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**CONTRIBUTION OF SCIENTISTS OF THE DEPARTMENT OF GENERAL
AGRICULTURE OF UMAN NATIONAL UNIVERSITY OF
HORTICULTURE TO THE DOMESTIC AGRICULTURAL SCIENCE
DEVELOPMENT**

The article deals with the contribution of scientists to the creation of the Department of General Agriculture and scientific research in agriculture from the end of XIX-th and during the 20-th century. The main tendencies of garden and field agriculture development are revealed. Particular attention is paid to the scientific work of the founder of scientific research in garden agriculture, head of the Department of General Agriculture during 1936–1985, Doctor of Agricultural Sciences, professor S.S. Rubin. The main scientific works of the department's staff, in particular, M.K. Vasiliev, F.V. Zamorskyi, S.K. Rudenko have been analyzed. It is noted that the scientific radioisotope laboratory and the scientific laboratory for soil maintenance and garden fertilization made a large contribution to the development of the research on problem solving in agriculture. The information on the main directions of future research work of the Department of General Agriculture for is given.

Key words: garden and field agriculture, Department of General Agriculture, Uman Agricultural Institute, scientific laboratory, research, soil fertility, agricultural crops, yield, S.S. Rubin.

ВНЕСОК ВЧЕНИХ КАФЕДРИ ЗАГАЛЬНОГО ЗЕМЛЕРОБСТВА УМАНСЬКОГО НАЦІОНАЛЬНОГО УНІВЕРСИТЕТУ САДІВНИЦТВА У РОЗВИТОК ВІТЧИЗНЯНОЇ АГРОНОМІЧНОЇ НАУКИ

У статті висвітлено внесок вчених у створення кафедри загального землеробства та їх наукові дослідження наприкінці ХІХ – упродовж ХХ ст.ст. Розкрито основні тенденції розвитку садового і польового землеробства. Особливу увагу приділено науковій діяльності фундатора наукових досліджень із садового землеробства завідувача кафедри загального землеробства упродовж 1936–1985 рр., доктора сільськогосподарських наук, професора С.С. Рубіна. Проаналізовано основні наукові праці співробітників кафедри, зокрема М.К. Васильєва, Ф.В. Заморського, С.К. Руденка. Зазначено, що великий внесок у розвиток дослідної справи з вирішення проблем у землеробстві зробили: наукова радіоізотопна лабораторія та наукова лабораторія з утримання ґрунту і удобрення садів. Наведено дані про основні напрями науково-дослідної роботи кафедри загального землеробства на перспективу.

Ключові слова: садове і польове землеробство, кафедра загального землеробства, Уманський сільськогосподарський інститут, наукова лабораторія, дослідна справа, родючість ґрунту, сільськогосподарські культури, урожайність, С.С. Рубін.

ВКЛАД УЧЕНЫХ КАФЕДРЫ ОБЩЕГО ЗЕМЛЕДЕЛИЯ УМАНСКОГО НАЦИОНАЛЬНОГО УНИВЕРСИТЕТА САДОВОДСТВА В РАЗВИТИЕ ОТЕЧЕСТВЕННОЙ АГРОНОМИЧЕСКОЙ НАУКИ

В статье освещен вклад ученых в создание кафедры общего земледелия, а также их научные исследования в конце ХІХ – в течение ХХ вв. Раскрыты основные тенденции развития садового и полевого земледелия. Особое внимание уделено научной деятельности основателя научных исследований в области садового земледелия, заведующего кафедрой общего земледелия на протяжении 1936–1985 гг., доктора сельскохозяйственных наук, профессора С.С. Рубина. Проанализированы основные научные труды сотрудников кафедры, в частности М.К. Васильева, Ф.В. Заморского, С.К. Руденко. Отмечено, что большой вклад в развитие исследовательской дела по решению проблем в земледелии внесли: научная радиоизотопная лаборатория и научная лаборатория по содержанию почвы и удобрению садов. Приведены данные об основных направлениях научно-исследовательской работы кафедры общего земледелия на перспективу.

***Ключевые слова:** садовое и полевое земледелие, кафедра общего земледелия, Уманский сельскохозяйственный институт, научная лаборатория, исследовательская работа, плодородие почвы, сельскохозяйственные культуры, урожайность, С.С. Рубин.*

Target setting. The formation of the Ukrainian state and its movement into the European space requires the concentration of material and spiritual efforts, creating the need to study the achievements of domestic scientists in scientific and organizational activities. It is particularly topical by the objective assessment of the contribution of scientists to the development of one of the largest and most important sectors of the Ukrainian economy – the agro-industrial complex. In view of this, the scientific achievements of Ukrainian scientists are an invaluable treasure for future generations of scientists and agricultural workers.

Analysis of the activities of scientists under the direction of by Professor S.S. Rubin is relevant in view of the scale and diversity of their world-class scientific achievements, which has glorified national science and has become its national heritage.

Actual scientific researches and issues analysis shows the lack of generalization and analysis of the scientific contribution of scientists of the Department of General Agriculture of Uman National Horticultural University to the development of agronomic science, in particular, garden and field agriculture. The scientific research of the team of scientists under the direction of Professor S.S. Rubin are highly respected by such scholars as: A.D. Burmistrov, O.P. Garbar, V.O. Yeshchenko, O.I. Zdrovtsov, I.M. Karasiuk, V.P. Karpenko, P.G. Kopytko, V.O. Pastushenko, Yu.F. Tereshchenko.

The aim of the research is to analyze and generalize the main aspects of scientific activity of the Department of General Agriculture under the direction of Professor S.S. Rubin; to trace its contribution to the development of garden and field agriculture and agricultural chemistry. In accordance with the stated aim, the following tasks are defined: to trace the scientific and organizational activity of Professor S.S. Rubin in Uman Agricultural Institute; to investigate the fundamental

works of a team of scientists under the direction of Professor S.S. Rubin on the peculiarities of garden and field agriculture.

The statement of basic materials. According to the reports published in the «Notes to the Imperial Society of Agriculture in Southern Russia» (Odesa, 1905, No.1, p. 43), the Department of General Agriculture at the Uman School of Agriculture and Horticulture was founded in 1868 and already in 1876 received two dessiatines of land for the experimental field. The head of the experimental field, the collegiate adviser, the inspector of the agricultural department, the Candidate of Sciences, and later Professor M.K. Vasiliev started the scientific research in agriculture. His works on soil cultivation and technology of growing cereals, fodders and other crops are published in the monograph «Soils of the Agricultural Nursery» in 1897. His articles on soil cultivation and fertilization were often published in the Journal «Agriculture and Forestry» [1, p. 37].

To increase the agriculture development, which deteriorated during the First World War and the Civil War, it was necessary to expand the training of agronomists and to make research on topical issues of agriculture at that time. Among studies of this period at Uman Agricultural Technical School, later polytechnic school, special attention should be paid to the research works of F.V. Zamorskyi, which were carried out not only in the educational institution, but also under conditions of production. By studying the species composition of weeds in rye and wheat crops, he offered fully justified measures to control weeds. The activization of research work at the technical school is also confirmed by the fact that at that time the involvement of students in scientific work began. Many of them became later prominent scientists in the field of agriculture and agrochemistry, among them P.A. Vlasiuk, O.I. Grinchenko, N.K. Krupskyi, T.D. Lysenko, P.K. Ursulenko, F.P. Yukhymchuk et al. [2].

During this period the technical school began to publish its printed works. In 1926 the «Notes of the Uman Agricultural Technical School» were published, which, in addition to the articles of F.V. Zamorskyi contained also the articles of the Professor S.K. Rudenko on the root system of field crops [3].

The researches in fruit crops at Uman School of Agriculture and Horticulture were initiated in the early years of the 20th century by such scientists and gardeners as V.V. Pashkevych, V.I. Edelstein and P.G. Shytt. However, at that time there was almost no experimental study of soil care in the gardens. [2]. The first studies in this direction were started by S.S. Rubin in 1930, when after graduating from the Moscow Timiryazev Agricultural Academy he was appointed to the Uman Agricultural Institute at the Department of Agrochemistry, Soil Science and Agriculture. He is the founder of scientific research on the study of soil maintenance and fertilization systems in the industrial large-scale fruit plantations, which were created in those years at large collective specialized farms. In 1930 and 1931 he made stationary experiments with fertilizer systems of apple orchard in the plants of varieties *Pepin Lytovskiy* and *Calville Snigoviy*.

Besides, in 1931 S.S. Rubin set up an experiment with gray podzolized soil maintenance in the row spacing of apple orchard with the *Pepin Lytovskiy* variety, where the fallow system, green-manured fallow system and soddy system have been studied and the soil was maintained under vegetable and field crops. In 1930–1935 S.S. Rubin together with P.A. Vlasiuk, M.I. Musich and others conducted detailed research on the absorption of nutrients by the main rootstocks of fruit trees, such as apple-tree, pear-tree, Mahaleb cherry. Simultaneously with the work at the department S.S. Rubin during 1932–1934 headed the experimental station of the Southern Research Institute of Fruit and Vegetables, which gave him the opportunity to further expand research with fruit and berry crops.

Having summarized the first results of the research in garden agriculture, S.S. Rubin prepared his Ph.D. Thesis on the topic «Conditions for the Growth of a Young Garden depending on the Ways of using Row Spacing», which was successfully defended on December 19, 1936 at the Academic Council of Moscow Timiriachev Agricultural Academy. On October 22, 1945, at the same Academic Council he defended his doctoral thesis on the topic: «Soil Maintenance in the Gardens» [5].

In 1949 on the basis of the materials of the 20-year research he published his monograph «Fertilization of Fruit and Berry Crops», for which in 1952 he was

awarded the USSR State Prize of the III degree. The monograph won widespread popularity and was reissued several times. The book summarizes the results of twenty years of work on the fertilization of fruit and berry crops, shows the experience of leading manufacturers and achievements of national research institutions. In this book, for the first time the information on the chemical composition of individual organs of a tree, on the flow of nutrients into a plant in different periods of its growth and development were presented. The book covers the issue of foliar nutrition of fruit plants, the deep introduction of fertilizers into the zone of occurrence of the bulk of the tree roots. The author of the book also offers the most rational ways, terms and rules for fertilizing on different soils.

In 1954, having summarized his research, S.S. Rubin published his second book «Soil Maintenance in the Gardens». The results of his observations are presented in the corridors and classrooms of the Department of General Agriculture, which resemble a museum. There are numerous boards where the beams of the apple root are attached in a peculiar manner. On the one board they are a lot of them, they are thick and on the other one, they are smaller and thinner. The first board shows the roots of an apple tree that grew on a plot where the row spacing was not planted, and another one demonstrates the batches of roots of such apple tree, which had in the row spacing the «tenants» – cereals. Professor S.S. Rubin explained the main idea of his book "Soil Maintenance in the Gardens" in a very simple way. It was these boards and the results of his experiments that clearly and unequivocally convinced also the opponents of Symon Samiilovych Rubin, who, advocating for the use of each piece of land, recommended to sow the row spacing with grain. Professor S.S. Rubin and his students proved that it does not provide good yields neither for grain nor for fruit [6].

In 1959 upon the initiative of S.S. Rubin involving V.F. Moiseichenko, A.G. Horodnianska, G.I. Dibrova, A.I. Mykhalevskyi, a scientific radioisotope laboratory was created at the department, which allowed using labeled atoms to investigate the absorption of the main elements of apple-tree, pear-tree and other fruit plants nutrition. S.S. Rubin was actively involved in the development of a new

method of agrochemistry – the diagnosis of mineral nutrition of fruit plants. The problems of continuous soil cultivation before planting trees have been studied by such scholars as I.F. Krasnoshchok, O.F. Danilevsky; dosages and the ratio of fertilizers – by P.G. Kopytko, V.S. Tsyrtta; terms of application – by O.K. Kharytonov; ways of fertilizers' application – by L.I. Leonovych, I.F. Galushko, G.K. Papenchuk; diagnostics of nutrition – by A.O. Bondarenko. All this contributed to the creation of conditions for the holding of the All-Union Scientific and Methodological Meeting on the Diagnosis of Plant Nutrition in Uman Agricultural Institute on August 22–27, 1977, and on October 3–5, 1978, – the Inter-Republican Meeting on the Problem «Microelements and the Biosphere». This contributed to the replenishment of the monograph of S.S. Rubin «Fertilization of Fruit and Berry Crops» (1949), reissued in 1958, 1962, 1974 and 1983.

On the basis of long-term (30-year) experiments of the Department of General Agriculture, upon the initiative of S.S. Rubin in order to summarize the results of studies on soil maintenance in the gardens of the All-Union Academy of Agricultural Sciences after V.I. Lenin (AUAASL), on October 1–14, 1960 in Uman Agricultural Institute the scientific and methodological meeting was held, which played an important role in improving the scientific and educational work of the department. Consequences of the meeting were widely used by educational institutions of the institutes, collective farms and public farms of Cherkasy region. As responsible for holding this meeting, S.S. Rubin considered it a matter of honor for the entire staff of the institute to prepare well for the meeting so that it was well-organized and interesting for the guests. He watched that all departments showed research on gardening, prepared substantive reports, at a high methodological level, and in an exemplary manner, kept all the experimental sections of the department and laboratory [7].

From June 15 to June 21, 1961, the section of horticulture of the Department of Agriculture of the All-Union Agricultural Academy held a scientific and methodological meeting on the development and testing of methodological guidelines for agro-technical experiments with fruit and berry crops. The first half of the

meeting was held from 15 to 17 June at the Ukrainian Research Institute of Horticulture in Kyiv, and from 19 to 21 June the meeting continued its work in the Uman Agricultural Institute. The scientific and methodical meeting covered a range of issues related to the methods of laying and conducting various agronomic experiments with fruit and berry crops. S.S. Rubin made a report in the city of Kiev on the topic: «Research Methodology in studying the Processes of Nutrition and Fertilization of Fruit and Berry Crops by the Method of Labeled Atoms» [8]. During the meeting, there were special committees on approbation of existing and new guidelines for agronomic experiments with fruit and berry crops.

The meeting played an important role in improving the research work in horticulture, the result of which was the development of unified methods of conducting agrotechnical experiments with fruit and berry crops, which enabled coordination the work of research institutions in the field of horticulture, better and faster implementation of science achievements in production. Conducting a meeting at Uman Agricultural Institute, as well as participation of well-known scientists gave the opportunity to a wide range of teachers and students to get acquainted with the state of methodical work with fruit crops, as well as to familiarize meeting participants with the scientific and educational work at the department of the institute. V. Koliesnikov, the head of the gardening section of AUAASL spoke highly of a staff of the institute and their valuable experimental works. The equipment of the isotopic laboratory and its work also made pleasant impression on him.

The results of the 30-year research on the soil maintenance in the row spacing of fruit plantations are summarized in the collection of scientific works «Soil Maintenance in the Gardens» (1963), published due to the care of S.S. Rubin. It is based on the scientific works of such Uman scientists as: Professors S.S. Rubin, M.M. Shkvaruk and A.K. Olkhovska, Associate Professors O.S. Andriienko, D.O. Gorbatiuk, N.E. Popova Z.S. Bezuhlyi, A.O. Bondarenko, O.K. Kharytonov, V.F. Moiseichenko as well as articles of scholars from all Soviet republics except Turkmenistan. The main conclusion of the book: the gardens give the highest yields by clean cultivation of row spacing and the use of vegetable crop rotation [9].

As a result of the meetings held in 1963 at the Department of General Agriculture under the guidance of Professor S.S. Rubin and with the participation of the staff of the department P.G. Kopytko and A.P. Butylo the scientific laboratory for soil maintenance and garden fertilization was created. This laboratory was the only scientific institution of this type in the USSR. Methodically correct research of this laboratory helped to solve many important problems of modern intensive gardening. The laboratory organization allowed to significantly expand and deepen the research. On the basis of the laboratory research together with the Departments of Horticulture and General Agriculture the «Recommendations on the Use of Fertilizers and Soil Maintenance System in the Gardens of Cherkasy Region» were published [10].

The long-term research of the problem laboratory of the apple tree fertilization system, which has been conducted since 1931 according to the Decree of the Cabinet of Ministers of Ukraine No. 1103-p of December 5, 2007, was included in the State Register of scientific objects that are the national treasure «Unique Research Agroecosystem of Apple Orchard of Uman State Agrarian University».

In 1967 S.S. Rubin published the top article «The Root System of Fruit Plants and its Importance for the Growth and Yield of Trees» in the collection of scientific papers of Uman State Agricultural University called «The Root System and Productivity of Agricultural Crops». S.S. Rubin sent this collection to his colleagues-scientists both to various parts of the country and abroad. S.S. Rubin was always interested in the latest news of foreign science. In the guestbook at the department there are 35 letters of gratitude from Czechoslovakia, Poland, Bulgaria, Hungary, Germany and other countries.

In 1974 in the Moscow publishing house «Kolos», a fundamental monograph of S.S. Rubin «Fertilization of Fruit and Berry Crops» was published [11]. During 1976–1980 S.S. Rubin focuses on studying and implementing the most rational crop rotation in the conditions of intensive field agriculture; development of agrotechnics for obtaining high and stable wheat crops; improvement of the methods of growing fodder crops in the forage crop rotation and selection of the most effective winter and spring crops in the system of green conveyor; intensification of fruit production [12].

Under the guidance of S.S. Rubin scientists of the Department of General Agriculture proved that an important condition for increasing wheat yield is the its placement after such predecessors as winter crops for green fodder, perennial grasses using them for one mowing, annual herbs for green fodder and hay, peas for grain. Crop rotation with different saturation of grain and technical crops was also studied. The research results formed the basis of the recommendations for the crop rotation for the Forest-Steppe of the USSR, which were developed by the problem council on crop rotation of AUAASL as well as scientific and technical council of the Ministry of Agriculture of the USSR. The meeting of this council (together with AUAASL) took place in the Uman Agricultural Institute on the basis of the Department of General Agriculture in October 1975. The scope of research on crop rotations at this department was so great that S.A Vorobiov, the Chairman of the All-Union Coordination Council on Crop Rotations even had doubts about the possibility of its implementation. But these doubts disappeared after being acquainted with the talent of the organizer, Professor Rubin and his ability to involve members of the department and numerous postgraduate students and undergraduate students in these studies.

Throughout his life S.S. Rubin looked for the ways of rational land use and soil fertility increase. This motivated him to write textbooks, at first for the students of agricultural colleges, and later – for the university students.

The first edition of the book «General Agriculture», prepared by S.S. Rubin on the basis of the experiment results, appeared in 1950. The textbook for students of technical schools was in demand and went into five editions (1955, 1960, 1964, 1971, 1976) [13].

For the sixth edition of the textbook «General Agriculture» [13] in 1982, the Committee for State Prizes of the Ukrainian SSR in the field of science and technology of the Council of Ministers of the UkrSSR awarded S.S. Rubin with the State Prize.

The works of S.S. Rubin were highly appreciated in the scientific community as well as among the specialists-producers and amateur-gardeners. In addition to his research, he summarized in his books almost all the latest achievements of world

science and practice on the issues that he considered, and also provided rich experimental material. In 1984 his last fundamental monograph entitled «Soil Maintenance and Fertilization in Intensive Gardens» was awarded with the Gold Medal after I.M. Michurin [14]. Scientific researches of the department headed by the Professor S.S. Rubin are well known in the USA, Belgium, Poland, Holland, New Zealand, Bulgaria, Hungary, Romania, China.

Head of the Department of General Agriculture (1936–1985) Professor S.S. Rubin created a world famous scientific school that worked in the following directions: nutrition of fruit plants and soil maintenance in gardens and minimization of soil cultivation for field crops and the specialization of crop rotation. At the department headed by Professor S.S. Rubin worked 10 Doctors of Sciences and 62 Candidates of Sciences, and under the direction of his students, professors Yeshchenko V.O. and Kopytko P.G. – ten and seven Candidates of Agricultural Sciences respectively.

The main directions of research work of the Department of General Agriculture today are: Specialization of crop rotation and reduction of energy consumption of technology in cultivation (investigator – Professor V.O. Yeshchenko); Agroecological justification of weed control measures in the short-term crop rotations of the Right-Bank Forest-Steppe of Ukraine (investigator – Associate Professor O.B. Karnaukh); Minimalization of the main soil cultivation in the system of fall field development for the field crops of the short-term crop rotation (investigators – Associate Professors M.V. Kaliievskyi, Yu.I. Naklioka); Agroecological substantiation of short-term crop rotation of different specializations for the production of fodder grain in the Right-Bank Forest-Steppe of Ukraine (investigators Associate Professors – S.V. Usyk, A.V. Novak); Optimization of soil fertility in fruit and berry plantations with application of scientifically substantiated systems of its maintenance in row spacing and fertilization (under the direction of Professor P.G. Kopytko).

Conclusions and prospects for further research. Professor S.S. Rubin and his followers (O.S. Andriienko, I.P. Galushka, D.O. Gorbatiuk, G.K. Karpenchuk,

I.F. Krasnoshchok, N.E. Popova and others) have created a new direction in the study of soils, namely – garden agriculture with the development of systems of row spacing maintenance and fertilization of fruit and berry crops. In the 1960–1980s, these studies were expanded and extended by the research works of A.P. Butylo, L.I. Donchuk, Yu.V. Kolarkov, P.G. Kopytko, A.O. Krasnoshtan and others. They have investigated the principles of transformation and profile distribution of organic and mineral substances after 50 years of row spacing use with different systems of soil maintenance in the gardens.

The scientific works of professor S.S. Rubin and his followers are a valuable contribution to the study of a set of problems related to the improvement of functioning and further development of the national economy of Ukraine, in particular, fruit production, agriculture and agrochemistry [15]. His scientific school preserves the traditions of its founder and is the focus of intensive concentration of creative energy and coordinated efforts of scientists in the process of scientific research, is the nucleus of new points of growth and development of science and its individual areas. It gave way to science by several generations of scientists - and this is the essence of its longevity and vitality.

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