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CENTRAL INTELLIGENCE AGENCY

INFORMATION REPORT

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1. The Ukraine, in spite of its traditional reputation for rich earth, presents many production problems for the farmer, and thus for the Soviet Government. Foremost among such problems is a shortage of certain minerals inherent to arable soil, which, albeit found in minute quantity in the earth, are requisite for proper cultivation of crops. Particularly affecting the growth of the sugar beet is the necessary presence of a small trace of borate and copper. The absence of a trace of borate stunts development of the beet's maturity and turns the root black. A shortage of a small quantity of copper makes protein assimilation and sugar synthesis difficult for the beet, and leaves it an easy prey to the ravages of indigenous diseases and pests. Unfortunately for the Soviet Government, the absence of these minute traces of certain elements has plagued the development of specialized agriculture on an intensive basis in the Ukraine for decades.

2. The Government's answer to the problem was the increasing use of chemical fertilization designed not only to produce bigger yields but to improve and increase the basic mineral content of the soil. In addition, pest control through the use of insecticides was widely practiced. The Department of Chemistry at the All-Union Sugar Institute in Belaya Tserkov was charged with research in both fields. This department, with a total of 50 men, was divided into four sections:

   (a) Soil: This section conducted soil tests and ran hundreds of samples to determine the soil composition of the Ukraine.

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(b) Microbiology: This section analysed the soil content for pest eggs and chronic shortages of requisite minerals.

(c) Fertilizer: This section recommended and tested through experimentation the efficiency of commercially produced fertilizers.

(d) Quality analysis: This section, which I headed, was designed to check the effect of fertilizers on the actual yield of the crop, as well as the possible effect upon the soil content. I was also responsible for reporting any adverse influences created in the soil by the extensive use of powerful insecticides.

My samples were collected at random from the more than 300 sugar beet factories of the Ukraine. In 1936, the Department of Chemistry completed the first Soviet soil map of the Ukraine, incorporating the findings of each section in minute statistical data.

Commercial Fertilizers Employed

3. Phosphate: This mineral is widely used on the Ukrainian sugar beet, as well as on the cotton crop of the area, because of its plentiful supply, and the ease with which it is assimilated by the sugar beet. Through assimilation of phosphate, the sugar beet soon builds up its protein content. The major source of phosphate in the USSR is a gigantic deposit at Chibinogorsk, now called Apatity, near Murmansk. This deposit has been worked since 1922, but in 1934 the mineral content of the rock dropped from 36% to 12% by volume, and a flotation plant was installed at the mine in 1936. Transportation of the mineral to the Ukraine was by ship from Murmansk to Odessa, where the product, powdered and somewhat concentrated due to the flotation process, was transported to a nearby superphosphate plant on Odessa's outskirts, or to the superphosphate works at Vinnitsa. At both plants, the old process of further refinement was divided into three parts: the rock crushing mill; the sulfuric acid treatment section; and the grinding mill, which reduced the treated phosphate gravel to powder. After the installation of the flotation plant at Apatity in 1936, the crushing and grinding mills at the Ukrainian plants were closed, and only the sulfuric acid treatment plants remained open to treat the powder. The final treatment of the flotation-processed phosphate yielded a superphosphate of unprecedented purity, running between 40% and 44%. The process was as follows: $Ca_3(PO_4)_2$ plus H_2SO_4 yields $CaH(PO_4)_2$ plus $CaSO_4$ which is dissolvable by water. The production of this superphosphate was made far simpler by the installation of the flotation plant near Murmansk, and production quotas were raised as a result. However, in spite of these advantages, phosphate remained in short supply in the Ukraine because the increased use of the mineral taxed the poor transportation facilities.

4. Potassium: The major supply for the Ukraine comes from a single mammoth deposit supposedly 700 feet deep and several miles square at Solikamsk on the Kama River. The potassium in this deposit is mixed with sodium, and several experiments were conducted in 1936 to determine whether the admixture was usable on crops without refining. Although the presence of NaCl in the mixture was not as strong as first suspected, it was soon determined that the product would have to be refined to increase its water solubility and ease of assimilation by the beet seedling. Consequently, a refinery was erected at the deposit site, and in 1933 refining of the original product (KCl-NaCl) with a 12% content of pure potassium chloride was begun. After refining, the yield was 40% pure potassium chloride with a high degree of water solubility. When applied to test plots of Ukrainian sugar beets, this excellent fertilizer always increased the yield between 18% and 20%.

5. Ammonium Sulfate: Ammonium sulfate is available in limited quantity, but until 1936 was derived only from the coal coking process as a by-product. The white crystalline powder from the coking process, still the major source, is 20%

nitrogen. In 1937, extensive efforts to combine ammonium sulfate with nitrogen hydroxide to economically form ammonium nitrate were successful. The characteristically heavy nitrogen content made this fertilizer especially popular and the demand was always great. I soon determined that ammonium nitrate was especially beneficial for the rapid restoration of the azobacterin content. It is also successful in revitalizing the minute quantities of borate and copper so necessary for effective maturity of the seedlings.

6. Nitrogen Fixation: Nitrogen fixation in the Soviet Union, other than from industrial coking processes, is virtually nonexistent. The great Dnepropetrovsk Dam was utilized totally for the production of electricity, and the consumption of kilowatts was limited to steel factories and other "essential" or war production. The dam supplied electricity for the steel, oil, and mine installations in the following cities: Krivoi Rog, Dneprodzerzhinsk, Nikopol, Zaporozhe, Melitopol, Mariupol, Dmitrevsk Stalinski, Stalino. [redacted] power lines from this dam were eventually extended to Rostov and Voroshilovgrad in the East, Kharkov to the North, and the Crimea to the South. However, even after these extensions, and the increase in kilowatt output of the dam, it never supplied the power for a nitrogen fixation plant. This is characteristic of Soviet inclinations to put war production first, regardless of the consequences. As an example, many villages close to the dam had no electricity.

In 1936, the coking process was found to yield 20% ammonium sulfate accompanied by a 30% release of nitrogen by volume, most of which was wasted. The Soviet scientist (fnu) Bereznika was the first to successfully and economically combine nitrogen and hydrogen into ammonium hydroxide, and then blend it with sulfuric acid to yield ammonium nitric acid, from which potassium nitrate and sodium nitrate were recoverable for commercial fertilization.

Pest Damage

7. Heterodera Schachti Schm (US-Nematode): Sugar beet production was so greatly affected by the nematode in 1936, 1937 and 1938 that every experiment station set up its own nematode laboratory following instructions from the Ministry of Food in Moscow to take drastic action. The laboratory scientists reported through their chiefs to the Director of the All-Union Sugar Institute, who relayed findings and corrective action reports to the Ministry in the capital. When several chemicals failed, a contact powder, acting on the stomach of the pest, known as chloripicium was employed with great success. Later, in extensively infected fields, a form of chlorine gas was discharged under intense pressure into freshly plowed ground. This practice was successful too, but very costly.

8. Dolgonosik (US-Snout beetle) (Latin - Bothynoderes Punctiventris): This pest, prevalent in the Dnepr Basin, is grey in color, three-quarters of an inch long with a very sharp and efficient proboscis. The creature destroyed a large part of the sugar beet crop for three years consecutively after collectivization. For two years the battle against it was out of control, in spite of almost daily threats and exhortations from the Director of the Institute, who was under continual fire from Moscow. The insect, with its rapier-sharp nose, can easily puncture a mature beet, but is partial toward attacking the young sprout a few weeks after the earth warms in the spring and after the seedling has sprouted. With amazing rapidity, the pest severs the root from the shoot, completely destroying the plant. The damage done by one insect is large, and when a horde attacks, the havoc wreaked is appalling. The best and most economical insecticide available to fight the beetle was Barium Chloride ($BaCl_2$), sprayed with excellent results from a horse-drawn rig over a wide area at moderate cost to the government. It is a contact powder and a stomach agent.

9. Lugovoj Motyljok (US-Butterfly larva) Sugar beet webworm (Latin - Loxostege Sticticalis): The larva, in the form of a webworm, attack the sugar beet crop sporadically, depending upon the previous year's crop of fertile butterflies, and their success at depositing eggs in the sugar beet fields under good weather circumstances which will assure a successful metamorphosis of the larva. Consequently, destruction is erratic, and often the larva do not attack the sugar beet so much as the winter wheat crop, which is maturing under the snow blanket coincidental with the larva maturity cycle. In 1936 and 1937, for example, the wheat crop, which was 90% "winter wheat," was greatly damaged by this pest. Entire wheat plots of vast acreage were turned black and made totally useless. The sugar beet crop was not so drastically harmed by the pest in those years. The best action against the pest is to break the ground thoroughly in the Fall before planting, thus destroying the deposited eggs. Some insecticides are also effective.

10. Zemljanaja Bloha (US-Earth flea) (Latin - Chrysomelidae Sub-family Halticini): This pest, though prevalent in the Ukraine, is not so harmful to the sugar beet as the above-mentioned ones.

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