-cooling of the tops at close to 0°, or any temperature close to it, during storage was established. An optimal temperature of plus 2 and plus 4 was recommended.

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The personnel of the Institute generalized (?) the experiments of advanced workers potato-growers (Kartavaia, Yutkina, Abramova, etc.), publishing the results in seven scientific papers of which four appeared in pre-war years, two during the war and one in 1946.

During the war particularly much attention was devoted to problems of searching for additional sources ("fondov") of seed potatoes, the preparation of the tops of tubers, the planting of potatoes by dividing the plants, etc. This work was performed in the Kuibishev, Ulianovsk, Riazan, Tula, Tambov, Orlov, Gorki oblasts, the Tartar, North-Osetin ASSR and others. In the Tambov oblast over 2000 hectares were planted with seedlings. The planting of potatoes, by using the division method, was done in 1947 in the Gorki, Orlov, Voronezh, Tula, Tambov, Kuibishev, Ulianovsk and other oblasts.

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Not all scientific achievements are entering sufficiently into production. It is of the utmost importance that recommendations be made in the nearest future with regard to the inoculation of the following methods:

1. Methods for the speediest propagation of valuable canker-resistant, new and early ripening varieties of potatoes;

2. Differentiated methods according to zones of growing seed potatoes on seed lots.

3. Methods for the rational utilization of seed material.

4. The vernalization of the potato in trenches and in open

platforms.

5. The application of a complete "agro-complex" of methods in growing potatoes.

6. Local methods designed to introduce organic fertilizers.

7. A system of methods to control the principal diseases of potatoes.

8. Of much importance will be the resumption of the production of the machineKP-2 for the planting of vernalized potato tubers, as well as the production of the combine IKKH on a mass scale for work on large state farms and zones of the distilling industry. A production series of the combine would solve the problem of machine harvesting of potatoes much more rapidly.

Aside from the inculcation of the above achievements into production, it is essential for the purposes of raising the efficacy of selective work to utilize widely the hybrid material first created at the Institute which will offer the possibility of producing valuable varieties resistant to phytophthora and early frosts. It is further essential to utilize new original material for producing drought and heat resistant varieties.

The February Plenum of the Central Committee [VKP (b)] has demanded of the Department of Agriculture and the Department of State Farms of the

USSR, the local party and Soviet organs to take measures for the speediest inculcation into production of the achievements of agricultural science, regarding this work as the most important condition for the raising of the agricultural level.

The fulfillment of these directions by our party represents the most important task of the Institute of Potato Industry.

End of Article.

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Novakov, F. A. Center of research work on potatoes. Sad i Ogorod 1947 (11): 72-77. Nov. 1947. 84 Sal

Translated from the Russian by
S. N. Monson

The Five-Year plan of restoring and developing the economy of the USSR contemplated the expansion of areas of potato crops in 1950 to 7 9.6 hectares, the increase of their yield to an average of 124 centners per hectare, envisaged the proper distribution of potato crops in the corresponding zones of the country and the organization of potato-vegetable and livestock stations close to large cities and industrial centers in places where processing industries are located.

The spread of the rational use of agricultural methods in potato growing, the distribution of the best potato varieties, the conduct of a systematic struggle with potato diseases, the improvement of the processes of mechanization in growing this crop - all these aims were considered essential in solving successfully the tasks set by the new Five-Year plan and the decisions of the February Plenum of the CC of the VKP (b) with regard to potato growing.

The network of scientific institutions plays a role of great significance in the successful development of potato growing.

The Scientific-Research Institute of Potato Industry is, as many other institutes, a product of Soviet times. The Institute was created in 1930 at the Korenev Selection Potato Experiment Station and the Polushkin Sand-Potato Experiment Field, both organized in the years 1919-1920.

The Institute is engaged in producing new varieties of potatoes, working out agricultural methods and measures of controlling diseases, studying new ways of potato storing, the constructing and testing of machinery for potato cultivation, the studying of the economics of potato farming, as well as problems concerning the physiology and biochemistry of potatoes.

The Institute considers its most important task to be the transmission of scientific achievements and data to production.

The Korenev Experiment Selection Station began its work by collecting all varietal material available in the country, by identifying and appraising these varieties. This large and painstaking work was completed with the compilation of a Soviet key to all varieties and diseases of potatoes. Over 1000 varieties were examined and submitted to tests; the result was the determination of the best varieties and the beginning of their propagation. The work of selection was simultaneously begun. The Institute first used in selection the frost-resistant and phytophthora-resistant species of the potatoes Solanum acaule and S. semidemissum. Species and varieties of potatoes, resistant to drought and high temperatures were segregated from the collection of South-American forms, permitting the widening of selective work for the purpose of obtaining drought- and heat resistant potato varieties.

In addition to the widely known and distributed varieties Lorkh and Korenevski, the Institute produced and transferred to production the following varieties: Sovietski and Phytophthora-Resistant, and during the war years - the variety Kolkhozni.

The Institute also transferred to the network of Government Experiment Stations the high yielding varieties of potatoes known under the numbers: 3398, 9729, 226, 12994, 2086, 18883. The last two varieties are of the early ripening kind and of higher yield than the standard varieties Epicur and Early Rose, and are distinguished by an exceptionally high resistance to phythophthora. In 1945 the Institute submitted to Government varietal testing the additional new forms known as Nos. 988 and 985. No. 12994 - is another late ripening variety of high yield and starch content, exceptionally resistant to phytophthora. All these will receive varietal names when regionalized and will be widely distributed among collective and state farms.

The potato variety Epron produced at the Leningrad Zonal Station enjoys great popularity. In the war years the following varieties were regionalized: Voronezhski, selected at the Voronezh Zonal Station; Ulianovski, of the Ulianov Station, etc. Aside from the newly produced varieties, the Institute and its network had produced, propagated and transmitted into production the valuable varieties of foreign selection: Varba, Chipeva, Fruboat, etc. There are at present many valuable inter-species hybrids in the Institute's nurseries, outstanding in their yield, starch content, and their resistance to phytophthora and frost. Many of them are early ripening, resistant to phytophthora, of good yield in starch content. The starch content of tubers in some hybrids amounts to 26 percent, and as to yield, the majority exceeds the variety Lorkh by 12-57 percent.

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6. Local methods designed to introduce organic fertilizers.

7. A system of methods to control the principal diseases of potatoes.

8. Of much importance will be the resumption of the production of the machineKP-2 for the planting of vernalized potato tubers, as well as the production of the combine IKKH on a mass scale for work on large state farms and zones of the distilling industry. A production series of the combine would solve the problem of machine harvesting of potatoes much more rapidly.

Aside from the inculcation of the above achievements into production, it is essential for the purposes of raising the efficacy of selective work to utilize widely the hybrid material first created at the Institute which will offer the possibility of producing valuable varieties resistant to phytophthora and early frosts. It is further essential to utilize new original material for producing drought and heat resistant varieties.

The February Plenum of the Central Committee [VKP (b)] has demanded of the Department of Agriculture and the Department of State Farms of the

USSR, the local party and Soviet organs to take measures for the speediest inoculation into production of the achievements of agricultural science, regarding this work as the most important condition for the raising of the agricultural level.

The fulfillment of these directions by our party represents the most important task of the Institute of Potato Industry.

End of Article.

Extract from the order issued by the Peoples' Commissariat of Agriculture ("Narkomzem") of the USSR, dated April 21, 1935, concerning the plan of VIZRa for 1935.
Plant Protection 2: 14. 1935. 421 P942.

Translated by S. N. Monson

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1. To confirm the scientific research plan of the Institute of VIZRa for 1935, submitted by its Director, comrade Zelenukhin, and the additional assignments to the plan presented by the Commission for the same year.

2. In order to ensure the performance of the above additional assignments, to allot additional funds to cover operating costs in the amount of 300,000 rubles in excess of the allotments extended to VIZRa for its original plan of 1935.

Of this additional amount for pest control to Glavzerno (Main Grain Administration) 50,000 rubles; Glavkhlopkom (Main Cotton Adm.) 100,000 rubles; Lesupru (Forest Administration) 20,000 rubles; the Quarantine Sector 20,000 rubles; and from the funds of Sel' khozsnab (Agricultural Supply Administration) 30,000 rubles; and the funds of VASKHNIL (ALL-Union Agricultural Academy, imeni Lenina) 40,000 rubles.

3. To increase the appropriation on the capital investment for VIZRa to 200,000 rubles, above the established expenditure for its yearly plan for equipping laboratories and sectors in connection with the execution of additional plans.

4. To require comrade Kudriavtsev (Selkhozsnabzhenie) of the Agricultural Supply Administration to deliver to the order of VIZRa, at the expense of the fund of Narkomzem of the USSR, (in excess of the plan of the Academy) 3 light auto machines, 3 half ton automobiles ("Pikop") of the "Pick-up" type.

5. To permit VIZRa to organize a subscription for the monograph on domestic and world research in the field of plant protection, the publication of which will

be begun in 1936.

6. From among the candidates completing their course at VIZRa in 1935 to assign ("zakrepit'") the following to the Institute: Poliakov, Kalashnikov, Kosmachevskii, Kamenskii and Zhilkin.

To dispatch the following students of the spring semester of the Leningrad Agricultural Institute for work at VIZRa: Dobretsova and Zaitseva.

7. In connection with the enlargement of the subject matter of VIZRa to increase the number of state units in the VIZRa system to 27 people at the expense of the norms of the Academy.

The Presidium of the Academy to permit VIZRa to enlarge the staff of temporary workers in 1935, within the limits of allotted funds.

8. In connection with the enlargement of the volume of the work of VIZRa and the opening of a group of new laboratories, to increase the number of candidates of VIZRa in 1936 to 30 people.

9. To require of the directors of branch scientific research institutes and the directors of territorial, oblast and republic Stations of Plant Protection to submit their reports on their work to VIZRa for the year 1934 and their plans for 1935 no later than by May 1.

End of Article.

3/27/51

Loza, G. (Acting director of Academy TSKHA) (Transl. 52)
Nauchno-issledovatel'skaia rabota Sel'skokhoziaistvennoi Akademii imeni K. A. Timiriazeva.
[Scientific-research work at the Timiriazev Agricultural Academy.
Sotsialist. Sel'sk. Khoz. 17(3): 70-75. Mar. 1946. 281.8 So73.

Translated in part by S. N.Monson

The oldest agricultural college in the USSR, the Moscow Agricultural Academy imeni K. A. Timiriazeva, of the Order of Lenin, celebrated its 80th anniversary in December, 1945.

The scientific conference which was held during the days of the anniversary celebration proved once more that the Academy is not only an outstanding scientific institution but also an important center for agricultural science. Over 70 professors, 130 candidates, 150 assistants, and a numerous group of scientific personnel engaged in diverse research on theoretical problems of agricultural science, problems of reconstruction and the further expansion of agriculture in our country.

Scientific research at the Academy is centered at the laboratories attached to the respective chairs, as well as at experiment stations, experiment fields of state farms of the Academy, and advanced collective farms of the Union. Entire groups of experiment stations are connected with the Academy: Field, seed control, soil, vegetable, fruit, forest, botanical gardens and introductory nurseries, experimental apiaries.

In 1944 a station devoted to ornamental floriculture and horticulture was organized, together with laboratories on the feeding of domestic animals, the breeding of livestock, economic research. The museums of soil science and horse breeding were reconstructed. Beginning 1945 the phytopathological and immunity-biological stations were reconstructed and stations restored for the processing and storing fruits and vegetables, the station of agricultural chemistry, imeni

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of the Academician D. N. Prianishnikov was reconstructed.

The scientific activity of the Academy was directed in the past 2 to 3 years to the solution of the following main problems.

1. Study of vegetative forms to expand raw vegetative resources essential for our country, and creation of new forms of plants for selection.

2. Production of new varieties of agricultural crops of high yields, frost- and disease resistant.

3. Development of agricultural technical measures to ensure the increase of yields of field and leguminous crops and fruit and berry orchards.

4. Development of measures for the increase of the fertility of soils.

5. Physiological research on the metabolism of plants, the influence of mineral fertilizers upon the qaulity of yields, the influence of permanent and temporary factors upon the development of plants.

6. Development of technical measures for the racial improvement and breeding of livestock.

7. Study of physiologic bases for the feeding of livestock, increase in the productivity of animals at a reduced expenditure of concentrated forage.

8. Rationalization of processing and storing of agricultural products.

9. Mechanization of work in agriculture, the construction of new and the improvement of existing machinery.

10. Study and generalization of results of the work of collective farms in raising crop yields, the productivity of the livestock industry, the organization of labor and administration of artel management.

11. Reconstruction of agriculture and organization of collective farm production in regions freed from the German invaders.

12. Organization of agricultural suburban zones, distribution of agricultural production in the main zones of the USSR.

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In the field of study of vegetative forms to increase raw resources, the chair of botany under the leadership of Professor P. M. Zhukovsky engages in extensive work. Prof. Zhukovskii delved into the problem of domestic guttapercha (Isonandra gutta or Eucommia ulmoides) and developed measures for the use, protection and organization of the exploitation of Euonymus, and the culture and utilization of the plant. He also proposed to utilize the Far Eastern lemon ("limonnik") to obtain preparations for stimulating nervous and muscular energy, and organized an expedition to the Far East to secure raw material. Zhukovskii worked in other problems by introducing new species of vegetative raw material for national nutrition, vitaminization, etc.

The chair of genetics under Professor A. R. Zhebrak covers the production of new species of wheats by experimentation. In the past years a large number of amphidiploid types of wheats and their hybrids were obtained. These forms of amphidiploid wheats were used by the chair and other experiment institutions as initial material in selection.

Under the direction of Professor P. I. Lisitsin Selection of clover, winter and summer wheat, rye, summer vetch, buckwheat was engaged in. Two varieties of clover, Nos. 216 (Altai) and 237 (Central Flow of Enissei River) were segregated. The new variety of clover 216 was transmitted for propagation and varietal testing to plots of the Government Commission on Varietal Testing.

Professor Lisitsin and candidate V. N. Khokhlov are engaged in the selection of rye. Prof. P. I. Lisitsin produced in 1945 the seventh selection of a new variety of non-lodging rye at the Alexandrov experimental base, named "Lisitsin." V. N. Khokhlov produced a seventh selection of a variety of rye called "Timiriazevka." It is a variety of high yield which yielded in 1944 30c/h at the field experiment station.

V. N. Khokhlov also produced a new hybrid variety of winter wheat "G-1" which, according to data submitted by the station of varietal testing, exceeds the standard variety by 20-25 percent in yield.

V. N. Khokhlov also produced a new variety of buckwheat "V-1," of high yield and early maturing. In studying the causes for non-resistance in buckwheat, the supposition was confirmed that they were the result of a lack of products of assimilation in generative elements. Measures are being developed to eliminate these causes. Beginning 1944, work on the selection of oats and barley has been resumed under the guidance of Professor P. N. Konstantinov, together with selection of alfalfa, and attempts were made to adapt them to northern regions. Nurseries of initial material were restored and seeds propagated of former yields.

In 1944 seven potential lines of barley were selected, of which five were experimented upon in 1945 in varietal testings. The segregated lines of barley possess a high absolute weight of grain, are fairly resistant to disease, and hardly lodge at all. Selection of summer vetch is engaged in by candidate N. V. Kharchenko. Beginning 1943 two varieties, the first and second lines, exceeding the standard variety in yield of seeds and amount of hay by 11 to 15 percent, were forwarded for tests to the Government Commission. In addition the 3rd and 4th lines were being studied. Repeated varietal testing indicated their superiority, as compared to the standard, in amount of hay at 16 to 20 percent and in grain at 7 to 19 percent.

A collective nursery of alfalfa was also established. High yield specimens of this crop were segregated: Alfalfa No. 1036, individual selection of No. 4011, Krasnokutskii; No. 233 Belotserkov, Shatilov, Leningrad, etc. Individual selection of best specimens and geographically distant forms was made.

The work of Professor P. M. Zhukovskii in the field of applied botany led to the production of a series of valuable varieties of wheats and barley. A new variety of wheat called "Bochonkovidnaia" (barrel-shaped) was produced by inter-species crossing. Following careful selection of hybrids and dual comparative varietal testing the milling and baking qualities were ascertained. The variety was forwarded to the Government varietal Testing station; it exceeds the standard variety Lutescens 062 in absolute weight of grain and milling and baking characteristics, does not lodge, but is not early maturing.

Inter-species crossing produced a new variety of wheat named "Sharovidnaia" (ball-shaped). This variety is distinguished by non-lodging. It is superior to the standard variety with regard to output of flour, but inferior in period of maturing and yield.

By a method of complicated synthesis a new variety of wheat named "Griboboinaia", Fungicidum, has been produced. This wheat is completely resistant to rust, smut, and mildew, and produces a very large grain rich with vitamins E and V, contains a high percentage of gluten and does not lodge. However, it lacks good milling characteristics, its grain is puny and baking quality unsatisfactory. The wheat is valuable in crossings for immunity to rust and smut.

During the war years two varieties of early, two-row barley of good tillering and large grain were produced.

In the same period Zhukovskii conducted experimental work on acquired immunity in non-resistant wheats. A new method for vaccinating these wheats was developed and the first encouraging results were obtained in artificial increase of resistance to rust and mildew in soft wheats.

Professor N. N. Timofeev conducted experimental tests in vegetable crops on selection; varietal tests of domestic and American varieties of legumes were made under the guidance of Professor V. I. Edelstein. Judging from the summaries of these varietal tests, the best 5 varieties of onions were selected from American specimens, one variety of peas, five of beans, 3 varieties of pumpkin, two of tomatoes and one each of cucumbers, beets and carrots.

Under Professor P. G. Schitt varietal testing of fruit trees and berry plants was engaged in, as well as the production of new varieties of berries. About 200 central Russian and Michurin varieties of fruit trees were planted in a new orchard. The orchard began to bear fruit in 1944 and led to the first evaluation of varieties on the basis of yield.

At fruit experiment stations varietal testing of currants and gooseberries was engaged in for several years and growth and fruit bearing of best varieties studied. (Omitted 15 lines on fruit growing).

A series of experiments were conducted under Professor I. V. Iakushkin which developed and defined closer new methods for increasing yields of field crops.

One of the aims was to fully utilize sunrays for field crops in spring months.

With regard to potatoes, the use of dense plantings and subsequent thinning in July offered the possibility of obtaining additional yields amounting to 75 c/h.

In forage root crops and sugar beet the application of thinning in two stages produces in the summer months harvests of 100-150 centners of foliage and 80 to 100,000 young roots, firm thickness (density) and regularity of distribution of plants, which all increase the ultimate yield of root crops.

With regard to grain crops the best utilization of sunlight in the spring is achieved by more regular distribution of plants on the surface of fields and by agricultural methods accelerating the initial development of plants (additional feeding, hoeing, etc.)

The second important group of problems under study was directed to the improvement of seed material, primarily by the use of agricultural methods. It was established that concerning rye, summer and winter wheat, rice, barley, flax and sugar beet ("vyravni yanie") that "leveling" seeds according to thickness produced a closer appearance of stalks, a more regular development of plants and uniform ripening. Separate sowing of groups of levelled seeds led to an increase in yield of 15 to 20 percent.

Research done by Professor N. A. Maisurian on the role of selection according to specific weight, and that of candidate N. M. Lapin on heating freshly milled seeds of winter crops were in line with the above group of experiments.

With regard to agricultural techniques applied to individual crops, conclusions were reached concerning the possibility of obtaining high yields of winter wheat after potatoes, (even if the latter were harvested in the last days of August), and succeeding flax; the beneficial influence upon yields of rye by early additional feedings which include small doses of manure was studied; it was established that harrowing improved the yield of oats. Methods were developed for obtaining high yields of roots and seeds of sugar beet. Prof. V. A. Kharchenko developed methods for using stubble in cultivating turnips. With regard to beans the best plots of nutrition were established for obtaining ripe seeds under conditions of Moscow oblast. With respect to kok-saghyz, the efficacy of transferring to narrow inter-rows and eventual thinning was proved.

(Omitted information on vegetable and fruit growing, dwarf trees, growth substances when applied as stimulants, forest growing, soil study and plant nutrition (p. 72-73));

Professor M. S. Dunin conducts research to increase resistance of plants to diseases. Of enormous theoretical and practical significance is the regularity established by Dunin which was demonstrated by the fact that, guided by the law of immunogenesis simple new methods were developed which ensured a radical increase in resistance to disease and an increase of yields of potato, sugar beet, cotton, clover, alfalfa and other crops.

As a result of using the recommended methods, infection of potatoes by phytophthora, infectious diseases of wilt and virus diseases, was reduced 2 to 9 times and waste in storage reduced 3 to 4 times.

Professor Dunin introduced conclusions and proposals to collective and state farms having large areas of planted potatoes. At about 10,000farms the result was a saving of more than 25,000 tons of seed potato and an increase in potato yield of no less than 300,000 tons.

Professor N. S. Dunin completed and prepared for publication his work named "Immunogenesis and its practical utilization."

(Omitted p. 74-75 devoted to livestock, poultry-breeding and dairy industry; new theories of plowing, dependent upon hard, soft and gas-like soils; agricultural machinery; reconstruction of work in occupied regions of the war zone; agricultural statistics (Prof. V. S. Nemchinov); organization of agriculture in suburban Moscow.)

End of article.

3/29/51

Gern, A. P.
On Certain Aspects of Non-Coordination in Planning. Sad i Ogorod 12, p. 65-66, Dec. 1947. 80 Sa13

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R-36

Translated from the Russian by
S. N. Monson

Potato selection was first paid attention to only after the Great October Socialist Revolution. Czarist Russia imported varietal material pertaining to potatoes chiefly from Germany.

At present potato selection stands on the same level, if not higher, than that of foreign countries. The phytophthora-resistant variety, of considerable economic significance, was first obtained in the Soviet Union. Canker-resistant varieties are equally available at present as a result of Soviet selection. According to data of the Government Varietal Commission, potato varieties of Soviet selection radically exceed in quality the best foreign varieties.

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Under a proper organization of potato seed growing there is every possibility for replacing old varieties with superior varieties of Soviet selection.

In accordance with the decree of the Government of November 25, 1944, on the "Improvement of Seed Growing of Potatoes," regional seed nurseries have been organized for the propagation of potato varieties. Forty-four experiment institutions have been directed to grow elite potatoes for seed nurseries.

The production of elite potatoes at scientific-research institutions in 1946 was improved as compared to that of 1945 and also showed an improvement in the quality of elite. Not all scientific institutions understood the importance of the work, however. The supervisors of agricultural administration at Briansk, Vladimir, Voronezh, Kirov, Novosibirsk, Saratov, Cheliabinsk, Chkalov oblasts and the Khabarovsk territory did not observe the system of administering and controlling the work of scientific institutions producing elite potatoes, as a result of which seed nurseries of these oblasts did not obtain elite seed for two years. Regional seed nurseries were at the same time able to obtain elite seed only of those varieties which were issued by the selection stations of a given oblast. It is to be noted that there exists a definite lack of coordination between the planning of growing elite seed potatoes and varietal regionalization administered by the Government Commission on Varietal Experimentation of Vegetables and Potatoes (Goscommissia). Elite seeds of several varieties, regionalized by the Goscommissia, are not produced at all or not produced in oblasts where the varieties are regionalized.

Thus elite seeds of 19 out of 88 regionalized varieties were not grown at all. The absence of elite seeds indicates that the specific variety is out of circulation. This may in many cases be all right. The production of elite seeds of such varieties as Deodara, Marker, Narodnii, Parnassia, Paul Wagner, Rose from Millet, Silesia is not efficacious and the sooner these varieties will drop out of production the better. The absence of elite varieties Korenevski, Great Scott, Jubel, and potential varieties reflects a lack of coordination in planning, however.

The variety KORENEVSKI is a strong competitor of WOHLTMANN in yield, supply of starch and production of alcohol. It is altogether non-permissible to lose this technical variety. The varieties GREAT SCOTT and JUBEL are canker-resistant, medium maturing, and have to be preserved in areas where there exists immediate danger of canker.

The growing of elite seeds of these varieties is essential in areas where this danger is particularly severe. As to the potential varieties, their absence in elite quality cuts off their introduction into production. Regionalization of these varieties does not correspond with the distribution of station-originators. PETROVSKI JUBILEE has, for instance, been approved as a potential variety for the Astrakhan, Chkalov and Saratov oblasts but none of the latter have one tuber of this variety. All that had been accomplished was to accept the varieties as potential but nothing was done to introduce them into production. One may see the results of this lack of coordination between varietal regionalization and the planning of elite growing by the example of several varieties. Thus the variety WOHLTMANN, for instance, has been regionalized for 32 oblasts, territories and republics, while seed is grown only in two oblasts (Gorki and Voronezh). The variety EPROK has been pronounced potential for 26 oblasts and republics, while seed is grown in 7 oblasts, where it is considered potential, and in addition, at the Chkalov, Krasnoiarsk and West-Siberian, Vladimir, Penza, Tomsk oblasts, for which it has not been regionalized. The variety SOVIETSKI, regionalized for 21 oblasts, is grown for seed in only two oblasts, Yaraslav and Novo-Sibirsk. The variety OKTIABRENOK, regionalized for 4 oblasts and republics, while seed growing is conducted in two oblasts, Saratov and Penza, although Oktiabrenok was not regionalized for the latter oblast (possibly because it had no varietal plots).

The variety PETROVSKI JUBILEE is regionalized for 8 oblasts; elite seeds are not grown in any of these, in spite of the fact that in five oblasts, where it is accepted as potential, there are elite seed farms.

This situation prevails with regard to many varieties. The weight of the responsibility for the existing situation falls upon the oblast agricultural administrative organizations. Selection stations are producing new varieties. These are tested, appraised on varietal plots; the agricultural administrative offices issue their conclusions, the Goscommissia arranges for regionalization, but locally the situation does not change. Collective and state farms continue to plant their fields with varieties of little value and have no opportunity to change to the production of improved varieties because of the lack of seed material.

It is time to put a stop to this sinful practice. Oblast agricultural administrations should take over the work and introduce potential varieties into production.

Danilovka, Penaz oblast.
Petrovsk Government Selection Station

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End of article

2-28-51

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R-59

Polianskaia, A. M. (Supervisor of Dept. of Selection and Seed Growing)
Variety Testing of Potatoes at the Ganusov Experiment Station. Selek. i Semen. 15(2)67-68. Feb. 1948. 61.9 Se5

Translated from the Russian by
S. N. Monson

The Section on potatoes at the Ganusov Experiment Station services the zone of the Western oblasts of the BSSR (Belorussia), the oblasts Grodno, Brest, Baranovichi, Molodechnenskaia, Pinsk, and Polotsk. These oblasts may become the most productive potato regions in Belorussia.

The soil and climatic conditions of these oblasts are most favorable for potato growing because of the mechanical composition of the soil, which is light clayey and sandy. The total annual precipitation amounts to 571 mm. (average data for the years 1929-1945). The average annual temperature of the air is 5.6° throughout the day. 54

Varietal plantings would under superior agricultural techniques ensure a considerable increase in potato yields. The distribution of the varieties Wohltman and Silesia in these oblasts led in the past to their introduction primarily on landowners' properties and to a much lesser degree, through marketing, by the owners of distilling plants into peasant households, as varieties of superior high starch content. Nevertheless, these two varieties do not meet the requirements of socialist agriculture because they are not resistant to canker, phytophthora, or other diseases, including black leg, rhizoctonia and ring rot.

Following the liberation and addition ("prisoedinenie") of the Western oblasts to Belorussia, varietal potato experimentation was begun at the Ganusov Station which from the start aimed at finding canker resistant table and universal varieties of high yields, resistant to phytophthora, and of increased resistance to other diseases. In tests made in the years 1939 to 1947 a multitude of diverse varieties of Polish and German selection were studied, among which were many canker-resistant varieties. The late variety Wohltman was taken as a standard. The results of the varietal testing are presented in the attached table. On the basis of accumulated data covering many years, we recommend the following varieties for planting in Western oblasts, all canker-resistant, of good tasting quality and high yield: OSTBOTE, VEKARAGIS, BERLICHINGEN, BELO-RUSSIAN 746-36, and of the industrial varieties ACKERSEGEN and VORAN.

Among the tested early varieties the best in yield proved to be EARLY ROSE and KAISERKRONE; these varieties are, however, not canker-resistant and it became therefore necessary to find superior varieties of early tuber formation among the canker-resistant forms.

Judging from the experimental data of other scientific institutions of BSSR, the early maturing, canker-resistant varieties COBBLER and COURIER were regionalized temporarily. These varieties are, however, subject to severe infection by phytophthora under Belorussian conditions, which reduces their yield considerably in years of heavy infections of that disease. The scientific personnel of the Station is facing a tremendous task in the field of potato selection by attempting to produce high yielding, canker-resistant and early varieties for table use for the Western oblasts of the BSSR, since the available varieties of Soviet and foreign selection do not fulfill the necessary requirements of socialist agriculture under the climatic and soil conditions of Western Belorussia.

TOTAL DATA ON VARIETAL POTATO TESTING AT GANUSOV EXPERIMENT STATION FOR THE YEARS 1939 to 1947

Rating	Name of Variety	Length of Vegetative Period in Experimental Days	Potato Yield in c/h						Average Starch Content in Above Years
			1939	1940	1945	1946	1947	Aver.	
1	Ostbote	96	-	-	217	298	334	283	20.2
2	Ackersegen	106	224	327	220	321	309	281	16.5
3	Mittelfrühe	94	208	269	222	299	306	261	18.5
4	Voran	102	216	242	274	292	269	259	17.9
5	Vekaragis	104	200	290	227	291	256	253	18.5
6	Fram	104	264	276	179	276	259	249	19.8
7	Berlichingen	90	-	-	-	260	266	248	17.3
8	Paul Wagner	89	232	254	197	263	293	248	18.3
9	Parnassia	99	208	291	204	268	256	245	18.7
10	Belorussian 746-36	-	-	-	229	229	256	238	18.3
11	Wohltman (standard)	104	220	238	210	221	295	237	19.3
12	Robinia	94	228	226	238	257	-	237	18.0
13	Early Rose	70	-	-	152	291	265	236	16.8
14	Cornea	96	218	252	180	248	251	230	20.4
15	Rosafolia	84	198	252	209	246	-	228	17.3
16	Kaiserkrone	67	160	216	151	293	264	217	18.3

End of article

3-1-51

Sidorov, V. D.
Azerbaidzhan Station of Plant Protection. (In Russian.)
Sad i Ogorod 1949(11):23-24. Nov. 1949. 87 Sal

(Transl 55 Plant Protect.)

Translated by S. N. Monson

The Azerbaidzhan Station of Plant Protection conducts a vast amount of practical work on pest control of fruit crops.

As a result of aircraft spraying, applied in the orchards of the State Farm No. 12 (a plot of 1,000 hectares) and adjoining collective orchards of Kuba-Khachmassk, with oil-clay emulsions against apple moths(?) (Psylla mali Schmidbg.(?) and violet scale insect ("shchitovka"), Aspidiotus Perniciosus Comst., fruit plantings in the last two years produced high yields.

Our statistics showed that by spraying in the early spring and fall-winter periods with 8 percent oil-clay emulsions on Diesel heat(?) the death rate of (Psylla mali Schmidbg.), wintering under caterpillar scales is 90 percent, of the violet scale insect ("shchitovka") 98 percent. 55

The Plant Protection Station studied the possibility of adding oil-clay emulsions to Bordeaux mixture and Paris green, usually used in spraying orchards. The addition of 1 percent oil-clay emulsion to the above combined mixtures increased the control of the remaining apple moths (Psylla mali Schmidbg.(?) by 20 percent and reduced the infection of orchards by scale insect, Laspeyresia pomonella L.(?), 85 percent.

The station recommended the application of the following system of treatment in orchards: 1. one spraying with 8 percent oil-clay emulsions in the fall-winter and early spring seasons. 2. a spring dusting (March) with DDT (15 kg per hectare).

3. a four-fold spraying of orchards in the summer with Bordeaux liquid and Paris green added to 1 percent oil-clay emulsion. After using this spraying method the yield in orchards was 3 times higher and the quality of fruits much better than from yields in orchards where no treatment was provided.

The greatest effect was produced by the new method of controlling Lixus Subtilis(?) ("dolgonosik-tsvetoed") by dusting with DDT. At the collective farm, imeni Pagirova, where previously 12,000 labor days were spent on shaking down insects aircraft dusting destroyed almost 86 percent in the course of two days.

Dusting of orchards with DDT (10-12 kg per hectare), when conducted in 1947, reduced the infection of buds 50-60 percent. An increase in dosage to 15-18 kg per hectare (applied in 1948 on a plot of 600 hectares) reduced the infection of buds 73.7 to 85.7 percent.

At the same time the shaking off of insects did not produce any effect in 1947 and reduced the infection of buds by only 30 percent in 1948. The harvest from plots dusted with DDT amounted to 130 c/h, while plots where insects had been shaken off produced a yield of 90 c/h.

The station developed its own method of preparing anabasin sulphate (senior scientific staff member G. B. Melkumian).

In Central Asia it is being prepared by the water-kerosine method from the wild growing leafless Echinochloa P. B. The raw product is treated with hot water in a complicated system of expensive batteries (of the type used in sugar refineries), the thick liquid then transferred into other reservoirs and the alkaloids extracted with the aid of kerosine. The alkaloids are then sulfonated (sulfureted, sulfurized) with sulfurous acid.

This method produces a low percentage in output (8 percent) and leaves a large amount of unutilized poisonous waste waters, containing 0.04 - .06 percent of toxic alkaloids that are harmful to sucking pests.

Because of the incomplete elimination of kerosine there are instances when plants are burned.

At the Plant Protection Station, .. in place of the expensive and impractical battery method, production of the preparation was organized with reverse freezers, alkaloids were extracted with the aid of water from the local leafless Echinochloa P. B. The sulfunation of alkaloids is done in other open filter tanks. The output of the final product was increased 5 to 6 times; neither kerosine nor caustic soda were necessary. Waste was altogether eliminated; the preparation did not cause burning of plants. The cost of the anabasin sulfate produced by the method used at the station was reduced one third.

In the course of many years individual plots of seed fields of onion at vegetable seed fields of collective farms of the Apsheron peninsula and Samur-Divichin zone did not produce any seeds at all because of the disease perenosporaceae and later black mold. All researchers usually do not devote attention to black mold but to perenosporacea as the immediate cause of the disease.

S. G. Abdullaev, senior scientific staff member, began his research in 1946 from this point on. In studying the biology of the fungus he established that this fungus possesses the highest stage of fruiting in the form of "peretetsii" in sacs. He studied elements of the biology of the inducer of black mold, never examined before and conducted many experiments to establish methods for controlling the latter.

It appeared that the percentage of infection of plants is radically reduced in early plantings of onion (early February) and also by a maximum widening of inter-rows and distances within the rows between the plants. The removal of post-harvesting residue and fallow plowing are essential as means of control. Considerable significance, as a prophylactic measure, is attributed to spraying of plants with 1 percent Bordeaux liquid.

S. I. Shipinov, sr. scientific staff member, studied for a number of years diseases of tomatoes: mosaic, spotted, bacterial and fusarium wilts and other diseases. He established that mosaic affects plants in a relatively small degree and gradually increases its action. Early tomato varieties, such as "Bizon," for instance, manage to escape the disease, while late varieties, such as ("Chudo Rynka") "Market Wonder" are heavily affected by mosaic. The variety "Erliana" is strongly susceptible to bacterial wilt and all its progeny (hybrids) ("proizvodnye") "Maiak," "Hybrid 30," "Break of Day," etc. are lightly susceptible.

Of particular interest is the fact that tomatoes grown from seeds, sowed directly in the ground, are practically free from virus diseases. This may be explained by the fact that virus diseases originate in hot dry localities and high soil temperatures; in sowing tomatoes into the ground the main mass of roots of the plant penetrates deeply into the soil.

S. I. Shipinov revealed diseases that had not been registered before at Azerbaidzhan (spotted wilt, leaf roll of tomato, mosaic of cauliflower, etc.)

The Azerbaidzhan Station of Plant Protection conducts all its experiments at state and collective farms of the Republic.

3/29/51 End of Article

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Fonina, O. Ia.
Berlichingen Potato Variety Under Conditions of Uzbekistan. Sad i Ogorod, 1948(6):63-64. June 1948. 80 Sa13

R-34

Translated from the Russian by S. N. Monson

In 1945 the Uzbek Selection Seed Growing Station obtained from the West Siberian Experiment Station a small amount of potatoes of the variety Berlichingen. In varietal testings made in 1946 and 1947 during early spring planting (March), the variety came out first (in 1946) and second (in 1947) in yield among the rest of tested varieties. It had also fewer plants affected by diseases of degeneration than did the remaining varieties.

The value of Berlichingen for Uzbekistan is, however, not only in its high yield, but in its capacity to grow rapidly from freshly dug tubers.

One of the methods for controlling degeneration of potatoes at Uzbekistan is to utilize freshly dug potato tubers for a second summer planting. But up to that time none of the early varieties tested at the experimental station (Courier, Epron, Early Rose, Epicure) had produced satisfactory results. 56

Berlichingen produced the following results in tests made in 1946 (Table 1):

Table 1

Variety	Grown tubers suitable for planting in %	Decayed tubers in %
Courier	0	29.4
Epron	46.6	27.8
Chippewa	7.2	2.4
"Novinka Pustyni" (Novelty of Desert)	26.4	54.7
"Podarok Rodine" (Gift to Country)	17.3	31.9
Berlichingen	66.7	10.8

On the basis of the large percentage of mature tubers and the insignificant number of decayed tubers, Berlichingen took first place.

Identical results were obtained in 1947 under conditions of production. The growing was done in trenches filled with sand. The bottom of the pit, 10-15 cm. deep and 1-1.5 m. wide, was covered with a layer of river sand of 1 to 2 cm., upon which the tubers were closely laid. They were covered with another layer of sand, 2.5 to 3 cm. deep, and mats were laid on top of that. Throughout the growing process the sand was watered (by means of a water can) to keep it moist. The tubers were planted in the period between June 19 and July 5. The results of their growth for 1947 are indicated in Table 2.

Table 2

Variety	Grown tubers suited for planting in %	Decayed tubers in %
Courier	18	0
Epron	16	0
Lorkh	12	0
Berlichingen	72	2

In another experiment to test the capacity for rapid and mass growth among 112 different varieties, Berlichingen also came out first. Mature, grown, freshly-dug tubers were planted in the field on the following dates: July 5, July 15, July 25, and August 5. They produced a second yield of 164, 131, 110 and 72 centners per hectare, respectively. In the yield obtained from the first three periods a high percentage of large tubers was observed (85.6-88) and a predominance of tubers of typical form (85 to 93.7 per cent).

The tests conducted provided the opportunity to rate Berlichingen variety, plantings should be best made in the early part of July; although a later planting may prove equally satisfactory from the point of view of economic expediency, such as the second part July or the first five days in August, particularly for seed growing purposes since planting in those days produces a high output (?) of tubers of medium size. August 5 should be considered as the last date for planting freshly dug tubers.

Along with further extended study of the variety Berlichingen, the station has already started its preliminary propagation. In the fall of 1947 the Experiment Station transferred eleven tons of seed material of this variety for further propagating to collective farms and seed nurseries. The entire stock of seed material will be planted during early periods and the yield will be used for a second summer planting with freshly-dug tubers.

End of article

3-5-51

Sel'skokhoziaistvennaia entomologiia; vrediteli sel'skokhoziaistvennykh kul'tur i mery bor by s nimi.
[Agricultural entomology; pests of farm crops and measures for their control.]
Ed. 2, rev. and enl. Moskva, Sel'khozgiz. 1949. 764 p. 423 Sh28.

(Transl. 57: Plant Protection.)

Translated in part by S. N. Monson

PLANT QUARANTINE (p. 186 - 189)

One of the most important features in protecting plants from pests is planned regulating of the qualitative content of entomocoenosis (insect association). This task provides for the introduction of measures that interfere with the penetration of new species of parasites from other countries, the restriction of the distribution of local species, and the gradual liquidation of their focuses, i.e. the reduction of the area occupied by any species of these parasites.

The execution of the above tasks is made possible with the aid of a system of measures destined for plant quarantine. The extension of commercial relations between individual countries and the reduction of the time necessary for the transportation of freights (fast steamships, railroad transportation, development of aviation), serves to increase the danger of importing new species of parasites. Correspondingly, ever greater attention is devoted to the organization of plant quarantine in the majority of countries.

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In pre-revolutionary Russia quarantine measures directed against harmful insects were not introduced in time and as a result such dangerous pests as the Pea Weevil ("Zernovka") ("Gorokhovaia") [Bruchus pisorum L.], phylloxera, many species of scale insects [Coccidae], and other pests of agricultural plants were brought in.

The first Government decree relating to the organization of foreign plant quarantine was issued in 1873. This decree forbade the foreign importation of grape vines into Russia. In 1881 the prohibition in import was extended to all live plants, composts and garden soil, at all ports of the Black and Azov Seas. This first quarantine law was belated because prior to its issuance such pests as phylloxera and blood aphid, Eriosoma lanigerum Fausm. (Homoptera), etc. had already penetrated into our country. In addition, the pre-revolutionary period did not possess the proper set-up in special organizations equipped to watch over the full observance of issued regulations.

The urgent necessity for more active plant quarantine laws in the USSR was stressed in 1924 by the Academicician V. P. Pospelov who in his reports to the Narkomzem of the RSFSR stressed the dangerous consequences from the penetration into the USSR of the most harmful pest of the cotton plant, Pectinophora gossypiella Saud. (Lepidoptera). In 1925 preparatory work on quarantine legislation was conducted by the inter-departmental quarantine commission of the Main Cotton Committee of VSNKH. In 1925 the Government issued a decree concerning quarantine of potatoes and in 1926 the Council of Labor and Defense established laws relating to cotton quarantine. In 1931 a single quarantine service was organized at the NKZ of the USSR which dealt with problems of foreign quarantine. In that period a special status relative to quarantine control was developed on the importation of agricultural products and live plants into the USSR, lists of quarantined pests were published and technical instructions issued on the investigation of quarantine methods. In 1934 the SNK Council of Peoples Commissars of the USSR enacted a decree concerning the "PROTECTION OF THE TERRITORY OF THE USSR FROM THE IMPORTATION AND SPREAD OF AGRICULTURAL AND FOREST PESTS," signed by the President of the SNK of the USSR, V. M. Molotov. In conformance with the decree, the Sector of Foreign and Domestic Quarantine of the NKS of the USSR produced series of resolutions and specifically, one on the "REGULATION OF FOREIGN QUARANTINE."

These Government decisions were of enormous significance for the organization of plant quarantine in the USSR. A wide branched network of quarantine organizations was gradually created in the country which contributed a great deal to the non-admission into the USSR of the most dangerous pests, such as Pectinophora gossypiella Saud., which affects the cotton plant and many other harmful parasites.

At present an All-Union Government Inspection Service on the Quarantine of Agricultural Plants is established in the USSR, attached to the Ministry of Agriculture of the USSR. This Inspection "executes quarantine measures within the Government system for the protection of the territory of the USSR from infiltration from foreign countries and also interferes with the spread within the country of particularly dangerous parasites, diseases and weeds of agricultural plants." (quoted from the Regulation on Inspection, dated 1948, confirmed by the Ministry of Agriculture of the USSR.

In an organizational respect the central working links of inspection are the Division of Quarantine of Agricultural Plants of the Ministry of Agriculture and its Central Quarantine Laboratory. Throughout the country Local Government inspection over quarantine of agricultural plants in Union and Autonomous Republics, territories and oblasts are at work. In the majority of regions and large urban centers, as well as at naval and river ports, aero-ports and customs, local departments of Government Inspection are functioning. The above organizations conduct their work based on the regulation concerning foreign quarantine of plants, which correlate with the diverse related Ministries (Foreign Affairs, Foreign Trade, Communication, Navy, Justice).

The established rules in this Regulation are compulsory for all Ministries, cooperative and social organizations, farms and individual citizens, connected with the import of various materials of plant origin.

The decrees and directions of central and local organizations of the All-Union Inspection on the quarantine of agricultural plants of the Ministry of Agriculture of the USSR, issued in conformance with the active decisions of the Government and the instructions of the Ministry of Agriculture of the USSR, are compulsory to all collective and state farms, additional sub-farms, preparatory and other institutions, connected with all production submitted to control and quarantine.

To fulfill this complicated, manifold and most responsible work the All-Union Government Inspection on Quarantine maintains special control-defensive posts, stations and detachments for the disinfection of freights and material subject to quarantine and organizes special expeditions to liquidate the focuses of infection of particularly dangerous pests and diseases of agricultural plants.

The disinfection of quarantined freights infected by parasites is performed in many cases with the aid of special vacuum disinfection chambers which apply the most toxic poisons.

In many instances it is necessary to keep plants under observation at special nurseries which are established in various parts of the Union. In addition to quarantining dangerous species, imports of useful species of predatory animals and parasites are subjected to inspection. Laboratories with insectariums are maintained for dealing with biological methods in controlling pests.

The All-Union Government Inspection and its organizations, central and local engage in scientific study of all problems connected with quarantine, in addition to applying practical measures for the quarantine of plants. The former pertains specifically to the study of individual species of quarantined insects, the development of methods for their investigation, surveying, the establishment of lists of quarantined species, the determination of the degree of danger in the event of their importation, etc.

The execution of plant quarantine requires the active participation of agronomists in various fields of interest from all areas. The agronomic personnel should energetically assist the proper and timely fulfillment of the rules and regulations on plant quarantine on all farms. In addition, the aid of local agronomists is imperative in the conduct of special quarantine surveys. These surveys are intended to disclose focuses of new species of pests in time and to establish the degree of their danger in the respective crops.

End of Chapter.

3/29/51

Naumova, N. A. Effect of potassium nutrition on lowering the susceptibility of spring wheat to brown rust. Vsesoiuzn. Akad. Sel'skokhoz. Nauk im. V. I. Lenina. Dok. 14(10):31-33. 1949. 20 Akl

Translated from the Russian by
S. N. Monson

The effect of fertilization on the change of reaction of breadstuffs to rust has been proven by numerous articles. (1). Fertilization with potassium increases stability, while nitrogen, in some doses, increases the susceptibility of plants to disease. The effect of fertilizatiommanifests itself differently depending upon the type and the physiological races of brown rust (Brown Rust is probably Leaf Rust - Puccinia triticina*). The variability in reaction is clearly demonstrated in the group of wheats which occupy an intermediate place among susceptible and stable varieties.

It is interesting to contrast the change, in growing wheat in the reaction of several varieties in this group to brown rust, which occurs under the influence of various conditions of temperature, as first noted by us. (2). The plasticity in the reaction of the variety [illegible] observed under the influence of different environmental factors offers an opportunity to utilize the types possessing growing stability as indicators, for the purpose of solving many practical problems and methods.

The present experiment represents an effort in actively influencing the reaction of wheat to the introduction of mineral feeding. The following varieties of summer wheat were placed under test:

Lutescens 062, distributed among districts all over; Tulun 3A-31, distributed in Eastern Siberia; Garnet - of the Northern Zone, and Marquis - with a small area of distribution (Azerbajian, Caucasus).

*Note supplied by J. T. Spencer

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The first two kinds are known to be susceptible to rust, the others belong to varieties of growing stability, i.e. to the group of medium stability.

In order to avoid the influence of a complicated "complex" in soil conditions which hamper the analysis of a "factor", a vegetative experiment (VISB, 1941) was deposited in the large vegetative Wagner vessels in quartz sand. A mineral mixture, 1, according to Gelrigel, was introduced in the vessels. Micro-elements were added by tens... The sowing was done with picked seeds, using 15 plants to each vessel; repeated four times. The change in the reaction of wheat was to be achieved by the feeding of potassium and nitrogen at the stage of full tillering. This period was chosen for the following reasons:

According to data available to us, some varieties, such as Marquis and Garnet, are subject to a change in susceptibility to rust in the heading stage, depending upon the temperature at which the development occurs, i.e. tillering. Lowered temperatures during such period produce increased stability, while a higher temperature results in a lowering of the stability during the heading stage.

This leads to the conclusion that this stage may prove critical in changes of the reaction to rust under the influence of other environmental factors. The feeding was applied in the form of a 40-per cent potassium salt fed in normal and triple doses, as well as in the form of ammonium nitrate. The formula of the experiment read: NPK, NPK plus K_1, NPK plus KN, NPK plus K_3.

The introduction (application) of feeding did not have any effect upon the phenology of the wheat until, the heading stage. The growth and development of the varieties proceeded uniformly along all variants. The artificial infection with the Race 20 (from the town of Pushkin) was done between July 19, and 20th, in the period when all grades passed through the heading stage. The suspension of the uredospores was applied with a small brush upon the leaves of the first and second layers. Following the infecting process, the testing vessels with the plants were placed in humid chambers for 18 hours.

The temperature was kept at a point favorable to further the spread of the infection. The maximum temperature did not exceed 24 per cent, the minimum varied from 18° in the evening to 12° in the morning.

The "variants" of experiments made with nitrogen feeding dropped out because of a strong development of mildew. This made it necessary to exclude all variants of experiments on the variety Marquis and to conduct the entire experiment only up to the heading stage. The results of artificial infection are listed on the following table.

Naumov, N.A. Effect of potassium nutrition ... 1949.

TABLE

VARIETIES	PLAN OF fertilization	LAYER OF leaves in order	MARK OF disease	Race	PERCENTAGE OF DISEASE	
					LEAVES	PLANTS
LUTESCENS 062	NKP	I	0-1	IV	67.5)	72.5
	NKP	II	0-1	IV	40.0)	
	NKP+K_1	I	0-1	IV	42.5)	62.5
	NKP+K_1	II	0-1	IV	27.5)	
	NKP+K_3	I	0-1	IV	22.5)	47.5
	NKP+K_3	II	0-1	IV	25.0)	
GARNET	NKP	I)	0-1	II	20.0	20.0
	NKP	II)				
	NKP+K_1	I)	2	II&I	25.0	
	NKP+K_1	II)			17.5	20.0
	NKP+K_3	I)	0-1	II	2.5	12.5
	NKP+K_3	II)			10.0	
Tulun ZA-31	NKP	I	3	IV	70.0)	90.0
	NKP	II	2	IV	70.0)	
	NKP K_1	I)	2	IV	57.5	57.5
	NKP K_1	II)			- *	-
	NKP K_3	I)	1	IV	52.5	52.5
	NKP K_3	II)			- *	-

* The percentage of infected leaves is not indicated because the fact that they were strongly affected by mildew masked the infection of rust.

The qualitative reaction of the grade was determined according to the Maintz and Jackson scales. The total percentage of infected plants was obtained by a count of the diseased leaves in the first and second layers. In all three variants experimented upon, the type of reaction proved steady and characteristic: type IV - in susceptible grades, and type II - in the grade of growing stability. The introduction of potassium reacted upon the mark of infection, particularly upon the percentage of infected leaves and plants of all three varieties. The variety Tulun ZA-31, took first place in susceptibility (a high mark and large percentage of degree of infection), but following a feeding of a triple dose of potassium, the mark decreased from 3 to 1. The infection was reduced by almost one-half, following the feeding of one dose of potassium.

Lutescens 062 - a susceptible grade, reacted upon a feeding of potassium only by a lowering of the number of infected plants, - the reduction of this process proceeding in proportion to the increase of the doses of potassium.

The results of the artificial infection of wheat in the stage of heading demonstrate, besides, that the use of the qualitative reaction, i.e., type of infection, are altogether insufficient for an estimate of the variety with regard to its stability against brown rust. In the present case, the type of infection did not change, as a result of introduced fertilization; it remained constant and characteristic for the variety. However, an increase of the dosage of potassium feeding brought changes in the mark of disease (Garnot and Tulun ZA-31); the higher the mark of disease, the higher the percentage of infection, and vice versa.

The work of Nosdrachev. (3) shows a highly effective degree apparent in spring feedings compared to fall feedings, particularly among plants of young growth.

The concurrence of the results of field experiments with our data points to a general uniformity of the effect, which in turn forms the basis of a practical realization of our conclusions.

Conclusions

1. The study of the grade of summer wheat Tulun ZA-31, Lutescens 062, from among the group of varieties susceptible to rust, and Garnot, from the group of stable varieties, shows their reacting upon potassium feeding and a change in the reaction to brown rust.
2. The introduction of potassium in additional feeding at the stage of the heading of wheat increases the stability of the varieties in the heading stage, while infected by race 20 of brown rust.
3. The effectiveness of the reaction of the same quantities of potassium depends upon the specific grade. A radical increase in stability in the varieties Tulun ZA-31 and Lutescens 062, is observed following a normal dosage of potassium. The variety Garnot shows changes in its reaction in the direction of a greater stability, following the introduction of potassium in triple dosage.

4. The correlation of the dosages of fertilization, as well as the periods of the introduction of potassium feedings, have to be worked out in advance to conform with the specific variety, i.e. to meet the amplitude of changes of its reaction to rust.

5. The estimate of the degree of infection of the varieties by brown rust, according to the qualitative reaction of Haintz and Jackson, does not reflect any changes in the stability of the respective varieties. These changes are determined by a qualitative estimate - the mark of disease and the percentage of infection. It is neces- therefore to apply a qualitative and quantitative estimate to the degree of infection on different varieties in the late stages of the plants development.

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Mycorrhiza and the Absorption of Radioactive Phosphorus
Priroda 39 (6): 79-80, June, 1950. 410 P933

Translated from the Russian by S. N. Monson.

Mycorrhizae were discovered in the eighties of the past century by the distinguished Russian botanist P. M. Kamenskii. Further study of the association between the two symbionts, the flowery plant and the fungus developing on its root system, led to the establishment of the beneficial mutual influence derived by the components of the symbiosis. It was particularly noted that among the seedlings of woody genera developing on poor soils those bearing mycorrhizae grew considerably better than the rest which did not possess mycorrhizae. Researchers attributed this distinction to the greater absorption of mineral nutrients (potassium, calcium, iron, magnesium, phosphorus) by roots possessing mycorrhizae. The greater degree of absorption may be attributed to the increased absorbing surface of the root system or the higher metabolic activity of mycorrhizal roots.

There was, nevertheless, no direct evidence of greater absorption of mineral nutrients by roots bearing mycorrhizae. Only indirect factors were available to compare the rapidity of growth and the chemical composition of different seedlings. More recently the application of marked (tagged) atoms of radioactive phosphorus has provided the opportunity to offer specific proof for this hypothesis. (P. J. Kramer and K. M. Wilbur, Science 110, 8, 1949).

Tests were conducted on two types of pine seedlings: Pinus taeda L. and P. resinosa Ait. Carefully washed roots of seedlings were placed for 3 to 4 hours into a solution containing radioactive phosphorus P^{32}. Following a second careful rinsing intended to free the surfaces from all absorbed phosphorus, and subsequent drying, the roots were cut into 1-cm segments and the radioactivity of each segment was determined (established) by a Geiger-Müller counter.

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The radioautographs convincingly indicated that phosphorus accumulates most in parts of roots bearing mycorrhizae and that here evidently occurs the most intensive absorption of nutrient elements. Phosphorus shows low accumulation on unsuberized root surfaces (lacking mycorrhizae). Surfaces without mycorrhizae but having lateral roots occupy an intermittant place. Surfaces with dead mycorrhizae do not assimilate phosphorus. Thus in the case of pine the maximum absorption of mineral nutrients is confined not to young regions of roots with lateral branches, but to the relatively much older regions where mycorrhizae have developed.

The cause of greater absorption remains unexplained. Prelimary experiments refer to the possibility of a general increase in metabolic activity.

End of article.

5/8/51

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Moskva, 1946. 226p. 464.32 R99F

Translated from the Russian
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Translated from the Russian by S. N. Monson

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The Lilliputian Country

The Flies of Professor Muller

The Birth of a Great Science

A Perfect Slipper, More about Pigmy and Giant Science

The Californian Magician

The Struggle and The Triumph

The Birth of Power

The Land in Bloom

The Creator

The Komandarm of the Fields

The Discovery of Vernalization

Steps of Life

The Secret of Birth

Conquered Old Age

Marriage for Love

The New Life of "Cooperatorka"

The Saga about Poplars

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Translated from the Russian by
S. D. Konson

THE DISCOVERY OF VERNALIZATION (pp. 151-164)

On a shelf hung close to Michurin's work table stood a thin book, one of the few strictly chosen by the great transformer of nature himself, and to be kept close at hand; it was printed on a poor grade of grey paper.

Its title was "Bulletin on Vernalization", and next to it - in handwriting - it read: "To my dear teacher Ivan Vladimirovich, from an unknown pupil, T. Lysenko. April 31, 1933."

Attached to the bulletin was a newspaper clipping with a photograph of the author of the writing, Lysenko, who worked far away from Michurinsk, in the Ukraine, and had never been engaged in gardening but had concentrated on field crops.

Two years later something happened. Well, actually nothing happened of any consequence. The Soviet papers simply carried a brief notice. In the Poltava district, in the village of Karlovka, a peasant had sowed the wheat "Ukrainka" in the spring, and it had produced a yield. That was all.

Why, Ukrainka? It is a winter wheat; it should be sowed in the fall! But here it had conducted itself as a summer wheat.

Who also is this peasant? Lysenko. D. N. Lysenko, and it is said

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that he had done something to it; some kind of a trick. He had soaked the seed - in the winter and then when it began to germinate, had buried it under snow in bags, later sowed it.

Another detail - Ukrainka had not only produced that year but its yield had been very high, 24 centners per hectare.

And also that the entire matter - the burying of seed under snow, etc., the peasant had done upon the advice of his son, an agronomist.

Actually, scientists could have heard even prior to this something about the transformation of winter varieties into summer varieties. In January, 1929, the All-Union Genetic Convention was held in Leningrad. The prescribed order of the Convention was interrupted by the appearance of a young, unpretentiously dressed out-of town specialist. He spoke with a pronounced Ukrainian accent. Never used such words as "mutation", "lethal", "transmutator", "inhibitor", "allelomorph". Neither did he refer to - Morgan, Muller, Goldsmith, Bridges, - and other celebrities of the genetic world of that time.

He related some remarkable things. That a plant in its development passes through a series of special stages, which had escaped the attention of the geneticists of the world. And that the most important thing in the life cycle of the plant is this yet unknown stage development. That the same variety of wheat may be both winter and summer grown.

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That if, for instance, seeds of winter crops are kept at a definite, comparatively low temperature at the time when the germ has not penetrated the skin (pod) of the grain, one may safely sow this grain in the spring.

Many listened to the young orator smiling politely. It sounded like provincial experiments performed on wheat, rye, barley, vetch, rape, (Brassica napus) peas. But what amazed them was the persistence in this experimenting. Entire groups of varieties had been sowed almost every 10 days, for two successive years, and thick notebooks had been filled with daily entries concerning this astounding mass of plantings.

One of the participants of the Convention leaned over to another - "Who is he?" "Some agronomist from Gandzha in Azerbaijan. Lysenko." "Lysenko! - never heard of him"....

In the six volumes devoted to the work of the Convention, the report of the agronomist Lysenko from Gandzha was given 5 pages.

Only a few years passed and from time to time with more frequency the most amazing news appeared in the papers. We learned that a simple and powerful instrument had been given man - to transform winter crops into behaving like summer crops, and adding new strength to the latter. The following estimate was made a few years later: if as a result of the application of this method, one would transport, separately, the entire surplus of yield obtained in the country in one year, it would take one thousand overfilled train units to do the job. This meant that in the summer of

Safonov, V. Zembia v tsvetu [The earth in bloom]. 1949.
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the year when this calculation was made (1937) the additional yield would represent 10 million centners.

We also read that the reasons for the mysterious degeneration of potatoes in hot and dry locations had been discovered. From now on they produce yields in our southern steppes that would equal those gathered only in the central belts and in the north.

The newspapers told about the regeneration of old, withering varieties of cereal crops for which the selectionists of the entire world knew no remedy. "It seemed (as if new blood had been poured into these varieties)", about the increase in the yield of cotton, and about the fact that in the Ukraine, cotton not inferior to any of the Central Asia regions could apparently be grown.

And each time the name Lysenko was mentioned.

And so pilgrimages literally began to the Odessa Selection-Genetic Institute of the Academician Lysenko, the home of these unusual plants.

A streetcar circles along the quiet streets of the old Odessa suburb. Widely spread, it adjoins the noisy port-city. The sea here is far away, it can't be seen, as if not there anymore. Low stone houses, with shuttered windows, a trying shine of lime on the yellow, split soil. Dusty acacia, thorny club moss near gardens. Links of enormous metal pipes and factory buildings.

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The city ends at the railroad. The inscription - "Kiev-Moscow" is seen on rapidly by-passing cars of express trains. Further out - the steppe. The golden green of ripening crops, hardly noticeable boundary paths, and the faint smell of growing luscious grass.

There is no longer any suburb. This is the golden granary of the Soviet land - the Ukrainian steppe. It begins here, at the Black Sea.

These fields, adjoining neighboring wealthy kolkhoz fields, represent the laboratories of the Odessa Institute of Selection and Genetics. 1925. The year when Trofim Denissovich Lysenko was appointed to the selection station at Gandzha (now Kirovabad).

He was 27 years old. His biography is very ordinary. Born September 17, 1898 in the Ukrainian village Karlovka, the son of a medium class peasant - Dennis Nikanorovich Lysenko. Graduated from the Poltava School of Gardening, then took a two-year course in selection in Kiev. Next the Kiev Agricultural Institute. In his student years he produced at the Belotserkov station of Glav-sakhar (Sugar Trust) an early variety of the tomato "Erliana 17". In 1923 he published his first articles on seed varieties in the "Bulletin of the Administration of Glav-Sakhar".

Many Soviet specialists were also peasant sons and to many life had shaped itself in a similar manner. It is possible that persistence alone distinguished Trofim Lysenko, his avid thirst for science, and his unswerving direction along a path once the latter was chosen. And

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another remarkable trait: knowledge to him was something that had to be immediately transformed into action. He hardly realized himself at the time that this was also a Michurin trait.

So here he was in a region of yellow soil, that cracked under summer heat and a cloudless blue sky.

It was fall. The Gandzha Selection-Experimental Station, just opened, was in the lower part of Azerbaijan. Cotton fields, already harvested, were spread all around. They were out-lined by a network of irrigation ditches. And only in a few of these some water was seen at the bottom.

The assignment given the young selectionist did not deal with cotton, the principal crop of the region, but with legumes. These served as fodder for cattle, and on some lots they were grown in order to be later plowed into the soil, as a green fertilizer; and they always enriched the soil with nitrogen, since, as we know, special bacteria - catching the nitrogen, live upon the roots of legumes, so that a field sowed with these plants is enriched by the most valuable nitrogen salts.

Here in Gandzha one could have grown southern varieties of leguminous plants with such exotic names as "mash" and "vigna". But there was little moisture, and to obtain it one had to conduct a continued struggle. During the summer the irrigation ditches carried their resounding load to the cotton fields, since one could not afford to have the "white gold" -

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cotton - suffer from thirst. What did legumes matter!

During the fall and winter there was, of course, plenty water. Because it was no longer needed for the harvested cotton. But what could one do in the field in the fall and winter? This was not our northern gloomy fall or our northern winter. This was Azerbaijan where the sun could spare all the light and warmth needed. Couldn't it be possible, therefore, to sow legumes here in the fall and winter, during the months of plentiful water supply, and leave the summer months for cotton? This was the first daring thought of the young selectionist in a new, unaccustomed place of work. The fact that having arrived in Gandzha, in the fall, he did not wait for the spring to begin work on his legumes, was already in pure "Lysenko style".

By winter he had planted peas, vetch, Vicia silvatica L. ("konskie boby"), lentils. He had been right in reversing the agricultural calendar: winter did not harm the majority of sowed plants.

It was natural to expect that the earliest varieties would come out best, those that in the north also succeeded in developing best. They, evidently, require the least amount of "average daily temperatures". It was reasoned that such varieties would prove the most suitable ones for Lysenko's planned winter crops.

However, the first yield of the spring of 1926 brought a surprise. The earliest among peas to germinate and ripen was the pea "Victoria".

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The same, well-known to him, "Victoria", of his Belo-Tserkov days - of medium ripening, which had never yet tried to speed up its short pea-existence. One could have, actually, overlooked this fact and accepted it as a minor misunderstanding. Lysenko, however, viewed this seemingly insignificant factor from an altogether different standpoint.

He sensed in this individual occurrence the action of a law, as yet unknown, a law of such significance that from its discovery a great deal would be changed in agricultural science and even in our understanding of the nature of plant life. (It is curious to note that Mendel had also once used the pea in establishing his "laws". Now again the pea was convincing the research worker about the falsity of these "laws".)

Lysenko next began sowing a collection of agricultural crops, among which were also grains: rye, wheat, barley. He sowed these every 10 days over a period of almost two years - in the fall, winter, spring and summer.

Altogether surprising things were found out.

Wheat, rye, and barley, either were tillering stubbornly and did shape into tubes or, if sowed in the spring, managed to produce a heavy stalk (stem).

They acted as either winter or summer crops; it was the same variety. This showed that the "lot of heredity" was not alone wilfully guiding its destiny. What happened next, however?

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The late, cold spring of 1928 - promising a short summer of warmth. And again pointing to the fact that only plants of a rapid development, summer crops, the early varieties, may succeed in "slipping through" a short summer and accomplish in time the task assigned to a plant in its life-time.

But everything came out in reverse.

In the summer a yield was gathered of some tens of varieties that had been sowed 15-20 days later than in the previous year of 1927 when the spring had been much warmer. The cold spring had, evidently, not harmed them but had, on the contrary, speeded up their development. It had made them summer crops of the early variety.

Why didn't anyone notice these remarkable facts before? Was it because the Morganists approached plants with their own preconceived ideas? Actually they even boasted over having freed themselves of the obligation to watch for some incidental occurrences in the individual existence of an organism.

The least that became apparent from these first Lysenko experiments was: one no longer could decidedly affirm that here were winter crops and there - summer crops; these the early ones and the other - late. Winter crops? Well, it depended under what conditions. Early varieties? Depending upon where grown.

Lysenko, however, also drew a much more important conclusion from this

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fact: that all these "caprices", exceptions, and seemingly incidental occurrences, were the results of a new law in academic science and that this law is extraordinary - on first sight it may appear even paradoxical. This law seemed to establish that growth and development were not identical.

Doesn't winter wheat grow in hothouses? It grows splendidly - in luscious, tillered grass. Represents an excellent green fodder for cattle. All it lacks are stalks. Winter wheat seems to spend its entire hothouse life period in a non-adult stage of development. Let us imagine a child that has grown to giant size but remained a baby, nevertheless - with fat little hands and legs and baby talk. And right next to this baby giant - a dwarf: some tiny stem which grew from a grain dropped inadvertently at the side of the road. This is a dwarf- adult. Here is its stem, as tiny as he is himself, bearing only two shrivelled grains. His was a poor lot, life had been unkind to him and still he is luckier than the nursery-trained "youngster". He had produced all that wheat should produce: had germinated, passed the booting stage, thrown out a stem, and had produced a yield - two grains.

What then is development? Here one should again remind oneself of the cold spring of Gandzha when many winter wheats, even those sowed late, managed to ripen and so became summer crops. The cold spring produced what no nursery could accomplish. Evidently, wheat in its early development is forced to pass through some stage which cannot be gone through without cold.

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This is why one may refer to this first step of development as the temperature stage (later named the "stage of vernalization").

What the Gandsha spring accomplished may be equally done by man. Once he knows that the winter variety requires cold in the first stages of its development, man may provide the necessary amount of cold at the time when the germ in the grain only moves towards growth. And then such "vernalized" winter plants will skip through a step in temperature and conduct itself later as a summer crop.

Never yet was such a case observed in science.

The year of the great turning point had just begun. The gigantic construction work of the first Stalin Five Year Plan was transforming the country. The collective socialist village (kolkhoz) was replacing small property. The collective farmers strived for yields, such as had never been produced before. They demanded of agricultural science: teach us how to cultivate the soil better, how to sow, grow (cultivate) plants.

How could, under the circumstances, a new knowledge, such as obtained by Lysenko, remain unnoticed? The word "vernalization" swept the country. Today it is even difficult to tell who first pronounced it.

The research begun at Gandsha grew tremendously. Trofim Lysenko stood at the head of it, as before. He was helped, however, by thousands of collective farmers - experimentors in the Ukraine, in Kazakhstan, Kursk, Moscow.

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"Without this, later wrote Lysenko, our laboratory research not only would have remained within laboratory walls, never penetrating into the fields, but the development of the very theory of the problem would not have produced the accomplishments that are attained today."

The truth of any theory is confirmed by practice. Whoever has to cut down a tree gets hold of an axe. But if a person would not fell trees and would only talk about felling them, there would, possibly, be some who would send into the forests a wood-cutter equipped with a pen-knife. And one would be unable to argue with such people.

The same happens in science. Theories which possess a small amount of truth and many preconceived ideas may occasionally persist for a long time in laboratories and books if millions of people are not placed in a position to apply these theories and experiment with them in wide and valuable work.

End of Chapter

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Translated from the Russian by S. H. Monson

STEPS OF LIFE (pp. 164-171)

In 1930 Lysenko transferred his major research from Azerbaijan to the Ukraine. The government created a special department for it at the Ukrainian Institute of Selection at Odessa.

Now Lysenko had the opportunity to utilize in his experiments the tremendously valuable collection of plant growth, gathered from all over the world and assembled at the Leningrad All-Union Institute. It represented the gist of all that humanity had created throughout its entire history on the fields of the entire globe. 1427 specimens of Azerbaijan wheats were planted in the spring of 1932 at Kazakhstan. 80 percent of these wheats proved to be summer crops under these conditions and produced a yield in the summer.

In the same spring an identical collection of wheats was sowed in the sovkhoz "Giant" in the Northern Caucasus. Almost the entire group of wheats turned out to be a winter crop. Only 5 percent of the sowed wheat tillered.

Indian wheats ripened at Gandzha almost 30 days ahead of the Finland wheats. And at Khibina, where at the request of Lysenko the crop was sowed by the pioneer of trans-polar agriculture I. G. Eichfeld, the Finnish varieties caught up and even surpassed them.

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Never yet had a scientific experiment been tested on such enormous area and with the aid of as many participants.

Soon the "temperature" each required for its own stage of vernalization was definitely established. If the plant did not get it, its development stopped; instead of cereals grew green fodder for cattle.

The seeds are spread on the floor of the barn and are well soaked. Next comes their temperature "treatment". Winter wheats are kept at a temperature of 0-3° above zero, for a period of from 30-50 days (depending upon the variety); the summer crops are given 5-12° above zero for a period of one to two weeks.

Mass vernalization of seeds has been practiced in the Soviet Union for many years. Statistics show that additional yield from the planting of vernalized seed equals, on an average, 1 centner per hectare. In 1937 it represented 10 million centners throughout the Soviet Union - the figure we formerly mentioned - the one thousand carloads of grain.

At present in speaking about the general law in plant development, we no longer refer to the word "cold". Cold is required by winter crops at the first stage; and even at that several varieties may be vernalized at a temperature of 10° above and even higher, except that their "non-adult" period in such case is lengthened by many months. The vernalization at 15° above, used in the case of some summer crops, may not be considered "cold" even by a southerner, generally suscept-

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ible to cold temperatures.

Cotton demands almost tropical temperatures: 20-30°. But once it passes the stage of vernalization, it becomes more yieldy; the average summer temperature will suffice.

Incidentally, it showed why cotton had grown poorly in the Ukraine before. Not because of the prevailing cold there, but because in the spring, for its stage of vernalization it required some degree of heat for a brief spell.

It all proves how essential it is for the organisms of plants to pass through stages that differ from each other, in order to complete their development. Stages? Are there then any more than merely the stage of vernalization mentioned above?

Here the workers of the Institute of Selection and Genetics recall the enormous Mexican corn which grew in Odessa in the hot summer of 1931. The word "crop" did not suit it at all. This strange tropical plant, of huge size, branched stalks and narrow winding leaves, - but not a single "pochatok" (sprout?) was visible anywhere on these giants.

Their stage of vernalization had been successfully gone through long ago. What then had caused this unrestrained, sterile growth? The guilt was found, - it was the Odessa day, which was to long. It provided too much sun for a tropical corn, in whose native land day and night were almost evenly divided.

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Of the numerous experiments performed at the Institute in the years 1931 and 1932, some were extremely simple. In the spring a dozen or more seedlings of northern wheat were covered in the field by a pot at the time they were already turning into a tube. This only for several hours a day. The rest remained as before; thus the day for these seedlings became a little shorter. And what happened? No seeds were gathered from any of them.

Vernalized winter crops were sowed towards the end of the summer and in the winter in a nursery. They never tillered. While barley, for which an artificially short 10-hour day was arranged replaced by a long, dark winter night, - this barley grew for two entire years, shot through one leaf after another, and perished, without tillering.

Next to it a barley was sowed which never knew any night. Light was provided by electricity. And this barley passed, - no, it ran through its life cycle, from grain to stem, within less than a month.

Thus was discovered the second stage of plant development - the LIGHT STAGE. Only after having gone through the stage of vernalization may a plant enter it. At this second stage each plant also presents demands of its own. One will require more light; let the sun shine even 24 hours a day. The other demands a shorter day. Each plant claims its own ration of light.

In time plants will grow less demanding with regard to light, though

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it will remain an essential: without sunlight the "green factories" will not operate; but for their work, any available daylight in the world will do. And there will no longer be any argument between the light ration required by the plant and its immediate environment.

We still do not know all of the stages. It is evident that the plant passes through some other stages as yet unknown after going through the light stage. But there are hardly many of those. Lysenko believes there are 4 or 5 stages in all, no more.

We spoke of temperature rationing and light rationing. Does this mean that the plant first requires only temperature and then only light? Certainly not. At first, as well as later, the plant requires moisture, nutritional substances, any number of things. Except that there always are enough moisture in the soil in the spring, plenty air, while the food elements are already stored in the grain. And in this lengthy chain, of which each link is needed to permit the plant to grow and develop, the researcher segregates the link which states its requirements for a given stage: temperature - in "infancy", light - in "youth".

There is no doubt that Lysenko already understood the exclusive importance of the law discovered by him at the time he conducted his first experiments at Gandzha. But a scientist has to be careful in his conclusions. And at first Lysenko spoke only about the law of development of an annual sowed plant. The subordination to this law by rye, wheat, barley, cotton, millet, soya, clover, and rape were quickly established.

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"Expartset" - Onobrychis Scop., grown from vernalized seeds, bloomed when there was not a bud on any other plant on adjoining control rows. The winter vetch, following vernalization, grew within a few weeks into a green, flower-covered mountain. The potato and later the perennial grasses submitted to this law. And what about shrubs and trees? The researcher stopped here for a while, but it was already evident that in the new, sharp light the old truth appeared - that plants are organisms which live, and that life means development.

The great accomplishments of science enrich the subsequent growth of not one but many of its branches. Series of factors, so varied on the surface, unite. A harmonious order in an apparently varied large group of factors is observed. This order will from now on be considered natural and self-evident. And many will wonder: why did'nt we notice this before?

I have in front of me the second edition of "Principles of the Ecology of Domestic Animals" written by the Leningrad professor Daniel Nikolaevich Kashkarov ("CFTEDGIZ, 1945). It is the swan song of the greatest ecologist. He died and was buried towards the end of 1941 at the station "Khkvoinaia"; through this station an echelon of people - evacuatees from Leningrad, passed at the time the Hitler hordes stood at the city's gates.

I open the book on page 40. Here the author-zoologist speaks of the

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"stage" theory of development. I read about the significance of the Lysenko law of interpreting life and the development of domestic animals (concerning which Lysenko hardly could have thought in planting his legumes in far-away Gendzha).

He quotes examples, of which there are many. Calves, young pigs, and the young of many other mammals develop with age a dependence upon the external temperature. In other words, they require different environmental conditions in temperature at the various stages of their development. In the early stages, they are more demanding than later on. This is because from the beginning they do not develop the real warm bloodedness which alone makes the higher mammals indifferent to the variations of temperature in an external environment.

A hot summer, - but the caterpillars of the Crataegus L. ("boyarishnitsa"), having reached the "third age", as the entomologists call it, lose their mobility and seem to have "died" in their nests. They winter in these. The first spring warmth awakens them, however. Alive again, active and gluttonous, they rapidly complete their transformation. Something changed within them. The rays of the sun affect them in a manner directly opposite to the one from the rays of the preceding summer: those had put them to sleep, these awakened them.

Sheep are easily pleased. They are perfectly happy either at 2° of frost or 24° of heat. The mating season starts. How capricious the

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animals get! The narrow limits of 2-1/2 to 9-1/2° now alone suit them. At lambing time, the temperature "optimum" again changes for the mother-sheep. They require no less than 6° and no more than 17-1/2° of warmth.

In such curious way requirements change with respect to the "temperature factor" alone.

Where do those changes originate?

The history of the species is imprinted upon them, and here unfolds the majestic all-biological and evolutionary meaning of the law of "stage development".

This is the reason ~~why~~ northern plants develop a demand for cold in winter crops, the seeds of which await the spring in frozen ground. The reason the seeds of the spiny Corispermum L. ("verbluizhie koluichki"), grow in the southern steppes, is that at first they require extreme heat (it is hot in those steppes when the seeds ripen), and afterwards demand moisture (the fall rains come there only later), otherwise these seeds won't germinate, no matter where they are sowed.

The wild forefathers of domestic sheep dwelled in mountain regions. At breeding time, in early fall, they climbed high up into the mountains - it was cool there. But they lambed in the spring: and today's "optimum" for the mother sheep - are the spring temperatures of the sheep mother country.

If we claim that definite temperatures of external environment are

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more important to young mammals than to adults, and observe clearly how the bloodedness improves, we look into the very depth of time: there, at the end of the cretaceous ("melevoi") period, or at the early third one only, the ~~ancient~~ ancestors of present-day higher mammals developed the ability to regulate the temperature of their bodies.

Caterpillars, wintering pupae, falling asleep yet in the summer - in expectation of the cold - isn't this the legacy of the great ice age when the brief, damp, and cold summer was replaced by a cruelly deadening frost?

In this manner the all-biological meaning of the law of "stages" becomes apparent. Involuntarily one recalls the simplest, most elementary facts. Known by everyone, they take on a new, deep significance; they stand close to these amazing facts proven by Lysenko. We are facing one family of facts.

Don't the caterpillar and the tadpole pass through a series of very clear, drastically separated and so familiar stages that transform them into a butterfly and a frog respectively? And at each stage the requirements of the organism to environment change radically, to an extent, that if one were to restrain the fulfillment of these requirements, one could, for instance, create a giant tadpole which will never change into a frog. We know that at times a species will adapt itself to such restraints, and there are animal-amphibia that have developed the ability

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to remain forever giant tadpoles. Within these transformations is sealed the early, long history of the evolution of these animals. It follows that the law of stage development is the simplest explanation for all enumerated and many similar facts.

This is why in 1942, the famous English cytologist Fife declared that had Lysenko developed the theory of stage development only, his "name would be known among selectionists and physiologists of the entire world."

But the discovery of the law of stage development was itself only the first "stage" in Lysenko's creative path.

End of Chapter

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Translated from the Russian by
S. N. Monson

THE SECRET OF BIRTH (pp. 171-179)

In January 1938 Lysenko made an unusual promise - to produce a new improved variety of summer wheat in two-and a half years.

The fact that a definite time period of 2-1/2 years had been set, was a most important and unusual occurence.

It was proposed to produce the variety in a planned order. Still, the Morgan handbooks claimed: one can produce a new satisfactory variety only in trying and failing, failing and trying....

The new variety was supposed to ripen very early. The Selection-Genetic Institute selected two very late varieties never sowed at Odessa before: the Eritrospermum 534/1, (actually a winter wheat) and the "Girka 0274": these were crossed.

What a strange pair they made! Not alone were these particular varieties very late, but they also suffered from firing in hot weather, their grain was poor and they possessed numerous other deficiencies. To select such varieties as a basic material for a new experiment was indeed a most daring undertaking.

Who would have bothered determining in advance whether these two hopeless varieties also possessed any good features. Lysenko, however, was particularly interested in some of their few positive qualities. It seemed that the "Girka 0274" was not susceptible to either rust, or loose or hard smut. And

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that if Eritrospermum 534/1 were vernalized it would produce a heavy grain that would not shatter. In other words, the two varieties were not altogether bad, provided their "sins" were not twice as numerous as their "virtues". Only one would require a strainer to separate the good qualities from the poor ones.

Nevertheless, Lysenko intended to acquire just such a strainer and to discard with its aid all sins from his unusual pair preserving not alone their good points, but adding the one, which those varieties had never possessed - that of early ripening.

From the time man had worked with plants, no one had ever engaged in more enterprising hopes. Only Lysenko was helped by his recently acquired knowledge on plant life.

Lysenko determined first of all, that all numerous and varied "sins" of both varieties were the result of only one circumstance in the case of either kind.

Eritrospermum, a native of Azerbajian, was well known to Lysenko from his Gandja days. This wheat remained long in the vernalization stage, and came out of it - as "neither peacock nor crow" - (Russian saying) - too "wintery" for a summer crop, and too "summery" for a winter crop.

While the Odessa native the summer wheat - "Girka 0274" - raced through the stage of vernalization. Its difficulties came later. The stems would not put out stalks. Who would think that this wheat entering its life cycle

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at such speed would later turn into such a "slow-poke". When it finally was through with its affairs, it was already too late; heat was drying the soil and the sowings could not be saved from firing.

Both varieties were late. But it seemed that there was nothing similar in their lateness: one was stumbling at the stage of vernalization, the other - at the light stage.

Now it becomes apparent why Lysenko decided upon this choice.

In the work of D. A. Dolgushin, Doctor of Agricultural Science, which tells the biography of the new wheat produced by Lysenko, I see a drawing. The variety "A" is presented by a combination of long and thin with short and thick bars. The variety "V" is indicated by short-thin and long-thick bars. What will happen if these two are crossed? A third drawing provides the answer. It is short throughout, consists of a short-thin and short-thick bar.

This is an early form which combined the best points of both parents and was therefore deprived of the disadvantages carried by either. It would overcome the stage of vernalization (as done by one of its parents, and also inherit the quality of the other, brought in as a "dowry", - the ability to go ~~through~~ without difficulty through the light stage.

This means that these two very late varieties could produce one that would ripen earliest. And since it would lack any of the basic faults of parents and hybrid, it would also be relieved of the rest of the deficiencies

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that accompanied the principal "sin".

The idea of producing the variety according to a plan came to Lysenko in 1932. And had he, as writes Dr. Golgushin, waited until spring to verify it, he would have never forgiven himself - it would have been contradictory to his nature.

"Girka 0274", "Eritrospermum 534/1" and "Lutescens 062" were sowed in a conservatory in clay pots on Dec. 8, 1932. The stubborn Azerbajianian was vernalized: electricity was shining over the seedlings at night. And by the end of January everything was tillering in the hothouse.

At this stage, the union between Eritrospermum and Girka was consummated, and for comparison another added with Lutescens. Both unions proved unfruitful: only 114 seeds were obtained; these were sowed on April 17 into clay pots again. Seedlings soon appeared. The hybrids practically all tillered earlier than their parents, although some were delayed in their tillering more so than the earlier parent; still none of the hybrids tillered later than the parent plants.

On July 19, 1933 "harvesting" was on - in clay pots. And on the following day the second hybrid generation was sowed in 75 pots. Everything went according to plan. But nothing could have been foretold as yet. There were hybrid forms, but no variety. And one had to hurry - all one had was 2-1/2 years.

How to use them best? If the sowing were to be done in the field,

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only three generations of wheat could be produced in that time. This meant that one had to let time itself flow differently. Change the division of the year into winter, spring, summer and fall, into periods of awakening and dormancy, as is habitual in nature.

Not permit any sleep, no rest whatever. Produce the work in 30 months, rather than 2-1/2 years. And to utilize every day of these months.

The third generation of hybrids was born in October. It was speeded up by the use of electric light, the artificial temperature of a summer day, the watering with fertilizing-mixtures.

November. The first stems... But what about the pollen? Some flowers had wide-spread glumes, the stigma spreading in to all directions. Another 24 hours; 48 tortuous hours more... Will pollination take place or will life be interrupted forever?

48 hours longer... Everything hung on a thread. Lysenko was growing an early form - the earliest stems, the most valuable ones... Let all the rest perish, so long as these were preserved!

What was interfering with pollination? The dim autumn light, barely trickling through perspiring glass, - a sunlight, much too weak, and not helped by sleepless "Jupiters"? (lights). The feebleness of the thin leafage, the pale, stretched stems? They were being "chased" rather than grown. The dry steam heat? The temperature that fell in freezing weather?

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Whatever it was, it did not matter now. In the future one may try to avoid these dreary, severest winter months. It would be desirable to relax the speed, to sow in such manner as to produce stems no earlier than in February, even March...

In the future... But what about now? What to do now?

Some flowers, (and how many hundreds of times, eager and sleepless eyes would watch for every change both day and night), yes some flowers actually showed slightly lengthened ovaries.

One could breathe more freely: the earliest kind was saved.

The harvest took place on December 27. The rest of the plants were rejected and thrown out. The yield consisted of: 193 grains from the hybrids 534/1 x 062 and of 20 grains of the most important hybrids, the 534/1 x 0274. Twenty grains...

What confidence in one's judgement was needed not to despair, - when in one's hands one had nothing but a thin thread of the third hybrid generation after a year of frenzied work!

The descendants of these twenty - the fifth hybrid generation. Pots and hothouses were at last abandoned. The first customary planting was done in the ground. Close to it grew the hybrids Eritrospermum crossed with Lutescens.

In the spring of 1934 the earth was burned by fiery winds. The soil lay in black clefts; it seemed dim from the dust hanging in the air. On

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the horizon loomed mirages.

The wireworm, thin and gluttonous, fell upon the delicate seedlings of the selected seed-beds. Women were picking the worms by the handful into attractants. The seed-beds, surrounded by barley, were visited from early morning into late at night by groups of Institute workers. It would be more properly said these actually lived there, taking time off only to eat and sleep, resenting even these necessary absences.

They intimately knew all their weakly and cherished nurslings. The impatience with which the people watched the minute events, observed the elusive and steady changes on the seedbeds! Here the stems of young leaves begin to spread in their furriness. There solitary slender stems transform into bundles and clumps. Yesterday yet - there was none of that. Today a grey film spreads over the leaves. What will follow tommorrow?

And in those long days, when throats were parched from thirst and eyes blinded by a pitiless glare from sky and earth, biologists, agronomists, and selectionists of the Institute searched with magnifying glasses and without them for characteristics and signs of the new variety.

When harvesting time came, a strict selection emptied the lots. It was necessary to segregate the families - originators ("zachinateli") of the variety. The elimination continued at the laboratory - according to size, form, degree of "filling" of the grain ("naliv"). Only 4 families stood all the tests: three - from the crossing with Girka, and one - from the

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crossing with Lutescens. These 4 families were given numbers: "1155", "1160", "1163", and "1165".

However, there was only a handful of seeds from these families. And only one year was left to the deadline proclaimed by Lysenko.

On July 19, 1934 forty boxes, containing 48 grains each, were planted with seeds of the four families. The Hessen and Swedish flies were around. No one knew how high they flew and how to protect the plantings from these pests. The entomologists shook their heads: You are asking whether it is possible to get protection from these flies? Well, no one has as yet ever sowed at this time of the year. No definite data was available for July.

The vegetative "house" was sewn from top to botton with gauze.

Rare, interspersed germination appeared. On August 1 there were still black empty spaces. Lysenko was away from Odessa at the time; he arrived on the 2nd.

"To reduce the temperature at all cost!" For all he cared, the seedlings were to be placed in the port's refrigerator.

One managed without this. For three evenings in succession the women packed lumps of ice in the house covered with gauze. The ice compresses remained all night, melting in the morning.

On August 6th a green brush of germination covered the boxes. The harvesting was done already in the fall, in the hothouses.

And here again, in October, 223 boxes were planted, at 84 grains each.

Hardly anyone at the Institute will ever forget this winter.

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Severe frost, uncommon in the south, hit the countryside beginning December. Cast iron stoves burned all night in the hothouses. Still the mercury kept dropping to: 6°, 5° ... and by January 5 to 1° ....

The winter sun, appearing on the following day, hardly helped at all. In the evening a wind began blowing. Torn clouds swept the desert, gloomy sky. Thin walls of boards and glass in the hothouse - was all that separated the priceless plants from the icy darkness of the stormy winter night.

One more stove, devouring fuel all through the night. The dimmed eyes of electro-reflectors. Even "Primus" (kerosine stoves) whose noise one is unable to hear because of the rattling of the wind in the pipes, sending back clouds of acrid smoke into the hothouses.

All 20 pieces of "Jupiters", at 500 candles each, were glowing full strength. Not because of the light stage. Who thought of that? But only to provide more heat.

Within the hothouse smoke stifled the breath. Oil was poured into the flames. The merciless mercury showed - zero, one degree of frost.... The earth in the boxes clang as stone would. All of a sudden someone tore in with a heap of blankets. The thermometer stood at 3° below zero. Daybreak. Still the danger not over yet. The seedlings stood pale, leaves weak. Many perished: they got poisoned by the fumes of ammonia gas from the stoves. Among the surviving plants the hybrid "1165" was the first to "tiller" in the second half of February. It produced later-1/2 kilogram of seeds; "1155" produced slightly more, the rest about one-a-half kilogram each.

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They were slated for a test in the summer. Those to be submitted to it were: the famous Saratov "Lutescens 062", the "parents" - "Eritrospermum" and "Girka", and two Odessa varieties - "Albidum" and "Alborubrum".

They were all planted at the same time on April 3. On July 5th "1163" ripened. On the following day it was joined by "1165" and "1155". The fourth hybrid was one day late. The Saratovka (Lutescens 062) arrived at the "finish" on July 8. Both Odessa varieties - "Albidum" and "Alborubrum" arrived neck to neck on the 9th. The column was closed on July 10th by "Girka 0274". The grain of the non-vernalized "Eritrospermum 534/1" ripened only in August.

The yield of the tested plants was not bad. But the matter of resistance to smut and rust was worse off. One of the 4 hybrids - "1165" - had to be altogether eliminated.

While the hybrids were being tested on the field plots, another, also unusual task was being solved. One thousand grains of the "fastest" of the four - "1163" - were not planted in the soil. They were sowed into one thousand pots at one grain to each pot. During the long spring days the seedlings were kept in the dark for several hours, so as to delay the light stage. And then they began to tiller. An entire forest of stems was produced from one root. Each clump of wheat resembled a tiny grove - the wheat grew, as does the tropical banyan, the Indian holy Ficus (carica).

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When the one thousand "groves" were transplanted into the ground, into rows separated from each other by one half meter, the tall stems (there were in some cases 80 on each clump), threw out stems. The grain was harvested in July. One thousand seeds weighing 25 grams had changed into 25 kilograms.

One more planting, one more wheat generation - and by the fall of 1935 Lysenko possessed 130 kilogram of the new variety. A little more than a year had gone by since July, 1934, when from among the 8 selected plants that had first received the number "1163", fifteen grams of seed had been gathered, - 600 grains in all.

Now one could look back. In two years and 10 months a new variety had been produced and propagated to an extent that the grain could already be stored in bins. During that time 10 generations of summer wheats had gone by - 10 years, condensed into two and a half.

After the "Lutescens 1163", a new variety, the "Odessa 13" was produced. As was to be expected it exceeded in quality the first one.

Lysenko was particularly proud of the fact that noneof the intermediate hybrid generations had required more than two square meters of hothouse area: he had been going in the right direction, without erring.

When the time came to propagate the varieties, the "one thousand" grains did not satisfy him anymore, he succeeded in obtaining one-and-a-halfthousand grains. The summer Barley "Odessa 14" was produced next, and so were

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winter wheats. Among the latter "Odessa 3" was frost- and drought resistant, and of better yield than the standard varieties. Man had exerted full control over the secret of birth.

End of Chapter

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Translated from the Russian by
S. N. Monson

CONQUERED OLD AGE (pp. 179-189)

None of the haughty family of feudal barons or sovereign princes whose pompous family trees fill heraldic volumes can boast of a history such as that of the potato tuber.

It is true that the fame of the potato family is not as ancient. It is only some 400 years old. On this point this family may not compete with those whose ancestors were knighted by Frederic Barbarossa or Pepin the Short. Nevertheless, it has amply compensated for the youth of its fame by the remarkable accomplishments it performed in all planted fields of the universe.

The potato family appeared on the world stage in the XVI century, at the time the Spanish conquistadores were shedding the blood of the "Incas" of Peru. There, on the elevated valleys of the Cordillerae, the European new-comers in their greedy search for gold, heard about the unknown plant "pappa".

Several decades later a strange colored drawing, that had crossed the Atlantic, amazed European scientists, compilators of herbs.

Years passed in a hunt for potato tubers. Admirals and pirates took part in it. The booty eluded them for a long time. Sailors sailed with the batata in the belief they were carrying potatoes. Walter Raleigh, adventurer, corsair, and admiral of "Merry Old England" brought back the Virginian [the earth in bloom]. 1949. (pp. 179-189)

"openauk" in the days of Shakespeare and Queen Elizabeth. He planted it in Ireland, believing he was planting the potato.

Finally two potato tubers traveled with a great deal of adventure across many European cities. By the time the native fruit of the people of Peru was introduced in the Old Country, one feared, at first, to bake or boil it. The clergy cursed the "devil's apples". The knobby earthen fruit both attracted and repelled. The tubers seemed to resemble truffles most, and because of the latter's name "tartuffle", they were called "kartoffel".

Commenced the XVIII century. The scientist-enthusiast Parmentier planted potatoes on empty lots below Paris. He presented a bouquet of the white-yellow flowers to Louis XVI, which the stout king promptly pinned to his camisole. A strong guard watched over the lots. It withdrew at night. This constituted a harmless trick on the part of the scientist. He used to steal to his lots in the darkness and watch the peasants carry away bags on their backs after emptying the unprotected rows of their fruits. Hiding in glee, he watched his precious tubers disappear in the peasants' bags. He would have gladly applauded them, had he not feared to frighten the looters and was delighted with the success of his devise - a living illustration of the saying: "forbidden fruit is sweet".

Soon entire stretches of potato fields spread over Alsace and Ireland. The potato found its distribution in Europe; the "pappa" fed many thousands of people. However, at times there were potato famines. The "plant destructor - phytophtora", a fungus, unseen and merciless, destroyed field after

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field. The dreadful visitor - death from starvation - penetrated into settlements. Then the owners of stored flour, landowners, merchants, noblemen, landlords would grow rich. At times, the people, driven to desperation, revolted. Hired soldiery quelled the insurgences, and blood, of which so much was spilled in the history of the potato, flowed anew.

In the East of Europe, in Imperial Russia, serfs were driven under duress into potato patches. The peasants were compelled to plant the strange plant and to consume the unheard of food under penalty of beatings. Here too potato revolts flared up. They were cruelly suppressed. In Russia as well, the Peruvian "pappa" left a bloody trace behind.

Decades passed. The potato honestly fulfilled its task in the fields, irrespective of the ruler of the country in which it grew. Its virtues were self-evident. Soon it was no longer necessary to use attractants or force to plant it. The potato was willingly sowed everywhere.

At present it feeds millions of people. It, so to say, conquered the entire world and has become almost as indispensable as bread. We prepare some fifty meals from the potato, eat it in the morning, at noon and in the evening, with herring, and jelly, and have difficulty in believing that only some two centuries ago our ancestors did not know of the potato, that it did not appear on the menus of Lucullus feasts, nor 1600 years later, at the feasts of Gargantua. Thousands of scientists, numerous special potato institutes have studied seemingly everything there is to know about this living progeny of the destroyed, mysterious land of the Incas.

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Nevertheless, even now, as was the case in the first years of the appearance of the potato family on the world arena, the baffling caprices of the potato confuse botanists, gardeners, and agronomists.

How strange the things are that take place in this South-American native plant... especially in the south. It shows no desire to settle in the entire steppe-zone. Nor will it grow in Arizona, Provence, or on the shores of the river Tiber, in our Ukraine, the Crimea, the Lower Povolzhie, Azerbajian, not to mention Central Asia.

To gather a yield of several tons of potatoes from the hectare - is a common occurence near Moscow. Even in the Polar region, at Khibini, 30-ton yields are not uncommon. But here, in the rich steppe soil, under favorable skies - it is hardly possible to "scratch together" 4-5 tons. And how little these tiny nuts resemble potatoes.

Most incomprehensible and worst of all was the fact that the potato degenerated rapidly. Even the first generation of tubers, when grown in the south, got smaller. And after 3-4 generations the potato had exhausted all its life - strength. Under each clump one would find some miserable little nuts weighing a total of about one half pound or even one quarter pound.

Entire trains had to be taken off the transportation of coal, machinery, and factory goods and were used to transport seed potatoes to the south. In Crimean markets it sold at prices equalling those of fruits. Each year tens of thousands of tons of splendid, "tightly starched" tubers were carried from the north to the south. They were soon doomed, however; grew sickly and turned

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into miserable and withered dwarfs. It seemed that the fatal cause was hidden in this very steppe soil which sucked the "juice" from the gigantic potato army the north continued to send.

The soils are unsuitable for the potato, - claimed the scientists. The fault lies in the soils.

There are tens of varieties of soils in the south, replied others, and and the potatoes degenerates on all; what has the soil to do with it in such case? The unknown enemy is a microbe. Degeneration is a disease.

No, stated scientists of the third group, shaking their heads. In our time no microbe is likely to escape the attention of research-biologists. And if we do not know of the microbe that causes degeneration, this means that none exists, to all appearances. Degeneration is a disease but it is stimulated by an ultra-virus.

Here the fourth group would smile with disdain. Why a virus?, they wanted to know. Only because it is unseen and you are unable to find it? The entire matter is up to the climate. A native of the mountains cannot adjust to steppe weather.

The last group was closest to the truth, as much as people can be who have learned to observe facts and not to engage in fantasies in doing so. However, they also did not understand the meaning of the facts they themselves described, nor were they aware of the entire truth.

What is weather?- is the question one should have put to these scientists. And does the Ukrainian summer resemble the summers of the Chile and Peru less than the dreary days, white nights and colds of Khibin?

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And to this they had no answer.

When in 1933 the "Potato Problem" came up before the Odessa Institute of Selection and Genetics, the following experiment was made. A large field was planted with potatoes. As soon as the tubers germinated, the potatoes were dug out daily, on every lot of 0.1-0.2 hectares. The harvest was carefully weighed. One could observe how with each day the tubers grew and the yield increased. Some days the daily surplus would represent one ton per hectare. Those were the cloudy days. During hot days, however, the increase was insignificant: it dropped almost ten times, - the underground "starch manufacturing factory" had stopped its work.

Then the suppositions of Lysenko became clear. The problem was not in the soil, not in microbes and ultra-viruses, not in the weather as a whole, but in the high temperatures. Almost every additional degree could be traced to the centners and tons in lost harvests. This was not alone a reduction in yield: the life strength of the potato was being destroyed, it could no longer produce a full and vital progeny, it degenerated.

This was, however, not the time to argue about the causes of degeneration, the problem was how to escape the summer heat.

Should one outstrip it? The powerful remedy that speeded plant development - vernalization - was already in Lysenko's hands.

The tubers were germinated at a temperature of 12-15 degrees. They were next kept in the open air for three weeks, in plain daylight. The scientist was speeding the development of the potato organism as fast as a machinist drives his engine.

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The tubers were then planted in the soil. Their growth was rapid. Yields were gathered at unheard of early dates. In spite of all that, one could not altogether escape the summer heat. Degeneration was restrained but not eliminated. And what could vernalization do in those cases when already from the beginning it dealt with a potato-dwarf, with "nuts", that had been produced by an exhausted plant.

What was there to do? Could one cool the southern summer?

Here we have to forget for a while about the potato. Lets look at this strange cotton shrub. It is of Abyssinian origin. It stands the long Ukrainian summer days as little as did the Mexican corn which grew to the height of a house. The Abyssinian cotton never produced cotton balls in our South. In spite of the fact that it had been kept for two years (it is a perennial) under constant light. It had, naturally, grown, become green, but had not blossomed. That is not blossomed in its entirety, except for one branch. This showed buds and flowers. The workers at the Institute would tell you that cotton balls had been picked from this branch several times. What a strange branch, so alien to its own shrub! As if a branch of another plant had been joined to it.

The secret was, however, very simple. This particular branch had been kept covered for 14 hours, of every 24. This only for a brief period, for 30 days altogether, and only in the first year of the life of the clump. Afterwards the sun had shone on it as it did on the rest of the clump. Only this did not matter anymore - it had passed its "light stage".

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The marvelous transformation of the branch no longer astounds us. We know how to explain it. Here, however, is what we shall have to pay attention to.

The transformation occurred on the growing buds of the darkened branch. And everything that grew from these buds was also transformed. But the thing that grew from it was just the branch from which later cotton balls were picked. This indicates that the millions of new cells produced from the transformed cells, did not have to go through the light stage anymore; this had already been done by their ancestors, the cells in the darkened bud.

The transformation could not, however, retrace its steps - from the branch to the stem of the shrub. This because the branch itself had been produced from the stem. And if, in transforming itself, it would have managed to also transform the clump, it would have meant that ancestors could be born of their progeny.

It all pointed, however, to a surprising and even paradox conclusion (to scientists of the Weissman theory).

One cannot assert that the "entire" plant is "at a certain stage". The stage transformations occur in the growing buds. The part that had grown before, remained at former stages. And that which grew afterwards - was at the new stage. This indicated that the body of the plant consisted of parts of a varied stage age. The opened bud, at the very top of the plant, full of viscous sap, was the oldest on the entire plant. It was older than the lower branches, older than the stem, older even than the substructure of the plant itself - the base of the stem, the cells of which first were produced by the seed, and first saw light.

This deduction may again have astounded anyone else, but not Lysenko. He decided that no particular discovery had actually been made: that the great Michurin had known this already long ago and had, morever, practiced this very truth.

And should on the growing top of the branch actually dwell babies that were born "older" than all the oldsters, the method of proving this in actual testing should now also have to be found.

Lysenko cut off two slips from a clump of tomatoes, - both from the upper part of the stem, one from above the first flowering bud, the other from below it. Both were planted. And the first bloomed much earlier than the second one.

This indicated that the developing plant body actually consisted of various parts of stages and was composed of continuous contradictions.

What did all this have to do with the degeneration of the potato?

A slip was cut from the top of a potato plant. It was planted. The yield of tubers gathered from it resembled greatly those that were dug up in due time from under the mother plant. This was not surprising, - wasn't this the same plant, only divided into two parts? Lysenko, however, would not permit himself to be fooled by this external resemblance. The experiment was far from completed, it had only been begun.

The tubers were planted again: in separate groups, those taken from the mother plant and those gathered from the top of the clumps. Now the false-

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hood of the resemblance was demonstrated. The yield from the tubers from the clump was twice as large as the yield from the tubers dug from the top: here there were only a handful of pitifully small tubers ... one could not mistaken them, these were the degenerated tubers, those gathered every year from southern potato fields.

The top was the "oldster", the clump the younger one. The "old one" produced degenerated tubers. Degeneration - means old age.

Its secret was now exposed.

The potato tubers planted in the south were developed during the hot summer. And their eyes, the germs of future plants, hardly awakened to life, had aged rapidly. They had produced a generation which was feeble from its first days, from its very infancy.

How does one combat old age? What remedy is there against it?

To combat old age - well, this has been humanity's mysterious obscure and ancient dream for a long time. Future science may possibly move back the beginning of old age and destroy all disease and the suffering it carries with it. ...

"The science of the future." But in this instance the potato's old age had already been conquered . Lysenko's prescription is now well known everywhere: to plant potatoes not in the spring but at the height of the summer.

Now it appears very simple. It goes without saying that the tubers of the summer potato will germinate when the heat is down; they will escape the July and August sunburn, escape old age.

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At first, however, it all sounded very strange to many. Potatoes which were degenerating because of the heat - to be planted at the height of it!

The first experiment of summer planting was begun on July 6, 1933. And in 1934 - 18 numerous collective farms became Lysenko's coworkers in this new enterprise - the fight against the degeneration of the potato. A year later there were already 500 instead of 18, and the experimental field consisted of 1,600 hectares of collective farm land.

Another year or two, and one could speak already in terms of tens of thousands of hectares.

By order of the government, three institutes: the Odessa Institute of Selection and Genetics in the Ukraine, the Azov-Black Sea Institute in the Crimea and the Northern Caucasus, and the Potato Institute for the Saratov Stalingrad and Chkalov regions, as well as the Karagandinskaia Experimental Station at Kazakhstan were entrusted with leading the countless army of collective and state farm workers who were committed to fight potato's old age.

Early in 1939 the All-Union Conference of Potato experts was called in Odessa, the soil of which had for so long proved fatal to the potato.

The delegates spoke of the results of the five year struggle to combat degeneration, of record potato yields in Ukrainian villages and Don stanitsii, about the Turkmenian potato fields.

Success had been overwhelming everywhere.

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In the collective farm "Ideia Iliicha" ["the idea of Illich"(Lenin)] near Melitopol, tubers had been gathered weighing over one kilo. "Our collective farmers never saw such potatoes"... The collective farms "Dvigatel" and "Dmitrov" in the Frunze region had each dug 30 tons of potatoes per hectare during the month of October. The Lenin collective farm of the Slabodzeiski region gathered all of 50 tons. And the collective woman-farmer Khudolii gathered over 70 tons from the hectare - three years in succession.

There was no need to deprive oneself of spring plantings either. Not for sowing, of course. The "spring" potatoes, grown from healthy "summer" tubers, went for food. In such manner, potatoes produced two yields a year in the south.

And thought was already given to the sending of the very first, earliest potato northward - to Moscow and Leningrad - so that bird flocks hurrying from the south would outdistance it only by a short time.

The areas of summer plantings grew in the meantime. Prior to the war they reached already six figures - in hectares. The potato was planted in the summer not alone in the Ukraine, but also in the South-Eastern districts of the country, in Transcaucasia, Central Asia.

There were record yields at times! 300, 400, 500 centners per hectare. We saw this southern collective farm potato at the All-Union Agricultural Exhibition held prior to the war: weighing one and a half - 2 kilos each, under clump - knotty, heavy monster-tubers. Is this really our old friend

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whom we were used to meet at home on our dinner plate? Is it actually the same potato or is it another? Weren't in those pre-war days other previously unheard of things being discovered?

It seemed the appearance of the new potato, grown from summer plantings, had also changed. The variety "Bila", for instance, broke every botanical rule after several generations. It lost the essential orange color of the anther, its leaves were lighter, the distribution of the lobes changed on the leaf axil.

But most important of all: in summer plantings - from one planting to another, the fertility of the potato seemed to increase. As if an accumulation of fertility was at work in these summer tubers. An important experiment was made in 1940. The variety "Early Rose" was brought to Moscow from Odessa; it had been planted 4 years earlier in the summer in the south. It had to stand the test of competition (on the fields of the Institute of Genetics of the USSR Academy of Science) with the Moscow "Early Rose" variety, which had never been south and did not know degeneration. The southerner produced 480 centners per hectare, the Moscow plant - 220.

This led many to believe that the last word in summer plantings had not yet been said that this may possibly be not merely a "local" summer problem.

When on June 10, 1945, Trofim Denissovich Lysenko, academician since 1939, twice receiver of the Stalin award, was also given the title of "Hero of Socialist Labor", the decree authorising this stated: "For outstanding services rendered in the work of developing agricultural science and raising

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the yields of agricultural crops, - potatoes and millet, in particular...."

A photograph is preserved at the Odessa Institute. It refers to the early stages of summer plantings. To the left it shows a tiny heap - 5 tubers, of which the total weight was 100 grams. This was the yield of potatoes degenerated after several years of spring planting. Next to it - a veritable mountain, 5 tubers of the same variety "Ella", of which each weighed between five and ten-times as much as all its five neighbors put together.

And when I looked at this photograph which irrefutably demonstrated the marvelous result of the use of a method, amazing in its simplicity, I remembered the ancient story of Columbus standing up his egg. He lightly struck it against the table, its tip broke and the egg remained standing. It was that simple. But no one except Columbus had thought of it.

I did not speak of this similarity aloud, however. I would have been told that summer plantings which represented a new era in the potato crop in the world, had not been the result of a lucky intuition. They had been the logical deduction of the theory of stage development and the deep knowledge of the transformation of the nature of vegetative organisms by environmental conditions.

End of Chapter

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Translated from the Russian by
S. N. Monson

MARRIAGE FOR LOVE (pp. 189-197)

The inexplicable substance of heredity was supposed to preserve the purity of varieties and races in the opinion of the Morganist' geneticists. They depended upon it as upon a stone wall. Contented it would preserve for centuries the best varieties of cereal crops without change or damage, i.e. keep them like canned goods in their containers.

The main point was to avoid every, - even the slightest mixture! To cross animals with their closest relatives. Pollinate plants with their own pollen. And then this valuable substance of heredity would remain in human hands; it won't have another place to go to.

This was the famous method of "Inzucht", as it was called by the geneticists, the method of "Inbreeding".

The Morgan-geneticists were placing their trust chiefly in wheat. Wasn't wheat - self-pollinating? Every wheat stem pollinated itself. Pedigreed domestic animals were bred by crossing only with their closest relatives. As for rye, which is pollinated by the wind, the geneticists demanded that a special rule be introduced to plant varieties no closer than one kilometer from each other. How much trouble and heartbreak this caused on the collective farms. Where was one to get one kilometer among the crowded, tightly populated districts? Neighbors who formerly had lived in peace for years would quarrel. Agronomists were threatened by the Courts for attempting to cut the merciless zone the least bit.

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The Morganists were grim and unyielding. Weren't they protecting the cage which held the fire-bird - "the purity of the variety"?

They consoled the grumbling: Even the pharaos and Peruan Incas had recognized the grandeur of the "Inzucht": those wise rulers, as is known in history, got only married to their sisters.

They did not hesitate to kill the most valuable representative breeders in animal husbandry, at the slightest suspicion that the breed had been mixed. Criminally, they almost destroyed the caracul industry in its main center - Uzbekistan, rejecting the best rams, unseen, only on the basis of tables and questionnaires. All the very best rams at that - so that in 1936 one could hardly find one sire for a new breeding farm in the entire republic. The Morganist, Vassin, in Moscow, marked the questionnaires indifferently - he thought he knew it all from a distance of three thousand versts - ... The marvelous "fox" rye - an attempt was made to "even" it out to make it conform to the Morganist ruler, to eliminate the least impurity, - with the result that the crop's yield dropped catastrophically, until the Morganists were stopped.

Thus, in spite of the most careful watch, the capricious "heredity substance" kept changing, and the watch remained unrelentless, ardent, and zealous.

Degeneration caught up with the most trusted, tested varieties. Strange and sad changes were observed in cases of self-pollinated crops, such as wheat. They seemingly withered. One could hardly recognize them. Only

Safonov, V. Zemlia v tsvetu [The earth in bloom]. Moskva, Moskovskii Rabochii, 1949. 438 p. (pp. 189-197)

old men remember now the names of many wheats which some decades ago were renown all over the south.

Twenty five, thirty years - is the age limit for wheat. Half-a century - is already a Methuselah age.

Lysenko made his unexpected proposal first, in 1935. It sounded to Morganist's ears like pure heresy. His was the claim that in order to preserve varieties and to return strength to the aging ones, it was necessary to take off all guard from time to time; while self-pollinating plants had to be helped by crossings.

The simplest method was indicated. Scissors were used. It was necessary to cut out the stamens on stems. Without stamens and anthers these stems would no longer be self-pollinating. Nature would take care of them instead. Clouds of pollen pass above the green wheat fields, along with swallows, butterflies and golden bumble bees. This pollen fertilized the cut stems. Fresh alien "blood" should renew their aging life. It remained to gather seeds from these plants, sow them once or twice, propagate them, and then safely sow fields with these seeds.

At first this was taken as a joke. But Lysenko knew how to command attention. With his customary energy he immediately went to work on his experiments destined to improve varieties. And the storm broke...

Lysenko wants to destroy all our varieties! Does he realize what he may expect from his cut stems? Selection - trusted to wind - indeed! Fields

Safonov, V. Zemlia v tsvetu [The earth in bloom]. 1949. (pp. 189-197)

sowed - as two times four - by fireworks of crazy splitting...

But nothing of the sort took place. No fireworks at all.

Instead something happened that was altogether new, that the Morganists had thought not possible.

At the Odessa Selection-Genetic Institute I was invited to walk through a narrow boundary along long strips where grew the progeny of cut stems. They could be recognized at a glance. There were the progeny of a tall plant - how evenly and united all three strips were sowed with its seeds. Here is the sowing of a branched ("kustistii") plant with leaves in a grey film; not necessary to even ask about it, all seedlings loudly proclaimed who they were.

And most remarkable of all - all rows of crossed, revitalized plants were taller, more luxuriant than any bed sowed with the usual seeds from self-pollinated plants.

Later I observed the strength of the new "blood" even better. I held in my hands the powerful, bearded stems of summer wheat "Melanopuss", resembling barley, and the giant stems of the "Moskovka" wheat, revitalized by intervarietal crossing.

What then is this? Why were there not alone fireworks but even no splittings? The cloud of pollen was carried by the wind. And from this cloud the plant selected its pollen. It chose it and did not pollinate with any pollen indifferently. Only organisms that suited and strengthened each other, united - whenever nature gave them a free hand.

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In this field, among cut stems, all marked with red thread, we stood as if at a threshold, beyond which one could see and sense the functioning of the deepest, most important and beautiful laws, those governing all life in the universe - animal as well as plant.

And the tender, courageous words describing the process that was taking place within those wheats - Mariage for Love - no longer suprised anyone.

The argument still centered around the basic problem: does animal and plant nature change with the change of environmental surroundings? In other words, can vegetative and animal organisms acquire inherited traits and symptoms in the course of their lives?

This is a very ancient question? Scientists have in the past rightfully considered it to be philosophical. It is directly concerned with our interpretation of life and its essence.

And here is where a radical division between materialism and idealism in biology took place.

Darwin was convinced that the changeability of living beings depends upon some changes in their environment (what these were - he did not know). To say that organisms change by themselves - is equal to proclaiming that they live and develop not on the earth but in a mystical vacuum, i.e. to state that organisms are not subordinated to natural laws and that there exist miracles in nature.

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One may read in Darwin's writings: "He who wishes to cross animals closely related to each other, has to keep them in surroundings differing as much as possible". "A small number of animal breeders, depending upon their observations, acted in conformance with this principle and kept the animals on two or more farms, distant from each other, under different conditions. They next paired individual animals from these farms and received excellent results".

Here are thoughts which the Morgan geneticists would never have supported. It sounded exactly as in the famous Russian fable, they'd say, the fable in which the heroes believed that all they had to do ~~was~~ to have the music sound differently was to change their seating arrangements.

The Morgan geneticists from the heights of their science looked down with utter contempt upon agronomists who were engaged in special cultivation of the soil under varietal plantings, picking seeds almost grain by grain; the gardeners who babied their seedlings in the nurseries; upon animal breeders who served selected food to thoroughbred livestock.

Doesn't it bear a resemblance to the rattling noise with the aid of which the natives of Central Africa attempt to influence the moon and sun?

The importance, Morganists thought, lies not in stable, but in pedigree records.

Here, however, is where the inconvenience of the point of observation became apparent: existing itself in a vacuum completely detached from the soil.

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Michurin clearly and simply had called an absolute nonsense the opinion of those who thought that an organism may form by itself, without the influence and participation of the external environment from which it drew the entire composition of its body down to the last atom, an environment which surrounded it from the day of its birth to death.

Lysenko once had occasion to make the following observation: The stems of the well-known couch grass - were pollinated with the pollen of other stems of the same clump. Couch grass never fruits from the pollination of its own pollen. But here the stems showed fertile grains. This meant that the pollen of another stem was no longer like its own. Nevertheless, this was the same plant. They then produced the following experiment at the Odessa Institute: Rye is also unfertile in self-pollination. A clump of the Tarashchanski rye was "rascheronkovan" (used for slips). The slips were grown in the most diversified conditions, but when blooming time came, they were once more placed together. And on all stems the grain was fertilized, although the fertile pollen had seemingly come from nowhere else except from the other stems of the very plant that had united them all before.

The heredity of the organism had changed in some respect when the conditions of its life had been changed. Nothing like it could be found in Mendel's formulae. Why then did one have to expect segregation conforming to these formulae?

Lysenko took to reviewing the complicated and confused biographies of plants of a dual nature - the hybrids.

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Here are the hybrids of the bearded wheat, crossed with the unbearded one. First generation. All hybrids of this generation have to be alike. The famous law of the uniformity of the first generation. But are they really so much alike? here are the smooth stems which, according to text-books, are supposed to be there, since the non-beardness predominates. But right next to them - there are smooth stems, though not altogether so. They prick the hand, show some degree of beards, as does the first mustache of a youth. How carelessly - swift a glance had to be to take them for brothers! But over there already it was no longer possible to mix them up, unless deliberately done so, observing those bearded specimens, so much resembling their mother, the bearded Azerbiadjanka 211s. Genuine mother's sons...

Many hybrids of garden plants resemble their mother from generation to generation. Some, however, stubbornly repeat the shape of their fathers, as if there had been no mother at all. There are splittings of 1 to 141.

The Mendel supporters either refused to see it altogether or explained the exceptions by specially invented complicated formulaes of genetic analysis, and referred to the incorrect conduct of the chromosomes.

There was, however, a much simpler explanation - as was the case in the Anderson fairy tale - the king was naked.

Mendel forcibly crossed his peas and then added the results of his experiments, mixing the life paths of hundreds of pea families. This is why he obtained a median deduction from large figures, while the live plants

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within this median conclusion, deprived of all individuality conducted themselves as if they were packs of cards where germs had been shuffled instead of kings and aces.

Mendel did not concern himself with the fate of every individual family. Nevertheless, it should have been advisable to show more regard towards the unnoticed privates of his army of peas. He should have inquired about the surroundings in which their lifehad been spent. And as a "64 dollar question", asked whether the yellow always dominated the green in all circumstances, in every environment?

It would have also been worthwhile to observe the scale upon which the monk checked his yellow color. Was it merely by eyesight? Was his eyesight so keen as to be able to perceive down to the last point whether the peas of the first generation were all of the same yellow color?

The Mendelists imagined that the germ cell represents only a case for the chromosomes, just as the entire body serves only as a case for "elements of heredity".

But, actually, the smallest germ cell is not a case at all, not a bag that holds some things, or a means for producing a new organism in the future: it is an organism itself. In its live body there are, naturally, organs of greater and lesser importance, and as any other body, it is infinitely complicated - we can hardly imagine to a hundredth part, how complicated it is. But to declare that this all, this marvelous perfect and delicate structure -

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is no more than a bag that holds chromosomes.

The kernel and chromosomes within it are also tiny organs of the microscopical live body of the cell, which are able to develop and change, as do all other organisms. It is no chest containing hereditary substances, on the pattern of the chest that, according to the Russian fairy tales, held the soul of Kashchei, while the key to it was thrown into the sea.

Each organism lives, grows, may reject one thing, require another. Without it, it would not be a live organism; would perish within the very first moments of its existence.

What indeed may be of greater consequence to the germ cell than the unification with another similar tiny being, another germ cell? The life of both depends upon it, as well as the fate of the being that will grow from them. How can one believe, under the circumstances, that in this decisive moment they lose the capacity of selection without which life stops being life and becomes a pack of cards that can be shuffled? How can one imagine that the germ cell unites with just anything at all, with the first accidental cell?

No, this cannot be. It would contradict everything we know concerning the history of life on Earth, the millions of years of the evolutionary development of animals and plants, of the motive power of this development - the natural selection - which has provided them with the capacity for struggling, adjusting, defending their place under the sun.

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"The forcible union" of Mendel's peas was not stable: it led to numerous splittings in the progeny - the pairs united by the yellow superior, were forever struggling to separate. Should a progeny, if freely pollinated, in a "Love Marriage", conduct itself in such manner?

And if this be all true, then the inter-varietal crossing will not destroy but revitalize the varieties. And first of all, there will be no need for the kilometer-wide zone between the rows of different varieties of rye.

Years went by. There no longer is a kilometer-wide cordon between rye fields. Lysenko's revitalized wheat varieties are heading on all corners of the Soviet land.

Hundreds of articles have been written about inter-varietal crossing. Indifferent rows of statistical data have summarized the struggle, the burning thoughts, the daring provocation thrown out to a stagnant tradition, the thorny, happy path of the scientist leading deep mysteries to a grandiose event, the name of which is LIFE.

More years passed, and the selectors will segregate within each variety many vegetative families according to their peculiarities and produce from them new and better varieties. This is how it has always been, from the time people made the green earth serve their purposes. Our famous wheat Lutescens 062, considered the "Southern Standard" variety has been obtained from only a few stems, once picked up on a field of the "Poltavka".

It shows that a variety lives as does any of the billions of plants that compose it.

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Free pollination, "Marriage for Love", also transforms plants. In 1945, the All-Union Selection and Genetic Institute received 59,000 grains, fertilized by pollens carried by wind onto the lots of 4 winter wheats - two of which were new ones: the "Odessa 3" and "Odessa 12", and two old ones: "Ukrainka" and "Hostianum 237". Since that time three generations of free hybrids have gone by. They proved still more resistant, better adjusted, of higher yield. This in spite of the fact that those 4 varieties were already considered the best in many districts of the Ukraine.

The famous Lysenko cotton "Odessa 1" the principal cotton for new cotton regions, was obtained by selection and rejection in its first hybrid generation, that quasi-uniform generation, that the selectors, who trusted the Czech monk had not wanted to take into account.

End of Chapter

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Vilenski, D. G.
The Founders of Russian Soil Science:
Dokuchaev, Kostiichev, Williams.
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by S. N. Monson

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PLAN OF LECTURE

Soil Science - A Russian Science

Brief History of Soil Science prior to Dokuchaev

V. V. Dokuchaev as a Scientist

The Complex Study of Nature

The Plan of the Struggle against Drought

V. V. Dokuchaev as a Public Figure (Man)

P. A. Kostychev

V. R. Williams

The Teachings of Williams about the Fertility of the Soil

The Teachings of Williams Concerning the Unified Soil-Forming Process

The Teachings of Williams About the Grass Field System of Agriculture

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Vilenski, D. G. (Professor)
The Founders of Russian Soil Science
Dokuchaev, Kostychev, Williams
Moscow, 1949 29 p. 56 V 712 O

Translated from the Russian by
S. N. Monson

SOIL SCIENCE - A RUSSIAN SCIENCE

Soil science has its roots in our country. Other nations have adopted it from us and not only accepted the theory and methods of Russian soil science but also the Russian nomenclature of soils, such as: "chernozem", "podzol", "solonets", and many others. Russian soil nomenclature has entered largely into scientific terminology and become part of practical agriculture.

The reason for the extraordinary influence our science has exerted lies in the exceptional fruitfulness and scientific presentation of the theory and the methods of research introduced by the founders of contemporary soil science, the outstanding Russian scientists V. V. Dokuchaev, P. A. Kostychev and V. R. Williams.

V. V. Dokuchaev (1846-1903) proved that the soil represents an independent, individual natural body which unites non-living and living nature. On the basis of this concept he established the theory of contemporary soil science, placing it in the service of our national economy. In fact, Dokuchaev laid the foundation of the theory of transforming the nature of the steppes by advocating the creation of tree shelterbelts.

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P. A. Kostychev (1845-1895) proved that there exists an indissoluble bond between soil and plants and that soil study outside of this connection is aimless. He developed the theory of combatting drought by the proper cultivation of the soil and snow retention.

A particularly significant role in the development of contemporary soil science must be attributed to the academician V. R. Williams (1863-1939), who developed this science as based on the Marxist teaching on soil fertility. Williams was the founder of the grass-rotation system of agriculture which ensures an uninterrupted increase of the fertility of soil.

BRIEF HISTORY OF SOIL SCIENCE PRIOR TO DOKUCHAEV

The accumulation of data on soils began in the early days of social development and proceeded simultaneously with the development of agriculture. Attempts to generalize and give a theoretical interpretation to this data were equally made long ago. We find, as a matter of fact, a series of interesting observations on the subject made in ancient Greece, in the works of Aristotle and particularly his pupil Theophrastus. Some information concerning soils is also found in the agricultural works of writers of ancient

Rome, - Varron and Pliny, for instance, and the poems of Virgil. These, however, were only separated theoretical attempts. Throughout the Middle Ages this ancient data on soils was partly distorted, partly lost.

We recall with much esteem and pride the great name of Lomonossov whose bright genius, already in the middle of the eighteenth century, i.e., almost one and a half centuries prior to the emergence of contemporary soil science, caught upon the most important points in soil science. Lomonossov first correctly stated the essence of soil formation, presenting it as a process of the interaction of plant growth with mountainous layers, continuous in time, and accompanied by an accumulation of soil fertility. Lomonossov's works, however, were not fully published and many of them remained unknown for a long time.

In the middle of the nineteenth century the German agrogeological school predominated. The basis of its teachings consisted in regarding soil not as an independent natural body (entity) but as a separate mountainous layer (strata) of the airing of the earth crust. The deduction drawn was that soil formation is reduced to airing, that soil represents the upper, washed-off, illuvial layer of dry land. From this followed that the process of soil

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formation is invariably accompanied by the loss of ashen elements of plant nutrition, i.e., it proceeds along a gradually "extinguishing" curve. In its final analysis - this led to the adoption of the notorious "law of the diminishing fertility of soils", so widely used by bourgeois economists in their Malthusian propaganda. The Malthusian theories are, however, closely allied to the cannibalistic racial "theories". The recognition of soil, as of purely geological and not geo-biological formation, led Western scientists inevitably to the theory of statics ("statichnost'"), the immobility of soils, the negation of its development, and correspondingly - to the possibility of its substantial changing under the influence of social techniques. This resulted in the belief that only morphological and chemical methods of research may be adopted for the study of soil, the biological and bio-chemical methods receiving but little consideration. Finally, this reactionary conception of the soil was connected with the attempt to "tear" soil science into two parts: the "theoretical" soil science which, according to these beliefs, belonged to geological sciences, and practical, agronomic soil science which should belong to agronomical sciences. "Theoretical" soil science was in turn artificially torn into separate, isolated parts. Dokuchaev already pointed out that

Western European soil scientists were "radically divided into rather artificial schools", of which one recognized the predominating chemical property of the soil, the other - physics, the third - geology and mechanical content, etc., the fourth, while subjecting soils to a mechanical and chemical analysis, leaving aside their geology, i.e., the origin of soils, their power, structure, relation of sub-soil, etc. In other words, none would study the soil as a natural biological body, nor would they examine the most important properties of these bodies in relation to each other.

Such was the situation with regard to soil science prior to the time that Dokuchaev entered its field and gave - for the first time after Lomonossov - a precise definition of soils which diametrically opposed the concepts of Western European scientists. Dokuchaev proved that the soil is not a mountainous layer but a separate natural body which develops according to its own laws and occupies its own place in nature.

V. V. DOKUCHAEV AS A SCIENTIST

The significance of the scientific activity of Dokuchaev is best described by V. R. Williams in the following words: "Vassili Vassilievich Dokuchaev belongs to the group of most distinguished scientists of the nineteenth century who are of world-wide importance. His works have laid the foundation for the enormous and important branch of our science, known as genetic soil science.... of extraordinary versatility, his scientific interests were widespread and he left behind an enormous literary heritage. The principal problems upon which he labored were: 1) the origin, properties and productive role of soils; 2) the structure and origin of river valleys and other problems of dynamic geology; 3) problems of hydrology; 4) experimental work; 5) agricultural education.

Most interesting are the order and content concerning these subjects in Dokuchaev's work, in that we observe from them that he, having begun with the study of geological problems, had switched to soil science, rebuilt it, establishing it practically as a scientific "discipline", next became involved in geo-botanical problems, and finally turned to work on promoting high and stable yields...

V. V. Dokuchaev deserves to be ranked among the first of classical naturalists. The significance of his works is enormous. Many of them are almost as new today as they were 40-50 years ago, when they appeared first. Aside from that they provided exceptionally valuable material for the proper understanding of the history of the development of soil science as a science."

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At the beginning of his scientific career Dokuchaev was no soil scientist. He was in charge of the department of minerology at the University of St. Petersburg, and in this first period of his scientific activity specialized primarily in quaternary deposits. His paper written for a master's degree was actually devoted to methods on the formation of the river valleys of European Russia. But even during that period he exhibited considerable interest in soils. Dokuchaev participated in the work of producing the soil map of V. I. Chaslavsky and participated in the "Black-Earth Commission" of the "Free" Economic Society. He subsequently undertook the research on soils of the black-earth region upon an assignment from this society.

Dokuchaev brilliantly accomplished the latter task. He made numerous trips to the steppe zone of European Russia, traveling over ten thousand (7,000 miles) versts (1 verst - 3,500 feet).

In the process of this work he gathered voluminous and valuable material which established the distribution, characteristics, composition and properties of black-earth soils. He also determined what soil actually is, the place it occupies in nature and how to study it. Here he became convinced that the methods of studying soils adopted in the West were altogether wrong. In studying black earth soils Dokuchaev came to the conclusion that these are distributed in a wide belt, are strictly adapted to definite climatic conditions and vegetation, i.e., that they are zonal. This proved that they were not mountainous layers, since the distribution of the latter is, as is well known, connected not with the climatic conditions of the earth's surface but with its geological history. It was sufficient to establish this fact in order to prove that soils do not represent a geological formation but are independent natural bodies.

Dokuchaev published the results of his research on black earth soils in a monograph "Russian Black Earth" (1883) which laid the foundation of the history of contemporary soil science. It formed his thesis for a doctor's degree at the University of St. Petersburg. One of his official opponents was D. I. Mendeleiev who was extremely interested in soil science and was first to experiment with mineral fertilizers in Russia.

Dokuchaev's monograph "Russian Chernozem" contained exhaustive data on the origin and distribution of chernozem soils and in that sense it has not lost its significance up to the present time.

COMPLEX RESEARCH OF NATURE

The study of chernozem represented the first step in Dokuchaev's scientific activity in the fields of soil science. The next steps were his rural ("zemskie") soil evaluation works in Nizhni-Novgorod and later in the Poltava gubernii. The scientist set himself the task of studying not only soils but also the entire complex of environmental conditions: the geological structure, climate, vegetation, as well as economics, agricultural practices, etc. The necessity of studying natural environment as a whole was prompted by the very definition of soils which, according to Dokuchaev, represents the "result of a most complicated interaction of the following soil formation factors: ground, climate, vegetative and animal organisms, the age of the country and the relief of the locality".

These soil-evaluating works of Dokuchaev represented the first complete research; here he studied not only the individual bodies and phenomena of nature but also their inter-relations and interaction. This approach to the study of nature produced his significant conclusion, - which represents one of the most important contributions he introduced not only into soil science but also into natural sciences in general.

Dokuchaev was the first scientist who not alone pointed to the necessity of studying nature in its entirety but also put his idea into practice.

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"There is no doubt - wrote he, - that the understanding of nature, its forces, elements, factors and bodies, has made such gigantic strides in the nineteenth century that the century itself is frequently referred to as the age of natural science, the century of naturalists. But in observing more carefully these greatest achievements of men's knowledge, achievements which, so to say, have turned our world-outlook upside down, especially after the works of Lavoisier, Darwin, Helmholtz, etc., one cannot help but note a most essential and important deficiency...Studied primarily were the individual bodies - such as minerals, mountainous layers, plants and animals, along with phenomena, individual elements - fire (vulcanism), water, soil, air, in which science, we admit, has reached remarkable results, but not the field of their correlation, not that genetic, century-old and always steady relationship, which prevails between forces, bodies and phenomena, between dead and live nature, between vegetative, animal and mineral kingdoms on one side and man, his mode of life, both physical and mental - on the other; whereas these relationships and constant interactions represent the essence of understanding nature, the kernel of the real philosophy - the best and highest attraction in natural science."

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This was a marxist approach to the study of nature. Dokuchaev deliberately approached the necessity of a full and synthetic study of nature. He understood that the most important error made by natural science in the nineteenth century was the isolated study of individual bodies and phenomena, their consideration apart from the correlation and interaction in which they exist in nature. This is confirmed by the marxist statement formulated by Engels, 20 years in advance of Dokuchaev, who in his "Anti-Dühring" wrote that this very method of "dividing nature into its separate parts, separating the various phenomena and matters in nature" has formed the basis for the metaphysical way of thinking since it "left with us the habit of accepting segregated objects and phenomena of nature, outside of their important general relationship, and because of that - remaining immovable, not changing substantially but unalterable, non-living, and dead".

In creating the new soil science, Dokuchaev accepted the materialistic point of view and undoubtedly exerted an influence upon other scientific fields. Therein was the greatest achievement of a scientist with regard to natural science as a whole. He provided samples of complete, synthetic research directed towards the study in nature of the entire complex of phenomena and bodies and these relationships that exist between them.

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In observing the basic error made by contemporary natural science, Dokuchaev provided his remarkable definition of soil science: "Only of late and then timidly, in individual cases and places, have the servants of natural science begun to pay more or less serious attention to this side of the problem. We believe that in the center of this new direction towards understanding nature, contemporary soil science, as it is understood in our Russian meaning of the word, should become the kernel of the teaching of the relationships between live and dead nature, between man and the rest of the world, whether organic or mineral".

Thus Dokuchaev defined soil science as a synthetic science dealing with the relationship between alive and dead nature and between living and dead nature - and man.

These are the most important statements contributed by Dokuchaev to science. They constitute the basis for the establishment of soil science. Dokuchaev stated that soil is an altogether independent body of nature, which exists and develops according to its own laws and therefore demands special methods of research. He was the first to study soils in general, proposed a method of describing them, established the fundamental regularity of their geographic distribution, provided methods for the composition of soil maps and thus laid the foundation for the geography of soils. Dokuchaev worked out the method of soil study in detail which is applied now not alone in the USSR but also abroad, in the state it was offered by him.

In using this method, Dokuchaev established and described a large part of known types of soil and provided their first genetic classification. He also established the basic laws of soil formation and the geography of soils, among these the most important one - the law of the zonality of soils - latitudinal and longitudinal. Dokuchaev simultaneously pointed out that agricultural zones are adapted to soil zones since agriculture possesses a series of specific traits in every soil zone. He wrote: "Agronomy has to be a zonal science", and not alone zonal but also a regional, ("oblastnoi"), not only Russian, but also chernozem, etc.

PLAN FOR CONTROLLING DROUGHT

V. V. Dokuchaev never limited himself to exposing theoretical conclusions alone. He always with great energy and persistence, dealt in problems from the point of view of their practical application. The study of soil meant to him a method of "taking possession and controlling soils for purely practical purposes". His entire work was directed towards the solution of production problems. While solving practical problems, he collected a vast material which helped create the new science.

It is interesting to observe the evolution of Dokuchaev's searchings. A geologist by education and official position, he dealt with unusual energy in agricultural problems and the practical applications of soil science in agriculture and forestry.

Russia in the 90's of the past century suffered heavy disasters. The poor harvest of 1891, the result of a severe drought, brought wide-spread famine to the country. Dokuchaev participated energetically in the work of helping the famine regions and simultaneously began studying the causes of periodically recurring droughts. His conclusions on the problem of controlling drought were presented in a remarkable work "Our Steppes Past and Present", published in 1892.

Here he proved that the cause of poor harvests, the result of droughts in the chernozem zone, lies in the slow but persistently progressing drying-out of the particular zone, which is closely connected with the destruction of natural vegetation, the crumbling of the grainy structure of chernozem soils and the strong development of erosion processes. He wrote: "All this should have inevitably led and actually produced the following results: - even if the former quantity of atmospheric precipitation had been preserved) - a rapid evaporation of steppe waters and a likely increase of the nightly cooling of the steppe; a reduction in the amount of soil moisture and a lowering of the level of ground waters; a considerable increase of water-fields ("vodopolei"), by both spring and rain - in the open steppe and rivers, along with a shortening of their duration, and a reduction of the amount of the summer supply of water in rivers and in steppe watersheds; the destruction of some sources and the sweeping of others; a vigorous, strongly increasing wash-off of fertile soils from the steppe and a blocking of river beds, ponds and all sort of hollows ("zapadin") with sand and other coarse segments. Finally, the increase of the harmful action of hot eastern and southeastern winds, drying vegetation and water sources during the summer, and cold winds destroying fruit trees and plantings in the winter and early spring.

The general and inevitable result of these factors were the much more severe winters and torrid, dry summers in southern Russia"

"To this must be added", wrote Dokuchaev, "that the above mentioned adversities have been in existence already for centuries..."

Dokuchaev referred in his work only to the natural causes of what he called the "overstrained and shattered condition", in which steppe agriculture existed under the blows of droughts. He clearly understood that under a bourgeois-landowner system, which involved private ownership of land and tolerated the extreme need of the peasant class, because of the latter's poverty in land and low technical and agronomic standards, the struggle against drought was bound to confront enormous difficulties. He wrote that government credit for combatting drought has to be extended to entire agricultural areas, and not benefit private individuals alone, that government credit given for the establishment of individual properties "will not be of government significance". He therefore worked out a plan for transforming the nature of the steppe belt which would not consider private property but regard the problem from the standpoint of government interests. This plan, as stated by V. R. Williams, "can in full measure be evaluated, worked out and carried out by the government under a socialist regime".

Dokuchaev's plan regarding the chernozem belt covered the following points:

I. THE REGULATION OF RIVERS

A. With regard to the large floatable rivers (Volga, Dnepr, Don, Dnestr, Kama, Oka) and others.

1. To narrow, as much as possible, the crossing of rivers, to straighten their course where necessary, to arrange for supplementary reservoirs, etc.;

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2. to reduce spring floods;

3. to shut off the admittance into the river valleys generally and in the river "fore-water", in particular, of coarse drifts (deposits), such as: gravel, sands, etc. For this purpose it is necessary to

   a. plant trees and shrubs along the banks of rivers, particularly on adjoining sands and crumbling hilly banks;

   b. block with fences or in other ways the mouths of ravines opening into river valleys;

4. to destroy sandbanks and stumps;

B. With regard to smaller rivers and navigable sources of large rivers.

1. River banks and mouths of ravines to be treated as in the case of the large rivers;

2. to wall the river beds with capital dikes (dams) in order to:

   a. regulate, at least in part, the course of spring waters and the heaviest rain waters;

   b. utilize for various purposes the movable strength of the water;

c. irrigate with the aid of these waters, as well as with the spring waters of the large rivers, - the old and new bottom lands from specially constructed artificial reservoirs, as well as the places in river valleys filled with drifts from adjoining ravines, and the lower third of slanting river slopes.

II. THE REGULATING OF RAVINES AND VALLEYS

A. According to the nature of ravines and valleys, their shape, depth, and particularly the geological structure and position of ground waters in adjoining steppes. It is necessary for this purpose to:

1. partition some with a number of fences and growing hedges in order to stop the further spread of inundation of their bottoms and banks, and to transform them into meadows;

2. build dams in several rows, in other places, especially in their flat upper parts, opening into the steppe, where natural hollows ("zapadiny") are frequently observed, and to form ponds in order to retain snow and rain waters and irrigate the low slopes and bottoms of valleys;

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3. plant trees around both ravines and valleys, especially on elevated sections, on steep slopes at the outlets of springs and around basins;

4. clean all outlets of springs;

5. prohibit the plowing of steep slopes of ravines.

III. REGULATION OF WATER ECONOMY IN OPEN STEPPES ON WATERSHED AREAS

A. For the sake of the better agricultural utilization of snow and rain waters, in order to reduce the number of spring - and other waters, steppe, - as well as river inundations, and also increase the amount of moisture in the soil, in order to raise ground waters, for purposes of irrigation, and finally, to increase the amount of moisture in the air and dew, it is imperative to:

1. establish pond systems in watershed steppe areas, planning them primarily along the natural hollows and shallow depths ("saucers"), and particularly along the course of natural run-offs of spring and rain waters into steppes; all banks of rivers to be planted with trees;

2. in other parts of the open steppes to plant rows of hedges (enclosures) with small but, if possible, long dikes on the order of those that are formed when ordinary ditches are dug; so as to aid the gathering of snow on the particular lots and the retention and better utilization of spring and rain waters;

3. the third places of the open steppe - all sands, hills and anything suitable for plowing, especially plots exposed to strong winds, to plant extensively with trees;
4. test in steppes the various types of artesian and other wells of uneven absolute height; at some degree of success these may serve as new powerful sources of irrigation which up to now were lost to agriculture.

IV. The working-out of norms defining the relative areas of plow-land meadows, forests and waters; these norms naturally to be considered in relation to local climatic, ground and soil conditions, as well as to the character of prevailing agricultural crops, etc.

V. A final determination of methods of working the soil, selecting those most favorable for utilizing moisture, and a better adjustment of varieties of cultivated plants to local soil and climatic conditions.

Dokuchaev in this manner worked out a wide complex of hydrotechnical, agro-meliorative and forest-meliorative measures directed towards controlling drought and preserving the soils of the chernozem zones from erosion. Other measures advanced by him concerned the creation of tree shelterbelts in the steppe, along with other forest plantings. The "Special Expedition", organized in 1892 under the leadership of Dokuchaev, was supposed to accomplish - on a productive scale the measures he proposed in order that they may be tested for their expediency. Three experimental plots were chosen for this purpose - Veliko-Anadolski, Starobelski and Kamenno-Stepnoi, - on which trees were planted and where meteorological, agronomic, soil and forestry research were organized.

Dokuchaev's plan only referred to but did not develop the system of agro-technical measures intended for the steppe zone. This was subsequently done by V. R. Williams who worked out the grass rotation system of agriculture. The experiments made by Dokuchaev on the plots played an enormous role in explaining the causes of poor harvests in the steppe belt and the working out of a system of measures to create a stable agriculture. In fact, the agricultural Experiment Station, established at the Kamenno-Steppe plot, subsequently in 1946 reorganized into the Scientific-Research Institute of Agriculture of the Central Chernozem Belt, imeni V. V. Dokuchaeva, fully confirmed the accuracy and great efficacy of the measures proposed by Dokuchaev and Williams. On its fields harvests of grain crops yielded within a short time an average of 20-25 centners per hectare. Even in the exceptionally dry year of 1946 the winter wheat yielded 16.5 centners per hectare, winter rye - 15 centners, summer wheat - 10.6 centners, oats - 15.8 centners, and sunflower - 21.2 centners, while in the adjoining collective farms the yield of grain crops was 3 to 4 times lower.

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Dokuchaev in his work "Our Steppes, Past and Present" also proposed a plan of developing scientific research work in the field of agriculture and advised the training of personnel of agronomists. He stressed the importance to Russia of establishing at least three scientific institutes or committees: soil, meteorological and biological (for the study of plants and animals) - for the study of natural conditions in Russian agriculture. According to his idea, agricultural experiment stations should be established simultaneously for working out agricultural practices on a scientific basis. These stations, wrote Dokuchaev, are necessary for solving general agricultural problems and zoo-techniques, as well as for specific fields: flax cultivation, fruit growing, viniculture, sericulture (silk worm breeding), fishery, apiculture, etc. To train professional personnel it was necessary, in his opinion, to organize at least three agronomic institutes within the borders of European Russia: 1) in the area below Moscow for the non-chernozem belt; 2) in the chernozem belt; 3) in the Western belt.

Considering the conditions that prevailed under private leader- and ownership and the presence of small peasant households, Dokuchaev's suggestions were at that time viewed as utopian. Only now, under a socialist agriculture, many of them are included into the great Stalin Plan of Transforming the Nature of the Steppes in Forest-Steppe Regions.

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V. V. DOKUCHAEV AS AN ACTIVE SOCIAL MEMBER OF SOCIETY

V. V. Dokuchaev devoted much attention not alone to the organization of soil study, but to agricultural sciences in general. To him belonged the idea of creating a network of agricultural experimental stations and experiment fields. He initiated the organization of museums of natural history which, according to him, should be established not alone in the main cities of the oblasts (gubernia) but also in cities of districts and even in rural villages (communities). He stressed the importance of teaching natural history to the wide masses, because only based on such knowledge could constructive measures be introduced to raise the productivity of agriculture.

Dokuchaev proposed the organization of a Central Soil Institute and departments of soil science and micro-biology at various universities. He proposed the natural zoning of Russia for agricultural purposes. He also did much to further the higher agricultural education in our country. His suggestions in this direction were put into practice at the Novo-Aleksandrovski Agricultural Institute of Agriculture and Forestry which between 1892-1895 he temporarily supervised. In spite of the short time he spent there he succeeded in attracting a group of talented scientists who turned this institution into the largest center of agricultural studies. When Dokuchaev was removed from this post, he began the organization of private courses in agriculture. And to these private lecture courses he drew the foremost scientific minds, among them - D. I. Mendeleev.

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Dokuchaev possessed an extraordinary ability to select pupils. He left a remarkable school, not equaled in world science. Among Dokuchaev's pupils were the soil scientists professor Sibirtsev and the foremost minerologist, the academician Glinka; the founder of geo-chemistry, the academician Vernadski; the prominent petrographer, the academician Levinson-Lessing; the outstanding dendrologist, the academician Visotski, and many others. From Dokuchaev's school came not alone outstanding soil scientists but those of related fields - geology, mineralogy, petrography, geobotanics, geography, dendrology, agronomy. A passionate patriot, Dokuchaev called upon his people to stop bowing to Western science and pointed to the necessity of creating a Russian science of their own. He wrote: "It is high time for our agronomists and their professor-leaders to discontinue their slavish following of German teachings and handbooks, written for other natural conditions, other people and other social and economic regimes. It is imperative that we develop our own agricultural norms; that we have complete analyses of our own waters, soils, their fruits, Russian butter, Russian milk, Russian cheese. It is necessary to adjust our crop rotations, our animal husbandry, our cultivated plants, gardening, fruit growing and dendrology to Russian zonal, physical and agricultural conditions."

His knowledge of Russian village life, derived from early childhood and the observations he made in the course of his travels throughout Russia, his fiery love for his country, produced in Dokuchaev the understanding that the development of science and education alone were not sufficient to relieve the lot of the largest number of humanity. He realized that the sufferings of the majority of people were the result of a "new, contemporary, possibly the bitterest and merciless element - capitalism and of economic and industrial slavery" which turned the majority of the people into "slaves of nature and their social regime".

Thus Dokuchaev was not only a progressive scientist but also a liberal member of society who understood the social causes for the privations suffered by the Russian people at that time, the Russian peasantry, in particular. He realized that under the prevailing social structure of government, control of nature was not possible since, as he wrote, this regime was rooted on cruel, merciless capitalism which made slaves of the majority of Russia's population. Dokuchaev's influence upon the scientific thought of his day was enormous. "In the history of natural science, in Russia in the nineteenth century, (told his pupil the academician V. I. Vernadski), there are but few people who can stand alongside him in the influence they have exerted upon the course of scientific work, in the depth and originality of a generalized idea. The influence of his aims and ideas is clearly demonstrated and extends beyond the limits of our country, while his achievements belong to the greatest derived from the scientific movement of the nineteenth century".

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PAVEL ANDREEVICH KOSTYCHEV (pp. 16-22)

P. A. Kostychev, one of the foremost Russian scientists, is also one of the founders of soil science. His teaching along with those of two other coryphaei of Russian science, V. V. Dokuchaev and V. R. Williams, has laid the basis for the great plan of transforming the nature of the steppe-and forest-steppe areas. He belonged to the number of naturally talented men of humble origin, of which there have been so many in Russian history of science, beginning with the great Lomonossov.

Dokuchaev's teaching on soil lacked the adequate recognition of the role of biological processes in soil formation, particularly of the role played by vegetation. This substantial deficiency was already corrected by Kostychev in Dokuchaev's lifetime. Kostychev proved that soil formation is primarily a biological process, that soil is the source of plant nutrition and thus responsible for feeding animals and man. All organic life on dry land is therefore dependent upon soil.

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Kostychev referred to soil as to the upper layer of earth which reaches to a depth penetrated by the greater part of vegetative roots. The task of soil science is to study the properties of soil with regard to their relationship to plants. The scientific study of soils, from an agricultural viewpoint, is therefore imperative for the purposes for the sake of which soil studies are generally conducted. The productivity of agriculture is connected with the fertility of the soil. Fertility is determined by the physical properties of soil and the content in it of compound parts of vegetative ashes and nitrogen in forms appropriate for plants. Fertility is a very complicated property and its determination by means of the chemical methods proposed by Western science is therefore not possible. There is first of all no definite quantitative dependence between yield and elements of nutrition essential to plants found in the soil. Next, the chemical analysis for the determination of these combinations, actually open to plants, is very crude. Aside from that, the development of plants depends not alone upon chemical but upon physical properties of a soil as well, the latter exerting as strong an influence upon the development of plants and yield as do the chemical ones. Finally, the development of plants depends a great deal upon climatic and weather conditions and an estimate of these influences is extremely difficult to make. An appraisal of soils from the point of view of their fertility may consequently be only comparative. In utilizing the available methods, one may approximately state which of two soils is more fertile. For purposes of a general appraisal of soils other diverse methods have to be applied. The chemical analysis of soils alone would lead to faulty conclusions. The views of Western agricultural chemistry claiming that the fertility of soils may be established with the aid of chemical analysis have proved erroneous. "At present", wrote Kostychev yet in 1886, "there is hardly anyone familiar with agricultural chemistry who would attribute serious consideration to chemical analysis in the above connection". Thus Kostychev, himself an excellent chemist, pointed to the wrong direction along which West-European science had developed in this particular field.

Proceeding from these theoretical views with regard to soil and its fertility, Kostychev devoted his entire scientific activity to the study of the biological foundations of soil formation and means of increasing the fertility of soils. An exceptionally many-sided scientist - agronomist, soil scientist, chemist, botanist, microbiologist, he concentrated all his knowledge upon one task - to understand the fertility of soils for the purpose of increasing agricultural productivity. Kostychev achieved considerable success in the study of the organic elements of soil and those of black earth soils. The result of this work was published in his book "Soils of Russia's Chernozem Areas", which appeared in 1886, three years after Dokuchaev's "Russian Chernozem". These studies, closely connected, led Kostychev to the very important conclusion that the accumulation of organic elements in the soil and humus, depends primarily upon the underground part of plants - the vegetative roots. If soil had formed under a grass vegetation, such as the chernozem in the steppe or the forest meadow soil, it would always show a large content of humus. Such soil possesses a high natural fertility. Vegetative residue is accumulated primarily in the shape of dead roots of crops and other grass plants. Decomposed in the soil, they almost completely are transformed into humus.

An accumulation of humus, however, does not take place under a woody vegetation. In a forest - vegetative residue accumulates primarily upon the surface in the form of fallen leaves, needles, twigs. In getting decomposed above ground, they are almost completely destroyed without being transformed into humus. This is the reason why in forests, especially pine forests, there are but poor humus layers and the soils are unfertile podzol.

The study of chernozem soils led Kostychev to the conclusion that one may grow a variety of natural vegetative plants on chernozem soils, which will include forests. A forest in the steppe can not be dislodged by other plants. In the majority of cases chernozem is covered with grass vegetation: a steppe vegetation - on elevated places and a meadow vegetation - on lower spots. This vegetation also firmly keeps its ground, once it takes possession and is seldom forced out by woody vegetation without human interference.

"As steppe forest growth develops, wrote Kostychev, the methods become simpler. They consist primarily in the destruction of the wild grass plants that grow among planted trees in the first years of their life."

Kostychev's observations on the structure of chernozem and the changes taking place in its structure during plowing and also in leaving the plow land waste, are of considerable interest. He saw in the structure of chernozem one of the most important factors for its fertility. The purpose of cultivation is to provide the soil with the proper structure. The best structure is grainy, consisting of small clods, it is resistant to mechanical destruction, to pulverization in cultivating and to washing-off by snow and rain waters. Virgin unplowed chernozem possesses such structure under steppe vegetation. It is equally preserved on virgin soil, that is in the first years following the plowing of virgin chernozem. The surface layer of such plowed land always remains friable even after heavy rains. This provides it with adequate amounts of air and moisture, microbiological processes are most active in it and the soil, as a result, is highly fertile. After prolonged cultivation chernozem soils are reduced in their fertility because of the destruction of the structure of the soil and also because of the spread of weeds. In the past when the steppe and fallow land system of agriculture prevailed in the steppe, such plowed lands covered with weeds were left without cultivation and seeding for several years and became covered with grass vegetation. A continuous alternate change in vegetation took place in these cases - weeds gave way to rooted crops, such as couch grass, brome grass, and the latter to the steppe Festuca ovina L. and Stipa L. (feather grass).

The soil changed simultaneously: from a soft, pulverized one, it became firmer, its structure was restored and 20-25 years later, it differed little from the structure of virgin soil. On the basis of the studies of these changes in the soil - in leaving plowed land lie fallow - Kostychev came to the most important conclusion that a similar change may be achieved much faster by sowing perennial forage grasses on the fields. He recommended therefore the change to grass sowing on farm land that had been lying waste for a short time, grass sowing alone being able to ensure the most rapid reconstruction of the soil's structure and provide forage for livestock at the same time. "Perennial forage grasses provide the means of preserving the fertility of soil on a high level and at the same time ensure a greater stability of yields", wrote Kostychev. If perennial forage grasses are not planted in the fields, the amount of organic matter in the soil is reduced even if amply fertilized with organic substances. It follows that field grass sowing represents one of the most important methods for the accumulation of organic matter in the soil without which a durable structure is not possible.

Kostychev was thus in this most important problem, the forerunner of the academician Vassili Robertovich Williams who developed the grass field system of agriculture, - the highest achievement in Soviet and world agricultural science.

In the tragic drought and famine year of 1891 - Kostychev, along with Dokuchaev and many of the best representatives of the Russian intelligentsia lent his knowledge and strength to the aid of the starving while working on the solution of the causes of poor harvests and methods to combat drought. He lectured on the latter subject at the Central Agricultural Museum, the course being subsequently published in 1893 under the title: "On Combatting Drought in the Chernozem Belt by Means of Cultivating the Fields and the Accumulation of Snow on Them". This work, as its title implies, represented a substantial supplement to the plan of controlling drought, as expounded by Dokuchaev in his "Our Steppes Past and Present". Kostychev here set forth points that were missing in the Dokuchaev plan, i.e., he proposed a system of measures for the accumulation, preservation and proper utilization of moisture in the soil by cultivation and snow retention. He considered timely cultivation to be of major importance in controlling drought. The most essential requirement in cultivating the soils of steppe regions was to keep the surface of the soil in a friable condition. The principal methods of cultivating directed towards controlling drought, were disking stubble, summer plowing, cultivation of the plowed land, and harrowing immediately after plowing. Snow retention was equally of enormous significance for the accumulation of moisture in the soil.

Kostychev further devoted much attention to the problems of controlling erosion on chernozem soils, since erosion strengthened the damaging effect of drought. Erosion cannot take place in chernozem covered with grass, because the falling rain, hitting stems and leaves of plants loses its mechanical destructive strength. Aside from that, water falling upon the surface of the soil is intensily absorbed by the structural lumps (clods). On steppes covered with woody vegetation a surface wash-off of the soil is not possible, nor may ravines form. The planting of perennial grasses is therefore the most successful means of combatting erosion.

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Kostychev studied in addition to chernozem also other steppe soils, - sands and solonchak, in particular. In his attempt to determine the causes of the destruction of young woody plants on the Aleshkovski sands at the lower Dnepr, opposite Kherson, he came to the conclusion that the young plantings were harmed by the severe heating of the surface of the sands by the sun. The matter of protecting young plants from the overheating of the soil in the afforestation of sandy areas was therefore of major importance. The plants suffered in a lesser degree from the dryness of the soil because sands usually are well provided with moisture in their deeper layers. The surface of sands, overgrown with vegetation gets considerably less heated than the surface of bare quicksand. These observations caused Kostychev to conclude that woody plantings on fixed sands covered with grass vegetation offer the best solution. It is therefore essential to discontinue the grazing of livestock before and after the planting of woody specimens on sands, which then become gradually more compact and overgrown with grass vegetation.

Kostychev engaged in research of not alone steppe but forest- and podzol soils, studying particularly the content and forms of compounds of phosphoric acid in it. He showed that on podzolic soils, in view of their acid reaction, phosphorite fertilizer (phosphate fertilizer) may successfully be applied, which aside from its direct action as a source of phosphoric acid, also reduces acidity. This favorable reaction of phosphorite fertilizer on podzolic soils was in the opinion of Kostychev closely connected with the prevalence of free organic acids in the soils. He further stressed that only under a combined utilization of phosphoric acid and potassium fertilizers and the calcification and cultivation of perennial legumes, one may raise the fertility of podzol soils to a higher level.

Kostychev also devoted much attention to weed control. He pointed out that the best method of controlling weeds in the fields lies in agro-technical methods which ensure the rapid and uniform development of cultivated plants. If the latter develop rapidly and uniformly, they will eventually choke weeds, which perish under those conditions.

P. A. Kostychev was thus preoccupied with the most complicated and difficult problems of soil science. In studying the origin and content of the organic elements of soil and humus, Kostychev was the first to apply the microbiological method for the purpose. He also was the first soil scientist-experimentor who made field and laboratory experiments on the decomposition of organic matter and the influence of water penetrating upon the organic elements of the soils. A soil scientist-geographer in the widest meaning of the term, he traveled throughout the length and breadth of all of

European Russia, the Caucasus and part of Siberia. He was the best authority on the nature and economy of the steppe belt, an acute and manifold observer, who studied soils, vegetation, agricultural methods and the organization of steppe agriculture. He lent his knowledge and strength to the work of raising the productivity of agriculture and the increase of yields. He threw light upon the most important and fundamental problems of agriculture. The proper cultivation of soils, field grass sowing, snow retention, tree shelterbelt development, the control of erosion, drought, the application of organic and mineral fertilizers, the phosphorization of podzol soils, the development of viniculture - are but a brief listing of agricultural subjects to which this indefatigable researcher devoted his life that was cut short only too soon. He participated personally in organizing eight large agricultural experiment stations, of which one is actually named after him, the Kostychev Agricultural Experiment Station in the Saratov Povolzhie.

These are the outstanding achievements for science and country by Pavel Andreevich Kostychev. As stated by one of Dokuchaev's foremost pupils, Nikolai Michailovich Sibirtsev, Kostychev deserves a place in soil science along with Dokuchaev and he is rightfully recognized as the second co-founder of Russian Soil Science.

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VASSILY ROBERTOVICH WILLIAMS (pp. 22-29)

The role played by the academician V. R. Williams in the creation of contemporary soil science is particularly large. Williams accepted as a basis of this science the Marxist theory on soil fertility and the methods of improving it. "He was, according to the academician T. D. Lysenko, a revolutionary scientist, a "bolshevik-scientist" who in force of analysis, capacity for wide scientific generalization and deep practical experience had no equals among the contemporaries in his field.

In terms of the significance of his scientific and practical activity and the style of his work, he may be compared with such giants of darwinism as were K. A. Timiriazev and I. V. Michurin. He is the author of the single soil formative process and the famous theory of the grass field system of agriculture".

The work of Williams has an enormous significance for bringing about an abundance in agricultural products. Williams worked out the grass field system of agriculture which raises the fertility of the soil and ensures ever higher yields. Grass field crop rotation represents one of the major links in the chain of this system, as do adequate systems of cultivating the soil, the proper application of organic and mineral fertilizers, the planting of tree shelter-belts, the construction of ponds and watersheds in steppes.

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Williams' theory presupposes, therefore, the proper utilization and transformation of all natural conditions with the view of increasing yields and generally raising productive agriculture. In his theory, as in all advanced agro-biological science, created by Michurin, Williams and Lysenko, deep theoretical thinking is closely bound to the practice of socialist agriculture. This accounts for its practical realization on the wide fields of collective and state farm lands of our country.

Williams raised soil science to a new level, introduced into it the theory of soil fertility which was lacking in Dokuchaev's and Kostychev's works. He proved that the fundamental property of the soil, as a body of nature, that new quality which distinguishes it from mountainoùs nature, lies in its fertility.

According to Williams, soil is the upper layer of dry land which was formed by wind and biological processes. "When we speak of soils, wrote he, we have in mind the FRIABLE SURFACE HORIZON OF DRY LAND OF THE GLOBE, CAPABLE OF PRODUCING A YIELD OF PLANTS. The concept of soil and its fertility are indivisible. FERTILITY - IS AN ESSENTIAL PROPERTY, A QUALITATIVE CHARACTERISTIC OF THE SOIL, INDEPENDENT OF THE DEGREE OF ITS QUANTATIVE MANIFESTATION. The concept of a fertile soil is to be contrasted with the concept of a non-fertile stone or, in other words, the concept of the massive mountainous nature."

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This definition of the soil changed the content of soil study as a science, the task of which was to study the formation, development and methods for increasing the fertility of soils.

"Soil science in its first function, told Williams, - studies the process of the development of the qualitative characteristic which made the soil - the principal and general means of production - its natural fertility...The study of the system and its principles, lying outside of the peculiarities of groups of soil of agricultural plants, those of production itself and their political-economic relations to the rest of the entire national economy represents the second function of soil science. This phase is usually referred to as general agriculture."

The scientific system is based upon the progressive marxist theory, on the abundant practical experience of socialist agriculture. Williams pointed out that the task of soil science was to study the development of the natural fertility of the soil and work out a system of production methods designed to increase effective fertility to its maximum. The scientist stressed that only a collective farm regime could guarantee an uninterrupted fertility of the soil and high and stable harvests.

The Soviet government, leaning on the powerful strength of the planned socialist management of agriculture, upon the achievements of a progressive agro-biological science, is steadily developing the productive forces of the country. A socialist system of management offers enormous opportunities in that it permits the concentration of all material and technical resources in government hands and uses them in controlling nature in the interests of the toiling masses.

The teachings of the great transformer of nature, I. V. Michurin, concerning the development of plants, the teachings of V. R. Williams regarding soil science and the methods of ensuring a high fertility of soils, the experiments of advanced workers in socialist agriculture - form the foundation of Soviet agro-biological science which was headed and further developed by the outstanding Soviet scientist, the academician T. D. Lysenko. The Bolshevist Party, in providing Soviet scientists with a marxist-Lenin viewpoint turned progressive agro-biological science into a powerful weapon for a planned transformation of nature.

WILLIAMS' THEORY OF THE FERTILITY OF SOILS

The fertility of the soil, according to Williams, - is the capacity of the soil to "ensure in some form or other, the demands of plants for a simultaneous and combined presence of two factors in their existence - water and nutrition". The life factors of plants may be divided into two groups: the group of cosmic factors - light and heat - and the group of soil factors - water and elements of nutrition. There is a considerable difference between these two groups of factors. The cosmic factors affect the green plant in the form of energy derived from the sun's rays and they directly exert their influence upon it. Man is practically deprived of the opportunity to regulate the quantative influx of these factors to the plant. As to the water and the greater part of elements of nutrition, these can influence the development of plants only through the medium of the soil, which permits a quantative influence upon them for the purposes of production. This influence represents the general productive task of agriculture which, according to Williams, "consists in ensuring cultivated plants uninterruptedly, throughout their entire life cycle, of a simultaneous, maximal presence in the soil of absorbed water and absorbed nutrition".

None of the factors in the life of plants may be substituted for another. This law of non-substitution he formulated as follows: "Plants require for their living the simultaneous, combined presence or the influx of all conditions or factors essential to their living". The second law - of the equal significance of factors - follows from the first: "...All factors essential to the life of a plant are definitely of equal significance".

Theoretically there is no distinction between the factors, none are of greater or lesser importance, irrespective of the quantative need for them on the part of plants. The plant may demand insignificant amounts of some elements, which may be the case with regard to iron, but should those insignificant amounts be absent, the life of the plant is discontinued in the same manner as if factors which the plant requires in much larger quantities, such as water, light, oxygen, carbon,dioxide were lacking.

In practical production the law of equal significance acquires a relative meaning because of the difficulty in giving practical satisfaction to the needs of plants. For instance, the demand for water is much more difficult to satisfy than are the plant's demand for calcium or iron. It depends upon the degree of the plant's needs, which is much larger for water than it is for calcium.

Williams further points out that: "No matter how simple and apparent these two agricultural laws are, both, and the law of indispensability in particular, are difficult to accept. Dreams still persist concerning a way of finding such a medium which would satisfy every demand and may be applied in all cases; people usually see such a medium in some artificial fertilizer or an improved variety of seeds". The uninterrupted and unlimited increase of yields and the general progress of agricultural production is "possible only in a case when our influence upon the conditions in which this complicated production takes place is directed simultaneously upon the entire set of conditions. This set of conditions represents an organic entity, the elements of which are closely bound and indissoluble. Influencing one of these elements leads inevitably to an influencing of all the rest. Should this not be the case, we would invariably confront the LAW OF A REDUCED FERTILITY".

"A stable and uninterrupted increase in agricultural production, said Williams, is the principal, most important and central problem in agricultural production...The task of fixing the continuity in an increase of agricultural production or the creation and the uninterrupted increase of conditions stimulating the fertility of soils, represents the essential trait which distinguishes a planned, socialist people's economy from an outmoded capitalist system."

WILLIAMS' TEACHING CONCERNING A SINGLE SOIL FORMATIVE PROCESS

Williams' theory concerning a single soil formative process represents a new phase in the development of soil science. The basic significance of this theory consists in that the former opinion about soil as an immobile, static, natural formation was replaced by the new concept of soils as mobile, dynamic systems that are in the process of development. The basic leading factor in this development was admitted to be the biological factor - the change in vegetation. It was also indicated that the development of a soil formative process indicates at the same time the development of the natural fertility of the soil.

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Dokuchaev laid stress on the age of soils among other factors affecting soil formation. This idea, however, was not further pursued. The accepted view in soil science was that types of soil are static formations. Williams shattered these views completely. He proved that soil formation is a historical process which passes through time following dialectic laws. "In nature, wrote he, there exists a single soil formative process with a multitude of apparent forms, the direction of which is determined by the "absolute" age of the country's soil. Soil zones and types of soil, as distinguished in soil science, are only static moments of a single colossal dynamic process in terms of duration and length."

According to Williams, one may distinguish periods, stages and phases of a soil formative process in the evolution of soil science, connected with the change in vegetative formations, i.e. the natural combinations of green and non-chlorophyll plants. Of these formations, according to Williams, there are four:

1. The woody vegetative formation formed from the association of woody green plants, fungi, actinomycidia and anaerobic bacteria.

2. Meadow-grass vegetative formation, wherein are associated meadow-grass green plants, aerobic bacteria and a radical predominance of anaerobic bacteria.

3. The steppe-grass vegetative formation which consists only of two members - the steppe-grass green plants and aerobic bacteria.

4. The desert vegetative formation in which the role of organisms which create the organic matter is divided in consecutive order among chemotropic bacteria and seaweed (alga), while the role of organisms which destroy the dead remains of these organisms belongs in the same consecutive order to the bacteria of both types and to fungi.

The process of a change in the maternal race, named the podzol-formative process, takes place under the layer of the woody vegetative formation and has to be viewed only as a stage in the single soil formative process.

The woody period of the single soil formative process, which possesses two stages - meadow and swamp - develops under the meadow-grass vegetative formation.

The steppe period of the single soil formative process develops under the steppe-grass vegetative formation.

Finally, the lowest stage of vegetation, the chemo-synthetic bacteria, especially, corresponds in its development to the first (initial) period of the single soil formative process.

The soil zones and types of soils represent, according to Williams, those "dialectic jumps" which depend upon our inability to observe these slow and insignificant changes up to the time they accumulate and reach the stage of "jumps"; the latter are determined by the qualitative differences of a combination of conditions obtained as a result of the accumulation of quantative changes. The identical process takes place in them under conditions which cannot be compared in quality. The difference in the frequency of these "jumps" is established by the relative age of a country's age. On an enormous stretch of territory this is reflected in the form of the presence of a number of soil zones.

We have found in the European part of the USSR of the glaciated area, an alternation of zones in a consecutive order: - tundra, forest-tundra and taiga (coniferous forest), as well as a widely spread area of "eternal freezing", while on the North American continent, the zone of the continental ice sheet directly meets the taiga which advances clearly upon forests and destroys century old spruce.

Thus Williams in his theory of a single soil formative process demonstrated that at the basis of soil formation lies the interaction between soils and the vegetation growing on them and that the development of soil types in time and distribution is closely and indissolubly bound with the development and distribution of growing formations.

WILLIAMS' THEORY CONCERNING THE GRASS FIELD SYSTEM OF AGRICULTURE

The most important prerequisite for soil fertility is the crumb structure of the soil which alone ensures the soil of favorable water and nutrients ~~eight~~ conditions and preserves it from wash-off.

Its most essential property is its durability, i.e. the capacity to withstand the power of water.

The aim and task of a system of soil cultivation, according to Williams, is to provide the soil with a crumb structure. However, every soil will be left on its own during harvesting and, after cultivation and sowing, be doomed to lose the crumb structure of its surface horizon and its durability. It is therefore imperative to cultivate every year, and on soils of poor structure, to cultivate even several times a year.

The necessity of restoring the durability of the soil structure will then come up at rarer intervals and be the task of a system intended to restore the fertility of the soil. This problem may only be solved by the GRASS FIELD SYSTEM OF AGRICULTURE during which a joint sowing of perennial grasses takes place - of friable-shrubby crops and legumes which provide the soil with an increase in humus, make its structure more durable and produce an accumulation of ashen plant nutrients and nitrogen. The grass field system solves two problems simultaneously: 1. it restores the conditions ensuring the fertility of the soil and 2. provides the livestock industry with forage.

Thus the theory of a single soil formative process, as a basis for the development of the natural fertility of the soil, logically leads to the advocating of a grass field system of agriculture, as a system designed to support conditions for a maximal increase of effective soil fertility. Williams' theory concerning the formation of the soil is indissolubly connected with the practice of socialist agriculture. He was fortunate indeed to live to see his theory put into practice on the fields of our socialist country.

The grandiose plan of introducing the grass field system of agriculture in the steppe and forest-steppe regions of the European USSR was adopted upon the initiative of comrade Stalin and presented in the decree of the Council of Ministers of the USSR and the CC of the VKP(b) of October 20, 1948. This plan envisages the creation of vast government shelterbelts and proposes the following measures:

a) the planting of tree shelterbelts on watersheds, on the boundaries of fields under crop rotation, along slopes of ravines and gullies, banks of rivers and lakes, around ponds and reservoirs, as well as the afforestation and fixation of sands.

b) an adequate organization of the territory for introducing grass field and forage crop rotations and the rational utilization of land use.

c) an adequate system of soil cultivation, care of sowings, and most of all, a wide adoption of black fallows, summer plowing and disking of stubble.

d) the sowing with selected seeds of high yield varieties adopted to local conditions.

e) the development of irrigation on the basis of utilizing the waters of local run-off by the construction of ponds and watersheds.

f) an adequate system of applying organic and mineral fertilizers.

The above system of measures, states the decree, represents a dependable weapon for the control of drought, in that it increases the fertility of soils, ensures high and stable yields, discontinues the wash-off and blow-off of soils, provides for the fixation of sands and the most rational utilization of lands. Simultaneously, this system offers the opportunity to develop a many-sided economy with the proper correlation between field cultivation, husbandry and other branches, and promotes a significant increase in economic goods.

Contemporary soil science, created in our country by V. V. Dokuchaev, P. A. Kostychev and V. R. Williams is thus extending its extraordinary gifts.

End of booklet.

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Zarubailo, T. Ia. Michurin's Teaching in Selection and Seed Production of Cultivated Plants. Leningrad, 1950. 38 p. 463.6 Z1

Translated from the Russian by
S. N. Monson

STENOGRAPHIC REPORT OF PUBLIC LECTURE HELD IN LENINGRAD IN 1950

The Central Committee of the VKP(b) (All Union Communist Party) took a historical decision in February, 1947, with regard to measures of raising and developing agriculture in the post war period. Large tasks were placed up agrobiological science in that decision, which included the work of producing new and better varieties of agricultural plants.

The science of producing new varieties of plants is called selection. The very process of producing varieties and species is also called selection. Off hand, it would seem that the work of a selector is quite simple: to select the best kind for stock. From the practical standpoint, however, selection is quite complicated. The very choice of a better kind is already complicated since it is far from easy to find and segregate this best kind from a large number of individual plants.

Still more complicated is the problem of securing sources for the best variety, as compared with the existing ones. Let us suppose that we have been given a large variety of plants of wheats and been assigned the task of segregating from this diverse group the best plants in order to produce a variety most adapted for production in some definite area. In undertaking this task we shall find it, however, far from simple. Once solved, when the variety best adapted for the given area is selected, another problem will arise: what to do next? No matter how good the

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chosen variety, it will never be so good as to prevent us from trying to find a still better one.

But how are we to obtain a more perfect variety than we already have? We already selected the best we could. What are the possibilities in this connection? Which are the ways and methods that we may use for the purpose?

The scientific solution to these problems is of enormous significance for the practice of production and the improvement of varieties and stock. One may solve them only by knowing the laws controlling the development of living nature. The key to the understanding of these laws with respect to any phenomena, including those of living nature, is provided by the only scientific method available in acquiring knowledge - the dialectical materialism.

This method forms the basis for the Michurin biological science. Because of it the latter was able to approach the study of the laws of the development of living nature in an adequate manner and to utilize it for transforming nature for the benefit of mankind. Founded by Michurin, subsequently developed and continued in its development by the academician T. D. Lysenko, it provides the answers to those stirring questions which are of such importance in selection. It represents a powerful weapon in the struggle for dominating living nature in the interests of our socialist society.

THE ESSENCE OF THE MICHURIN-LYSENKO TEACHINGS CONCERNING HEREDITY AND ITS CHANGEABILITY

Michurin science teaches that the change in the environment of an organism leads to a change in its nature and its heredity. The changes occurring in heredity will under those circumstances equal the influence of changed conditions upon the organism. It follows that in changing the environmental conditions of an organism IN A SPECIFIC WAY we shall also be changing IN A SPECIFIC MANNER and in a DEFINITE DIRECTION the very nature of the organism and its heredity.

The fact that a "specific" change of environmental conditions will change the heredity of an organism in an equally "specific" way does not indicate, however, that all changes taking place in such case will be of use to the organism or to man, for that matter. "One should not confuse, writes Lysenko, the process of adjustment which takes place in an organism with the usefulness and expediency of a given adjustment occurring for the sake of the harmonious entity of the organism and its relationship with the environment. Harmony and expediency of the organisms, are obtained only through natural selection in nature, - and through artificial selection, in cases when the harmony of cultivated organisms and their adjustability to satisfy our needs are involved."

This tenet should always be firmly remembered.

What then is meant by the heredity of an organism?

Michurin science proved first of all that the organism does not possess any specific "element of heredity" outside of its living body, a claim that thus shattered the reactionary basis of the faulty scientific theory of the Morgan-Weissman followers. The property of heredity is possessed by the entire organism and everyone of its parts, by every cell of its living body. The reproductive cells of an organism, those cells from which a new body is formed, whether by sexual or vegetative propagation, represent the product of the life activity of the entire organism and reflect in the fullest manner upon its nature and heredity. MICHURIN SCIENCE UNDERSTANDS BY HEREDITY THE "CAPACITY OF THE LIVING BODY TO DEMAND SPECIFIC CONDITIONS FOR MAINTAINING LIFE, FOR ITS DEVELOPMENT AND FOR ITS ABILITY OF REACTING UPON A VARIETY OF CONDITIONS".

This interpretation of heredity stems from the recognition of the indissoluble unity of the organism and its environment. One cannot isolate a living body, separating it from the conditions under which it lives, because in such case it would no longer be a LIVING body but will change into a corpse. This represents the difference - in principal - between a living and any dead body. "The more a non-living body, states Lysenko, will be isolated from the influence and inter-action of the external environment, the longer it will remain what it is. A living body however, INSISTS upon some definite conditions in its external environment in order to keep alive."

Every organism begins its development from a cell or a group of cells. In assimilating the necessary conditions suitable to its nature from the surrounding environment, these cells multiply, change, differentiate, and in such manner finally produce the organism with all its characteristics.

It follows therefore that every organism builds itself from the conditions of its external environment, adjusting them to suit its needs. The EXTERNAL ENVIRONMENT in the life of an organism - i.e. the nutrition in the widest sense of the word - is transformed by this change into its inner characteristics. The nature of the living conditions of an organism is therefore bound to affect its traits and characteristics, including those of its heredity. The heredity of every organism is formed in a series of generations under the influence of environment. Thus, as is pointed out by Lysenko, "heredity represents a sort of concentrate of the conditions of the external environment assimilated by vegetative organisms in a series of former generations". The conditions essential to the normal development of a given organism were BOUND TO HAVE PARTICIPATED in the forming of its heredity in the course of previous generations.

The greater the adjustability of an organism to some definite conditions, the more difficult is its acceptance of other, unsuitable conditions in its existence, and the sharper the organism's demands for the conditions it requires.

An organism usually possesses some degree of stability in heredity. This explains the similarity observed among various - especially the closest - generations.

In knowing these basic tenets of the Michurin doctrine with regard to heredity, one is able to understand the cause and manner in which heredity changes under a change of environmental conditions.

Thus if we desire to alter the heredity of an organism in some direction, we are obliged to change its living conditions accordingly.

But does the change in environmental conditions always produce a change in heredity?

The heredity of an organism is expressed in its capacity to absorb from the external environment and to assimilate not all conditions indiscriminately but only those that suit its nature and those essential for its normal development. In other words, the organism possesses the capacity of selectivity with regard to conditions of an external environment.

A change in environment does not therefore necessarily mean a change in the living conditions of an organism. In order to change the heredity of an organism it is necessary to alter its living conditions in the first place. Once we change the external environment, in such manner as to provide for all the conditions required by the nature of the given organism for its normal development, preserving the type of the latter - the nature of the organism and its heredity will not be exposed to change. It is possible, on the other hand, to change conditions in such manner that the respective organism will be utterly unable to continue its development.

In changing the heredity of an organism it is essential to transform the conditions in which it exists in such manner that they should, to some degree, non-conform to the nature of the organism but at the same time, prevent the changed conditions from interfering with its development. In such case the organism will begin to interact with the new conditions. In spite of some difficulty, it will absorb and assimilate them. In the end, the organism will continue its development although the type of the latter will differ and reflect the adjustment to new conditions.

Should this process of adjustment prove useful to the organism as a whole, increase its viability in the surrounding external environment, the following generation will under the same circumstances feel much better and develop with less difficulty. The development of the third* generation will proceed still easier.

At the expiration of several generations the organism will not only react well under these conditions but will already demand them for its normal development. Thus the change of living conditions leads to the change in the type of the development of the organism, while the change of type produces a change in the demands placed by the organism to external conditions, i.e. reflects the change in its heredity. Let us illustrate the above on the example of the transformation of a winter wheat into a summer wheat.

It is known that if one takes summer and winter wheat and sows both in the spring they will conduct themselves in a different manner. Summer wheat will rapidly produce a culm, will tiller, and within approximately 3-4 months produce a yield. Winter wheat will remain a grass throughout the summer, get bushy, grow new leaves but will not tiller, nor produce any yield. It follows that summer wheat obtains everything essential for its normal development in the conditions of a spring sowing, these conditions proving therefore suitable to its nature and heredity. Winter wheat, however, is unable to develop normally under these conditions because they do not conform to its nature and heredity.

What is it that is lacking in spring sowing for the normal development of winter wheat?

To begin with, let us recall that in developing annual plants (cereals, for instance) Lysenko discovered and studied the two stages of development - the stages of vernalization and light. The totality (combination) of conditions required for the normal passing of either stage is different. A Specific Temperature over a definite period of time (depending upon crop and variety) is essential for the normal passing of the stage of vernalization, in addition to other conditions, such as moisture and accessibility of air. The light factor is of no significance in this stage. For the second, the light stage, however, another combination of conditions is required, which will also claim a specific temperature, (different from that of the first stage) and further demand as an absolute essential the presence of light for some crops and complete darkness for others.

Another absolute condition for the passing of every successive stage is the completion of the preceding one. This means that until plants have not gone through the stage of vernalization, the light stage may not begin, while until the light stage is completed, no further development may be expected.

This has been proved by the academician T. D. Lysenko who showed that the difference between summer and winter wheats consists in that they demand different conditions in their stage of vernalization. Summer wheat goes through this stage under rather high temperatures (10-20°), in a rather limited time (5 to 10 days). Winter wheat requires for normal vernalization lower temperatures (from 0° to 4-6°) and a longer time (35 to 70 days), depending upon the variety. It follows that for winter wheat to develop normally, it should be provided with lower temperatures during its early development, these temperatures to last for a rather long period of time. If sowed in the fall, as is usually the case, it has the opportunity to satisfy fully its demand for low temperatures until the spring of the following year, and after wintering to get into the booting stage. We may also satisfy this demand for low temperatures artificially, in which case the plant will tiller and ripen even if sowed in the spring. Lysenko's research proved that wheat and many other plants may go through the first stage of development not only when grown to the level of a green plant but also when in the state of a hardly germinated seed. One may, therefore, bring the seeds of a winter wheat up to the germinating stage, before they penetrate the seed capsule, and then place the plants for the necessary time into colder conditions. No light is required. It is only necessary to provide the seeds with an adequate supply of air, moisture and prevent them from drying out.

This method is usually practiced with regard to summer crops and it is widely known as the method of vernalization.

If we do not provide the winter wheat in its early stages with the required conditions, specifically, low temperatures, it will stop in its development. If, however, this necessary demand for low temperature in the first stage is fully satisfied, the further development of the plant under spring and summer conditions will proceed normally. In the first case the plant will not produce a yield, i.e. not leave any progeny. In the second instance, the progeny will in its character not differ from the original plant. Neither in the first, nor in the second instance will there be a progeny of changed heredity.

The situation will be different if we provide winter wheat plants with the low temperature they require in their early development - not in full but in part. Let us suppose that a plant requires 50 days and nights of low temperatures in order to complete normally its stage of vernalization. We provided it, however, with only 40 to 45 days and nights of low temperature and then placed it into conditions of higher temperatures. In such case the process of vernalization will not have been completed under low temperatures. But since its vernalization had already been begun, it will continue under the conditions of higher temperatures. Only the vernalization will proceed at a reduced pace. Instead of the 5 to 10 days, formerly needed, 15 to 30 days will be required under higher temperatures. The very nature of the process will also be different in such case and the type of development change to some extent. Finally, the progeny obtained from such plant will require a smaller share of low temperatures in its stage of vernalization. It will be capable of going through that stage at higher temperatures and in shorter periods. At a customary spring sowing the progeny will consist of a considerable number of plants which, though late, will tiller and produce a yield, i.e. come closer to summer types.

The stage of vernalization will be gone through even more rapidly at high temperatures by the next generation. As a result, we shall obtain, following several generations, a typical summer progeny which will not only be capable of going through the stage of vernalization at high temperatures but even DEMAND these temperatures for a normal and rapid development in the stage of vernalization.

It is necessary to take into account that the formation of all traits and characteristics of a plant is connected with its stage development. The organs, traits and characteristics of a plant are produced not simultaneously but gradually, in a definite consecutive order based on going through the stages of development. Cereal crops, for instance, are unable to form culms until they pass through the stages of vernalization and light. The characteristics of this culm, its traits and properties, such as - height, thickness, color, stability, etc., are consequently unable to form and develop any earlier. Their development should therefore be prepared by the entire cycle of the preceding development of the plant. In addition, the presence of suitable external conditions is also essential.

Each organ, every trait and property of an organism requires specific conditions for its development in an external environment. Should these conditions lack, any of these characteristics will not be produced, although the possibility for their development may have existed in the hereditary nature of the organism and been prepared by the entire cycle of its former development.

Let us cite another simple example.

If we take a variety of wheat, characteristic for its stability and resistance to lodging, and sow this variety too closely on soil, over-fertilized with nitrogen, we shall fail to obtain a stable culm. In such case, the characteristic of stability of the culm will not develop although the possibility for developing this trait existed in the hereditary background of the given variety. If, however, our plants are kept less crowded, the plants not shading each other, and a type of mineral nutrition is provided that will give the plants an adequate amount of potassium and phosphorus, without their being overfed with nitrogen, - then the characteristic of the stability of the culm will receive the most favorable conditions for its development.

The cited example belongs to the field of agricultural methods, but these very methods - providing for conditions of plant growth - are leaving their imprint upon the racial qualities of the variety and its heredity. If one takes the seeds of one variety, divides them into two parts and proceeds to grow one part according to one agricultural method and the other part according to another, one will eventually obtain two varieties which will differ considerably from each other.

The inter-relationship between organism and environment occurs through metabolism: the organism under specific conditions always absorbs from its surrounding environment definite elements essential to its nature, it works them over to suit its needs and provides the products of life activity to the surrounding environment. Every organism possesses its own type of metabolism which determines its heredity. If the type of metabolism changes, the heredity of the organism changes along with it. The inter-relationship between the individual parts of the organism - the organs, tissues, cells - occurs also through metabolism. In a normally developing organism the elements produced by its respective parts - the organs, tissues and cells, - are included in the general process of the development of the organism and they participate in the formation of the reproductive cells - both sexual and vegetative, which serve as the stock for a new generation.

Because of that, the reproductive cells, representing a product of the life activity of the entire organism, are reflecting most fully the aggregate of hereditary traits.

Any trait or property of the organism is the result of the life activity of a part of its body - either cells, tissues or organs, - which are in a close relationship with the rest of the parts through metabolism. This means that the change of any trait or property is connected with the change in the character of the life activity of the corresponding parts of the body of the organism, depending upon the change of the type of metabolism in them. If the organism takes the substances produced by the changed part of the body into the general chain of its development and lets it participate in the creation of reproductive cells, then the change that in some form or other has taken place will be reflected in these cells and transmitted to the next generation. The degree of the hereditary transmission will depend upon the degree in which elements of the changed part of the body will be included into the general chain of development of the organism and through this - upon the degree they will participate in the development of the reproductive cells.

It is natural to assume therefore that not all changes are as easily and rapidly reflected or fixed in the heredity of the organism. This explains the many well known cases when a change that appeared in one generation does not reappear in the next if the identical conditions under which it was developed are not repeated. There is, however, no change - (except deadly disfigurements of the organism) that may not be alone fixed but also strengthened in the heredity of the organism through its constant reproduction in a succession of generations and by the creation of correspondingly necessary external conditions. It only remains to discover which are the conditions that advance the appearance and development of the given change.

Knowing the requirements of the plant in its separate stages of development and the conditions essential for the formation of its various characteristics and traits, one is able to control the development of plants and the formation of desirable properties and characteristics. By changing skilfully the living conditions of a plant, one may transform its heredity, aiming at the highest development and the creation of those qualities which under the conditions of production in a given area ensure the best yields.

The task of agrobiological science proceeding from the above general principle, consists at present in working out and improving concrete ways and means of managing the nature of organisms, the nature of any of its properties and characteristics as applicable to concrete objects and set tasks. Much in this respect has already been done by I. V. Michurin himself, as well as by the academician T. D. Lysenko and the large group of Soviet agrobiologists working under him. However, still more has to be done in the future so that the nature of organisms may become completely controlled by the will of man and entirely placed in the service of communist society.

THE MICHURIN TEACHING OF HEREDITY - THE THEORETICAL FOUNDATION OF SELECTION

An orderly system of methods used in selection-seed-growing work emanates from the above understanding of heredity and its changeability, as provided by the Michurin doctrine. This system ensures a constant improvement of agricultural plants, their advance into new regions, the systematic improvement of the quality and quantity of harvests.

At the foundation of this system lies the skillful utilization of the influence of environment upon heredity within a vegetative organism. The first rule ensuing from the Michurin doctrine, consists therefore in according the greatest share of attention - in selection-seed-growing work - to the creation for plants of such conditions that will aid most the development of traits and characteristics which the selector wishes to produce and fix in some given plants.

The selector must consequently work with a plastic initial material which reacts to external conditions. In that case, by choosing the external conditions skilfully, the selector is in a position to "mold" the desired forms according to a previously laid plan. Among this pliable material will be plants in which the conservatism of heredity has been eliminated or weakened, where the capacity for demanding particular conditions in an external environment has been weakened, where the heredity has been SHATTERED, so to say.

In referring briefly to the substance of the system of selection work, as proposed by Michurin, one may state that it contains two fundamental elements: first - the shattering of the heredity of the original plants, and secondly - the training of plants of shattered heredity, along with the use of the proper selected material.

It is understood, of course, that the selector should possess a clear comprehension of the task set before him and should skilfully study and select the original material.

The shattering of the hereditary nature of plants may be accomplished in several ways. By sexual or vegetative hybridization, and the transformation of the environmental conditions of the vegetative organism.

These three methods do not exclude but supplement each other. They may be utilized - and are used in practice - singly and in combination with each other. The choice of any of the three methods or that of any of their combinations, depends upon the object involved, the set task, etc.

THE MICHURIN DOCTRINE OPENS THE WIDEST POSSIBILITIES TO THE UTILIZATION OF HYBRIDIZATION FOR THE PURPOSE OF PRODUCING NEW VARIETIES

The Morgan pseudo-geneticists shouted much about hybridization, referring to it as a method of selection. Nevertheless, hybridization is unable to produce practical and valuable results under the "Morganist" treatment.

The trick in producing new varieties by hybridization, in following the Morganist methods, consists in having the selector wait - (after he has crossed the parent forms, of which each possesses some useful traits), for these traits to "condescend" to unite "accidentally" in hybrid plants in a manner desirable to the selector. Michurin pointedly remarked concerning this "theory" of hybridization that it may be expressed by the words - "pour, mix, shake up - something is bound to come out". The "theory" does not permit neither the foretelling, nor still less the controlling of the conduct of hybrid plants. In the light of the Michurin doctrine the substance of hybridization and its practical significance assumes another aspect.

The Michurin doctrine proceeds from the fact that in crossing, because of the "mutual" metabolism between sexual parental cells, a new hybrid organism is produced. At that, not only the ordinary sum of possibilities of developing paternal and maternal traits, but new possibilities not carried by the two may also be produced. The paternal and maternal sides possess each a definite stability, a conservative heredity and they demand relatively strictly defined conditions for their normal development. There is no conservatism in the hybrid, since it is a new organism. It will potentially follow different ways of development. Which of these will be realized will depend upon the conditions in which the young hybrid organism will develop.

"The hybrid - states Lysenko, - is a single organism, there is no division in it for paternal or maternal possibilities of development. It possesses all these possibilities and develops in the directions which suit best the respective conditions of an external environment."

Hybridization begins with the selection of parental forms for purposes of crossing. The Michurin doctrine teaches that for a skilful selection of parental forms it is necessary to study well their biological properties, their history, and also the conditions under which the traits and characteristics of interest to the selector develop best in a given form. Only after this is done, one may make one's choice on this or the other pair of forms.

To cite an example, we shall point to the method proposed by Lysenko and now widely used in selection work - the method of selecting parental pairs, according to the stage analysis, i.e. on the basis of a study of the peculiarities of stage development. The original material (the accumulation of varieties and forms available to the selector, from which he will select parental forms) is sowed in vernalized and non-vernalized form. The most favorable conditions for going through the light stage (additional artificial lighting for plants requiring a "long day" and darkening for plants requiring a "short day") are artificially created for the non-vernalized sowings. Some varieties will prove best in vernalized sowing, others, on the contrary, will produce their best specimens under favorable conditions created for them for the light stage. To cross - it is necessary to take of one parental form a variety which had proved best under conditions of vernalized sowing, and of the other parental form - a variety which had produced the best specimens under favorable conditions in the light stage.

Under ordinary sowing conditions both varieties may be late ripening and therefore prove inadequate in a given locality, and a selector of the Morganist school would reject them on that account. Nevertheless, if crossed these varieties will produce excellent results.

Guided by this principle in selecting parental pairs, Lysenko produced in two and a half years a drought resistant variety of summer wheat, the "Lutescens 1163", of rapid ripening. The academician A. A. Dolgushin obtained in the same manner the wheat variety "Odessa 13", the academician M. A. Olshansky - the cotton variety "Odesski".

I. V. Michurin established that the greater the geographical distance or place of origin between parental forms and the more pronounced the difference in the conditions to which they were adapted, the more "shattered" and more plastic the hybrid.

It is known that parental traits may develop in hybrids in various degrees: some develop most fully and will dominate, others will develop only in part, the third may not develop at all. The Morgan pseudo-genetics considers that dominating characteristics supposedly do not depend upon the living conditions of an organism and that the domination of one or the other parental traits in hybrids may not be changed deliberately by man.

Michurin and his followers have established the theoretical and practical insolvency of the Morganist claim, by discovering experimentally that the domination of one or the other trait may not be foreseen in advance, but depends upon a number of conditions which can be controlled by man.

Thus, for instance, the traits and characteristics of domination of a parent older in varietal history will be stronger. The parental properties of the respectively older in age will also dominate over those of the younger parent. If one of the two parents is of local origin and the other originates from a distant area, the characteristics of the local parent will predominate in the hybrid. If prior to crossing the parent form will be accorded conditions during which that or any other trait will achieve the greatest development, the particular trait may develop to a considerable extent in the hybrid.

Most important, however, is the fact that the development and predomination of any characteristics in the hybrid will depend upon conditions in which it will develop and grow. Let us cite an example to illustrate this.

Two varieties of summer wheat were crossed - a bearded and an unbearded one. When the hybrid grains obtained from this crossing were sowed in the spring all hybrid plants of the first generation were non-bearded, i.e. the non-bearded trait was predominating. When, however, these hybrid grains were planted in the late fall, close to winter, bearded plants resulted, i.e. in this case the bearded characteristic predominated. It follows that in accurately selecting pairs of parental forms for cross and in growing parental forms, prior to cross, under conditions favorable for developing the most desirable characteristics, and finally, in creating the corresponding (suitable) conditions for the growth and development of hybrid plants, the selector may CONTROL the characteristic of domination in the hybrid and generally aim at developing traits of greatest interest to him.

In place of the dead and useless scheme the Morgan hybridization appears to be, the Michurin doctrine offers the genuine theory of hybridization which opens enormous creative possibilities to the selector.

Zarubailo, T. Ia. Michurin's Teaching in Selection....

The Michurin science looks upon hybridization as upon the source of changeability in plants, the source of obtaining a plastic original material most adapted to the influence of environmental conditions. The next, most important task of the selector consists in the skillful development and the hereditary fixation of those characteristics in the hybrid which are of interest to man.

It is a general rule in selective work that in order to produce a good variety, plants should be grown under favorable conditions. But to grow plants in these conditions does not mean that they have to be artificially segregated from the influence of harmful external environmental conditions which may prevail in the locality for which the variety is intended and to which it will have to become adjusted in production. It is necessary to train plants generally to develop resistance and stability to unfavorable conditions. To achieve this it is occasionally required to train plants, at a certain stage of their development, under even more severe, - so to say, Spartan conditions.

Various conditions of wintering both severe and soft may, for instance, be provided for winter plants. It is natural to assume that soft conditions may prove more favorable for the growing of plants. Judging from this point of view, they will be good while severe conditions will be bad. But if the selector is faced with the problem of producing a highly frost resistant variety, he will be unable to achieve his goal if he provides his plants from generation to generation with soft wintering conditions. He will under those circumstances be unable to train his future variety for high frost resistance. In this case, the conditions that are considered good from the point of view of growth will prove wrong for the purpose of producing the necessary characteristic of high frost resistance.

This example shows that there can be no "good or bad" conditions, as such. It all depends upon the concrete aims: good conditions for plant growth may also be considered those which most contribute to the development and fixation of qualities that determine the receipt of a stable, high-quality yield under conditions of a specific locality. To learn in every case what these conditions are like and how to produce them for the plant - is the creative task of every selector. It may not be solved according to pattern and it requires individual research in every case. Michurin's activities provide classical examples for this creative work, since he developed an entire system for training plants.

One may achieve, by way of VEGETATIVE HYBRIDIZATION, the same shattering effect of the hereditary foundations of plants, as are obtained from sexual hybridization; i.e. by producing hybrids from two different plants that have been grafted together.

Vegetative hybridization represents a vivid proof of the insolvency of the Mendel-Morgan "theory" and the adequacy of the Michurin doctrine regarding heredity.

When two plants are grafted together their cells do not merge, which means that their chromosomes do not unite either, though it is in these that the Morganists claim "hereditary elements" are. An exchange of plastic substances takes place only between the stock and the scion and, according to the Morganists, the latter may therefore not lead to the creation of a hybrid organism.

Facts are obstinate, however. I. V. Michurin obtained such hybrids on a mass scale. He widely utilized the possibility of vegetative hybridization for obtaining, and particularly for the additional production of numerous varieties of his best apples, pears, cherries, etc. The famous Michurin "Mentor" method (training) is a method of using vegetative hybridization for the training of characteristics required by the selector for the variety under production.

Lysenko extended the development of the theory and practice of vegetative hybridization. Upon his initiative and under his supervision much work was accomplished in producing vegetative hybrids of annual plants among different varieties of tomatoes, between tomatoes and potatoes, tomatoes and Solanum, etc.

All these experiments confirmed one thing: one may obtain hybrids by grafting plants of different varieties together, which in principle would notdiffer substantially from hybrids obtained from sexual crosses. It follows that the hybrid-characteristic of the organism is not the result of a combination of a phantastic parental "hereditary substance", but the result of an inter-exchange of substances. This inter-exchange reaches its highest point in sexual hybridization, the two sexual cells when united, stopping their independent existence, assimilating and producing a new third cell which possesses a dual heredity, though it does not represent the sum of the two original united cells. In vegetative hybridization the inter-exchange of substances is less complete - here the stock and the scion do not lose their independence entirely. The degree of this independence may vary, and so may the degree of influence the stock may exert upon the scion and vice versa; this accounts for the difference in the degree of hybridization of seeds obtained from grafted plants. It also explains why not every progeny of a grafted plant exhibits hybrid properties in all cases in equal measure.

The Michurin doctrine provides numerous methods which may be used to either strengthen or weaken the degree of influence grafted plants exert upon each other. Thus, the degree of influence the stock exerts upon the scion will depend upon several causes:

1. Upon the degree of "conservatism" in the heredity of the stock and scion . The stabler the heredity of the stock and the less stable the heredity of the scion, the stronger will be the influence of the stock upon the scion.

2. Upon the age of the grafted plants. The older the stock and the younger the scion, the greater the strength of the influence of the former upon the latter.

3. Upon how long the scion grows upon the stock. The longer it remains upon the stock, the greater is the degree of influence it experiences.

4. From the degree of development of the leaf mass of the scion. If the leaf mass is well developed, the scion lives only at the expense of the root system of the stock, while it is nourished by its own leaves. Should the leaves be removed, however, the scion would have to fall back upon the "keep" provided by the stock and in that case remain under its influence, etc.

In selecting the corresponding components for a graft, by taking them at a certain age, by regulating the development of the leaf masses of the stock, as well as of the scion, one is in a position to control the development of grafted plants and the formation of their heredity.

What are the new possibilities, compared to sexual hybridization, opened by vegetative hybridization for the purposes of selection?

First of all, vegetative hybridization represents an irreplaceable method of "polishing" varieties, i.e. improving them with regard to certain characteristics and qualities. This applies particularly to new young varieties obtained from cross.

Here one must refer to Michurin's wealthy practice in applying his Mentor method, which is nothing but the use of vegetative hybridization for the "filigree polish" of all qualities of the new variety. The famous Michurin varieties of apples - "Kandil-Kitaika", "Bellefleur-Kitaika", the pear - "Winter-Dekanka", the cherry "Northern Beauty" ("Krasa Severa"), and many others were given their final "polish" by Ivan Vladimirovich (Michurin) with the aid of the Mentor method - i.e. vegetative hybridization.

All the peculiarities of these varieties formed under the influence of mentors, are preserved not alone in vegetative but also seed propagating. This proves that the mentor-plants exert considerable influence upon the formation of the heredity of trained varieties.

Vegetative hybridization for purposes of overcoming the uncrossability of plants, belonging to different systematic groups, is also of considerable significance. It is known that plants belonging to different species present difficulty in crosses and occasionally do not cross at all. It is still more difficult to cross plants belonging to different genera. Nevertheless, these crosses may be of great interest to the selector. Vegetative hybridization comes to the aid of the selector in this instance. It seems that plants which ordinarily would not cross, can be crossed with comparative ease if they are first grafted one on the other. Thus, for instance, the pear and Sorbus Domestica L. ("riabina") do not cross. But Michurin crown-grafted a scion of the riabina onto the pear and when the riabina bloomed it easily crossed with its stock, the pear.

This method of overcoming the inability to cross plants Michurin named the method of preliminary vegetative "rapprochement". In applying it, Michurin crossed such plants as cucurbita and cucumbers, melons and pumpkins, etc., which prior to that did not cross.

The method of vegetative "rapprochement" is now widely used by our selectors in overcoming the non-crossability of plants. In using it, professor V. E. Pisarev successfully crossed wheat with the wild crop Elymus and obtained a fruitful progeny.

The department of root crops of the All-Union Institute of Plant Growth applies this method most successfully (under the supervision of professor S. M. Bukasov, laureate of the Stalin premium) in overcoming the non-crossability of the cultivated potato and an entire group of wild species of this plant. Thus were obtained a large number of hybrids, resistant to frost and to the COLORADO BEETLE.

The practical significance of these hybrids in selection work is invaluable. In correspondingly training and selecting the best plants, good cultivated varieties of potatoes will be produced, capable of withstanding frost up to 6°, and also safe from one of the most dreaded scourges of potato culture - the Colorado beetle.

Finally, vegetative hybridization is practically used as an independent method for obtaining new hybrid varieties. Among the first ...ples of such vegetative-hybrid variety is the Michurin variety of pear-apple - the "Renet Bergamot". This variety is the result of grafting the young scion of the apple "Antonovka" (of 600 gram) to the equally young scion of the "Bergamot" pear. Under the influence of the pear-stock the apple scion leaned in its development towards the pear to such extent that when it bore fruit, it appeared to be a cross between apples and pears in form, build and taste. This characteristic proved to be permanent and was retained by the variety in vegetative and also seed propagation. At present vegetative hybridization begins to enter more and more practical selection work - not only with respect to woody perennials but also annual grasses. It is at present widely used, for instance, in work with tomatoes. Through vegetative hybridization dozens of varieties of tomatoes have already been produced, all of economic significance. They were produced by the academician A. A. Avakian, professor I. E. Glushchenko and others.

The selector F. S. Solodovnikov obtained new prospective varieties of tomatoes after grafting the tomatoes to the potato "Smyslovski". The scion produced three fruits of which only one ripened. The seeds of this fruit were sowed in the following year and produced a large variety in their progeny which differed in shape, size, color of the fruit, taste. From this diverse choice, plants were selected which served as the originators for new varieties.

As a result of the graft of the tomato to the potato a new dwarf variety of tomatoes, of rapid ripening, was obtained by the experimentor-michurinist N. V. Brusnetsov (near Moscow). In grafting the tomato "Bizon" to the black Solanum consistently throughout three generations, the agronomists V. A. Ezhov and A. Ogiev (city of Kustanai, Kazakh SSR) obtained the new variety of tomato, the "Bogarny 71". At the Gribovski Vegetable selection station a new variety of melon, the "Gribovskaia rassadnaia - 13" was produced from the melon and pumpkin by vegetative hybridization which proved adequate for productive use under the Moscow oblast conditions.

Similar examples may be cited at length.

In all those cases when it is difficult or almost impossible to secure hybrids by sexual means, vegetative hybridization comes to the aid. It enormously widens the possibilities of creative work by the selector.

Vegetative hybridization represents a vivid example as to how living conditions can change the heredity of the organism. This is easily understood if one considers that the plastic elements of the stock in relation to the scion represents its food, i.e., THE EXTERNAL CONDITIONS. Once they are assimilated by the scion, they become a composite part of its body, thereby changing its heredity, and simultaneously change to correspond to its nature. "Vegetative hybrids", states Lysenko, "represent the intermediate link between the changes in heredity of vegetative organisms by cross and the changes in heredity brought about through the influence of environment.

ONE MAY ALSO SHATTER THE HEREDITY OF A VEGETATIVE ORGANISM BY CHANGING THE CONDITIONS OF ITS ENVIRONMENT. Any such change, if it goes beyond the limits of conditions to which the organism is adapted, will lead to a change of the latter's heredity. This process begins with the breaking up of the old heredity of an organism, the "liquidation" of its "conservatism". The result is an organism of a shattered, not yet fixed heredity. The selective capacity for choosing environmental conditions is weakened in such organisms and they therefore adjust easier to new conditions. In skilfully creating conditions suitable for such an organism, one may direct the formation of its new heredity into the necessary channels.

The degree of "shattering" and of change in heredity may also vary depending upon how radical the change in conditions is. In some cases it may reflect only upon the nature of individual characteristics, in others, it may deeply affect the entire nature of the organism.

We have already referred above to the classical example of a deliberate transformation of the nature of plants by the creation of changed environmental conditions, as proposed by Lysenko's theory and the practice of the hereditary transformation of winter plants into summer plants and of summer into winter crops. Aside from the considerable theoretical significance this phase of Lysenko's work has for the further development of Michurin agrobiological science, it also possesses an enormous practical significance.

It is known that stable yearly yields of winter wheat crops are, in many of the oblasts of the Soviet Union, interfered with by the poor wintering capacity of these plants. This proves that available varieties of winter wheat are of insufficient frost resistance in the areas where they are produced. How is one, nevertheless, to obtain highly frost resistant varieties that would winter well year in year out, even in the most severe frosts? Here Lysenko's theory of controlling the heredity of plants comes to one's aid. He contends that these varieties may be obtained by transforming summer crops into winter crops, provided they were trained for several generations under severe winter conditions. Plants of shattered heredity are able to develop a high capacity for wintering and frost resistance under these conditions. This is the method used for creating new high frost resistant varieties for severe Siberian winters, in areas where until recently no available variety of winter wheat had proved sufficiently frost resistant.

Siberian winter conditions are excellent for developing this characteristic in varieties of winter wheat. Moreover, the same conditions may by used for creating high frost resistant varieties of winter wheat not only for that area but for other regions of our country.

Nevertheless, such a variety, if produced in Siberia, may while frost resistant, prove unsatisfactory in other aspects and characteristics in different areas. To produce a frost resistant variety, equally suitable in its other characteristics for other localities Lysenko recommends to train the varieties for frost resistance only under Siberian conditions and to continue the further development of the plants under conditions of the respective regions. To achieve this, it is necessary to sow in Siberia in the fall several generations of seeds of the variety under consideration and then to transport the plants in the late winter into the area that requires them for production. This method is at present practiced by Soviet selectors.

The transformation of winter plants into summer plants and vice versa is achieved by transforming the character of the vernalization stage, i.e. the first stage in the development of an annual plant which represents the BASIS for its entire future development.

It clearly follows that if we shatter and change the character of the stage of vernalization, we shatter and change the nature of the entire vegetative organism and all its characteristics in some measure or other at the same time. This explains why in transforming winter plants into summer plants and vice versa, diverse changes in many morphological traits are generally observed, such as - the build and the coloring of the stem, its beardiness, pubescence, color of grain, etc. Such changes are not only limited to morphological traits but also to physiological characteristics, such as resistance to disease. The most important feature is however the fact that many of these changes are of practical value to the selector.

We possess at the present time enough facts to substantiate the indisputable accuracy of this claim.

The scientist A. I. Shaliavin, for instance, has discovered "forms" in the progeny of plants of winter wheat which completed the stage of vernalization under conditions of increased spring temperatures; these forms differed also from the original variety in the large size of the stem and grain, i.e. characteristics which are of great value in selection.

The laureate of the Stalin premium, P. P. Lukianenko, (Krasnodar Selection Station) obtained a series of "forms" distinguished by their high resistance to yellow and brown rust and possessing other characteristics valuable from a practical standpoint - by transforming the winter wheat "Voroshilovka" into a summer wheat. At the genetic plant laboratory of the All-Union Institute of Plant Growth varieties were obtained from the Polish variety of winter wheat "Ina" (of poor frost resistance) by applying negative temperatures (to - 8°) towards the end of the vernalization process. These varieties were of considerable interest to selectors in view of their high frost resistance. Here also varieties were obtained that differed from the original and standard variety by their large stem, stable culm, large, high grade grain, and high resistance to brown rust.

These examples demonstrate the enormous possibilities that are open to the selector as a result of a progressive Michurin agrobiological science.

MICHURIN DOCTRINE AND SEED GROWTH

The Morganists drew a sharp distinction between the process of creating a variety (selection) and the process of its further propagation and preservation (seed growth). Seed growth was assigned only the technical role of propagating and of preserving the purity of the seed. According to the Morganists, it did not matter where and how the seed of any variety was grown, or what the yield of seed grown sowings was like. This because, in their understanding, racial qualities are determined by "hereditary germs", the genes, while the latter are independent from the living conditions of the organism.

Michurin science radically changed this concept concerning the substance and tasks of seed growth.

It requires of the selector to devote the greatest attention to conditions under which the plants grow, propagate and are preserved. Agricultural practice offers numerous examples which refer to the enormous significance conditions play in the production of plants and the formation of their racial qualities.

One of the most vivid examples in this connection was the degeneration of the potato in the south. When potato tubers grown in the north were brought south and planted there in the spring, they produced a good harvest in the first year. However, in three to four years, after repeated spring plantings, the plants degenerated and did not produce any yield at all. Selectors tried for many decades, by selection and crossings, to produce a variety that would not degenerate, but failed invariably in their efforts.

The situation changed radically when Lysenko discovered the causes for the degeneration of the potato. They consisted in the lack of nitrogen nutrition felt by the potato plant in its first stage of growth (during the spring planting in the south) while at the stage of tuber formation it reacted to the harmful action of temperatures that were too high for this particular stage. This meant that the environmental conditions in this given case were inevitably leading to degeneration.

Having established the cause, Lysenko showed the way to eliminate it. He advocated to postpone the sowing of the potato from spring to summer. As soon as this was done, degeneration stopped. (Omitted are 18 lines, p. 26)

The term "elite seeds" or simply "elite" is used in seed growing. It refers to selected seeds of highest racial quality in any variety. Under our system of seed growing elite seeds are grown at government selection stations and then transferred to regional seed farms for propagation on seed lots. Morganist science considers that in elite sowings one should care only about the external, morphological identity of plants and their strict uniformity with the sample considered typical for the given variety in external appearance. The yield of an elite sowing was considered of small importance by the Morganists since it did not reflect upon the racial qualities of the seeds. They thereby worked to the disadvantage of the economically valuable qualities of seeds and confused seed growing work.

The position taken by the Michurin doctrine, however, placed its main requirement upon the ability of elite seeds to produce a higher yield of better quality than would other seeds of the same variety.

This is achieved, primarily, by growing elite seeds under the most favorable agro-technical conditions. Any collective farm may create on its fields the most favorable conditions for plants. And this will eventually become an ordinary occurrence, considering the vigorous growth of cultivation in our socialist economy. In such case varietal seeds obtained from a collective farm will not be any better than elite seeds produced at the selection station. How then is one to obtain elite seeds of improved quality and still better yield?

Michurin science also provides the answer to this by proposing safe methods that heighten the viability of plants and enrich the hereditary foundation of the specific variety.

An entire group of economic plants, among them such plants as wheat, barley, oats, peas, tomatoes, beans, etc., belong to the group of self-pollinating plants. Every flower of these plants is usually fertilized by its own pollen.

Pollination, if repeated steadily from year to year, reacts harmfully upon the viability of a variety, limits its hereditary possibilities and reduces its adaptability to the diverse conditions of an environment. Varieties of self-pollinating plants therefore gradually deteriorate and degenerate even when good agricultural methods are applied. To prevent this, Lysenko proposed the introduction of intra-varietal crossings into the practice of seed growing, i.e. the crossing of plants of the same variety among themselves.

To achieve this a group of plants on a lot occupied by the same variety is emasculated, i.e. the anthers are removed from the flowers. The latter remain exposed after this operation and the pollen of other plants freely penetrate to them, fertilizing them. Seeds obtained from such crossings appear to be rejuvenated and the plant provided with more viable, powerful and stable characteristics. This effect from intra-varietal crossings is retained throughout many generations; the latter subsequently revert to natural self-pollination.

Let us cite one example: The selector N. D. Muchin(Belorussian) (White Russian Government Selection Station) produced in 1937 intra-varietal crossings from the barley variety "Wiener". The seeds obtained from this cross were propagated and then (beginning with the third generation) tested for five years in a comparison with the ordinary seeds of this variety. Throughout the five years the progeny of the seeds obtained from intra-varietal crossings was of higher yield than the progeny of ordinary seeds. The surplus in yield varied in different years between 1.2 and 6.7 c/h, consisting on an average of 3 centners per hectare in the five years.

Similar examples may be quoted at length. The method of intra-varietal crossings is now widely used at selection stations to improve the racial qualities of elite seeds.

Another, even more effective method designed to increase the viability of the variety and enrich its heredity is to use inter-varietal crossing in free selective fertilization.

When two varieties are crossed a hybrid progeny is usually obtained which, in the second generation particularly, produces a great diversity in form. It seems, however, that such diversity is obtained only in cases when we - in forceful crossing - artificially transfer the pollen of one variety to the flower of another variety. The result is different when, upon emasculating the plants of one variety, we provide it with the opportunity to pollinate freely the pollen of other varieties, planted close to it for the purpose. It appears that in this case the hybrid plants preserve, as a rule, all the typical traits of the maternal variety producing for the most part a uniform progeny in subsequent generations. These hybrids also retain the maternal trait of powerful development, great stability, tiller early as a rule, and produce a large yield.

This is explained by the fact that sexual cells, as does the organism as a whole, possess the capacity for selection. The organism chooses from the external environment those conditions that are adapted to its nature. If the demands of the organism are satisfied by prevailing conditions, the heredity of the organism remains unchanged. If the organism, however, is obliged to develop, in one form or another, under conditions unsuitable to its nature, its heredity is shattered and changed.

This equally occurs with the nature of sexual cells at fertilization. When we place the pollen of any variety upon the emasculated flower of another plant variety this flower is forcefully fertilized by the pollen although the latter may not altogether suit its nature. As a result, a hybrid organism with a strongly shattered heredity is obtained.

It is natural that the progeny of such an organism will be varied, depending upon the diversity of conditions into which every individual plant will get. If we, however, emasculate a plant of a certain variety which grows close to a group of other varieties, and if we do not bring over the pollen ourselves, then the emasculated flowers will receive a large amount of the pollen from plants of adjoining other varieties. In that case every emasculated plant, every one of its egg cells has the opportunity of choosing the pollen which best suits its nature for fertilization.

The result is also the production of a hybrid organism of less shattered heredity, which preserves more fully the basic traits and characteristics of the maternal variety. The heredity of these hybrids has at the same time been enriched, their adaptability increased, their viability raised. They have generally increased in power, stability and yield.

The method of inter-varietal free crossings is also being adopted for the production of elite seeds of high yield - the self-pollinating, as well as of cross-pollinating plants (rye, corn, buckwheat, sunflower, etc.). In cross-pollinating plants the inter-varietal free crossings take place even more easily: they do not have to be emasculated since they grow in the open and at the slightest opportunity get pollinized by another pollen.

It is worth noting here that the Morganists took particular care to prevent different, though closely related varieties of the same cross-pollinating culture from pollinizing between themselves. Seed growers were required to isolate these varieties from each other. If it was noticed that isolation had not been observed, the varietal sowings were invariably rejected in spite of their producing excellent yields and preserving external uniformity. No attempt was made to even verify the results produced by the sowing of seeds obtained from non-isolated fields. It is true that in many cases the isolation of varieties from each other is essential. Thus, for instance, in growing seeds of the sugar beet one may not sow seed stock plants next to varieties of low sugar content because the variety of high sugar content may thereby lose this valuable trait. The isolation of varieties is imperative in this instance. To isolate, however, good varieties of the same type is not necessary and directly harmful. The selection station carries the task of determining which varieties are preferrable for intra-varietal crossings in a given area.

Similar results for increasing the viability of higher yield in elite seeds may be obtained if elite plants are grown under somewhat unusual conditions. Lysenko recommends for this purpose to grow the elite of summer varieties for one generation in late fall. By growing one generation under practically winter conditions, plants while not changing into winter crops will be raised in their viability in a measure equalling that of free inter-varietal crossing. The progeny of these plants will also possess good adaptability to various changing conditions in the external environment and will be hardier and of better yield.

It is recommended to grow the elite of winter varieties for one generation - from a spring sowing with artificially vernalized seeds.

The method proposed by A. S. Musiiko of supplementary pollination of cross-pollinating plants - rye, corn, sunflower, buckwheat, etc., - also contributes to higher yields and to an improvement of the variety.

The supplementary pollination increases the yield of these crops by 15 to 30 percent and is widely practiced in our seed growing institutions and at progressive collective farms. The above indicates that seed growing, according to the Michurin method, is not merely an ordinary propagation of a variety. Its task is not only to preserve but to constantly improve the racial qualities of a variety. Seed growing may consequently not be set apart from selection - it represents its natural continuation and is closely, organically connected with it.

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We have briefly reviewed here some of the methods used in selective-seed-growing Michurin practice. They adequately testify to the active force of this scientific theory.

Michurin principles concerning the selection of parental pairs in crossing; his methods of overcoming the uncrossability of distant forms; the utilization of the selective capacity in fertilization for the enrichment of the hereditary foundation and the viability of plants; vegetative hybridization, and particularly, the control of the transformation of the nature of organisms through a change in environmental conditions, including the specific training of organisms with shattered heredity - all these methods, together with selection, form an exceptionally wealthy arsenal intended to prepare the selector for active combat in creating new varieties.

The strength of Michurin's teaching is great indeed with respect to transformation. In regarding the living organism as an insoluble entity of a living body and the conditions of its existence, Michurin science proceeds thereby from the dialectic-materialistic concept of inner and external unity. It logically follows from this that the change in environmental conditions for plant or animal leads to the controlled transformation of their nature, racial qualities, the appearance of new traits and characteristics, to be passed on by heredity and fixed in future generations. This theory provides the selectors with the keys to an unlimited improvement of living organisms and opens exceptionally wide possibilities and potentialities.

PRACTICAL RESULTS DERIVED FROM THE APPLICATION OF THE MICHURIN THEORY IN THE FIELD OF SELECTION OF AGRICULTURAL PLANTS

Let us attempt, even if briefly, to observe the practical results obtained from our selection and seed growing based on the Michurin doctrine, in order to determine what they have contributed to plant growing and what they promise to provide in the near future. Here it is necessary to mention the enormous inheritance in varieties left by I. V. Michurin himself.

Zarubailo, T. Ia. Michurin's Teaching in Selection....

Over 300 varieties of fruits and berry plants, produced by Michurin, represent a gold mine for our fruit and berry culture. The new varieties permitted the transfer of orchards far to the north. The Michurin apple tree -"Golden Kitaika", is now grown north of Petrozavodsk, Molotov, Swerdlovsk. Prior to the appearance of Michurin varieties, winter varieties of apple trees of high grades did not penetrate beyond Kiev, while varieties of winter pears grew even closer to the south. The first grade Michurin winter varieties, such as - the winter pear "Bere", the apple - "Pepin Safran", the "Bellefleur Kitaika", and others now grew as far north as Moscow and Leningrad. The native of the south - the apricot - has been transformed by Michurin and already has become adapted to the central belt of the USSR. Varieties of grapes produced by Michurin offered an opportunity to transfer this valuable fruit into regions which had never dreamed of possessing it.

Following the death of the great transformer of nature, his pupils and followers, guided by his teachings, have successfully continued his great work of rejuvenating and transforming plants of our country.

Michurin fruit growers have in the past years produced - at fruit and berry selection stations - about 700 new varieties of fruit and berry plants - apples, pears, apricots, peaches, cherries, currants, raspberries, etc. These new varieties are distinguished by their high yields, resistance to cold, excellent taste. A large part is already used in practical cultivation in many orchards; others are undergoing government varietal testing, following which the best grades will also enter into the varietal fund of our orchard growing.

Zarubailo, T. Ia. Michurin's Teaching in Selection....

The successes achieved in transplanting fruit growing into severe northern and north-eastern climates of the USSR are significant. Siberia... a short summer, a long, severe winter, frost of 50° below zero, snow storms...May one talk about fruit growing under those conditions? Until recently the boundless Siberian spaces appeared as white spots on the map of our fruit growing regions. This has radically changed since the October Revolution. The orchard growers of the Ural and Siberian regions received deserved acclaim and attention, and their products have now become national property. There are hundreds of Michurinists in the Ural and Siberia at present. Sverdlovsk, Cheliabinsk, Novosibirsk, Narym, the Altai - have now their own experiment fruit growing stations. Here the selector-fruit growers - P. A. Zhavoronkov, F. A. Dibrov, M. A. Lisavenko, Olonichenko, V. M. Krutkovski, N. N. Tichonov, I. M. Leonov, and others have produced dozens of new varieties of apples, pears, plums, berry plants. Their varieties are distinguished by high yield, good quality of the fruit and resistance to frost.

Other hundreds of individual Michurin followers, frequently non-specialists, are engaged in advancing the science of pomology. The bookkeeper Abramov in the city of Mias produced in his suburban orchard several varieties of apple trees, one variety of black cherry, one of gooseberry. Another produced five varieties of apple trees, new varieties of pears and plums. A third, Dr. A. P. Biruikov, a physician by profession, produced 40 varieties of apples, plums, cherries, grapes. At present there are in his city 1000 suburban orchards wherein grow the A. P. Biruikov varieties.

At Magnitogorsk there are about 2,500 suburban orchards. In the Minusinsk region of the Krasnodar territory every collective farm has its orchard. The entire area devoted to orchards amounts to over 1,100 hectares, of which 840 hectares belong to collective farms.

In the Altai territory, the president of one of its collective farms, F. M. Grinko, hero of Socialist Labor - extended his collective farm orchard to 45 hectares; in the course of 11 years, his collective farm obtained an income of over three million rubles from its orchard and nursery.

The Altai now possesses collective farms orchards at one thousand collective farms. These examples may be multiplied with regard to other northern and eastern oblasts of the Soviet Union.

The boundary for producing the mazzard cherry (Prunus avium L.), ("chereshnia") extended until recently to the Ukrainian SSR and the southern part of Belo-Russian SSR. Michurin moved it to the Tambov oblast. Several excellent varieties of the mazzard cherry ("chereshnia") - the "Svetlana", "Early Black", the "Leningrad Rose", "Zorka", "Black Leningrad", "Yellow Leningrad", etc. have already been produced at the experimental station of the All-Union Institute of Plant Growth "Krasny Pachar'" in the town of Pavlovsk, near Leningrad.

These varieties were produced by F. K. Teterev, laureate of the Stalin premium, by training young seedlings and subsequently grafting them onto a cherry. The varieties withstand even the severest Leningrad winters (such as the winter of 1939-40), produce a plentiful yield, are of excellent taste and attractive appearance. The earliest among them ("Svetlana" and "Early Black") ripen in the beginning of July, the latest ("Leningrad Yellow") in the middle of August. Thus Leningrad is assured of fresh "chereshnia" during two months - July and August. They are now being propagated and will go into production.

In conformance with the Stalin decree of October 20, 1948, concerning the establishment of tree shelterbelts, 10 - 15 percent of the entire territory intended for the purpose will be occupied by fruit trees and shrubs. This will represent a total area of 650 hectares, equal to almost one half of the total area of all existing orchards in the USSR.

These forest-orchards can and will produce additional hundreds of tons of fruits and berries. It is necessary for this purpose, however, to select appropriate varieties of fruit plants, which would adapt to unfavorable steppe conditions and still produce high grade large yields. Our fruit growing industry, thanks to Michurin and his followers, now possesses an adequate assortment of varieties ample for this purpose. This will be further increased by new and better varieties. (Omitted p. 33).

Some 15 years ago the collective farmers of the southern oblasts of the Ukraine did not know how cotton looked. At present the cotton plant is one of their leading crops. This was accomplished because of the works of Lysenko and his pupil and assistant M. A. Olshanski, since named academician and laureate of the Stalin premium.

Lysenko worked out and proposed the method of disbudding the cotton plant to speed its ripening and increase the yield of the fiber. Olshanski produced varieties of cotton adapted to the environment of the southern Ukraine. This laid the basis for the cotton industry in new regions.

Equally great are the achievements in cotton performed in the field of selection by the selector-michurinists, laureates of the Stalin premium - academician I. S. Varuntsian, S. S. Kanash, L. V. Rumshevich, and others.

Prior to the October Revolution Russia imported its tea from abroad. During the Soviet period the native tea industry was developed. Imported varieties of teas were used as a basis, for lack of native ones. These varieties proved, however, poorly adapted to our local conditions. New varieties were required to develop this crop successfully. Dr. K. Bachtadze (agronomist) laureate of the Stalin premium, solved this problem. The varieties he produced in Georgia are hardy, of good yield and higher quality than the foreign ones.

F. M. Zorin of the Sochin Experiment Station of sub-tropical crops (Caucasus) produced tea shrubs able to withstand 20° of frost without snow cover. At present, upon Lysenko's initiative, michurinists have begun work on transforming the "nature" of tea, in order that this sub-tropical plant may grow as far north as Moscow and Leningrad.

A daring task. But Soviet progressive agro-biology is equal to it. The geographical environment of other sub-tropical crops, such as lemons, oranges and tangerines is also changed. Thus F. M. Zorin produced varieties of citrus plants, the tangerine and orange - of high resistance to frost.

In the spring of 1949 work on a large scale was begun on planting sub-tropical plants in the northern region of the Crimea, the northern Caucasus, the southern Ukraine, Moldavia, as well as in the East - the Central-Asiatic republics.

The entire work of selection and seed growing has also been rebuilt with regard to cereal, technical crops and fodder. Dozens of new varieties of higher yields have been produced in the past years by selector-michurinists.

At present work on a vast scale has been begun upon Lysenko's initiative on producing varieties of branched wheat. These varieties will provide yields one and a half times higher than the available ordinary, non-branched wheat varieties. Some twenty years ago no one would seriously have considered that tomatoes, this presumably southern vegetable crop, may grow beautifully at Leningrad. At present tomatoes represent one of the basic vegetable crops at the collective and state farms of the Leningrad oblast. Soviet selectors have produced a number of varieties which permit the tomato to grow in open ground and to yield good harvests in the northern zone of the USSR.

The laboratories of the All-Union Institute of Plant Growth at Pushkino (Leningrad oblast) have produced two varieties of tomatoes for the Leningrad and other northern oblasts of the Union - the "Pushkin" and the "Urozhainy" varieties. Both - rapidly ripening, of good taste, high yield. Eggplants and peppers are also grown in open ground at dozens of collective farms in the Leningrad oblast. The Luga collective farmers earned the distinction of having first introduced watermelons and melons to the Leningrad oblast. This supports Michurin's view that eventually the future of our plant growing will be in the hands of our collective and state farms.

Professor N. A. Drozdov of the Leningrad Agricultural Institute produced the early ripening variety of corn - "Leningradska", which in five years of testing yielded 70-90 centners of cobs and close to 250 centners of the green crop per hectare. And corn at that is a southern product and had not been grown in a cultivated state until now, not alone in the Leningrad oblast but even in the south.

A. Y. Kameraz, collaborator at the All-Union Institute of Plant Growing, laureate of the Stalin premium, produced new varieties of potatoes of high yield, resistant to cancer and phytophthora.

The above does not exhaust the achievements of Michurin science in the field of plant selection. They are indeed stupendous. But the tasks confronting Michurinists at present are still greater. (Omitted several paragraphs, pp. 56, 57, and 58).

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End of pamphlet.

For plan of year 1935.
Plant Protection (Zashch. Rast.2:5-14. 1935. 421 P942.

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Translated by S. E. Monson

The plan for scientific research work at VIZRa for 1935 has been confirmed by the ("Narkom"), People's Commissar of Agriculture of the Soviet Union, comrade M. A. Chernov. The very fact that the Narkom reviewed the working plan of VIZRa proves the extreme attention given the subject of plant protection by the Party and Government, and the significance of the plan as a basis for the initial stage of the entire research project. The latter fact should be stressed particularly, since disdainful tendencies predominate among some members of the Institute with regard to the plan and a lack of recognition of its tremendous significance. This attitude appears to stem from a lack of understanding of the fact that under conditions of socialist economy the problems covered by the plan form the fundamental and most important element of the work of any organization, including that of scientific research institutions, and that the fulfillment of the plan presents one of the fundamental tasks in our research.

This neglectful attitude may also be explained by the remaining petty-bourgeois and anarchistic tendencies of certain individuals who consider that science may not be planned, that the process of scientific research may not be subjected to any organizational influence, that in problems of constructive search there is no room for limits, norms and regimentation.

It is true that if considered formally, VIZRa has always engaged in a considerable amount of planning. Up to recently the Institute had its own planning office and prior to that operated a planning sector composed of 20 staff members. Forms for listing subject matter, forms for diaries, etc. were worked out at the Institute. But the approach to this work was purely formal, plans were not brought

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to the attention of the personnel, nor were individual staff members encouraged to participate in the fulfillment of the plan.

The plan itself represented a summary of potential desires and criticisms by individual scientific staff members. The Institute assembled these demands into a more or less organized plan and has attempted by persuasion and convincing methods to introduce the material into an organized channel. The Institute formerly did not express its own aims or desires, indicate its own direction, or show initiative; and the result was therefore that its plan did not reflect actual needs of agricultural production.

Not having organized its own planning, the Institute assumed the task of planning scientific research throughout the Union. The fulfillment of this difficult task proved hopeless since the Institute did not have the right, nor any real means for planning the work of scientific research institutions totally independent and detached from it. As a result, altogether unrealistic plans were adopted for research on plant protection, leading to unnecessary wasteful expenditure of time and large funds.

The Institute, moreover, in trying to avoid duplication with the work of other institutions and in attempting to coordinate its own work with theirs, gradually changed from an All-Union Main Institute of Plant Protection into an ordinary institute of plant protection, possessing limited functions and dealing with subject matter of no significance On an All-Union scope. Instead of leading the rest of research institutions in the development of the most important problems in plant protection, VIZRa turned to the study of problems not taken up by other scientific research institutes. Hence the detachment and isolation of VIZRa, not alone from production, but other research organizations on plant protection.

The plan of 1935 is the result of a vast amount of work performed by the entire staff of VIZRa, and it represents an argument directed to supporters of the "formal approach to planning," to their assertion that new subjects proposed in the plan for 1935 do not actually introduce "anything new, that they are merely caps, and that under these caps remains the old content of the work of the Institute." These individuals named the structure of the plan a "chess board" which supposedly does not clarify the situation, claiming that everything depended upon how all work produced by the Institute was distributed on the chess board, etc.

The VIZRa Plan for 1935 is characterized by three new features:

1. The Institute rejects all participation in the planning of plant protection on an All-Union scale, and transfers its activity from the drafting of an All-Union plan of scientific work on plant protection to the reconstruction of its own work, in such manner that would allow VIZRa to take upon itself the development of principal divisions of decisive significance in the field of plant protection, and the provision of foundations for the work of scientific research institutions on plant protection. VIZRa, its zonal stations, the network of the Record Service, and other research institutions, such as those dealing with the protection of cotton industry from agricultural pests and diseases (the Division of ZARA of the Cotton Institute), grain protection (the group of Grain Institutes, etc.), will all jointly participate in the development of these problems. As to scientific research institutions of plant protection which do not enter in the system of VIZRa, the Institute will limit itself to servicing these by conclusions on

planned research, thus exerting its regulating influence upon the set-up of plans relating to scientific research on plant protection throughout the country.

2. The entire subject matter of the Institute will be "built" not according to sectors and divisions of work, but on the basis of a complex, and the entire group of sectors and laboratories will participate in the development of these complexes and not of separate sectors and laboratories. A collective effort will thus make its appearance in scientific research in place of individualism and disunity, and the labors of sectors and laboratories and mutual control over scientific work will be coordinated.

3. The Institute will for the first time devote the most serious attention to the work of individual staff members, the problems and methods of work, the organization of scientific research, and the technique of formulating all scientific data in the process of its collection, as well as in the process of its synthesis.

In its final form, following its review by the NARKOM, the plan of the Institute for 1935 will shape up as follows:

1. MAJOR THEORETICAL PROBLEMS

Into this group belong:

1. the ecological-economic regionalization of the Soviet Union with respect to pests and diseases of agricultural plants (Professor V. N. Shchegolev); The extent to which this problem is ripe is perfectly evident. Without regionalization it is not possible to plan operative work on plant protection, conducted on tens of millions of hectares; nor is it possible to give decisive prognoses without regionalization; or take into consideration many factors while arranging for the

distribution and transfer of agricultural crops throughout the Union.

2. The study of physical and biological factors of mass propagation and distribution of pests and diseases to establish the regularity of mass propagation and to make prognosis (active member of the Institute, Ia. I. Prince). The solution of this problem offers the means for a theoretical prognosis and necessary theoretical foundation for a series of agricultural and biological measures in the control of pests.

3. The study of the composition and dynamics of biocoenosis (plant association) of uncultivated and reclaimed soils (scientific specialist G. Ia. Bei-Bienko).

The demand for the development of this problem stems from an enormous amount of work done on the movement of agricultural crops into steppe zones of the Non-Black Earth belt, and the resulting essential need for prognosis concerning the changes in relationship between the principal elements of biocoenosis and the determination of causes of the formation of mass flare-ups of pests and diseases and the purpose of developing methods for controlling them.

4. To reveal the racial composition of rust, smut and fusarium of grain crops, the nature of plant resistance to them and to develop methods for raising the level and evaluation of the work. (scientific specialist T. I. Fedotov).

This particularly important work will be conducted in order to utilize immunity in controlling fungus diseases which possess a high degree of dynamics in propagating.

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II. SYSTEM OF MEASURES DESIGNED TO PROTECT AGRICULTURAL CROPS IN ROTATION.

The second group of problems within the plan for 1935 refers to the development of a system of measures intended to control crops in rotation.

Instead of developing measures applicable to individual pests and diseases, a procedure usually followed by the Institute, other systems will be developed in 1935.

1. the ecological-economic basis for protecting agricultural crops in the Grain Industry from pests and diseases and the development of a concrete system of measures applicable to one of the grain regions of the Central-Black Earth Belt (active member of the Institute, A. V. Znamenskii).

2. ecological-economic foundation and development of a system of measures designed to protect cotton in the old cotton regions of Uzbekistan against pests and diseases. (scientific specialist V. V. Nikolskii).

3. ecological-economic foundation of a system of measures designed to protect hemp under conditions of the forest steppe zone /against pests and diseases. (Professor V. N. Shchegolov).

The enormous difficulties the Institute faces by changing to a system of measures relating to respective crops in rotation are evident. Nor was it possible to concentrate on developing an enormous number of mutually unrelated systems that concerned individual pests and diseases.

4. To this group of problems may be referred the development of measures designed to protect tree shelter belts of the south-east of European USSR, against pests and diseases. (Professor V. N. Stark).

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The necessity of studying this problem is prompted by work of drought control and the planting of shelter belts, which in large measure are subjected to the destructive influence of pests and diseases. VIZRa intends to prepare lists of agricultural plants, least affected by pests and diseases, for planting in shelter belt areas, on the one hand, and to develop a system of measures to protect these belts from pests and diseases on the other.

III. DEVELOPMENT OF NEW METHODS FOR THE CONTROL OF PESTS

In the current year VIZRa will considerably widen its work on the study of parasites and carnivora of harmful insects, and apply an entire series of its scientific data to agricultural practice. A vast amount of work is being proposed for the search for parasites of insects on the boundaries of the Soviet Union (DVK), ("Dalne-Vostochny Krai") Far East Territory. A new angle introduced by VIZRa into its plan will be the study of parasitic fungi and bacteria harmful to insects and their utilization in controlling pests (Professor V. P. Pospelov). And finally, new to the Institute's work will be the study of electro-physical methods of controlling pests and diseases of grain and storage products. (Professor N. Ia. Kuznetsov).

In connection with the two latter projects the Institute is organizing two new laboratories: an electro-biological laboratory and a laboratory for fungus and bacterial diseases of insects.

IV. NEW OBJECTS OF RESEARCH

In the current year the Institute will include in its plan studies on the determination of causes of diseases, the epidemiology and geography of bacterium of agricultural crops, the nature of filtered viruses and the development of measures for the control of virus diseases of agricultural plants. (Active member of the Institute, M. S. Dunin).

The Institute has never yet made a serious study of the latter two problems. Individual staff members on the periphery, at laboratories, not even belonging to the Institute, had occasionally engaged in this study. In view of the wide scope of the work, the Institute is setting up two laboratories in the current year for the study of virus and bacterial diseases of agricultural plants.

V. PROBLEMS OF CHEMIZATION

The working plan of 1935, as related to problems of chemization, extends beyond that of 1934, when the transfer took place from an endless "specification" of dosages, according to geographical usage, to the development of fundamental principal problems of chemization in plant protection work. The principal subjects of this plan are:

1. the study of the activity of insecto-fungicides upon insects, fungi and plants, and the basis of their resistance to poisons (Prof. B. N. Dashkevich).

2. The stimulation of the efficacy and improvement of the technique of applying fungicides in order to reduce their expenditure (scientific specialist, B. G. Nemiritskii).

3. Search for new fungicides in order to reduce the expenditure of scarce poisons (hydrogen sulfide)-N. N. Arkhangelskii; cianides A. M. Il'inskii; synthetic oils B. G. Nemiritskii and A. A. Ulianishchev; sulfur preparations G. D. Ugriumov.

4. In conformance with the direction of the Narkom, research on vegetative poisons and studies of residues in local industry are included in the plan of VIZRa for utilization in the control of pests; and specification of standards of poisons to be developed.

VI. PROBLEMS OF MECHNIZATION

Two subjects are planned in this field.

1. The improvement of principal (main) working parts of machinery under construction required in controlling pests and diseases.

2. Technical-economic evaluation of machinery destined for the control of pests and agricultural diseases, as applied to different types of branch industries.

The task of the first subject is the theoretical and experimental testing of working parts (mixers, tips, nozzles, mechanisms of supply, (lifting) pumps, ventilators, etc.) that are transferred into production, as well as that of newly constructed machinery. The necessity for testing these is caused by the fact that almost all machinery used in the control of pests had been adopted non-critically in the past, represented old, pre-war models or foreign machines. This subject also includes the development of a new method of applying liquids by the use of mist sprayers.

The task of the second subject is the relative evaluation of machinery and the recommendation of the main models for the different branches of industry. It is proposed to develop in 1935 types and complex of machines for grain and cotton industries. In addition, labor norms and directions for the care of machinery will be developed.

VII. PROBLEMS OF ECONOMICS AND STATISTICAL RECORDS

The plan of 1935 devotes considerable attention to problems of theoretical foundations and the appraisal of applied systems in recording the distribution of pests and diseases, the study of losses from both, and the economic efficacy of applied measures in controlling pests.

These problems will be dealt with under four subjects:

1. Critical evaluation and improvement of methods of statistical recording of losses from pests and diseases in agriculture (Prof. A. A. Luibishchev).

2. Critical evaluation and improvement of methods of statistical recording of the efficacy of measures in controlling agricultural pests and diseases. (Candidate F. S. Pervukhin).

3. Critical evaluation and improvement of methods of research and statistical recording of the distribution and numbers of harmful insects and diseases (Prof. A. A. Luibishchev).

4. Distribution, course of development and economic significance of pests and diseases of agricultural crops and forests in 1935.

VIII. GENERALIZATION OF EXPERIMENTS OF SCIENTIFIC-RESEARCH INSTITUTIONS OF PLANT PROTECTION

Generalization of experiments at scientific institutions of plant protection in the USSR and abroad occupies a prominent place in the plan of VIZRa for 1935. The Institute did not devote any attention to this problem in the past and the publishing activity of the Institute shrunk considerably in recent years. Matters stood worse yet at the periphery, which actually discontinued the publication of its achievements.

In order to overcome this altogether intolerable situation, the Institute proposed to begin in 1935 the publication of a wide monograph devoted to summaries of Soviet and world science on the subject of plant protection. The most prominent researchers of the Soviet Union are being drawn into the project. The monograph will reflect the entire experience of VIZRa, its stations of plant protection, branch institutes, VUZ, and other research institutions of the Union, including foreign data.

The publication is planned for three years and will consist of 8 to 10 volumes. In the current year summaries and monographs will also be presented on the subjects of: meadow and corn borers, Euxoa (Agrotis) segetum Schiff, smut, rust, fusarium, locust, beetle Anobiidae, gummosis of cotton, rodents of the mice type, etc.

The same aims are pursued in the compilation of summaries on the distribution, course of development and economic significance of pests and diseases of agricultural crops and forests for 1930 - 1934, as well as the generalization of the data of the work of advanced collective and state farms and MTS in the field of plant protection, from the standpoint of their application of scientific methods and the efficacy of applied measures. The Institute establishes for this purpose systematic contact with a group of cottage-laboratories, collective and state farms and MTS(Machine Tractor Stations). This work will result in a series of proposals to the Narkomsem and operative organizations concerning the improvement of the organization of pest control at collective and state farms and MTS, and the transmittance of the experience of advanced farms to operative organizations.

IX. TRANSMITTANCE OF SCIENTIFIC ACHIEVEMENTS TO PRODUCTION

Considerable place in the plan of VIZRa is given the transmittance of scientific achievements to agricultural production.

1. For collective farms and MTS of the Northern Caucasus and Azov-Black Sea Territories, and the Ukraine four laboratories are being set up under the guidance of the bio-laboratory of VIZRa, to deal with the propagation of the parasite trichogramma and its control of the corn borer.

2. For the Azov-Black Sea and the North-Caucasian Territories, as well as the Moscow railroad network, under the guidance of Azov-Black Sea STAZRA, control of storage ticks (Acarina) is organized on a wide scale at warehouses of the Zagotzerno (Stored Grain Supplies) with the aid of hydrogen sulfide.

3. At MTS and the collective farms of the Azov-Black Sea Territory work is begun on the utilization of hydrogen sulfide and aluminum sulfate in controlling Citellus (ground squirrels) and for the treatment of seeds. (Az.-Black Sea STAZRA).

4. The application of oils in the control of scale insects in Azov-Black Sea Territories and Azerbaijan (Slavic scientific-research base of VIZRa and Azerbaijan STAZRA), will be widely practiced.

5. Prognoses on pests and diseases for 1935 have been prepared and published, and short-term prognoses by the Main Administration of Narkomzem issued concerning

the most important pests and diseases, such as the meadow borer, locust, rodents, mildew, etc.

6. A series of instructive directions to production for the benefit of state, collective farms and MTS are issued, concerning pest and disease control. The publication of the magazine ("Na Zashchitu Urozhaia") "In Aid of the Yield" has resulted in wide consultations and contacts with farms; instructions and regulations on the care of machinery used in pest control are being issued.

X. METHODIC GUIDANCE OF THE PERIPHERY

In 1935 VIZRa will devote a great deal of attention to steady guidance on the part of the Institute, to the work of the periphery and the network of branch institutes.

In addition to providing consultations and conclusions on plans of scientific research institutions, VIZRa will

1. together with ZAKNARKOMZEM (Order Division of NARKOMSEM) call a conference at Tiflis with the participation of a large group of research institutions, industry and soil organizations on the consolidation of experiments and the development of the program in research for 1935, as related to oil wastes and oil emulsions.

2. Call a conference at Kharkov on consolidation of experiments and development of research program for 1935 on the subject of virus diseases.

3. Call a conference at Rostov-on-the-Don on the consolidation of experiments and development of research on hydrogen sulfide for 1935.

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4. Call a worker's conference at Voronezh devoted to the instruction of organizations participating in the development of measures of protecting the grain industry from pests and diseases.

5. Call a workers' conference on a wide scale at Tashkent to deal with the working plan and instructions of organizations participating in the development of measures to protect cotton crops from pests and diseases.

All stations of VIZRa, branch institutes, the network of observations points of VIZRa, soil organizations and industrial representatives will participate at all conferences. The latter will aid VIZRa in establishing closer supervision over local units, increase the role and specific weight of periphery organizations and finally, will offer an opportunity to acquaint VIZRa on location with the performance of its own and related institutions. In addition, the plan for 1935 contemplates to:

1. Call a workers' conference for the revision of all instructions concerning the Service Record Division and the introduction of necessary corrections into these instructions.

2. To compose and publish handbooks on methods of laboratory-experimental ecological research.

3. Compose a series of handbooks on the technique of recording losses from pests and diseases, the efficacy of measures, etc.

CONCLUSION

The VIZRa plan for 1935 was composed with the view of achieving maximal utilization of all resources of the Institute: personnel, laboratories, equipment, etc. Only the proper distribution of forces, a specific organization of labor, and systematic active guidance of the scientific work will ensure a timely fulfillment of the plan.

It is necessary to point out that until now the management of VIZEa did not devote proper attention to problems of active leadership and control over the fulfillment of the plan. Scientific supervisors did not visit sectors and laboratories. Supervisors of sectors and laboratories did not provide their scientific staff with directions, carefully developed working plans, charts, forms for first drafts, etc.

All this led to the fact that a considerable part of the scientific staff of lesser experience spent much unproductive time in searching for unnecessary ways and methods. Control was limited to a formal review of the "percentage" of performed work, while there was no qualitative proof for determining this percentage in the Institute's files. Control was merely exercised by eyesight and the "percentage" of fulfillment usually determined by the person under examination.

No attention was paid to presenting research data in its proper form. As a result the Institute had accumulated large supplies of executed work in the past years which cannot be passed on to production in the form of instructions, statements or recommendations; nor can they be published, since they were not submitted in literary form. The data represents raw, unprocessed material which will require considerable time before it can be put into shape. Moreover, the Institute established the practice of concluding agreements with workers from other scientific institutions which provided for the party under agreement to submit to the Institute material without completed conclusions and proposals but in the form of original drafts, that cannot be published, nor still less transmitted to production.

This situation should be immediately and entirely done away with. Every worker should have his individual plan, supported by methodical directions, charts of tests, forms for recording, etc. Every scientific worker should conduct his work in such manner that he could be replaced by another person at any moment, should he leave his job, without interference with the normal course of the work.

The Institute has significant achievements to its credit, based on past work, but many of these "achievements" should be mentioned under quotation marks, since they cannot be transmitted to production. We cannot call any kind of scientific research and discovery an achievement until such time that it is accepted by production. The fundamental fault that prevailed at our Institute, as well as at many others, consisted in that a considerable part of achievements did not lead to completion, nor did they reach production. The scientific worker considered his job done at best when he presented an article written in literary form or a set of instructions. He was not interested in arranging for his scientific achievement to go into production, in the belief this should be done by someone else, either Narkomzem, Krai-ZU(Territorial Soil Administration), state farms, MTS, etc. This is an altogether wrong position. No scientific worker should rest until his achievement is accepted by production and adopted on a wide scale in practice.

The plan for 1935 suffers from the major shortcoming of maintaining adequate contact with production. VIZRa has in the past years leaned towards closer relations with production for a number of reasons (directives from the Narkomzem and the Academy, pressure from OBV, agreements with other producing organizations, etc.). Many scientific workers, however, drew the inaccurate inference that such contact with production was adequate. Actually, however, proximity with production may not alone be determined by the Institute selecting objects of research and subjects close and necessary to production. It is equally important for the selected material to prove of active use to production; for achievements to be produced in the shortest space of time; the data to possess the least amount of ambiguity and vagueness, as is often the case with data of scientific research institutions. All this may take place if the Institute works under conditions of actual production, in unity with the entire complex of agricultural work engaged in at state and collective farms and MTS, when in the field of scientific research participate not only scientific personnel but farm laborers, the personnel of cottage laboratories, etc. in equal measure.

The weak point in the plan of VIZEa for 1935 consists in that while state and collective farms and MTS are drawn into research of individual problems, farms as units and not individual people in those farms were contacted. This is vividly illustrated by the situation under which the Institute in its five year existence has not achieved real, close contact even with a limited group of principal farms, (grain, cotton, sugar beet, etc.)

1935 should be the year of the great change (turning point). Through our expeditions and observation points we have to establish completely concrete contacts with concrete farms; we should learn to know these farms not only by name or the names of their leaders, but also by their production plans, mechanization, Zelanukhin, I. A.

their system of crop rotation, the condition of organized labor, inventory, etc. VIZRa should, in other words, possess as its main base several dozens of state and collective farms and MTS, which it should know as well as it knows its own STATIONS of PLANT PROTECTION, its own observation points. In fact, it should know the former better than its own organizations, since it hardly knows the major part of its network sufficiently; knows them only by name and address.

The central and primary problems in fulfilling the plan for 1935 should be those indicated by the Narkom, M. A. Chernov, in his review of the Institute's plan.

These refer to mechanization in plant protection; chemization; the full acceptance by production of our achievements of the past years.

The significance accorded by the Party and Government to the work of our Institute is demonstrated by the fact that the Narkom of Agriculture (M. A. Chernov) and the responsible leading personnel of the Narkomzem of the Union spent two days in examining the VIZRa plan. Almost all leaders of the different sectors and laboratories of the Institute were heard. The Narkom gave concrete directions to each department and made concrete decisions. This attitude concerning our plan should evoke the energy of our staff, the desire to accomplish in time the plans set before us and to communicate them to production.

The attitude of the Narkom also indicates the enormous role played by plant protection in its aim at higher yields. This was equally brought out in the approved statutes (rules) of the agricultural artel (worker's assn) at the All-Union Conference of collective farmers-shock workers, where problems of pest control were placed next to other problems of agricultural techniques.

The widest masses of collective and state farmers and ETS personnel expect from scientific organizations urgent answers to a series of the most burning problems in agricultural production. Soviet science is becoming the property (and task) of wide masses, transmitted through cottage laboratories to collective farms, in contrast to capitalistic countries where the best and foremost laboratories are closing, the best scientists are without work, where the motto of the day is "less of scientific achievements and discoveries," and where, as a method for controlling unemployment and the slack of production, the call "back to manual labor" is frequently heard.

Every scientific worker, in recognising the enormous demands of our country for scientific research and discoveries should give his knowledge and strength to the fulfillment of the plan in the fastest and best manner. Everybody should change from individual petty-bourgeois tendencies in the organization of research to socialist methods of labor, collective participation in it, creative competition between laboratory and laboratory, between one scientific worker and the other, etc. Every scientific worker should constantly keep in mind comrade Stalin's direction: "A Plan-is the living, practical activity of millions of people;" that "The Reality of our program consists in living people, that it will be we together with you, our desire for labor, our readiness to work in different fashion, and our decision which will fulfill the Plan." (Speech made at the conference of farmers, June 23, 1931).

End of article.

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Lorkh, A. G.
Kartofel' (Potatoes).
Ed. 2, Moskva, Moskovskii Bol'shevik, 1945. 63 p.
75 L89

Translated in part from the
Russian by S. N. Monson

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Lorkh, A. G. Kartofel' (Potatoes). Ed. 2, Moskva, Moskovskii Bol'shevik, 1945. 63 p. 65 L89

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CLIMATIC AND SOIL CONDITIONS OF THE MOSCOW OBLAST (p. 32-36)

We are giving below the characteristic of the climatic and soil conditions of the Moscow oblast which determines the nature of agricultural methods in potato culture. The climate, as seen from the presented data, is altogether favorable for the culture of potatoes.

Year of testing	Date fields were cleared of snow	Beginning of field work	Date of potato planting	Last spring frost	First appearance of shoots	First fall frost	Frost which destroyed the foliage	Period of assimilation of foliage (in days)	From date of planting to destruction of foliage (in days)
1934	---	4-20	5-18	5-16 -5.7°	6-4	9-12 -2°	10-2 -5.7°	120	137
1935	---	---	5-10	6-4 -1.7°	6-4	9-13 -1°	11-2 -3°	151	176
1936	4-20	4-27	5-13	5-26 -0.4°	5-31	9-11 -1.6°	10-15 -5.6°	137	155
1937	3-29	4-7	5-5	5-7 -3.7°	5-26	9-28 -0.9°	10-10	137	158
1938	3-26	3-28	5-16/17	5-24 -2.1°	6-2	--	9-19	109	126
1939	4-17	4-19	5-20	--	6-1	8-11	9-27	119	131
1940	4-5	4-10	5-10	6-15 -1.5°	5-21	10-2	10-13 -8.0°	145	156
1941	4-16	4-27	5-24	6-11	6-9	9-16	10-10 -4.5°	123	139

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While in areas in America where record potato yields are obtained the median temperature for the summer varies from 15 to 16.4 degrees and the vegetative period of potatoes lasts 115 to 132 days, the median Moscow temperature throughout the summer is 15.8 degrees and the vegetative period of potatoes lasts 126-176 days. The total precipitation at Korenevo near Moscow is uneven, as seen from the table shown below.

Distribution of Precipitation in Moscow Oblast

	Amount of Precipitation (in mm.)						Yield in Tons (per hectare)		
Years in which experiments were conducted	May	June	July	August	Sept.	Total for summer	EPICURE	LORKH[1]	WOHLTMANN
1934	17.1	71.5	126.4	98.4	29.6	343	27.36	-	30.24
1935	33.6	45.1	142.8	101.0	122.6	444.8	28.06	-	26.08
1936	20.7	61.5	55.1	73.1	53.6	264.0	12.44	25.85	19.01
1937	53.3	27.8	105.1	47.2	50.1	283.5	17.40	31.81	21.45[1]
1938	53.0	76.9	15.6	6.7	25.0	177.2	-	19.91[2]	2.44[1]
1939	73.9	52.3	26.2	9.2	33.4	195.0	-	6.77	-
1940	1.0	39.0	99.15	36.85	83.0	259.0	-	36.85	-
1941	84.1	61.2	38.9	64.4	73.2	321.8	-	24.92	-
Average for 8 years	41.97	54.4	76.12	54.61	58.15	285.9	-	-	-

1 Lorkh and Woltmann in the 2 latter years received improved agric. methods.
2 In 1938 Lorkh was planted on a terrace with nearby ground waters.

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The variety Lorkh and the variety Woltmann for the past two years were given the benefit of high agricultural methods. In test years the variety Lorkh was grown in bottom lands having closer ground waters. Mean temperatures over periods of many years, lengthy vegetative periods and the average monthly precipitation in the Moscow oblast are most favorable for potato growing. The variation of all these factors, however, within different years is so large that it is not possible to establish a system of agricultural methods on the basis of median (average) data.

Thus, for instance, in May 1940, it was necessary to cultivate a field and plant at one millimeter of precipitation, in such manner as not to dry the soil while making it more friable, i.e., cultivating the surface layer without turning the bed, while in May 1941, at a precipitation of 84.1 mm., on the same field, it was necessary to plow over the inundated land two and three times, especially on heavy, clayey land. During the spring, with a small amount of precipitation, it was necessary to plant potatoes under the plow or under the spade, while at a precipitation equalling 84 mm. in May 1940, a higher yield was obtained from a planting by hilling on a previously marked field, by opening the trenches for a prolonged time, and occasionally an entire day, to warm and dry the soil.

In the year 1936 a drought that lasted 27 days in July and early August stopped the growth of potato plants on sandy land. The foliage of the early, non-vernalized variety EPICURE was almost completely destroyed and EPICURE completed its development by July 25. August rains did not aid its growth. The medium-maturing variety Lorkh was also stopped and in its development reached only the early stage of ripening: its buds and flowers dropped, the foliage wilted, the lower leaves began getting yellow and were dying. The August rains, nevertheless, revived the Lorkh plants and resulted in a new growth of foliage, a second blooming and new tuber formation. During the drought the young tubers (Lorkh) had also begun to ripen, their starch content had considerably increased and the thin skin had thickened. Following the rains the new supply of organic elements obtained from the foliage and carried to the ripening tubers resulted in the development of new stolons from the eyes of young tubers and in their overgrowth. In those places where the clumps shaded and thereby cooled the soil, new secondary tubercles formed on the tips of new stolons, while in sections where clumps had become less crowded, following the destruction of individual plants, the soil had warmed considerably and stolons were unable to produce tubers because of the maximal high temperature; instead they began to come to the surface forming new above-ground stems.

The late variety Woltmann did not show any overgrowth of tubers at all in that drought year, but its vegetative period was considerably extended, the variety not reaching maturity until frost came, resulting in an inadequate yield. In the deep black-earth areas of the Altai Territory (mountains) a 43-day drought (in 1943) during approximately the same summer months, led to a slow reduction of shoots but did not produce any overgrowth in the variety Lorkh. During the drought the yield increased 13.7 tons on the black soil land and only 3.34 tons per hectare on sandy soils.

This proves that dry spells are less harmful to black soils which are capable of retaining more moisture than sandy soils. The soil of Moscow oblast

THE ROLE OF POTATOES IN CROP ROTATION AND FERTILIZING (p. 39-44)

The presence in the soil of supplies of dilutable and absorbable nutrients for potatoes depends upon the nature of the soil, upon the predecessor crop, weather conditions, crop rotation, previously introduced fertilizing, soil cultivation, etc. This is why it is not possible to establish in advance concrete dosages in fertilizers for the different soils and fields. One may, nevertheless, safely state that THE GREATER THE QUANTITIES OF FERTILIZERS CARRIED INTO COLLECTIVE FARM FIELDS, THE HIGHER WILL BE THEIR YIELD. It is equally known that suburban plots, especially those cultivated individually, are frequently over-fertilized. Estimates and knowledge of the most favorable dosages of fertilizers for practical use are therefore essential.

By knowing the history of a field and the need of potato plants in mineral nutrition, it is possible to estimate the most favorable dosages of fertilizers. Let us cite as an example dosages of fertilizers and the yields of three potato varieties grown in Moscow. In 1934 and 1935 the potato variety EPICURE, planted after oats, was grown on soil fertilized with 18 tons of manure, two centners of ammonium nitrate, three centners of super phosphate and 1.5 centners of potash. It produced on sandy soil by August 20-25 27.3 tons of tubers per hectare. During the same years and following the same dosage of fertilizers the variety Woltmann produced in September 30.2 and 26.1 tons of tubers per hectare. The variety Lorkh produced on the same sandy soil, in 1936, following oat crops and the application of 60 tons of manure, 6 centners of ammonium sulfate, 6 centners of super phosphate and 2 centners of potash, 25.8 tons of potatoes. In 1937, after a potato crop, and fertilized by 60 tons of manure, 4 centners of ammonium sulfate, 8.4

centners of super phosphate, 2 centners of potash, and 1 centner of ammonium nitrate (additional feeding in July) the gross yield was 31.8 tons. In 1940 the potato field planted after lupine and fertilized in the fall with 60 tons of manure, 40 tons of peat and 5 centners of potash, and in the spring with 3 centners of potash, 8 centners of super phosphate and 2 centners of ammonium sulfate produced a yield of 36.8 tons per hectare. On sandy soils the variety Lorkh produced in 1937, after a crop of legumes, 49.2 tons of tubers,after the soil had been fertilized with 60 tons of manure, 8.4 centners of super phosphate, 3 centners of ammonium sulfate and 2 centners of potash. In the same year 1937 Lorkh produced on clayey soils, when planted after summer grain crops, 51.9 tons of tubers after the field had been given 60 tons of manure, 10 centners of super phosphate, 3.6 centners of montan saltpeter and in the spring 2.5 centners of potash. The tubers contained 16.2 per cent of starch, i.e., a total of 8.4 tons of starch per hectare. The yields at several collective and state farms were even higher.

(Omitted 19 lines)

It is apparent from these examples that in the Moscow oblast, on sandy as well as on clayey soils, yields were obtained of 50-70 tons per hectare after a variety of predecessors, after the introduction of considerable quantities of fertilizers. It is to be noted that in 1934, 1935, 1937 and 1940 there were abundant rainfalls in the month of July and yields were obtained without irrigation. By applying irrigation in the dry years of 1936, 1938 and 1939 yields were higher yet.

The more exhausted a soil by a predecessor crop, the larger is the amount of fertilizer it will require. The best predecessor crops for potatoes are legumes: clover, lupine, etc. These crops enrich the soil with nitrogen through bacteria in the nodules and the dosage of nitrogen fertilizer may consequently be somewhat reduced. The abundance of manure and mineral nitrogen fertilizers increase foliage growth and thus increase the evaporating surface of leaves. The need of plants for water increases correspondingly. If water is lacking in the soil, the foliage drops, wilts more easily, and the yield of tubers is reduced. This over-abundance of foliage, frequently observed in suburban gardens, is called fattening ("zhirovanie") of the foliage. It should be avoided. We already pointed out that EPICURE produced a lower yield from a foliage of 17.6 tons than from a foliage of 15.6 tons per hectare.

If one takes the increases in yield during five days per hectare, we find that the highest increase in the case of EPICURE was 7.18 tons of tubers, in starch 1.33 tons, obtained within 5 days from foliage weighing 14.9 and 14.8 tons. LORKH, without irrigation, produced on sandy soils an increase of 6.75 tons of tubers and 1.06 tons of starch from foliage weighing 33.3 tons per hectare. When irrigated the same variety produced an increase of 8.93 tons per hectare and 1.3 tons of starch from foliage weighing 25.4 tons. On clayey soils LORKH (not irrigated) produced an increase of 10.37 tons of tubers from 43 and 42.6 tons of foliage. WOLTMANN produced within 6 days an increase of 5.8 tons of tubers and 1.32 tons of starch from foliage weighing 30.9 tons per hectare.

While legumes are the best predecessor crops for potatoes, their cultivation tends to destroy the structure of the soil more. The academician V. R. Williams argued therefore against crop rotations of potatoes after legumes in all collective and state farms of the Union, while recognizing the efficacy of planting potatoes in suburban areas following legumes.

Vegetable crops are good predecessor crops for potatoes. In the Lenin district near Moscow potatoes are planted after cabbage and root crops.

In growing potatoes after winter crops organic fertilizers are introduced both for winter crops and potatoes.

Following summer crops, oats and particularly flax, the amount of fertilizers should be greatly increased.

As a rule, the application of manure and mineral fertilizers produces better results than the application of manure alone. When manure and mineral fertilizers are lacking, all local fertilizers are to be gathered with greater care and utilized to their fullest extent. The deeper the plowing and the richer the soil in nutrient substances, the more radically may the dosages of fertilizers be increased. On shallow uncultivated lands, dosages of manure of 60 tons and over may lead to "fattening" of the foliage and the burning of plantings. Under those conditions it is practical to apply 30-40 tons of manure and 20-30 tons of peat. The best results are obtained from peat when composted together with manure or from peat used as bedding on livestock yards. Peat manure and peat dung are introduced in the same dosages as manure.

Of much importance is the period of introducing fertilizers. In the spring and fall the principal fertilizers are introduced and additional feedings are applied to regulate the growth of foliage and tuber formation. Dosages and time of additional feedings are determined by the condition of the plants and the nature of precipitation.

All organic fertilizers are best introduced in the fall or prior to the first spring plowing. If the former is not possible, manure, peat and refuse are carried in the winter onto the fields and are piled close to the road in piles no less than 30-40 tons each; a layer of peat is placed underneath, pressed down firmly and the pile covered with another layer of peat and soil.

In transporting and spreading fertilizers it is essential to observe an even distribution throughout the field; for this purpose the fields are divided into squares and fertilizers transported to each square separately. If irregularly distributed, the clumps develop irregularly, mature at different periods and the field appears variegated and spotted. While the roots of potatoes are capable of spreading in width 75 cm. from the clump, during a dense planting roots do not go beyond the neighboring clump and the fertilizer is actually utilized only by the closest clump. In order to spread evenly and not to dry out manure, it is necessary to apply it in the amount of no less than 18-20 tons per hectare. Simultaneously with the spreading of fertilizers, plowing takes place in order to prevent drying out.

Mineral nitrogen fertilizers on clayey soils are introduced prior to planting, under the harrow. On sandy soils they are introduced twice. One half under the harrow and the other prior to cultivating.

Super-phosphate is introduced in the spring: on clayey soils during the first or second plowing, on sandy soils under the spring secondary plowing.

Ashes are best introduced in the spring, prior to the spread of organic fertilizers and should be plowed in together with manure. Wood ashes are richer in potassium and are introduced in the proportion of 0.5 to 2 tons per hectare. Peat ashes are poorer in nutrient substances and should be added in amounts four and six times as large. Potash is introduced during the second plowing, or on clayey soils in the spring, prior to the first harrowing. On are carried in the winter onto the fields and are piled close to the road in piles no less than 30-40 tons each; a layer of peat is placed underneath, pressed down firmly and the pile covered with another layer of peat and soil.

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Near Moscow, especially on sandy soils, brown mottling of stems is frequently observed as a result of irregular feeding. Brown mottling causes premature dying of the foliage and reduces the yield. This disease is connected with the washing off of lime and magnesium from the soil by rain. As a result, a considerable amount of iron changes into a form easily absorbed by the plants. The oxidizers of iron by entering the plant in excess cause oxidizing processes in the chlorophyll tissues, destroy them and reduce yield. In order to prevent this disease it is necessary to introduce in the spring 2-3 tons of ground lime or marl. Lime changes the iron in the soil into a non-absorbent form and gives the plants an opportunity to develop. Marling should be performed simultaneously with the introduction of considerable dosages of organic fertilizers. Nitrogen fertilizers increase the formation of sugars in the plant and reduce the harmful reaction of increased oxidizing processes; nitrogen fertilizers consequently also aid in controlling brown mottling of stems. Large dosages of potassium fertilizers without marl increase the development of brown mottling.

Fertilizers should be carefully mixed with the soil and spread. Only when there is a lack of fertilizers they are applied directly under the tuber in planting, but in that case it is necessary to have a layer of soil between the planted tuber and fertilizer.

To control the development and growth of foliage in the fall and spring organic fertilizers are primarily applied, while mineral fertilizers, especially nitrogen and a small amount of potash are left for additional feeding in the summer.

During a dry year additional feedings do not increase a yield. In a wet year, when nitrogen is washed off the soil by rains, an additional feeding with nitrogen fertilizers may bring an increase in yield of 2-7 tons*per hectare. When there is "fattening" of foliage the additional feeding of one centner of potash stops the growth of the foliage and increases tuber formation.

Nitrogen fertilizers increase yields greatly but when potassium and phosphorus are lacking the tubers remain long. In proper feeding and with all elements of nutrition present, tubers of the Lorkh variety develop a regular round shape. Additional feedings should be applied deeply, in order that nutrient substances may reach the root system of plants.

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Lekhnovich, V. S.
Vyrashchivanie kartofelia (Growing Potatoes).
Leningrad, 1949. 69 p. 75 L53

Translated in part by
S. H. Monson

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POTATOES IN INDIVIDUAL GARDENS (p. 3)

Gardening, principally the growing of potatoes, is the occupation of many Leningrad inhabitants. The gross potato yield from individual gardens constituted in 1948 close to 140 thousand tons. This figure alone indicates the significance individual gardening bears in satisfying the demands of the Leningrad population for potatoes. The gardeners of the Kirov district of the City of Leningrad gathered an average of 322 centners of potatoes per hectare. Shock gardeners obtained 600-700 centners per hectare. Not all gardeners secured, however, similar yields. By committing serious errors in the agricultural methods they apply, the yield is frequently drastically reduced.

Potatoes represent the basic crop in our gardens. In nutritional amount of starch and albumen obtained from one square meter, it has no equal among other garden products. Potatoes are the principal contributors of vitamin C for the population of the non-Black Earth Belt. It also contains vitamins B1 and 2, and several others.

This pamphlet deals with directions for obtaining high potato yields on individual and collective gardens.

FOR A HIGH YIELD FROM PRIVATE AND COLLECTIVE GARDENS (p. 50-53)

World records in potato yields have been set by the Soviet Union. The collective farmer M. S. Khudolii of the Zhitomir oblast obtained a potato yield of 1,285 centners per hectare without the benefit of irrigation. The collective farmer A. K. Iutkina of the Kemerovsk oblast obtained 1,331 centners per hectare using one irrigation. Many Leningrad gardeners also had considerable success in their individual gardens.

In 1948 the average potato yield among gardeners of the Kirov district of the City of Leningrad represented 322 centners per hectare from an area of 762 hectares. The average potato yield of the gardeners of the Kirov plant amounted to 480 centners per hectare on an area of 350 hectares. Gardeners of the Mikoian plant gathered an average of 440 centners; of the K. Marx plant 470 centners; the Lenin plant 440 centners per hectare, etc.

The success of individual gardeners was even more significant. Thus individual gardeners of the City of Leningrad obtained in 1948 the following potato yields:

Names	Plants	Potato area in sq. m.	Actual yield in kg.	Yield per hectare in centners
M. G. Abramov	Vulcano	300	2,370	790
A. B. Terentiev	"	800	5,200	650
N. F. Federov	Kirov	683	4,100	600
A. N. Rokachevski	"	499	2,800	560
G. A. Kostin	"	450	2,250	500
M. A. Nikitin	Plant of Automatic Machine Tools	220	990	450
P. N. Nekrasov	All-Union Inst. of Plant Industry	400	1,600	400
N. I. Nazarevich	Imeni Leps	200	800	400
M. E. Modestov	" "	150	600	400

A highly cultivated, well fertilized soil of the garden type, excellent agricultural methods, and a healthy potato variety planted in time, at normal density (400-500 plants per 100 sq. m.) are the requirements ensuring high potato yields.

Proper and good cultivation of the soil is essential for obtaining high yields. A sample fertilizer of a garden producing 500 kg. of potatoes and over from 100 sq. m. follows:

	In kg. for 100 sq. m. of garden
Manure of good quality, dispersed	400
Humus in holes	300
Ammonium nitrate in holes	3.5
Manure liquid (for first feeding)	30
or	
Potassium nitrate	0.25
Wood ashes	15
Super-phosphate on clayey soil	10-15
Super-phosphate on sandy loam	8-10
(Wood ashes and super-phosphate are best introduced in three applications: two-sixths spread prior to secondary digging; one-sixth spread prior to dividing with rakes, or along with the feeding prior to the first hilling, and three-sixths into the holes at planting.)	
Potassium chloride prior to secondary digging, spread	1-2

Aside from the lack of nutrition in the soil, the most frequent reason for delays in the formation of the foliage of plants is due to lack of moisture in the soil during drought periods. Our potato plants do not perish, as a rule, from droughts but are delayed in their development. The control of these delays, resulting from droughts and occurring during the summer and in the moist areas of the Northwest, will play a large role in obtaining record potato yields. Irrigation of potato plants should therefore be introduced during periods of drought wherever possible.

The foliage has to be preserved from disease.

Harvesting should take place in the last ten days of September.

The destruction of foliage, as a result of diseases or early frosts, may reduce the yield 50 per cent or more.

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