JPRS 83429

9 May 1983

USSR Report

ECONOMIC AFFAIRS

No. 1052

EKO: ECONOMICS AND ORGANIZATION OF INDUSTRIAL PRODUCTION

No. 12, December 1982

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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10272
CSO: 1820/57

ECONOMIC INTERDEPENDENCE OF UNION REPUBLICS EXTOLLED

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[Article by Doctor of Economic Sciences, Prof A. G. Granberg of the Institute for the Economics and Organization of Industrial Production at the Siberian Division of the USSR Academy of Sciences in Novosibirsk: "Economic Cooperation between the Soviet Republics"]

[Text] In establishing the necessity for a state association of Soviet socialist republics, V. I. Lenin emphasized the importance of their close economic union. Only in this manner, he was convinced, was it possible to restore the destroyed production, ensure the prosperity of the workers and create a unified socialist economy which was managed under a general plan. [1]

The state union of the Soviet republics has withstood the test of time and provided convincing proof of its economic advisability. "From their own experience," states the Decree of the CPSU Central Committee "On the 60th Anniversary of the Formation of the USSR," "the peoples of the Soviet nation have been convinced that uniting into a single union multiplies their forces and accelerates socioeconomic development."

Figures show the economic might of the USSR. By the 60th jubilee, the national wealth of the country had reached 3 trillion rubles (without including the value of land, mineral wealth and forests) and exceeded 11,000 rubles per citizen. The annual product of material production has surpassed 1.05 trillion rubles. During the jubilee year, in 2 days as much national income is produced as in all of 1922, the year of the birth of the USSR.

Interrepublic Economic Ties: Essence and Forms

The formation of the USSR gave rise to new economic relations among which an important place is held by the **economic ties** between the Soviet socialist republics.

In the economic organization of the USSR, socialist federalism is combined with democratic centralism. Among the most important functions of the USSR in the form of the superior state bodies is the **"carrying out of a unified socioeconomic policy and leadership over the nation's economy"**(USSR Constitution, Article 73). At the same time, the Union

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[1] V. I. Lenin, PSS [Complete Collected Works], Vol 41, p 164.

republics possess broad economic independence and real means for solving their specific problems. Each Union republic is an economic complex with characteristic processes for the reproduction of the population and labor resources and for utilizing the natural conditions and previously created elements of national wealth. In accord with the USSR Constitution (Article 77) a Union republic "ensures comprehensive economic and social development over the entire territory." However, the comprehensive development of the republics has nothing in common with economic autarky. The effective activities of the economic complex in any Union republic is impossible without broad and diverse interrepublic ties.

Since the end of the 1960's, the concept of the **"unified national economic complex of the USSR"** has become a permanent part of the political and economic lexicon. Its essence has been described in the materials of the 24th, 25th and 26th Party Congresses and in Article 16 of the USSR Constitution.

The economic integration of the Soviet republics in a single national economic complex is caused by the development of **interrepublic economic ties and the nationwide infrastructure and economic organizational systems.**

The most important infrastructure systems of national significance are transportation, communications, power supply, material-technical supply and trade; the elements of interrepublic water supply are being formed. The economic organizational basis of the unified national economic complex in the USSR is formed by state administration and the national economic mechanism. Here the elements of this are monetary circulation, the formation and distribution of income, price formation, finances and credit and so forth.

The interrepublic economic ties develop in diverse forms. This includes the exchange of products from material production and scientific-technical information, the migration of the population and the training of personnel, trade, domestic and cultural services for the migrating population and production maintenance. Under the conditions of commodity-monetary relations, the material, physical, human and information flows are partially handled by interrepublic financial flows.

The interrepublic exchange of products between the industrial and agricultural sectors serves as a necessary condition and most important means in the territorial division of labor in the national economy.

The fuel, energy, mineral raw material, forest, water and soil resources are located very unevenly over the enormous territory of our nation. The republics and regions differ sharply in terms of climatic conditions, geographic position, the concentration and composition of the population and the presence of fixed capital. For this reason, the development in each republic of all basic types of production needed to satisfy local needs is practically excluded and the spectrum and scale of the economically effective production are greatly narrowed. For example, Latvia, Lithuania and Moldavia do not have explored industrial reserves of coal and oil and ferrous and nonferrous metal ores. Uzbekistan and Turkmenia show a lack of water and do not have forest resources of economic significance. The climatic conditions in the north of Siberia and the Far East impede human activity and do not make it possible to develop traditional agriculture.

On the other hand, modern production methods, products and resources are so diverse that each republic has constantly had various advantages in certain types of economic activities

on a scale going beyond its own requirements. Thus, the northern regions of Siberia possess definite reserves of oil and gas, nonferrous and precious metals. Turkmenia and Tajikistan have good conditions for raising cotton and other thermophilic crops. In Uzbekistan and Azerbaijan there are conditions for developing labor-intensive production in the manufacturing industry. The high technical level and skill composition of workers in Latvia and Estonia facilitate the development here of precision machine building and instrument building. Due to its climate and coastal position, Georgia can be developed as a national base for medical treatment and recreation.

The economic specialization of the repubilcs encourages bilateral interrepublic exchange of products and here the interrepublic ties are closely intertwined with the intersectorial ones. Interrepublic turnover (the total imports or exports in cost terms) comprises one-fifth of the gross industrial and agricultural product and has shown a tendency for more rapid growth in relation to the material production in the Union republics.

The interrepublic material and physical ties have a commodity form; however, their commodity nature does not give rise to those financial obligations which are characteristic for international relations. An imbalance in the total exports and imports (in current prices) means the redistribution of the national income (net product) created on the territory of the republics. The exceeding of the total exports over imports means that a portion of the national income created in the republic is transferred to other republics and vice versa. As a rule, national income is redistributed in favor of the republics producing less per capita national income.[2]

The interrepublic material and physical ties are also reflected in the relationships of the Union and republic budgets. The funds are redistributed through the budgets both directly and also by the turnover tax and the budget regulation of the difference between the ex-factory and payment prices (chiefly for agricultural raw materials). As is known, the budgets of the Central Asian republics, Kazakhstan and others for many years were covered from subsidies out of the Union budget. For example, in 1924-1925, the share of Turkmen income in its budget slightly exceeded 10 percent and in 1927 in the Tajik budget was 8 percent.

In the present-day economy, a special role is played by the **exchange of the results of scientific research, design and experimental design studies.** Previously, science and design activities were concentrated in Moscow, Leningrad and a small number of other centers while the interrepublic scientific and technical ties had basically a one-sided nature. The accelerated development of science in the new centers and the bringing of it closer to production substantially altered the geography of scientific and technical ties. Moscow, Leningrad and Kiev still hold the leading positions in scientific and technical progress (Moscow alone employs one-third of the nation's scientific workers). But the products from the scientific and design organizations in all the republics evermore intensely are going beyond the internal republic limits. The national territorial division of labor is penetrating more and more deeply into intellectual activities.

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[2] The ratio between produced and utilized national income for the Union republics is largely determined by the prices for the imported and exported products. Price formation in the USSR is not directly oriented at interrepublic "cost accounting." For this reason, the quantitative estimates for the redistribution of national income between the republics are rather arbitrary.

The major centers of the economy, culture and leisure satisfy the needs of the population from many of the Union republics for trade, cultural and medical services. The interrepublic migration of consumer demand has become a major element in the trade and monetary circulation of the USSR.

The interrepublic migration of the population and labor resources involving a change of permanent residence at first glance appears relatively small: approximately 2 percent per year of the nation's population. However, this is double the figure for the natural increase in the population and 5-fold more than the increase in labor resources.

The interrepublic migration of the population also plays a part in the training of specialists for the needs of the other republics. Such a form of interrepublic cooperation has played a key role in forming the national personnel of skilled workers, engineers and technicians in the Central Asian republics, Transcaucasia, Kazakhstan and Moldavia. However, at present its possibilities are not fully utilized. One of the reasons for the disproportions in satisfying the nation's demands for specialists in various areas, as L. I. Brezhnev has pointed out, has become the "manifestation of localism and the desire to place specialists in their own republic without fail, even not in their specialty, while in other regions there is a great shortage of workers in this specialty." In the nation the seasonal pendulum-like migration of the population has been growing rather rapidly and this is due chiefly to the development of the national tourist and recreational facilities and to a lesser degree to the interrepublic movement of the labor force (the rotating and expeditionary forms of labor to develop natural resources as well as seasonal construction and agricultural work).

The present-day demographic situation in the USSR and its evolution demand increased processes of the interrepublic movement of the population and labor resources. Over the last 20-30 years, the territorial differentiation in the growth rates of the population has strengthened. While in the RSFSR the annual increase in the population now equals 0.5-0.6 percent, in the Central Asian republics it is 2.5-3 percent. By the end of the century, three-quarters of the national increase in the working age population will come from Central Asia, Kazakhstan and Azerbaijan, that is, republics which even now possess manpower reserves. At the same time, the labor shortage will become greater in a majority of the Western and Central regions of the nation, and particularly in Siberia and the Far East.

Even a partial utilization of the surplus demographic potential in the southern republics for replenishing labor resources primarily in the eastern regions of the RSFSR would provide a significant economic and social effect. Such a task was posed in the Accountability Report of the CPSU Central Committee at the 26th Party Congress: "Carrying out the program for the development of Western Siberia, the zone of the BAM [Baykal-Amur Mainline] and other places in the Asian part of the nation would increase the influx of population there. Yet people still often prefer to move from the north to the south and from the east to the west, although the rational movement of the productive forces requires a migration in the reverse directions.... In Central Asia and in a number of regions of the Caucasus, conversely, there is a manpower surplus, particularly in the countryside. Hence, the population of these places must be more actively involved in developing the new territories of the nation." The necessity of this task was further outlined in the speech of L. I. Brezhnev in Tashkent: "It is no secret that the republic still has surplus manpower.... A shortage of manpower is felt with particular acuteness in those regions of Western Siberia and the Far East, where the main fuel and energy base is being formed and large industrial centers are being set up.... For this reason it is essential in every possible way to support the desire of the youth in your republic to take a personal part in the major

construction projects of our age.... This, comrades, is a remarkable school for civic international indoctrination."

The cooperation of the Soviet republics is clearly apparent in the carrying out **major national economic problems** requiring the concentration of resources. Among such problems one might mention the plowing up of the virgin lands in Kazakhstan, the development of the Russian Nonchernozem area, the construction of the BAM and the creation of the territorial-production complexes [TPK] in Siberia and the Far East. Along with the regular forms of interrepublic ties, here they have widely practiced the attracting of large production collectives from many republics.

Thus, the exploitation of the oil and gas deposits in Western Siberia has involved more than 30,000 drillers and oil field workers from the Ukraine, Belorussia, the Northern Caucasus, the Volga Area and other regions of the RSFSR. They have flown here as part of the rotating watch brigades. The construction organizations of Moscow, Leningrad, the Ukraine, Belorussia, Lithuania, Latvia, Estonia and a number of RSFSR cities have participated in creating the Western Siberian oil and gas complex. Each year, they complete over 0.5 million m^2 of housing and many production projects. Organizations of Kazakhstan, Latvia and Uzbekistan are building roads here. Obviously in the future as well, this form of economic cooperation between the republics will be employed in the major regional national programs.

Thus, diverse forms of interrepublic economic ties are developing intensely in the USSR. But is it possible to integrate these forms or correlate their impact on the economy of the individual republics and the national economy as a whole?

The concept of "interrepublic economic interaction" (the interaction of the republic economic complexes) corresponds to a higher, system-based level of analyzing the interdependence and intercausality of republic development. The essence of the approach is to study not only the **individual** ties (in their specific form) between the **individual** regions (deliveries of a certain type of product or the migration flow between two republics) and their immediate influence, but also the **aggregate** of the ties (as wide as possible) and their **combined** effect on all the essential characteristics of **all** the republic economic complexes. We feel that such a task can be carried out only by using structural mathematical national economic models which reflect the development conditions of the republics and the economic ties between them.

The Role of Interrepublic Material and Physical Ties in the Republic Economy

Each Union republic participates in the interrepublic exchange of products from many industrial and agricultural sectors. However, the dependence of the economy in one or another republic upon its external ties is far from uniform. One can trace a close correlation in the intensity of the republic's external ties and the area of its territory. Quite understandably, the economy of the RSFSR which occupies 76 percent of the nation's territory with the most diverse natural and economic conditions can have a more self-contained nature than the economies of the small-sized republics (Moldavia, Armenia or Estonia) which do not have objective possibilities for the efficient development of many production sectors. [3]

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[3] The coefficient for the rank correlation between republic territory and the share of exports in the total production volume is around 0.8 (the maximum value of the coefficient equals 1).

In the Union republics, with the exception of the RSFSR, the Ukraine and Kazakhstan, the share of exports in the industrial and agricultural product is over 25 percent while the share of imports exceeds 30 percent of the total volume of industrial and agricultural product consumed on the republic's territory (see Table 1).

Table 1

Exports and Imports of Industrial and Agricultural Products by Union Republics, %

Republics	Ratio of Exports to Production	Ratio of Imports to Internal Republic Consumption
Ukraine	17	17
Belorussia	32	32
Uzbekistan	25	30
Kazakhstan	14	24
Georgia	33	36
Azerbaijan	37	35
Lithuania	28	32
Moldavia	29	31
Tajikistan	30	35
Turkmenia	37	38
Estonia	30	31

Note: Here and below, exports include foreign exports and imports include foreign imports. All measurements are given in the end consumption prices, that is, considering the turnover tax, the trade and transport surcharges and so forth.

The creation of a modern diversified economy in each republic and the bringing of the economic development levels of the republics closer together have not been accompanied by a unifying of economic structures. On the contrary, there has been a prevailing trend toward the deepening of specialization.

Over the last decade, the interrepublic turnover as a whole has risen more rapidly than production. Its share (separately for exports and imports) has increased by one percentage point. The share of exports has risen for 9 republics and the share of imports for 10. The share of interrepublic turnover in gross social product has increased particularly in Turkmenia (from 24 to 34 percent for exports and from 30 to 35 percent for imports), Belorussia (from 25 to 33 percent and from 25 to 32 percent) as well as in Azerbaijan and Georgia. The relative values of interrepublic turnover have declined somewhat in the Uzbek, Kazakh, Tajik and Kirgiz republics. This has largely been due to the tightening up of the fuel base, the creation of production for processing local raw materials and internnal republic cooperation in machine building and metalworking.

The modern physical structure of the interrepublic ties is extremely diverse and this is characteristic for all the Union republics without exception. **As a result of the fundamental transformations in the economy of the former national borderlands, the one-sided dividing of the republics into agrarian-raw material and industrial has been eliminated;**

the greater complexity of the production structures necessitates extensive and diverse interrepublic ties. Let us take the Georgian SSR.

Presently it ships out to the other republics and delivers for foreign exports manganese ores and ferroalloys, steel pipe, rolled steel, production equipment for the food industry, electric locomotives and battery-operated plant trucks, metal cutting machines, welding equipment, electrical engineering products and instruments, mined chemical raw materials, synthetic materials, volatile oils, food industry products, canned goods, wine and tobacco goods, tea, citrus and so forth.

According to the data of the republic intersectorial balances, Kazakhstan uses products from 96 sectors of the other republics; Kazakhstan delivers products to 74 sectors of the economy in other republics. Moldavia receives products from 93 sectors and delivers products from 72 sectors to other republics. The deliveries to Georgia are made by 100 sectors of all the Union republics while 82 sectors from the USSR republics receive products from Georgia.

The data of Table 2 show the broad participation of the republics in the national division of labor and their close interdependence. Even broken down for the large industrial sectors, the volumes of product produced and consumed on the republic territory differ substantially. For example, the consumption of ferrous metallurgy products exceeds internal production in Belorussia by 4.5-fold, by 4-fold in Lithuania and by 9-fold in Kirgizia; for the fuel industry it is by 3.2-fold in Lithuania and 7.7-fold in Latvia. Conversely, Belorussia produces 26 percent more machine building products than it consumes and for Armenia the figure is 28 percent. It is fundamentally important that **each Union republic has a positive balance of interrepublic exchange** (net exports) for the various aggregated industrial and agricultural sectors.

It is essential to bear in mind that the data for the consolidated sectors greatly smooth over the real relationships in the regional volumes of product production and consumption. Overlooked is the internal sectorial turnover of product which is of particularly great importance in machine building, the chemical and light industries. Analysis for the detailed sectors and particularly for the individual product types shows rather greater differences in production and consumption.

A comparison of Tables 2 and 3 indicates that for the consolidated sectors, the exports and imports to a significant degree cancel themselves out and this creates an illusion of the relative self-containment of the republic balances for the production and consumption of products. But in actuality this is not the case. As a rule, various types of products within the sectorial groups are involved in the reciprocal exchange. For example, for Kazakhstan the production and consumption of products from the fuel industry differs by just 3 percent, however Kazakhstan ships out 40 percent of the fuel industry products and ships in 37 percent (basically refinery products). In Kirgizia, the "net" importing of machine building and metalworking products equals just 5 percent of the consumption volume, but Kirgizia ships out 53 percent of the sector's product and imports are 58 percent of the production volume. With the exception of Kazakhstan, all the republics ship out more than 50 percent of their machine building products; the republics ship in more than one-third of the consumed light industry product, regardless of the scale of their own production. A significant portion of the shipped-in products is irreplaceable, that is, it cannot be replaced by existing internal production (the so-called "irreplaceable" imports).

Table 2

Ratio of Internal Production to Consumption of Product on Republic Territory, %

Sectors \ Republics	Belorussia	Kazakhstan	Georgia	Lithuania	Latvia	Kirgizia	Armenia
Ferrous metallurgy	22	75	105	25	34	11	16
Fuel	87	103	75	31	13	37	15
Machine building and metalworking	126	64	76	103	116	95	128
Chemical	108	77	59	103	88	19	124
Lumber	99	67	70	60	105	56	52
Light	105	77	102	107	112	104	114
Food	100	90	125	107	113	99	97
Agriculture	95	107	97	96	90	97	96

Table 3

Ratio of Product Exports and Imports to Production Volumes, % (a—Exports, b—Imports)

Sectors \ Republics	Belorussia		Kazakhstan		Latvia		Kirgizia		Armenia	
	a	b	a	b	a	b	a	b	a	b
Ferrous metallurgy	36	389	6	39	67	257	54	902	14	551
Fuel	57	72	40	37	26	675	55	222	1	566
Machine building and metalworking	62	41	5	63	66	53	53	58	59	37
Chemical	77	69	28	57	72	86	29	452	60	41
Lumber	30	31	4	54	32	26	5	82	3	95
Food	20	20	9	20	29	18	22	21	23	26
Light	39	34	16	45	41	30	41	37	46	33
Agriculture	3	8	9	2	2	13	3	5	3	7

The eye is struck by the too humble position of agriculture in the system of interrepublic ties. The imbalances between the production and consumption of agricultural product for the republics themselves (see Tables 2, 3) are limited to just 3-7 percent. Here also the shares of exported product are relatively slight. How is this explained? A large portion of the produced agricultural raw materials is processed within the republic (feed, livestock on the hoof, milk and industrial crops) and is exported in the form of light and food industry products. The population supplies itself with fresh vegetables and potatoes largely by republic production; the products of the private subsidiary farms are also basically consumed within the republic. Such subsectors as the market production of fresh fruits, grapes and thermophilic vegetables as yet have not come to hold a noticeable place in the structure of the gross agricultural product of the USSR.

In a majority of the republics, **machine building and metalworking** plays a leading role in interrepublic turnover. Its share in the exports of the RSFSR, the Ukraine, Belorussia, Lithuania, Kirgizia and Armenia exceed 30 percent (the share in the imports for all the republics is 20-30 percent). In the practices of international trade, such a share of machine building in exports is considered an indication of a high level for a nation's industrial development. The fact that the one-time most backward borderlands of Tsarist Russia are becoming suppliers of products from the advanced machine building sectors is one of the major accomplishments in the economic and political union of the Soviet republics. For example, in Kirgizia the exports of machine building products has reached 35 percent of total exports; Uzbekistan exports products from 26 subsectors of machine building out of 33 according to the classification of the intersectorial balance, including for more than 10 million rubles for 11 items (materials handling equipment, electrical engineering products, chemical and oil equipment, tractors and agricultural machinery, radio electronics and so forth).

The share of the three sectors of machine building, the light and food industries is responsible, as a rule, for 65-80 percent of the republic turnover. The exceptions are Kazakhstan (with high shares for the exporting of fuel and agricultural products), the Ukraine (high exports of ferrous metallurgical products), the RSFSR and Azerbaijan (the exporting of fuel). In none of the republics does the exporting of unprocessed industrial and agricultural products hold a leading place. The highest amount of ferrous metallurgical products is exported by the Ukraine (18 percent), fuel industry products by Azerbaijan (20 percent), machine building and chemical industry products by Belorussia (38 and 15 percent), light industry by Tajikistan (59 percent), the food industry by Georgia (33 percent) and agriculture by Kazakhstan (16 percent).

The dynamics of interrepublic trade is shaped under the impact of numerous factors. One of them helps to increase specialization (the use of favorable natural opportunities and the advantage of production concentration) and, consequently, to accelerate the growth of interrepublic turnover. Others, on the contrary, contribute to the diversification of the regional economic complexes and to the development of production oriented at the local market (the savings in transport expenditures, dependability of supply, conglomeration effects, the utilization of local resources with their general scarcity and so forth).

The growing diversification in the supply of the republics with fuel, energy, mineral raw material and lumber resources has led to an increased flow of extracting sector products primarily from the RSFSR. A more rapid growth of interrepublic exchange in comparison with production will obviously continue in machine building and in certain sectors of the B group (due to the advantage of the increased scale of production and specialization and the demands for the diversification of commodities). As for the processing of natural raw

materials, here factors operating in different directions are at work and it is more difficult to predict dependably the dynamics of the interrepublic division of labor. The Food Program adopted by the May (1982) Plenum of the CPSU Central Committee envisages the development of nationally important bases for producing high-quality grain, groat crops, meat, fruits, vegetables, grapes and, consequently, an increase in the interrepublic deliveries of the corresponding food products. The population's demand for potatoes, late vegetables, dairy products and eggs would basically be satisfied from regional production.

The data on exports and imports, in comparison with the volume of production and consumption for the production sectors characterize only the direct influence of the external ties on the formation and distribution of the republic resources of certain product types and, correspondingly, only the direct involvement of the republic sectors in the Union-wide division of labor. The limiting of analysis to just these data means to ignore the intersectorial relationships which arise as a consequence of the interrepublic exchange of products from the various sectors.

Let us assume that a republic has experienced a shortage of electric power and there are no possibilities of substantially increasing internal production in the immediate future. The rationalizing of the republic's external economic ties is one of the ways for overcoming or mitigating the shortage of power supply. It is simplest to seek a solution in increasing the importing of electric power or reducing its transmission to the other republ ics. However, a solution is not unfailingly the best one. Moreover, it can be completely unrealistic, for example, due to the limited capacity of the power transmission lines from the other republics. The solving of the question must be approached more widely, in analyzing the structure of interrepublic exchange for reducing the indirect exporting of electric power by limiting the exporting of energy-intensive products or, conversely, for increasing its indirect importing by importing products of power-consuming production. Certainly the indirect interrepublic exchange of electric power surpasses its direct transmission by scores and even hundreds of times and this makes it possible to maneuver the electric balances of the republics in rather wide limits.

A step toward a systems analysis of interrepublic interactions is the calculating of the indicators of **"full exports"** and **"full imports."** Because of these there is a possibility of studying the impact of the aggregate of a republic's external material ties on all the most important characteristics of the republic economic complex.

The full export of one or another product (for example, metal) equals the volume of its production in the republic as needed to cover the direct exporting of products from all the sectors which directly or indirectly consume this product (in the given example, machine building, construction and so forth). Conversely, the full imports characterize the possible reduction in the production of the corresponding product in the republic due to the direct importing of the products of all its sectors. The calculations for the full export (import) are made for the models of the intersectorial balance.

The full export and import in the republics greatly exceed the corresponding amounts of the direct exports and imports. For example, the full export of fuel from Latvia is 23-fold more than the direct, for the chemical industry products from Georgia it is 3.2-fold more while the full export of lumber products from Armenia surpasses the direct export by 25-fold. A significant exceeding of the full export over the direct is also characteristic for agricultural products: by 21-fold in Latvia, by 40-fold in Lithuania and by 14-fold in Kirgizia. This confirms the conclusion of the predominantly indirect participation of agriculture in interrepublic exchange (chiefly through the delivery of food and light industry products produced from agricultural raw materials).

The ratio of the full export (import) to the direct for all products of material production varies for the republics within an interval of 2.2-2.5. This ratio is greater the higher the share of the product from the end stages of social production (machine building, the light and food industries) in the interrepublic exchange. If the republics have exchanged only primary resources, then the ratio of the full export (import) to the direct would approach one.

In the aim of saving in transport expenditures it is obviously preferable to exchange fully processed products (with a higher value per unit of weight) and not ship raw coal and ores, lumber, chemical raw materials and so forth. For this reason the coefficients for the exceeding of full exports (imports) over the direct ones and their dynamcis serve as a sort of indicator for the rationality of the physical structure of interrepublic exchange. According to calculations, there is characteristic for a majority of the Union republics a rational displacement in the structure of exchange from the viewpoint of the ratio of the extracting and manufacturing sectors in comparison with the structure of the product produced and exchanged within the republic.

The full export in the Union republics (with the exception of the RSFSR, the Ukraine and Kazakhstan) exceeds one-half of the gross social product, and in Latvia reaches 77 percent (see Table 4). Over the last decade, these shares have increased for 11 republics and this is one of the main indications of the growing economic interdependence of the Soviet republics. The share of full imports exceeds one-half the consumed gross social product in 12 republics, and in a majority of them surpasses two-thirds. Moreover, if one subtracts from gross social product the construction product which is not part of either the direct or the indirect interrepublic exchange (in accord with the method for constructing the intersectorial balances), the shares of the full export and import in the produced and consumed product will rise by another 5-8 percentage points.

Table 4

Shares of Full Exports and Imports of Product in Gross Social Product (GSP), %

Republics	Full Exports to Production of GSP	Full Imports to Consumption of GSP
Ukraine	36	36
Belorussia	64	64
Kazakhstan	25	47
Georgia	64	67
Azerbaijan	72	73
Lithuania	61	66
Latvia	77	74
Kirgizia	52	64
Tajikistan	53	65

For a number of sectors (ferrous and nonferrous metallurgy, the fuel and chemical industries and so forth) in a majority of the republics the full exports exceed the production volumes and this is explained primarily by the indirect exporting of the product from the consuming sectors. For example, the indirect exporting of ferrous metals is a consequence

primarily of the direct exporting of machine building products. For these same sectors, the full imports in many republics significantly exceed the internal republic consumption.

The calculations for the full exporting and importing thus show a much higher interrepublic interdependence in the production and consumption of the products from the sectors than could be observed from the data on the direct interrepublic turnover. The development of interrepublic exchange in the future will be carried out against the background of the deepening sectorial division of labor and the complicating of the intersectorial ties.

For this reason, it is essential to have more advanced tools for analyzing and planning the interrepublic ties which increase the efficiency of the national economic complex.

The Economic Interaction of the RSFSR with the Union Republics

"The RSFSR has played the decisive role in creating a unified state and all the Soviet republics have rallied around it on a voluntary basis," states the Decree of the CPSU Central Committee on the 60th Anniversary of the Formation of the USSR.

The RSFSR is the first republic among equals; it plays the leading role in the single national economic complex. Russia has approximately 60 percent of the Union economic potential and for a number of the most important sectors, particularly for heavy industry, makes a decisive contribution to national production. Thus, in 1980, the RSFSR produced 62 percent of all the nation's electric power, 91 percent of all the oil, 55 percent of the coal, 58 percent of the rolled ferrous metals, 53 percent of the chemical fiber, 86 percent of the motor vehicles, 54 percent of the agricultural machinery, 92 percent of the wood, 67 percent of the textiles, 53 percent of the TV sets and 61 percent of the whole milk products.

Due to its territorial scale, the RSFSR economy covers from its own production a much larger portion of its demand in comparison with the other Union republics. At the end of the 1970's, the exporting of products (including foreign exports) was approximately 9 percent of the produced gross social product of the RSFSR while the importing of products (including foreign imports) exceeded 11 percent of the gross social product consumed on RSFSR territory.

In the sectorial structure of the exports from the RSFSR to the other Union republics, a key place is held by the heavy industry products of machine building and metalworking, the fuel, chemical and lumber industries. Up to one-fifth of the products from these sectors is shipped out. In the import structure of the RSFSR, more than one-half (in value terms) is made up of products from three sectors: light and food industry and agriculture. According to calculations on the basis of the 1972 intersectorial balance, the share of means of production exported from the RSFSR was 70 percent and the share of consumer goods some 30 percent; in imports the means of production were approximately 60 percent and consumer goods 40 percent. [4]

Thus, a characteristic feature of the interaction of the RSFSR with the economic complexes of the other republics is the exporting of the means of production in exchange for consumer goods.

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[4] See P. Gushvin and V. Luk'yanov, "The Production and Distribution Balance of RSFSR Products," VESTNIK STATISTIKI, No 5, 1976.

Let us emphasize that even the comparatively shall share of exports of products from the RSFSR is of very important economic significance for the other Union republics. Some 6 percent of the RSFSR exports goes to Uzbekistan, however for Uzbekistan, this is more than 45 percent of the total imports. In the territorial structure of Uzbek imports, the share of the RSFSR for oil products is 63 percent, for synthetic resins and plastics 96 percent, for motor vehicles over 80 percent, for tractors and agricultural machines 66 percent, for wood almost 100 percent, for fish and fish products 60 percent and so forth.

According to calculations, at the end of the 1970's the full export of products from the RSFSR surpassed the volume of direct imports (in end consumption prices) by 2.3-fold and reached (including foreign exports) 20-22 percent of the RSFSR produced gross social product. The full importing of products into the republic exceeded the direct importing by 2.4-fold and was (including overseas imports) 27-29 percent of the gross social product consumed on RSFSR territory.

Considering not only the direct, but also the indirect ties, the RSFSR has a positive balance of interrepublic exchange for products of the fuel industry, electric power, nonferrous metallurgy, the lumber industry and the building materials industry. In particular, the balance of fuel exports and imports is around 15 percent of the production volume and for lumber products 20 percent. Full imports exceed imports for ferrous metallurgy and particularly strongly for the light and food industries and for agriculture.

A predominant portion of the existing fixed productive capital and employed labor resources does not participate directly in republic exchange. However, these resources are consumed in producing the exported product (or their savings is achieved as a consequence of the importing of products, as the republic is "freed" from their production). Thus, the republics can indirectly "exchange" the fixed productive capital and manpower.

The intersectorial analysis made by the Institute for the Economics and Organization of Industrial Production under the Siberian Division of the USSR Academy of Sciences disclosed an important and permanent trend in the economic relationships between the Union republics. This is that the RSFSR indirectly "exports" fixed productive capital and indirectly attracts labor resources. Thus, in 1972, 0.3 billion rubles of fixed capital was indirectly sent out of the RSFSR and 0.8 million annual workers were indirectly attracted. In subsequent years, as a result of the increased scale and change in the structure of the interrepublic exchange, the indirect exporting of fixed productive capital from the RSFSR has significantly strengthened and, in our estimate, has exceeded 3 billion rubles. As is known, in a majority of the regions of the RSFSR, as a consequence of demographic shifts, the tautness of the manpower balances has increased. For this reason, particular significance is assumed by a structural reorganization in the economic ties of the RSFSR which would contribute to a relative reduction in the demand for manpower. In this sphere of interrepublic relations, there are numerous unused reserves.

For analyzing the development of the RSFSR as part of the unified national economic complex, the Institute for the Economics and Organization of Industrial Production under the Siberian Division of the USSR Academy of Sciences has employed several modifications of the intersectorial national economic models. The nation's territory has been broken up into two zones: the RSFSR and the other Union republics. Calculations for the bizonal models substantially deepen the understanding of the mechanisms of interrepublic and intersectorial interactions. Table 5 gives the results of the calculations for one of the models of the bizonal intersectorial balance for the USSR in 1972. These show the reciprocal participation of the republics in the end use of product for consumption and accumulation.

Table 5

Redistribution of Resources between the RSFSR and Other Union Republics for End Product Utilization, Percent of Volume of Resources in Supplier Zone

	Full Expenditures on Used End Product	Including	
		For Nonproduction Consumption Fund	For Accumulation Fund
RSFSR for other Union republics			
Gross product	12.0	7.2	2.5
Labor resources	10.2	6.2	2.1
Fixed capital	13.1	6.9	3.0
Other Union republics for RSFSR			
Gross product	19.1	14.4	2.7
Labor resources	16.7	13.6	1.9
Fixed capital	20.1	13.7	3.3

In the Soviet national economy, an unique functional division of labor has formed and is growing stronger. The RSFSR carries a significant load for forming the accumulation fund in all the other Union republics while the remainder send significant resources to supply the RSFSR consumption fund. The territorial division of labor contributes to the saving of labor resources on RSFSR territory, but increases the republic's demand for fixed productive capital. The analysis has made it possible to conclude that there is an ongoing deepening of specialization between the two economic zones of the nation, the intensifying of the direct and indirect interzonal ties and the growth of interdependence and reciprocal complementariness of the economic complexes in the RSFSR and the other Union republics.

The state unity of the equal Soviet republics based on public ownership of the means of production provides fundamental advantages in comparison with the other forms of economic cooperation between nations and regions. "The merging of the economic opportunities and resources of all the republics," said Comrade L. I. Brezhnev in the report on the 50th anniversary of the USSR, "accelerates the development of each of them, both the smallest and the largest. Nation-wide management and planning have provided an opportunity to rationally approach the placement of the productive forces, they have provided a freedom of economic maneuvering and have made it possible to deepen cooperation and specialization whereby the overall gain greatly exceeds the simple arithmetical total of the components, that is, the efforts of each republic, region and oblast."

The economic effect from the interaction of the Soviet republics creates an universal economic interest in close cooperation and a fundamental basis for reconciling the national and republic socioeconomic interests.

Due to Lenin's nationality policy, the Soviet Union in an historically short period of time has been able to eliminate the backwardness of the former national borderlands of Tsarist Russia and to bring the nations and nationalities to socialist forms of management

on a modern scientific and technical base. Each Soviet republic is now a developed economic complex with a diversified production structure, a service sphere and an unique culture.

At the present stage, it is particularly important to more fully utilize the advantages of the national division of labor and interrepublic cooperation for increasing the might and effectiveness of the unified national economic complex. "To carry out all the economic and social tasks primarily from a common state position and to fight against any manifestations of localism and a departmental approach," states the Decree of the CPSU Central Committee on the 60th Anniversary of the USSR, "this is an indispensable demand in a truly party and internationalist approach to the matter."

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CSO: 1820/57

ECONOMIC GROWTH, ATTENDANT PROBLEMS OF UKRAINIAN SSR CHRONICLED

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 38-55

[Article by Doctor of Economic Sciences V. N. Kal'chenko, deputy chairman of the Ukrainian Council for the Study of the Productive Forces, and Doctor of Economic Sciences Yu. M. Kanygin, laboratory chief at the Sibernetics Institute of the Ukrainian Academy of Sciences in Kiev: "In a Free, New Family..."]

[Text] On the eve of celebrating the 60th anniversary of the USSR, one involuntarily looks back and sees how difficult the path of the Ukrainian people was during these decades. Twice over such a short historical period it had to start over and raise the towns and villages up out of ruins.

The Beginning--Complete Chaos

After the Civil War, the republic economy was in a catastrophic state. In 1919, iron production was 0.9 percent of the 1913 level, while for steel the figure was 3.8 percent and rolled products 3.7 percent. The mining of iron ore had virtually ceased. The light and food industry enterprises were destroyed. Sugar output by the start of 1919 had declined by 4-fold. The disruption of transport had caused great losses. In January 1919, there were 165 steam locomotives and 8,000 railway cars in operation (in comparison with 2,500 and 40,000 during the last months of 1918).

Agriculture was also living through a difficult time. As a result of the drought and crop failures in 1920-1921, the overall grain harvest had declined by 4-fold. The economic ties between city and countryside were broken and speculation reached an unprecedented scope.

Inflation increased continuously. For example, a 100,000-ruble note in terms of its value on 1 October 1922 equaled a prewar kopeck.

In 1919, V. I. Lenin wrote: "The Germans devastated the Ukraine to such a degree that there is...complete chaos there. The worst times when we were sitting in Smol'nyy during the first weeks after the October Revolution and were fighting against the chaos are nothing in comparison with those difficulties which the Ukraine is presently living through."[1]

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[1] V. I. Lenin, PSS, Vol 38, pp 68-69.

The devastation was particularly bad in the Donets Basin and the Dnepr Area, the basic fuel and metallurgical source for Russia. In the Donets Basin hundreds of mines had been flooded, only one of the 48 blast furnaces was in operation and coal mining had declined to 6 percent of the prewar level.

The First Countersteps

The incorporation of the Ukraine as part of the USSR was a logical conclusion to the cooperation and mutual aid, primarily in the military and economic areas, which had been established between the workers of the RSFSR and the Ukraine from the first days of Soviet power. Thus, over the period from 13 December 1918 through 8 April 1919, Russia had sent the Ukraine a large amount of industrial goods including 65 trainloads of kerosene, 40 trainloads of oil, 61 trainloads of mazut, 5 million rubles worth of machine tools, 12 million rubles worth of lumber, 21,000 poods of nonferrous metals, 1,500 sheaf-binders, 2 railway cars of spare parts for agricultural machinery, 1.5 million arshins [a linear measure of 28 inches] of cotton textiles and so forth.

In turn, the Ukraine shared what it could with the neighboring fraternal peoples. This can be seen, in particular, from the numerous instances of its food aid to the working class of Soviet Russia. In April and May 1919 alone, 20.3 million poods of food were sent from the Ukraine.

This was also confirmed by the statement of V. I. Lenin that "we now have a Soviet Ukraine. And the Soviet government in the Ukraine in terms of us, when the question of grain arises, sets the price not like a merchant, not like a speculator or a peasant who might say: 'A hungry person will give a thousand for a pood, I couldn't care less for the state monopoly, my only concern is to profit, and if the people go hungry all the better as they will pay more.' The Ukrainian government has said: 'The primary task is to help the hungry north. The Ukraine cannot survive if the hunger-plagued north cannot survive; the Ukraine will last and certainly be victorious if it helps the hungry north'."[2]

On 25 March 1919, the Higher Council of the National Economy [VSNKh] signed an agreement for carrying out a uniform economic policy on the territory of the two fraternal republics. The agreement envisaged the pooling of the commodity stocks of the RSFSR and the Ukraine and their common distribution through a special VSNKh commission, the setting of a unified production plan and uniform prices for the raw materials and a common solution to the questions of nationalizing the enterprises and organizing production.

Economic assistance was provided to the Ukraine for developing the coal, metallurgical, chemical and food industries. In the first quarter of 1919, the RSFSR Council of the National Economy allocated 500 million rubles for financing Ukrainian industry, 800 million rubles for rebuilding rail transport and 150 million rubles for purchasing sugar.

The RSFSR VTsIK [All-Russian Central Executive Committee], the SNK [Council of People's Commissars] and STO [Labor and Defense Council] at their sessions constantly discussed the questions of providing aid to the Ukraine. On 8 February 1919, the RSFSR SNK received a telegram with the following content: "The Provisional Worker-Peasant Government of the Ukraine has ruled to request a loan of a billion rubles from the Russian

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[2] V. I. Lenin, PSS, Vol 38, p 68.

Soviet government. We urgently request an advance against the future loan to be forwarded." The request of the Ukrainian government was granted. The economic support for the Ukraine assumed a large scale and from 12 February through 1 May 1919 alone, some 1,675,000,000 rubles were provided.

During that difficult period for the republic the aid provided to it by the RSFSR was of crucial importance. The RSFSR government financed a large number of Ukrainian enterprises and cultural institutions, it granted large loans and provided constant support in literally everything. In June 1919, in the aims of economic cooperation, the strengthening of defense and the ongoing reconstruction of the national economy, the republics signed an agreement on centralizing the commissariats of military affairs, food, labor and social security, railroads, post, telegraph, roads and finances.

Of important significance in developing fraternal cooperation was the Union Worker-Peasant Treaty between the RSFSR and the Ukraine signed in Moscow on 28 December 1920. It marked a new stage in the relationships between the two equal republics both in the military area as well as in economic activities. Article 1 of the Treaty stated that the RSFSR and the Ukraine were to enter a military and economic union.

The Prewar Upsurge

The formation of the USSR made it possible for the Ukraine even in a few years to emerge from an extended economic crisis and attain great successes in the development of the economy. In terms of its economic potential and role in socialist industrialization, the Ukraine held second place after the RSFSR.

Here was a major base of the coal, metallurgical and other heavy industry sectors. The industrialization of the nation demanded a high rate of their development as many enterprises and construction projects had assumed national significance. Flowing here in a continuous stream were machine tools, electrical equipment and instruments from the cities of the RSFSR, oil products from the Transcaucasian republics, lumber from Belorussia and agricultural raw materials from the Central Asian republics. The following figures are eloquent: in 1925-1929 alone, around 2 billion rubles were invested in the Ukrainian economy, or over 50 percent of the Union-wide total of capital investments into heavy industry. The construction of Dneproges, the new construction projects of the Donets Basin, the creation of the Kharkov Tractor Plant, Zaporozhstal' [Zaporozhye Steel], Azovstal' [Azov Steel], the Novokramatorsk Machine Building Plant and many other pioneers of socialist industry have gone down in history as vivid proof of the advantages of socialist labor cooperation.

In 1940, the gross product of Ukrainian industry had increased by more than 7-fold in comparison with 1913 and for machine building products by 29-fold. Mechanization had increased sharply, particularly in heavy jobs in such industrial sectors as the coal and metallurgical industries. Profound changes had also occurred in the sectorial production structure. While in 1928 there was a predominance of consumer goods production (58 percent of all product), in 1940, the leading place was held by the production of the means of production (62 percent). The Soviet Ukraine had become a powerful industrial-agrarian republic. In terms of the development level of heavy industry it had caught up with a number of Western European nations.

The successes of the Soviet Ukraine in the prewar period became possible due to the unbreakable ties of its economy with the economy of the other republics. Developing historically, these ties under the conditions of the USSR obtained the best conditions for

their development. The Ukraine, in turn, being the most important coal, metallurgical and food center of the nation, played a major role in the industrial growth of the other republics and regions. The involvement of the republic's workers assumed particular intensity in the forming of the second coal and metallurgical center in the east of the nation. On the question of the party's decision to create this, the secretary of the Central Committee of the KP(b)U [Communist Party (Bolshevik) of the Ukraine], S. V. Kosior, stated at the 11th KP(b)U Congress: "Our Ukrainian party organization has never approached such major questions from a localist viewpoint, but has always been able to rise to the heights of nation-wide, all-proletarian tasks.... It is clear how important it is to create a second coal and metallurgical center in the East of the USSR. We on our part, should help in every possible way in carrying this party decision out."

Around 30 plants from Kharkov, Odessa, Dnepropetrovsk, Zaporozhye and other Ukrainian cities worked in fulfilling the honorable orders for Magnitostroy [Magnitogorsk Construction] and Kuznetskstroy [Kuznetsk Basin Construction]. Ukrainian workers also played a major role in creating the nation's third coal center in Kazakhstan. In particular, in 1931, Donets miners assumed sponsorship of the Karaganda construction projects.

Resurrected from the Ashes

The losses of the Ukrainian economy during the years of the Great Patriotic War have been at 285 billion rubles (in 1941 state prices). This amount includes only the losses from the direct destruction of property. In the Ukraine the Nazi troops destroyed 16,150 industrial enterprises including hundreds of coal mines and machine building plants, all the metallurgical plants and power plants. The enemy put out of operation 10 main railroads and destroyed around 6,000 railroad bridges and 1,786 terminals and stations. Some 714 towns were wiped from the face of the earth, over 28,000 villages and hamlets and 10 million persons were left homeless.

On 21 August 1943, the Central Committee of the VKP(b) [All-Union Communist Party (Bolshevik)] and the USSR SNK adopted a decree on immediate measures to develop the economy in the unoccupied regions. A program of primary measures was outlined to rebuild industry, transport, agriculture and civil construction. This decree in particular involved the Ukraine, the economy of which was in an extremely severe situation. The workers of the Soviet Ukraine, due to the aid of the Soviet peoples and primarily the RSFSR, raised the economy from the ruins. By the start of 1944, upon a decision of the Union government, the republic had received 4,500 machine tools and specialized equipment, 6,000 motor vehicles, 7 turbines for 100,000 kilowatts, 30,000 tons of steel pipe and beams, 450,000 m^3 of lumber, 15,000 tons of cement and 300,000 m^2 of glass. During the war years, more than 17 billion rubles were allocated from the Union budget for the Ukraine. For improving agriculture, a large number of tractors and other agricultural machines as well as fertilizers and seed were provided. The kolkhozes were given financial aid. Trains bound for the Ukraine left Moscow, Sverdlovsk, Magnitogorsk, Chelyabinsk, Tashkent and other cities and republics. Zaporozhstal' was aided by 57 plants in the nation; more than 70 Leningrad plants participated in the technical equipping of the Donets Basin. During the war, the Leningrad Elektrosila Plant which was 5 km from the front line assembled generators for Kadiyevka and Dnepropetrovsk.

By the end of 1945, around 30 percent of the prewar production capacity was back in operation on Ukrainian territory, including 30 percent of the ferrous metallurgical capacity, 34 percent of the iron ore industry, 56 percent of the manganese mines and 44 percent of the fixed capital of machine building. Over 120 basic, 500 medium and small mines had

been rebuilt. The socialist system, the unified planning system for the national economy and the fraternal aid from all the peoples of our nation became those mightly forces which each day raised the war-devastated Ukrainian economy from the ashes. The prewar level of industrial production was reached in the Ukraine in the first postwar five-year plan.

The Republic in Union Cooperation

At present, the republic produces around 20 percent of the USSR industrial and agricultural product. The Ukraine has kept the role of an important fuel, energy and metallurgical center in the nation. At the same time, the sectors which determine scientific and technical progress are developing rapidly here and these include electric power, machine building, the radio industry, instrument building and electronics, chemistry and petrochemistry. The republic economy almost completely covers the needs of the national economy for diesel locomotives, coal loader-cutters as well as beet and corn harvesting combines. One-half of all the mainline freight cars are produced here.

The Ukraine has the most developed economic ties with the RSFSR and which is responsible for around 75 percent of the Ukraine's interrepublic freight turnover. The RSFSR is the basic supplier of oil and oil products as well as natural gas. In turn, the Ukraine supplies the RSFSR with electric power, coal, iron ore, rolled ferrous metals, mineral fertilizers, cement, machinery and instruments. Close economic ties have also developed between the Ukraine, Belorussia, Moldavia, Kazakhstan and the other republics. Here a particular feature is that the means of production play the basic role in economic exchange and these make up almost three-quarters of the total deliveries.

The Ukraine plays an important role in the interrepublic deliveries of light and particularly food industry products. The present-day Ukrainian food industry is a diversified system bringing together 22 subsectors including the sugar, flour-milling and groat, bakery, confectionery, macaroni, oil and fat, perfume-costmetic, fruit-vegetable, tea, meat, butter-cheese and others.

Particularly great is the share of the Ukrainian sugar, oil-fat and fruit-vegetable industries on an Union-wide scale. Subsequently, these should continue to develop in order not only to meet the internal republic demand, but also to ship a significant portion of the product outside the Ukraine.

Growing Pains

The production of industrial product in the Ukraine should increase by 23 percent during the 11th Five-Year Plan. Here there will be more rapid growth for energy and chemical machine building, the electrical engineering industry, machine tool and instrument building and the production of machinery for livestock raising and feed production. All sectors of the republic economy will be developed.

Up to the present, the Ukraine has almost fully satisfied its requirements for electric power, but as a whole the availability of power resources, regardless of the rapid increase in the share obtained from nuclear power plants, during the 9th and 10th Five-Year Plans constantly declined. In the 11th Five-Year Plan, the demand for energy resources will begin to surpass their output. Here numerous factors are at work: the internal reserves, like the deliveries of oil and gas are limited, the depth of coal mining and the coal ash content have increased (without a noticeable improvement in the processing technologies), the capital intensiveness of all the sectors in the fuel and energy complex has substantially increased and so forth.

For this reason, obviously one of the main problems presently confronting the republic is a rise in the efficient operation of precisely these sectors. For example, fuel efficiency in various industrial systems varies from 10 to 70 percent. For many types of production this could be increased by 1.5-2-fold without any special capital outlays. However, proper attention has not been paid to this problem which influences the operation of all republic industry. Of course, a range of measures is being carried out to rationally utilize both energy as a whole as well as each type of it and the sources are being defined for satisfying the energy requirements. But too great an emphasis is being put on the obtaining of fuel resources from other republics and the increase in the volume of industrial product will basically be achieved by this.

The republic has a higher than the national average share of machine building, high quality metallurgy, chemical industry and certain other leading sectors. These set the pace in scientific and technical progress and the rate of production intensification. At the same time, labor productivity (the output of national income per employee in material production) is somewhat lower here than the average for the USSR. How can this be explained?

In even the most progressive industrial sectors, there still is too much manual labor in assembly, materials handling and transport operations. In certain sectors these employ up to 45-50 percent of the total number of employees. There is too great a share of miners operating manual pick-hammers. In Ukrainian agricultural production 18 percent of the workers are employed in mechanized labor and the proportional amount of equipment operators is 60 percent. Heavy physical labor has remained on the livestock farms, although an entire system of machines has been developed for them for full mechanization. Agricultural machine building which has developed in the republic is slow in producing the machine systems for agriculture and when this is being done "blank spots" remain which are production areas where much is still done by hand. For example, in sheep raising, the level of full mechanization is 3-5 percent.

In republic industry itself, there has been a slow decline in the share of manual labor because up to now rational proportions have not been reached between article, part and production forms of specialization. The ratio between these forms (in terms of the volume of product, the value of fixed capital and the number of workers) at the beginning of the 11th Five-Year Plan was 95-96 percent, 3-4 percent and 1 percent, respectively. World industrial experience shows that it is advisable to increase part and technological specialization as this provides comparatively better conditions for production automation and mechanization.

Moreover, in all the republic sectors, the pace of replacing equipment is low. A majority of the machine building plants still produces general machine building products with unjustifiably high labor expenditures.

The metal intensiveness of the Ukrainian-produced machinery, equipment, pipe and other articles from metal exceeds the metal intensiveness of analogous products in a number of foreign countries (by an average of 25 percent). One of the reasons, undoubtedly, is the poor quality of the ferrous metals and the narrow range of their assortment. The republic casts one-third of the national volume of steel and 8 percent of the world volume. One-half of this steel is produced in open-hearth furnaces. For example, Japan has completely abandoned open-hearth steel. The largest open-hearth shops were built in the Ukraine prior to 1962 and are already obsolete. The pace of introducing converter and electric steel casting shops in the republic is low.

Some 90 percent of the pieces made from rolled metals is manufactured by cutting at the republic enterprises and this does not make it possible to raise the metal use factor above 0.5. Thus, on the one hand, there is poor use of progressive metal working methods and on the other, one-half of the metal is scrapped.

In the foreseeable future, metal will remain the main structural material, but at present it is often being replaced by highly-effective materials, for example, plastics. Just one-tenth of the republic's demand for plastics is covered from its own production. The policy is still to ship it in from other republics or import it from overseas.

The list of factors impeding republic economic development could be continued. Its industrial potential at present is such that these and many other problems could be resolved in a comparatively short period of time. Further economic development will largely be determined by the policy of saving production resources including labor, fixed productive capital, raw products, materials, fuel and energy.

A most important factor in intensifying production is the training of scientific personnel and their rational utilization. The institutes of the Ukrainian Academy of Sciences, the sectorial institutes and VUZes employ around 200,000 scientific workers, including around 5,000 doctors of sciences. They are making a marked contribution to solving all the economic problems. The effect obtained from the introduction of scientific studies runs into hundreds of millions of rubles. This effect could be even greater if all the scientific institutions presently possessed experimental and testing facilities (at present, 20 percent of the scientific institutions have them). For every 10,000 persons, Ukrainian science employs 113 persons (for the nation, the figure is 160), and among these are 35.2 scientific workers (in the nation, 48.3). Some two-thirds of the research potential is found in the five leading republic cities and three-quarters of the academy personnel is in Kiev. These figures show that the republic's scientific subdivisions must do a good deal of work on solving their own development problems.

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CSO: 1820/57

BELORUSSIA'S DYNAMIC TRANSFORMATION UNDER SOVIET SYSTEM LAUDED

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 56-67

[Article by Doctor of Economic Sciences M. V. Nauchitel' and Candidate of Economic Sciences Ye. P. Tsybina from Gomel State University: "The Former Backward Borderland --A Region of Great Dynamicness"]

[Text] The Accountability Report of the CPSU Central Committee to the 26th Party Congress stated: "Since the first years of Soviet power, our economic and social policy has been so organized as to raise the former national borderlands of Russia as rapidly as possible up to the development level of its center. This task has been successfully carried out. At present, there are no backward national borderlands."

Great October was also a turning point in the life of the Belorussian people. At the 6th Northwestern Oblast Conference of the RKP(b) [Russian Communist Party (Bolshevik)] which was opened on 30 December 1918 in Smolensk and which declared itself to be the first congress of the Belorussian Communist Party, a decision was adopted to form the Belorussian SSR. The date of the promulgation of the Manifesto of the Provisional Revolutionary Worker-Peasant Government, 1 January 1919, became the birthday of the republic. The Manifesto proclaimed the basic provisions of the state organization: the turning over of power to the soviets, and the nationalizing of all land and enterprises. A significant point along the path of Belorussia's socialist development was its incorporation in the USSR on 30 December 1922.

In prerevolutionary times Belorussia was an extremely backward agrarian region with small and little-developed industry. In comprising 4.3 percent of the population of the Russian Empire in 1913, it produced 2 percent of the gross industrial product. Here the product of large-scale industry was 1.5 percent of Russia's production volume while for small-scale industry the figure was 3.1 percent. The proportional amount of enterprises with up to 5 employees was 98.3 percent, up to 50 persons 1.4 percent and from 51 to 500 persons 0.3 percent. There was a predominance of sectors based on the local types of raw materials, such as woodworking, food, glass, paper, lumbering and rafting.

In the structure of national income, industry and construction comprised 19.3 percent while agriculture and forestry were 65.8 percent. The indicator of per capita gross product (8 rubles) in Belorussia was much lower than in the developed regions of Russia. In particular, in Moscow Province it equaled 212 rubles, in Baku 239, St. Petersburg 164, Vladimir 146, Estland 130, while in Kaluga Province it was just 14 rubles, Smolensk 11, Pskov 4.6,

Dagestan 0.4 and Kutaisi 0.5 rubles. As a whole, the per capita production of industrial product in Belorussia was almost 5-fold lower than the average indicator of prerevolutionary Russia.

Belorussian agriculture was also backward. The gross grain harvest did not reach even one-half of the food requirement. For example, in Vitebsk district ["uyezd"], it was 34 percent of the annual requirement, in Polotsk 33 and in Lepel 35. In 1913, around 430,000 tons of flour and grain were shipped into Belorussia.

With the formation of the USSR, the Belorussian workers carried out transformation that were revolutionary in nature and grandiose in scale. A strong industry was created and its proportional amount is now more than 60 percent in the Belorussian gross social product. The appearance of the republic is shaped by new progressive sectors such as power engineering, machine building and instrument building, chemistry and petrochemistry, electronics and radio electronics.

Socialist industrialization has been carried out very intensely, with high growth rates for industrial production, accumulation and the completion of production capacity. In the First Five-Year Plan alone, the volume of industrial production increased by 4.8-fold in the USSR (in Belorussia by 2.3-fold). The volume of industrial production in 1940, with an increase of 7.7-fold for the nation as a whole, surpassed the 1913 level in Belorussia by 8.8-fold, including by 15-fold for large industry. During the years of industrialization, the sectorial structure of industry changed substantially considering the national division of labor, the historically formed economic ties and the local raw material and labor resources.

In line with the taut fuel balance in the nation, a major peat industry was organized in peat-rich Belorussia. The volume of product in the metalworking industry rose significantly. For the first time in the history of the republic, new sectors--machine building and machine tool building--were created.

In agriculture as well, there were major changes. On 1 January 1941, in the eastern oblasts of Belorussia, 93.3 percent of the peasant farms had been collectivized as well as 99.3 percent of the planted area. The physical plant had also grown and 360 MTS [Machine-Tractor Station] covered 10,165 Belorussian kolkhozes.

During the prewar period, the designated social tasks were carried out and unemployment and illiteracy were finally eliminated. In 1940, expenditures on education were 38 percent of the republic budget. In 1941, there were 35,000 persons studying in the 25 VUZes and 128 technical schools, while the republic economy employed 87,600 specialists with a higher and specialized secondary education. The material situation of the workers had improved. From 1933 through 1940, the wages of workers had almost trebled.

The 3 years of Nazi occupation caused the severest losses to the Belorussian economy as more than one-half of the national wealth was destroyed. In 1944, only one-half the 1913 product was produced, or 5 percent of the 1940 product. The Nazis had destroyed and transported to Germany some 2,597,000 persons, that is, 28.7 percent of the Belorussian population of 1940. By the time of liberation, 27 percent of the prewar population remained in Vitebsk Oblast, 29 percent in Polesye Oblast and 35 percent in Mogilev Oblast. During the years of World War II, no nation suffered such great losses.

By the war's end, the Belorussian economy was in such a state that it would have taken decades for its unaided reconstruction. The fraternal socialist republics provided great material aid. With the insignificant local accumulation, the volume of capital investments in the Fourth Five-Year Plan was 695 million rubles, that is, it greatly surpassed the actual investments in the Belorussian economy during the three prewar five-year plans. As a result of the aid provided and the unstinting labor by the republic workers, the Belorussian economy and its productive forces were quickly rebuilt. In 1950, the volume of industrial production surpassed the prewar by 15 percent.

A characteristic feature of the present-day economy in Belorussia is the dynamicness of its development. Over the years of Soviet power, the total volume of industrial product has risen by 235-fold, and in comparison with 1940, by 29-fold (in the USSR by 21-fold), in comparison with 1950 by 25-fold and in comparison with 1960 by 6.9-fold. Particularly rapid development has occurred in the production of the means of production and the advanced sectors which determine the acceleration of scientific and technical progress. At present, in accord with the republic's specialization within the nation, a number of new products are produced which were not turned out in the prewar period, including: tractors, combines, motorcycles, bicycles, transformers, bearings, pumps, electric motors, mineral fertilizers, chemical fibers, timepieces, refrigerators and TV sets.

The growth of labor productivity in Belorussian industry in the postwar period (by 8.74-fold) outstripped the Union average (by 7.7-fold).

The material basis for such development has been the major capital investments which increased sharply in the Ninth and Tenth Five-Year Plans. Out of all the capital investments made over the years of Soviet power (1919-1980) (62.4 billion rubles), more than one-half (37.1 billion rubles) has come in the last 10 years. During this same period, 1.5-fold more fixed capital was put into operation than in the previous 30 years. Precisely during these years, there was the predominant development of the sectors which mean an acceleration in scientific and technical progress.

During these same years, agriculture was created in Soviet Belorussia virtually from scratch, on a qualitatively different material and technical basis. The growth of gross agricultural product was 186 percent in relation to 1940, including 388 percent for livestock products. During this period the yield of grain and flax fiber doubled while the increase for vegetables was 1.5-fold. The state purchases of these crops and livestock products increased as follows: by 7.3-fold for livestock and poultry, by 17-fold for milk and by 13-fold for eggs. Over the last 15 years alone, the capital- and energy-to-labor ratios in agriculture have increased 4-fold.

The republic's specialization is also deepening in the national division of labor. Belorussia produces over one-half of the potassium fertilizers, one out of every six tractors in the nation, one out of every seven metal-cutting machines, one out of every five tons of chemical fibers, one out of every ten refrigerators, one out of every seven Soviet watches and one out of every five linen textile. In terms of the output of silage harvesting combines, potassium and mineral fertilizers, trucks, chemical fibers, metal-cutting machines, tractors, peat briquettes and many products of the light and food industries, Belorussia has no equal among the other Union republics with the exception of the RSFSR.

There is a broad exchange of products within the specialization and cooperation among the republics. Belorussia receives petroleum, gas, coal, metals, chemicals, machines, passenger cars, machine tools and electrical instruments. In deliveries from Belorussia there is

a predominance of tractors, farm machinery, silage harvesting combines, trucks, machine tools, motorcycles and bicycles, radios, oil products, synthetic filaments, automatic lines, TV sets, timepieces, refrigerators, potassium fertilizers, flax fiber and knitwear.

Belorussian products are in great demand also outside the USSR. More than 300 republic enterprises export to 100 nations of the world machine building products (including tractors, motor vehicles and machine tools) the proportional amount of which comprises over one-half of Belorussian foreign exports. Almost one-half of the foreign imports consist of light industry products. The structure of production and foreign trade turnover characterizes Belorussia as an industrially developed republic.

The importance of Belorussia's contribution and the fulfilling of its obligations to the nation can be seen from the fact that in the republic the per capita production of national income and industrial product has surpassed the average Union level. In addition, there has been a tendency for more rapid production of national income in relation to its consumption.

The strong production potential, the scale and complexity of the economic tasks necessitate the activating of qualitative growth factors. The most important means for implementing the increased possibilities of socialism are naturally becoming **intensification and increased efficiency and quality.**

Over the last 5 years alone, the growth of labor productivity has provided 84 percent of the increase in Belorussian national income and this is the equivalent of saving the labor of over 750,000 workers (3-fold more than the natural increase in the labor resources over the given period). At the Minsk and Brest enterprises, labor productivity has risen by 38 percent, including by more than 3-fold at the Integral Production Association and by 45-82 percent at the Termplast Plant and in the associations producing broaching and cutting machines and automatic lines. However, at individual enterprises the increase in product output has often been achieved by extensive factors, for example, by increasing the number of workers. As was pointed out at the Fourth Plenum of the Central Committee of the Belorussian Communist Party, one out of every nine enterprises has not met the quotas for the growth of labor productivity.

The search for labor productivity reserves involves such equally acute problems as mechanizing labor intensive processes and the rational utilization of labor resources. At present, in the republic seven workers out of ten are employed in complex and skilled labor. Over the last 20 years, worker skills have risen greatly. While in 1962 the low-skilled workers were 37.5 percent, medium-skill ones were 49.4 percent and highly-skilled were 13.1 percent, in 1980, the proportional amount of lowly-skilled workers had declined to 23.7 percent, the number of medium-skill workers had reached 54.8 percent and highly-skilled 21.5. However, regardless of the increased skills and the decline in manual jobs in the Tenth Five-Year Plan, the proportional amount of workers engaged in manual labor is more than one-third of the workers in industry and the figure reaches 39-44 percent at the enterprises of the Belorussian Ministry of Meat and Dairy Industry, Ministry of Light Industry and Ministry of Food Industry and in the electrical engineering industry.

The ensuring of high and stable growth rates for production will depend upon how technically advanced, and efficiently it is organized and how rationally the labor resources are utilized. The means for overcoming the shortage of labor resources and the lack of manpower for the enterprises due to the natural increase in the population must be sought out

in the intensifying of social production and in raising labor productivity by introducing advanced production methods, mechanization and automation. How this problem is to be solved can be seen from the fact that in 1970, labor productivity increased by more than 3-fold in comparison with 1960.

The decline in the losses of working time and personnel turnover is an important reserve for the rational utilization of labor resources. In Belorussian industry during the Tenth Five-Year Plan, millions of man-days were lost. For this reason, a portion of the equipment stood idle and the volume of product was less than the possible. A significant portion of employees in industry change their job annually. The level of discipline as yet does not meet the requirements of modern production everywhere.

A task of exceptional importance is the improved use of the fixed productive capital, both in operation and just completed. The increase in the capital-to-labor ratio still outstrips the growth of labor productivity. For better utilizing the existing capital, it is essential to raise the equipment shift factor. Increasing the operating time of equipment by just 30 minutes will raise the return on investment by 5 percent and produce an additional product of almost 1 billion rubles a year. The delayed completion of enterprises under construction causes tangible outlays for Belorussian industry. In the Tenth Five-Year Plan, more than 1 billion rubles of product was not obtained because of this.

An equally important problem is the rational utilization and saving of raw products, materials, fuel and electric power. A 1 percent saving of raw material, fuel and energy resources increases the national income of the republic by more than 180 million rubles. During the Tenth Five-Year Plan, material intensiveness in the Belorussian economy declined by 3 percent and in 1981 by 0.7 percent. However, from the consumed raw materials as yet less product is produced than the opportunities would allow. Production wastes and losses are still high in the lumber, woodworking, meat-dairy industries, in construction, trade and agriculture. In particular, in machine building they are around one-quarter of the employed metal and more than one-half at the Baranovichi Automatic Lines Plant. The reserves for reducing the proportional consumption of materials lie primarily in improving their quality, in the technical and engineering improvement of production, in systematizing norm setting and accounting of materials and in a considerate attitude toward them on the part of the workers.

A solution to the problems of intensifying production should be based upon accelerating scientific and technical progress and on introducing scientific achievements into the national economy. Over the last decade there has been a marked rise in the return on theoretical and applied research based upon the integration of science with production. In just the Tenth Five-Year Plan, Belorussian scientists have obtained 7,500 certificates of invention and the introduction of these provided around 200 million rubles for the national economy. Within the national division of labor, Belorussian scientific institutions are involved in carrying out 66 programs related to solving major scientific and technical problems. In addition, 60 republic programs are being carried out. Some 14 scientific-production associations have been organized in the republic for more effectively introducing the scientific developments.

In republic construction there has been a tendency for a decline in the effectiveness of capital investments. During the Tenth Five-Year Plan the increase in national income per ruble of production-end capital investments was 25 kopecks in comparison with 38 kopecks in the Ninth Five-Year Plan and 44 kopecks in the Eighth. Regardless of the 12 percent

reduction in the average construction times, the repayment times have increased by 1.5-fold. For eliminating this tendency, more attention is being paid to concentrating the capital investments, to their economically sound allocation (primarily for reconstruction and reequipping of operating projects), to improving the plans and construction itself, to shortening the time for putting the projects into operation and to reducing the amount of incomplete production.

The carrying out of the tasks posed for the 11th Five-Year Plan involves a further improvement in economic management and the economic mechanism. Practical measures are being implemented in this area, including: the utilization of the specific program approach in planning, the implementing of general plans for managing the industrial sectors and the converting of construction to cost accounting with the evaluating of the work in terms of the completion of capacity and projects. A number of measures has been outlined for the economic soundness and balance of the plans, for improving the organizational structure of management and for introducing advanced experience and progressive forms in the organization of labor.

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CSO: 1820/57

ECONOMIES OF TRANSCAUCASIAN REPUBLICS RESHAPED IN SOVIET ERA

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 68-75

[Article by Doctor of Economic Sciences V. S. Advadze, deputy director of the Scientific Research Institute for the Economics and Planning of the National Economy under the Georgian Gosplan in Tbilisi: "Economic Progress of the Transcaucasus"]

[Text] Prior to the socialist revolution, Transcaucasia was a backward colonial borderland of Tsarist Russia and an agrarian raw material tributary. Regardless of the rich raw material and energy resources (oil, coal, hydropower, manganese, iron ore and so forth), industry was little-developed here. Basically small semiartisan enterprises existed. The large scale of oil production in Baku merely contrasted with the agrarian nature of the entire remaining economy, but did not alter it.

In 1921, V. I. Lenin commented that "the Caucasian Republics are even more peasant lands than Russia."[1] There was also a great difference in the economic development levels between the central regions of Russia and Transcaucasia. The comparatively small share of urban population corresponded to the nature of the economy. In 1920, urban dwellers were around 20 percent in the total population of Transcaucasia. Agriculture itself in agrarian Transcaucasia was a very backward sector and this was explained by the feudal vestiges, by the small holdings or landless state of the peasantry, by their suppressed situation and the rudimentary nature of equipment.

With the establishing of Soviet power, a new era commenced in the history of the Transcaucasian peoples. As a result of the fundamental changes, the economic and social structure of society was completely changed and broad scope was opened up for increasing the economy and culture of the region.

From the very first days of the socialist revolution, V. I. Lenin and Soviet Russia provided moral and material aid to the Transcaucasian republics. In a letter to G. K. Ordzhonikidze of 2 March 1921, V. I. Lenin posed for the Georgian communists those tasks the carrying out of which would provide a successful start to socialist construction in Georgia. In a letter of 14 April of the same year to the communists of Azerbaijan, Georgia, Armenia, Dagestan and the Mountain ["Gorskaya"] Republic, V. I. Lenin urged "to develop with all forces...the productive forces of the rich region, white coal [windpower] and irrigation.

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[1] V. I. Lenin, PSS, Vol 43, p 199.

Irrigation is particularly important to raise farming and livestock raising no matter what the cost....

"It is essential to endeavor immediately to improve the situation of the peasantry and begin major work in electrification and irrigation. Irrigation is essential most of all and will most transform the region, resurrect it, bury the past and strengthen the transition to socialism."[2]

The creation of the USSR provided an opportunity to rebuild and develop the Transcaucasian economy by joint efforts in the single family of fraternal republics on the basis of a unified national economic plan and the interrepublic division of labor, the rational use of natural and other resources. In 1921-1980, 77.8 billion rubles were invested into the economy of Transcaucasia. Out of this total 96.5 percent has occurred in the postwar period, 79.3 percent in 1960-1980 and over one-half (50.6 percent) in the 1970's.

The major capital investments have brought about a systematic completion of fixed capital and an increase in its amount. As a total over the postwar period (1946-1980), fixed capital valued at 66.6 billion rubles was put into operation. In 1951-1980, around 1,100 large state industrial enterprises were built in the Transcaucasian republics. The value of the fixed capital in the economy of these republics over 1960-1980 increased by 3.8-fold and reached around 65 billion rubles (3.7 percent of all the nation's fixed capital).

The policy of industrialization has become a general line for all the Union republics. As a whole, over 1921-1980, 41.1 percent of the capital investments of the state and cooperative organizations and enterprises (without the kolkhozes) in Transcaucasia went into industry. This indicator was higher in the prewar five-year plans (47.3 percent) and in the first two postwar ones (54.2 percent). As a result, over the years of Soviet power such major enterprises of heavy and light industry went into operation as the Zemo-Avchala and Inguri GES, the Armenian AES, the Rustavi Metallurgical Plant, the Baku Home Air Conditioner Plant, the Kutaisi Motor Vehicle Plant as well as major enterprises producing oil field and drilling equipment and compressors, for plastics processing, textile combines, wineries, tea factories and so forth.

Such sectors arose or underwent significant development as electric power, ferrous and nonferrous metallurgy, the chemical and petrochemical, petroleum, gas, manganese, coal and ore mining industries, machine building and metalworking (electrical engineering, electronics and petroleum machine building, instrument building, machine tool building, the tool, motor vehicle and other industries). The light and food sectors of industry have also developed successfully.

Extensive industrial construction, the increased number of industrial-production personnel at a more rapid pace than the persons employed in the national economy as a whole and the growth of labor productivity have ensured accelerated industrial development. Even in the reconstruction period (1921-1928), the volume of industrial production in Georgia increased by 2.5-fold, in Azerbaijan by 3-fold and in Armenia by 3.3-fold. As a whole over 1913-1980, the corresponding growth indicators for industrial production were 177-, 73- and 390-fold. Along with the growth of industry there has been an improvement in its placement and as a result of this new towns and industrial centers have arisen such as Rustavi, Mingechaur, Sumgait, Razdan, Abovyan, Kafan, Charentsavan and others.

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[2] V. I. Lenin, PSS, Vol 43, pp 199-200.

The most important industrial sectors in Transcaucasia are sectors of Union specialization and they determine its place in the all-Union division of labor and play a significant role in the nation's economy. These, in particular, are the mining of manganese ore and chemical ores and petroleum; the production of ferroalloys, iron and steel casting, the rolling of ferrous metals and steel pipe; nonferrous metallurgy based on the copper-molybdenum and other deposits; machine building with the production of metal-cutting machines, mainline electric locomotives, trucks, electric motors, vibration and electric welding equipment, equipment for the petroleum industry; chemistry includes the production of fertilizers, synthetic fiber and rubber; in the light industry there is the production of silk textiles, hosiery, knitted underwear and outer knitwear and leather footwear; in the food industry there is the production of tea, canned fruits and vegetables, wines and champagnes, cognac and the bottling of mineral waters.

The Transcaucasian republics have also developed the service sectors which produce products designed to satisfy internal production and personal needs. These include the fuel and energy industry, the production of building materials and a number of subsectors in the light and food industry.

In 1980, in the industry of the Transcaucasian republics, there were 268 production and scientific-production associations. Their proportional amount in terms of the volume of sold product was 29.1 percent in Azerbaijan, 41.1 percent in Georgia and 57.7 percent in Armenia.

Agriculture is the second major economic sector in the Transcaucasian republics. Its economic and technical backwardness was overcome by socialist industrialization and conditions were created for the reorganization and rapid development of it on socialist principles.

The social structure of the rural population has changed fundamentally. Even in 1940, 96.5 percent of the peasant households in Transcaucasia had joined kolkhozes. In 1980, all the peasant households (604,000) had joined 1,618 kolkhozes while the number of sovkhozes was 1,629.

Over the years of Soviet power, a diversified collective agriculture has been created. A fundamental reconstruction of its physical plant was carried out. While prior to the revolution draft animals were the only tractive force, at present over 99 percent of the energy capacity is made up of mechanical engines. The electrification of all the kolkhozes and sovkhozes has been completed and the level of mechanizing agricultural jobs has increased. In 1940-1980, the tractor fleet increased by 6.7-fold, the combine fleet by 4.9-fold and the truck fleet by 10-fold. The amount of mineral fertilizers delivered in 1960-1980 increased by 4.1-fold.

In accord with the instructions of V. I. Lenin, irrigation work has been carried out widely. The area of irrigated lands in the Transcaucasian republics in 1980 was 1,878,000 hectares, or 10.9 percent of the area of the nation's irrigated land. The area of drained lands equaled 159,000 hectares (basically in the Kolkhid Depression).

Over the years of the five-year plans, the national economic complexes of the Transcaucasian republics have been formed and the most important sectors of these are specialized ones. Industry has developed more rapidly than the other economic sectors and has had a decisive impact on all aspects of social production. Precisely due to the higher rates of its

development there has been a process of the evening out of the economic level of the Union republics and the economic structure has changed.

Industrialization and industrial growth have been accompanied by changes in the ratio of the urban and rural population which in 1980 for Transcaucasia was 56:44 in favor of the cities. In 1913-1980, with an increase of 2.4-fold for the entire population of the region, the urban population rose by 6.1-fold while the rural rose by just 37.6 percent.

Economic progress has brought about a constant decline in the rural population and the persons employed in agriculture and they have basically been absorbed by industry. But by the 1970's the share of employees in industry and construction stabilized and an ever-larger portion of the workers coming out of agriculture have found employment in the service sphere.

The proportional amount of employees in the nonproduction sectors has risen both as a whole for the nation and in all the Union republics while in the Transcaucasian republics this process has occurred more intensely. Thus, in 1960-1980, the share of employees in the nonproduction sectors increased by 9.1 points in the USSR as a whole, by 9.7 points in Armenia, by 9.9 in Azerbaijan and 11.6 in Georgia.

As a whole, the structure of employees in the national economy has changed in favor of the industrial sectors of the economy (industry, construction, transportation and communications) the share of which over 1960-1980 rose from 29 to 35 percent in Georgia, from 30 to 35 percent in Azerbaijan and from 34 to 45 percent in Armenia.

As a result of industrialization, industry has taken the leading role in the creation of gross social product and national income in the Transcaucasian republics. In 1980, the share of industry was 67.6 percent of the gross social product and 52.2 percent of the national income while as a whole the share of industrial sectors was, respectively, 80.1 and 66.2 percent (in comparable prices).

The structure of industry itself has fundamentally changed. This has been caused by the rise and rapid growth of new heavy industry sectors and in particular those which are responsible for scientific and technical progress such as machine building and metalworking, the chemical and petrochemical industries. Thus, in 1940-1980, with an increase of 16.9-fold for all industrial production in Georgia, the chemical and petrochemical industries grew by 46-fold while machine building and metalworking rose by 91-fold. The corresponding indicators for Azerbaijan are 12-, 303- and 65-fold and for Armenia 45-, 126- and 726-fold. From 1970 through 1980, the share of the designated sectors in Georgian industrial production increased from 15.2 to 17.4 percent, in Armenia from 30.8 to 36.9 percent. In Azerbaijan, prior to the revolution, 85 percent of all the industrial product came from the fuel industry. At present, this share is just 10 percent of industrial production while the proportional amount of the above-named sectors is 24.8 percent.

The dynamic economic development has created conditions for a systematic **growth of the material and cultural standard of living** of the population.

There has been a constant rise in the number of workers and white collar employees in the economy of the Transcaucasian republics. In 1980, the number reached 4,972,000 persons (238,000 in 1922, that is, over this period it rose by almost 21-fold). The skill composition has also increased. Over 1940-1980, the number of specialists with a higher and specialized secondary education employed in the Transcaucasian economy increased by 9.5-fold.

The national income of the Transcaucasian republics, in being the basis for the material well-being of the population, in 1960-1980 increased by 3.8-fold. The real income of the population grew systematically. Thus, in 1965-1980, on a per capita basis it increased by 2.1-fold in Georgia and by 2-fold in Armenia. In 1970-1980, the amount of benefits and payments received by the population from the public consumption funds increased for the three republics from 2,571,600,000 rubles to 4,718,900,000 rubles, that is, by 83.5 percent, and on a per capita basis by 1.6-fold. Average monthly wages of employees in the national economy and the payment for kolkhoz members increased. All of this created conditions for raising the level of consumption and increasing in it the proportional amount of both high quality food products and industrial goods, particularly cultural and service goods.

Housing construction has been carried out widely. In 1921-1980, apartments with a total usable area of 144.3 million m^2 have been put into use in the Transcaucasian republics. In 1956-1980, 12.5 million persons received new apartments.

The domestic services for the public have become evermore diverse and better quality. The number of enterprises in this sphere in 1960-1980 increased in Transcaucasia from 10,800 to 23,400. The volume of consumer services in the 1970's alone rose by 2.6-fold (in comparable prices).

The successes could have been even greater if in the 1960's Georgia and Azerbaijan had spotted the unfavorable trends of a declining growth rate in industry and the economy as a whole. Their causes have been discussed in detail by the party organizations of these republics. The ranges of measures worked out have underlain the corresponding decrees of the CPSU Central Committee and the USSR Council of Ministers.

As a result of carrying out the party and government decrees, in the 1970's the negative phenomena as a whole were overcome and economic and social growth accelerated. The quotas in the Tenth Five-Year Plan were overfulfilled for the most important generalizing indicators. In recent years, all the Transcaucasian republics have continuously emerged as winners in the all-Union socialist competition.

The tendency for dynamic economic development in Transcaucasia has been reinforced in the plans for the 11th Five-Year Plan and the Basic Directions for the Economic and Social Development of the USSR for 1981-1985 and for the Period Up to 1990. In 1981-1985, Georgia intends to increase the output of industrial product by 30-33 percent and the figures for Azerbaijan and Armenia are 29-32 percent. These are higher than the average Union indicators.

Development will be more rapid for the types of production which are not metal or energy intensive, but are labor intensive. These include: machine building, the electrical engineering, electronics and radio engineering industries and instrument building. The increase in the average annual volume of gross agricultural product in Georgia is planned for 22-24 percent, in Azerbaijan for 15-17 percent and in Armenia for 10-12 percent. Georgian agriculture will continue to specialize in vineyards, tea raising and subtropical orchards. Work will be carried out to drain and develop the Kolkhid Depression as well as for irr igating land in all the Transcaucasian republics.

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CSO: 1820/57

ROLE OF CENTRAL ASIA'S AGRICULTURAL-INDUSTRIAL, LABOR AND WATER RESOURCES IN REGION'S DEVELOPMENT

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 76-87

[Article by Academician of the Uzbek Academy of Sciences S. K. Ziyadullayev, chairman of the Council for the Study of the Productive Forces of the Uzbek Academy of Sciences in Tashkent: "Central Asia: A Modern Industrial-Agrarian Economy"]

[Text] The particular features of Central Asia as an economic region are determined by two key factors. The first of them is the **unique natural conditions:** the climate, the soil and water resources which are favorable for cotton raising, orchard growing and vineyards as well as the minerals and fuel which provide a center for the ore-mining industry and power.

The second distinguishing factor is the rapid growth of the region's population and the **high level of labor available** to the economy. The growth rates of the population in Central Asia are significantly higher than the average of the USSR. While in 1959-1980, the nation's population grew by 30 percent, in the Central Asian economic region the increase was more than double and reached 27 million persons. Here the natural increase is felt (2- or 3-fold higher than in the European regions) and because of this the region's population annually increases by approximately 600,000 persons. More rapid growth rates of the population and labor resources are also expected in the future.

The major labor potential of the Central Asian republics serves as a prerequisite for the tapping of the raw material and energy resources and the unique natural conditions in the region and for the rapid develoment of social production, particularly its labor-intensive sectors. The leading sectors of Central Asian industry are machine building (primarily agricultural), nonferrous metallurgy, the light and food industries; energy with the production of gas, coal mining and hydropower; the predominant farm products are cotton, silk, astrakhan wool, vegetables and fruits. In the Union division of labor the Central Asian economic region operates primarily as a major **territorial agroindustrial complex.**

The Agroindustrial Complex of Central Asia

This complex is responsible for 65 percent of the gross product in the region, 67 percent of its net product and 70 percent of the employees in material production. As was pointed out by the First Secretary of the Central Committee of the Uzbek Communist Party, Sh. R. Rashidov, in the APK [agroindustrial complex] of just one republic "there is the

interaction of around 2,000 kolkhozes, sovkhozes, interfarm organizations, hundreds of processing enterprises, large plants producing mineral fertilizers, farm and irrigation machine building, very large administrations of water management construction, an extensive network of material and technical supply enterprises and around 100 scientific research and training institutes and experimental stations."

The interdisciplinary approach to the problems of intensifying socioeconomic development has been termed in the decisions of the 26th Party Congress one of the key areas for improving production management. This applies fully to the diversified economy of the Central Asian economic region. Thus, effective agricultural development has been carried out in close cooperation with the industrial sectors which supply the means of production. Here also we should put the enterprises involved in the processing of agricultural products, the construction industry and the transport network.

The Central Asian region provides more than 90 percent of the nation's production of cotton, natural silk and astrakhan wool. Here also the entire fleet of agricultural equipment for cotton raising is produced along with a significant portion of the machines and equipment for the textile industry. The region's industry also produces metalworking machines, electrical engineering equipment, materials handling equipment, cable products and products of the ore-mining sectors and nonferrous metallurgy.

The industrial sector of the APK includes the sectors which supply agriculture with the means of production and process agricultural products. The first group includes tractor and farm machine building specialized in the output of equipment for livestock raising and feed production, the light and food industries as well as for producing specialized motor transport and land reclamation equipment. Also being developed are the production of chemicals for agriculture, the combined feed and microbiological industries.

The enterprises and organizations engaged in the designing and manufacturing of machinery and equipment for cotton raising are represented by large associations. Thus, the All-Union Soyuzmashkhlopkovodstvo [Cotton-Growing Machinery) Production Association includes the Tashkent Tractor Plant, Uzbeksel'mash [Uzbek Farm Machinery], Tashsel'mash [Tashkent Agricultural Machinery] and Chirchiksel'mash [Chirchik Farm Machinery] plants as well as several design and engineering organizations.

The region's **machine building** is represented by large tractor and electrical engineering enterprises, by plants producing materials handling equipment, cotton harvesting machines (Uzbekistan), motor vehicle assembly and farm machinery (Kirgizia), and textile machine building (Tajikistan and Uzbekistan). The Tashkent Tractor Plant is the nation's sole enterprise producing special cotton tractors. The products of this plant and the other enterprises of Soyuzmashkhlopkovodstvo have made a marked contribution to the technical support for the region's economy. In the association's future is the output of 100- and 150-horsepower cotton tractors and tractor trailers with increased carrying capacity.

Major advances have been made in organizing the machine harvesting of cotton and the task has been set of mechanizing the entire production cycle for growing this crop. This is the purpose of the specialized graders, the equipment for applying mineral fertilizers to the soil, the cotton strippers, the wagons for the unbaled transporting of cotton and so forth. The production and use of units for the simultaneous execution of all harvesting operations excludes the hand picking of the fallen cotton and reduces the time for bringing in the crop. Full mechanization also has a particular socioeconomic purpose as the releasing of a portion of the rural and urban population from cotton harvesting tells favorably on the work of the other sectors in the region's economy.

Within the APK, production of mineral fertilizers and chemicals for protecting the cotton plants has been organized. The chemical industry of Uzbekistan can serve as an illustration of a sector's rapid progress. It produces 7 million tons of nitrogen and phosphorous fertilizers, defoliants and plant protection agents. The needs of the agricultural sector can thus be satisfied from local production and this accelerates the supply of the fields and reduces transport expenditures and losses.

Yet the present level of the chemical industry is insufficient for fully satisfying the growing needs of the cotton complex. However, the major supplies of hydrocarbon, chemical mining and plant raw materials in the region ensure a great potential for the sector's development over the long run.

The raw cotton harvested on the fields is delivered to the network of enterprises in the **processing industry.** The region has more than 140 cotton plants which provide the primary processing of the cotton and manufacture fiber for the textile industry. Cotton gins produce one-half of the gross product for Central Asia's light industry. At the same time, their capacity is as yet insufficient for processing the cotton in the newly irrigated regions and it has been essential to resort to the ineffective transporting of raw cotton.

In the Central Asian region a developed network of **light industry** enterprises has developed, including: textile combines, knitwear, garment and leather footwear mills. Textile enterprises are operating in Tashkent, Fergana, Dushanbe and Bukhara. Silk textiles are produced in Margilan and Namangan, Osh, Leninabad, Dushanbe and Chardzhou.

However, light industry still does not fully satisfy local demand and does not meet the great potential of the region. The large contingent of working-age persons (particularly women) combined with the raw material resources (cotton fiber and so forth) makes it economically advisable to locate light industry enterprises here. The expansion of the textile industry will make it possible not only to more fully satisfy local demand, but also to increase the shipping of textiles to other regions of the nation and overseas.

The Central Asian **food industry** is represented by 2,000 enterprises which basically process local agricultural raw materials. The cotton oil seed, [1] grapes, vegetables, fruits and tobacco are characteristic agricultural products for the zone and these are utilized by the sector's enterprises. The oil and fat and fruit and vegetable industries are located predominantly in Uzbekistan and Tajikistan while the sugar and meat and dairy industries are in Kirgizia.

The Central Asian APK, particularly after the 26th Party Congress, has been developing in the effective organizational form of agroindustrial associations. These combine the functions of production, procurement, industrial processing and sales of the products. This has made it possible, for example, for Uzplodoovoshchvinprom [Uzbek Association for the Fruit, Vegetable and Wine Industry] to increase the production volume by 1.5-fold over the years of the Tenth Five-Year Plan. The Uzbek Ministry of the Fruit and Vegetable System now has 215 sovkhozes and 44 processing enterprises. The agroindustrial associations of the ministry produce around 60 percent of the republic's fruit and vineyard products.

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[1] The proportional amount of the oil and fat industry in the region surpasses the average Union indicator by 2-fold.

The Region's Industry in the Union Division of Labor

Along with the sectors of the APK, **heavy industry** has developed in Central Asia with a broad spectrum of modern technologies. Machine building, in addition to the sectors directly supplying equipment to agriculture, is represented by nationally important plants. Among them are aviation (Uzbekistan), physical instruments (Kirgizia), transformers (Tajikistan) and oil machine building (Turkmenia). Large cable plants also are operating in the republics.

The significant labor potential, on the one hand, and the scarcity of ferrous metals, on the other, have made it wise to develop primarily electrical engineering machine building, instrument building and electronics in the region. The products from the machine building enterprises not only meet local demands, but are also shipped to other regions of the nation and overseas. However, the geographic remoteness from the other machine building centers impedes cooperation with enterprises outside the region. For this reason, the specialization and cooperation of Central Asian machine building over the long run will obviously assume an internal regional nature.

Prior to the revolution Central Asia did not have a chemical industry. Over the decades of socialist construction, **chemistry and petrochemistry** of national significance were developed in the region. In addition to producing mineral fertilizers and protective chemicals for agricultural crops, there has also been the development of paint and varnishing production, the purification and processing of natural gas.

For the first time in the nation, the Navoiazot [Navoi Nitrogen] Association began production of katoran, an effective agent for combating cotton weeds. This is a long-action herbicide. In the opinion of specialists, the use of katoran will make it possible not only to clear the weeds off of hundreds of thousands of hectares of land planted under cotton, but will also increase the cotton yield by 2-3 quintals per hectare.

Another event was the starting up in 1980 of a very complex unit to produce caprolactam at the Chirchik Elektrokhimprom [Electrochemical Industry] Association. Caprolactam is a chemical feedstock for producing motor vehicle tires, nonwoven materials, artificial fiber and carpets, plastics and so forth. In 1982, the nation will receive 80,000 tons of the valuable product or double the amount in 1981.

The intensive agriculture in the Central Asian republics requires millions of tons of nitrogen, phosphorous and potassium fertilizers. The region has a number of large enterprises producing nitrogen and phosphorous fertilizers. The lacking capacity can be covered by developing the phosphorite reserves in Bukhara Oblast and this will make it possible to reduce the shipments of superphosphate and phosphorites from Karatau.

Potassium fertilizers are still not produced in Central Asia and are shipped in, although the raw material resources are completely sufficient. By 1990, the demand for fertilizers will reach approximately 1.5 million tons (1 million tons for Uzbekistan). This can be covered by setting up an interrepublic potassium fertilizer combine on the basis of the Tyubegatan (Uzbekistan), Gaurdak and Karlyuk (Turkmenia) potassium salt deposits.

The development of chemistry in the region is impeded by its water intensiveness and by the toxic effluents. From the viewpoint of maintaining the ecological equilibrium in Central Asia this is undesirable. Water intensive chemical production in the Siberian regions possessing natural gas could operate on the chemical salts from Uzbekistan dispatched in empty railroad cars.

Ferrous metallurgy is represented primarily by the metallurgical combine at Bekabad (Uzbekistan). The combine possesses open hearth furnaces, rolling mills and equipment for continuous steel casting. Steel is cast in small amounts in Kirgizia and Tajikistan. Central Asian industry cannot satisfy its demand for ferrous metals fully by internal regional production. For this reason, rolled metal and castings are shipped in from the Urals and Kazakhstan and from other regions of the nation. The annual transport outlays on delivering ferrous metals reach many millions of rubles.

The poor supply, on the one hand, of iron ore in the region for blast furnace production and, on the other, the significant resources of scrap metal (5-6 million tons a year) create prerequisites for developing reconversion metallurgy. The large energy resources make it possible to build powerful electrosmelting production here.

The prospects for developing the full cycle of ferrous metallurgy in the region are present due to the coke-free direct reduction method. The deposits of Tebinbulak (Karakalpakia), Chokadbulak (Tajikistan), Irisu and Abail (Southern Kazakhstan) will become the basis for ferrous metallurgy.

Central Asia holds third place in the nation (after Eastern Siberia and the Far East) in terms of hydropower potential. Here is concentrated a significant portion of the national reserves of natural gas. On the basis of the cheap hydropower resources and gas deposits, a power complex has been created and this is the second complex after cotton of national significance.

Prior to the 1960's, the power system of Central Asia consisted of scores of small isolated power units. In the last decade, a unified power system has been organized in the region. In terms of electric power production, the developed nations of the overseas East and many European states are behind Central Asia.

Table

Electric Power Production in Central Asian Republics, billion kwh

	1970	1980
Uzbekistan	18.3	33.9
Kirgizia	3.5	9.2
Tajikistan	3.2	13.6
Turkmenia	1.8	6.7

The development of Central Asian **electric power** has outstripped the rate of industry (see the Table). Among the major electric consumers are the aluminum plant in Tajikistan, the Chirchik Electrochemical Combine, the Fergana Nitrogen Fertilizer Plant, the Navoiazot Association as well as the enterprises of the metallurgical and electrical engineering industries. Agriculture is placing an ever-greater demand on electric power, particularly with the spread of machine irrigation methods. It must be pointed out that hydraulic engineering construction in Central Asia pursues not only energy, but also irrigation purposes.

There is a difficult problem in organizing the interaction between hydropower and water management. Here priority has been given to the water managers and this is fully justified by the need of irrigating cotton and other crops.

The irrigated areas must be coordinated with reservoir capacity; a definite water reserve is still needed. Due to the imbalance, the reservoirs are fully "worked" for irrigation and this limits the generating of electric power by the hydropower plants. During such periods, the electric balance is supplemented by the thermopower plants.

Grid construction has lagged behind the capacity of the electric plants and this limits the effectiveness of their use. The Central Asian Power System has still not been hooked up to Siberia and the European USSR and uninterrupted power supply is still difficult.

The present electric power of Central Asia includes automated control systems, technical support on a level of the requirements of scientific and technical progress as well as thousands of skilled design, construction and operating workers. But regardless of the rapid development of electric power, the level of electrification in the region is somewhat lower than in other regions of the nation. The prospects of Central Asian electric power are linked primarily to hydropower construction which, in contrast to the early period of electrification, is now concentrated on the creation of large hydropower complexes in the mountain zone, on the Naryn and Vakhsh.

The **gas industry** which developed at the beginning of the 1960's, is marked by a high scientific and technical level. The complete use of the rich deposits is based upon gas fields with modern control equipment and involved systems for the storage, transmitting, purification and processing of the gas.

Over the decades of socialist construction, the Central Asian republics have achieved major successes in creating their own fuel base. The main reserves of natural gas are concentrated in Uzbekistan and Turkmenia.

One of the aims of improving the **fuel and energy balance** of Central Asia is the wider use of gas as a chemical feedstock. There are possibilities for doing this due to the brown coal reserves in the region. Along with using the Angren coal for energy purposes, it also makes sense to exploit the Biysun deposit in Surkhandarya Oblast of Uzbekistan. Coal is presently consumed as a furnace fuel, particularly in the inaccessible regions without gas supplies and is transported in from Kazakhstan and Siberia. The working out of methods and the construction of enterprises for pelletizing the local coals would make it possible to reduce freight traffic and more fully utilize the local resources.

In the interest of saving gas as a chemical feedstock and for covering the growing need for electric power it would obviously make sense to build several nuclear power plants in Central Asia.

Central Asia possesses rich reserves of nonferrous and rare metal ores. Their deposits are located in the mountainous regions of Southern Kirgizia, in the west of Uzbekistan and in the north of Tajikistan.

Prior to the revolution, Turkestan carried out rudimentary surface exploitation of the deposits of several types of nonferrous metals. Now there is a large ore-mining industry in operation and it meets the most modern requirements. **Nonferrous metallurgy** in Central Asia is a range of ore mining and processing enterprises which provide the nation with copper, lead, zinc, antimony, mercury as well as rare and precious metals.

The copper and lead-zinc industry is represented by the large Almalyk Mining-Metallurgical Combine in Uzbekistan. The ore veins are favorable for working by the economic open pit method. The mining of lead and zinc ores has been developed in the east of the Chuya Valley in Kirgizia and Tajikistan. Enterprises of the antimony and mercury industry are operating in the south of the Fergana Valley in Kirgizia and in Central Tajikistan. Since the Great Patriotic War, the Khaydarken Mercury Combine in Kirgizia has been the basic

supplier of antimony and mercury in the nation. In Central Asia there are also enterprises of the tungsten-molybdenum industry; the raw material supplies also make it possible to broaden the mining of tin and bismuth.

The prospects of the aluminum industry are linked to the cheap electric power from the series of GES on the Vakhsh River in Tajikistan. Raw materials are to be shipped into the region from the European portion of the nation. Shipments over thousands of kilometers without countertraffic will intensify the already significant excess of goods transported into the region over those transported out.

However, aluminum raw materials do exist in the region in the form of the Angren kaolins (Uzbekistan). The comprehensive utilization of the kaolins is necessitated by the tasks of developing building materials production. The organization of alumina-cement production will make it possible to obtain 6 tons of high-grade white cement per ton of alumina. Raw materials for porcelain production is shipped into the region from the Ukraine while local raw materials are dumped out.

The exceptionally large deposit of sulphate-magnesite salts in Kushkanatau (Karakalpak ASSR) can become the basis for a chemical metallurgical combine. It will provide the nation with magnesium, sodium sulfate, chlorine, caustic soda and other products.

The Organization of Interregional Traffic

Central Asia ships out cotton fiber, vegetable oil, raw silk, ore raw materials and nonferrous metals, gas, wool, equipment for cotton raising and electrical engineering products. Products from the Central Asian economic region are exported to scores of foreign nations. From Eastern Siberia, Central Asia receives lumber, ferrous metals, cement and coal; phosphate fertilizers and grain come from Kazakhstan. Machinery and equipment, steel pipe, sugar, potatoes and salt are also sent here.

In the foreseeable future, Central Asia will supply products of the textile industry and the labor-intensive sectors of machine building, fruit and vegetable products, wines, canned fruits and so forth.

In organizing the interregional shipments, an important role will be played by the specific features of the region's transport and economic ties with the negative traffic balance for Central Asia. An analysis of the interregional ties indicates that more than four-fifths of the products shipped in are delivered from the remote regions of the nation with a tendency for a systematic rise in the shipping distance. The rational organization, for example, of rail shipments could reduce the run of empty cars by thousands of kilometers. For example, it would be better to ship in from Eastern Siberia not logs, but rather sawn lumber. A broadening of capacity for the flour milling industry would make it possible to deliver large quantities of grain from Kazakhstan.

Over the long run, one must expect the development of the interregional inbound and outbound transporting of products in economically justified amounts due to the broader ties with the Union republics and overseas countries. In particular, it is a question of increasing the production of consumer goods in Central Asia (the demand of the population is approximately 85 percent satisfied in terms of the level of rational standards). The other portion of the product would be shipped beyond the economic region in exchange for shipping in complementary products.

Water and the Prospects of the APK

The May (1982) Plenum of the CPSU Central Committee opened up new possibilities for developing the nation's APK and particularly in the Central Asian republics.

The Central Asian economic region, with the development of its material and technical base and the solving of the water resource problem, could become a major supplier of fruits and vegetables for the nation and primarily for Siberia and the Far East. The guarantee of this is the scores of millions of hectares of fertile (now empty) land, the great and rapidly growing labor resources and the age-old skills of raising high-yielding food crops.

The broad scope of water management construction and the development of new irrigated lands (in Uzbekistan alone, each year 100,000 hectares of them are developed) has led to reduced drainage from the Syr-Darya and Amu-Darya. As a result of this, the level of the Aral Sea has dropped by 7-8 m over the last 15 years.

Deferring the elaboration of design documents and preparatory work for building the Siberia--Central Asia Canal can lead to a gap between the time for the exhaustion of water resources and the arrival of water from the north. The development of the productive forces, and particularly the APK of Central Asia and Kazakhstan, presupposes a prompt resolution to the grandiose problem. The creation of an abundance of food products and industrial raw materials and the flourishing of the unique region depend on this.

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CSO: 1820/57

MORE PROFESSIONAL-TECHNICAL TRAINING SEEN AS CURE FOR LOW LABOR PRODUCTIVITY IN TAJIK SSR

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 88-96

[Article by Doctor of Economic Sciences A. I. Zavulunov, sector chief of the Council for the Study of the Productive Forces under the Tajik Academy of Sciences: "Tajikistan Industry: Certain Development Questions"]

[Text] The Decree of the CPSU Central Committee "On the 60th Anniversary of the Formation of the USSR" emphasizes: "The economy of each republic holds an important place in the social division of labor and makes an ever-weightier contribution to national wealth. Multinational production, scientific and creative collectives have formed everywhere and are working successfully."

The Tajik economy is developing rapidly. Over the years of the Tenth Five-Year Plan, 4.7 billion rubles of capital investments have been invested here and this ensured the completion of over 80 industrial enterprises and shops, including the Nurek GES which is the largest in Central Asia, five electrolysis buildings and a shop for fired anodes at the Tajik Aluminum Plant, major capacity at the Yavan Electrochemical Plant and many other production projects. The total volume of utilized state capital investments during the years of the Tenth Five-Year Plan was 22 percent greater than in the Ninth. Some 3.6 billion rubles of fixed capital was put into operation and this was 17 percent more than in the previous 5 years. Over the years of the Tenth Five-Year Plan this made it possible to increase gross social product by 25 percent, national income by more than 22 percent and the volume of industrial production by 30 percent. The republic made definite advances in increasing the efficiency of social production. Around 23,000 workers were conditionally released due to the introduction of equipment and advanced production methods. Labor productivity in republic industry rose by 9 percent in 1975-1980.

Capacity Designed and Developed

Regardless of the achieved successes, Tajik industry possesses large reserves for the additional output of products at the operating and particularly at the newly opened enterprises. The high rates of capital investments and the completion of fixed capital in the republic still do not ensure the corresponding growth rates for labor productivity and product volume. One of the main reasons is the extended time for reaching designed capacity at the completed enterprises. At the 19th Congress of the Tajik Communist Party, it was pointed out that in the Tenth Five-Year Plan the new republic enterprises provided

41 percent of the product increase. The increase could have been significantly higher with the prompt achieving of designed capacity by the newly completed industrial enterprises.

In Tajik industry one can observe an unfavorable ratio between the indicators for the growth of the capital-to-labor ratio and labor productivity at the enterprises. The capital-to-labor ratio in 1970-1980 rose by 120 percent while labor productivity increased by 29 percent. Such a ratio led to a decline in the return on investment, that is, to a lag in the growth rate for product output and national income behind the growth rate of fixed industrial-productive capital. Product output per ruble of fixed productive capital declined by almost 50 percent.

Both objective and subjective factors have influenced the drop in the return on investment. Conditionally, among the objective factors one can put the structural shifts in industry and the national economy, the changes in prices for equipment which are not proportional to the change in equipment productivity. However, the decline in the return on investment also occurred under the impact of factors which depend partially or completely upon the enterprises and related organizations, namely: the extended time for reaching designed capacity, insufficient utilization of equipment and so forth.

An analysis of the operation of the new Tajik industrial enterprises indicates that they possess enormous reserves for the additional output of product, primarily through the fuller utilization of designed capacity (see Table 1).

The realization of the republic's production reserves by approximately 40 percent depends upon eliminating the shortage of skilled manpower, 20 percent upon eliminating design shortcomings, 18 percent upon providing complete completion and elimination of design and installation flaws, 14 percent upon improving material-technical supply, 5 percent upon increasing the quality of installed equipment and so forth.

Personnel Training

Approximately one-half of the republic's industrial enterprises was put into operation in the Ninth and Tenth Five-Year Plans and they now produce two-thirds of all the republic's industrial product. The successful opening up of the new enterprises which have been put into operation or are to be put into operation in coming years will depend largely upon the prompt training of the necessary amount of skilled personnel and workers in the leading professions.

Tajikistan has the highest rates for the natural increase of the population. In 1980, per 1,000 persons in the USSR, the number of births was 18.3, in Lithuania 15.1, in Latvia 14.0, in Uzbekistan 33.8 and in our republic 37 persons, while the natural increase in the population was, respectively, 8.0, 4.6, 1.3, 26.4 and 29.0 persons. In terms of the number of births and for the natural increase per 1,000 persons, Tajikistan holds first place among the Union republics and exceeds the national average indicators by 2-3-fold.

With the growth of the population, the labor resources also grow and this creates the prerequisites for the further development of the region's economy. However, modern production requires trained skilled workers. The republic must deal with the paradox that there are many free hands, but not enough skilled personnel. The question is one of the insufficient training and production facilities for training the personnel.

Table 1

Reserves for Reaching Designed Capacity at New Tajik Enterprises in 1980

Enterprises, Product	a	b	c	d	e	f*
Dushanbe Fittings Plant imeni S. Ordzhonikidze:						
Pipeline fittings, 1,000 units	1976	50	20	40	30	
Same	1977	325	122.5	38	202.5	1; 2
Same	1978	276	32.6	12	243.4	
Leninabad Tadzhiktorgmash [Tajik Trade Machinery] Plant:						
Finished product, 1,000 rubles	1978	10,212	4,480	44	5,732	1; 2; 3
Dushanbe Asbestos Cement Products Combine, Production Line SMA-172:						
Asbestos cement pipe, km of pipe units	1977	1,050	486	46.3	564	1; 2
ZhBK [Reinforced Concrete Products] Plant No 1:						
Nonpressure pipe, m^3	1978	6,000	681	11.4	5,319	1; 2
Pyandzh Cotton Gin:						
Cotton--fiber, tons		15,291	12,145	79.4	3,146	2
Isfara Cannery:						
Canned fruits and vegetables, million can units	1976-1978	64	33.3	52.0	30.7	1; 3; 4
Dushanbe Dairy Combine (second stage):						
Whole milk products, 1,000 tons	1976	73.5	34.8	47.3	38.7	5
Leninabad Dairy:						
Whole milk products, 1,000 tons	1977	20.5	18.3	89.3	2.2	2; 5
Khorog Meat and Dairy Combine:						
Whole milk products	1976	2,200	2,039	92.7	0.161	5

*1--Lack of skilled personnel
2--Lack of raw products and materials
3--Construction and installation flaws
4--Design errors
5--Difficulties in marketing products

Key: a--Year of Completion
b--Designed Capacity
c--Actual Output
d--Utilization of Designed Capacity
e--Absolute Product Losses
f-- Basic Reasons for Underutilization of Designed Capacity

Each year large amounts of capital investments are channeled into the development of the Tajik economy. However, here fewer skilled workers are trained than in a number of other republics (see Table 2).

Table 2

Capital Investments into Economy and Training of Skilled Personnel in System of Vocational-Technical Education (PTO)

Republics	Capital Investments		Training (Graduation) of Workers in PTO System	
	1976-1980, mil. rubles	1980, rubles per capita	1976-1980, 1,000 persons	1980, persons per 1,000 population
Belorussia	20,858	433.1	403.3	8.7
Moldavia	24,748	247.5	503.5	7.1
Uzbekistan	7,431	372.7	129.5	7.3
Latvia	6,266	504.13	96.0	8.2
Lithuania	8,017	467.3	112.1	7.2
Turkmenia	5,914	422.8	75.0	8.2
Azerbaijan	9,008	322.4	257	9.1
Kirgizia	4,725	271.0	142	8.4
Tajikistan	4,733	242.1	79	4.5

In Tajikistan, more than two-thirds of the capital investments go for new construction while in certain other republics a predominant share of the money is channeled into the reconstruction and technical reequipping of existing enterprises. This requires many fewer new skilled workers.

Over a number of years in our nation the worker personnel has been predominantly trained on the job. In 1980, the USSR trained around 22 persons per 1,000 of the population on the job and 9 skilled workers in vocational-technical schools (PTU); in Tajikistan the figures, respectively, were 10.5 and around 4.5 persons. It is essential to sharply increase the proportional amount of workers trained in the PTO system, particularly in our republic.

The volume of the republic's industrial production in 1981-1985 should increase by more than 27 percent. The leading republic industrial sectors including metallurgy, chemistry and machine building are developing and will develop rapidly. The production volume of nonferrous metallurgy is to increase by more than 2-fold in comparison with the Tenth Five-Year Plan, including by 3.2-fold for aluminum. Machine building products will increase by 42 percent over the 5 years. There are plans to build and put into operation a large number of new industrial enterprises. Construction on the Rogun GES is to be continued, and there are plans to put the first units of the Baypaza GES into operation, all the electrolysis buildings at the aluminum plant, construction will be completed at the Yavan electrochemical plant and on other projects, while reconstruction and technical reequipping will be carried out at many operating enterprises.

However, we, unfortunately, have not achieved proportional growth in the number of PTU and the training of skilled worker personnel. From 1975 through 1980, the number of PTU

in the republic increased from 59 to 71, while the training of skilled workers rose from 14,000 persons to 18,000, that is, by just 29 percent. At the end of 1980, approximately 8 percent of the youth 16-18 years of age was studying in the PTU of the republic while in the RSFSR, the Ukraine, Belorussia and Kazakhstan up to 15 percent of the youth of this age are studying in the PTO system.

The data of the Tajik State Committee on Professional-Technical Education indicate that the personnel graduated by the PTO system cover approximately 30 percent of the republic's needs. According to our calculations, the republic presently lacks around 60,000 skilled workers. For this reason, for the broader involvement of the local youth in PTO in our view it is essential to double the network of PTU. The same opinion is held by the above-mentioned committee. By 1985 it would be advisable to bring the number of PTU up to 100, the number of student places up to 49,000 and the number of students up to 50,000 persons (at the end of 1980, the number of persons studying in the republic PTU was 37,100).

The question of supplying the new enterprises with personnel must be solved in the designing stage, in working out the technical plans, where it is essential to specifically determine the sources, volume, forms, methods and times for training the labor force. New enterprises can spend 2 percent of the estimated cost of the project under construction for these purposes. If these funds are not sufficient, the enterprises may increase the current operating expenses.

The Quality and Dates for Designing Construction and Development

The times for reaching designed capacity at new enterprises depend largely on the level of designing. A significant portion (20-25 percent) of the new republic enterprises at present have not reached designed capacity due to design shortcomings. In our view, the final payments for design documents between the clients and design organizations should be made only after achieving the plant's designed capacity while the bonuses for designers should be linked to the achieving of the designed economic indicators for the operation of the new enterprises. At present, it is prohibited to accept projects for operation with flaws while the acceptance statements have begun to permit "flaws which do not prevent normal operation." Among the flaws are those where normal operation of the enterprises is impossible without their elimination. Obviously, the acceptance commissions, in submitting the project's acceptance certificate, must prepare an explanatory note to the given certificate on the basis of the Construction Standard and Rule Sh-3-76 and incorporate in this the conclusions of the commission on the preparation of the project for normal operation. Particular attention should be given to the complete supply of the new enterprise with material-technical resources, personnel, food service points, housing and public building and so forth.

In the prompt achieving of designed capacity at new enterprises, an enormous role is played by economic incentives for the operating personnel. For newly completed projects during the period of the normed reaching of designed capacity and the economic indicators, in forming the economic incentive funds and bonuses for workers, one of the main indicators could be the level of reaching designed capacity and the designed economic indicators of production.

We have every reason for promptly reaching full capacity at the new enterprises. The experience of many Soviet and foreign enterprises shows that with the correct organization of designing, construction and the preparation of the new enterprise for operation, the period

of reaching designed capacity does not exceed 1-1.5 year. The prompt and early reaching of the design indicators is a major reserve for increasing the efficiency of social production in the 11th Five-Year Plan.

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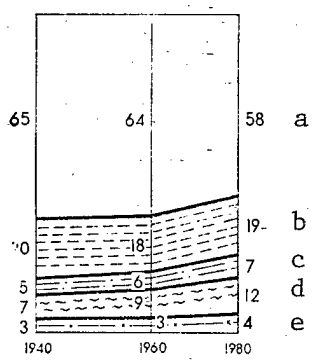
CSO: 1820/57

CHARTS SHOW BREAKDOWNS FOR: LABOR, HOUSING, CAPITAL INVESTMENTS, EDUCATION, FOOD PRODUCTS, RETAIL TRADE AND CONSUMER SERVICES

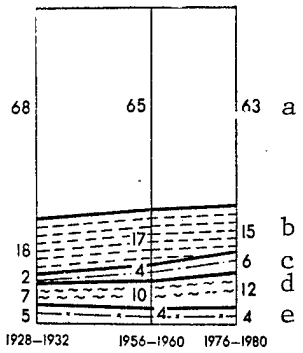
Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 97-102

[Unattributed statistical materials]

[Text]



Distribution of Number of Workers and White Collar Personnel by Groups of Union Republics, USSR = 100%



Distribution of Capital Investments by State and Cooperative Enterprises and Organizations (without Kolkhozes and Populations) by Groups of Union Republics, USSR = 100%

Key to both diagrams:
- a--RSFSR
- b--Ukraine, Moldavia
- c--Belorussia, Baltic republics
- d--Central Asia, Kazakhstan
- e--Transcaucasia

In 1928-1932 the share of Belorussia without the Baltic republics is given in the total volume of capital investments

Housing Space Available to Urban Residents by Union Republics, m^2 of Total (Usable) Housing Area per Person

	1940	1960	1970	1980
RSFSR	4.6	8.6	11.3	13.2
Ukraine	6.9	9.8	12.2	14.0
Moldavia	6.0	8.4	10.4	11.6
Belorussia	6.7	8.8	11.1	13.0
Lithuania	11.3	9.4	11.7	13.6
Latvia	**18.0**	**12.2**	**14.2**	15.8
Estonia	15.5	11.5	14.0	**16.3**
Kazakhstan	5.2	7.9	10.0	11.6
Uzbekistan	6.7	7.8	*8.3*	*9.3*
Kirgizia	*4.8*	*7.4*	9.0	10.0
Tajikistan	5.1	7.9	9.1	9.8
Turkmenia	5.0	8.4	10.1	10.5
Georgia	7.2	9.8	12.4	14.5
Azerbaijan	5.4	8.1	9.5	9.9
Armenia	5.6	7.9	9.9	10.9

Maximum and minimum values of indicators are shown by boldface and italics.

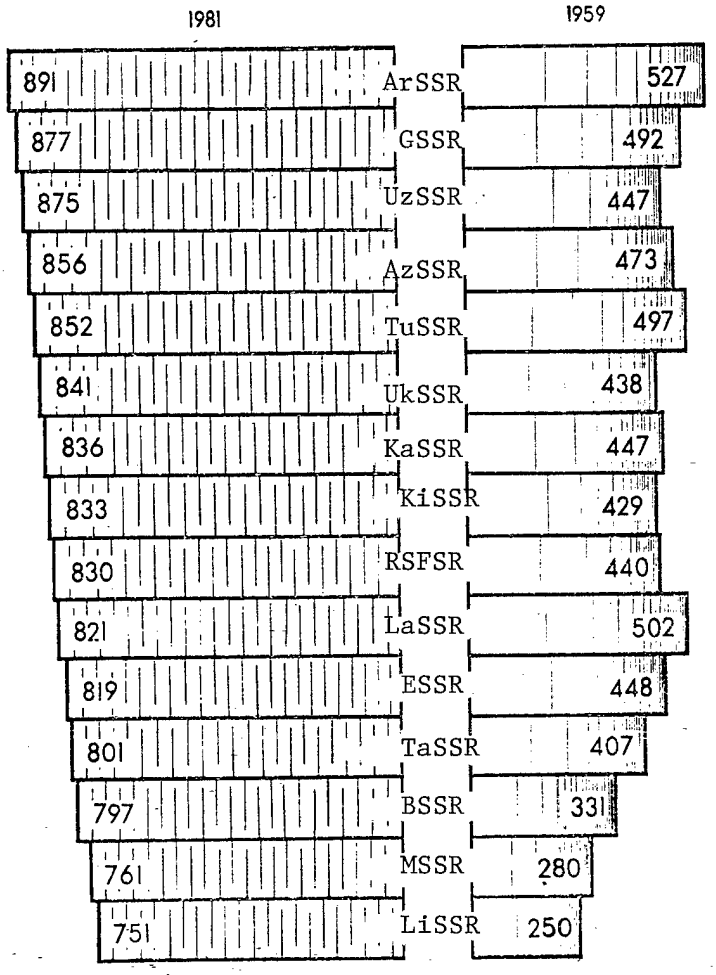
Energy Capacity in Agriculture of Union Republics

	Hp per Worker				Hp per 1000 Hectares of Planted Area			
	Kolkhozes		Sovkhozes		Kolkhozes		Sovkhozes	
	1960	1980	1960	1980	1960	1980	1960	1980
RSFSR	6	27	8	34	69	221	*61*	253
Ukraine	3	16	6	24	75	276	90	401
Moldavia	*2*	14	5	16	93	541	169	**962**
Belorussia	3	18	4	22	105	381	94	382
Lithuania	3	36	6	36	75	518	117	567
Latvia	4	37	6	38	84	476	115	477
Estonia	7	**52**	7	**49**	131	513	127	529
Kazakhstan	**10**	28	**23**	46	*60*	*167*	78	*159*
Uzbekistan	3	9	5	16	158	554	129	508
Kirgizia	5	14	6	15	120	431	109	460
Tajikistan	3	10	8	12	130	**633**	222	482
Turkmenia	4	13	8	17	**237**	516	294	623
Georgia	*2*	*5*	*4*	*7*	176	503	**309**	539
Azerbaijan	3	8	10	10	130	309	206	587
Armenia	4	10	5	13	170	506	283	616

Maximum and Minimum values of indicators are shown by boldface and italics.

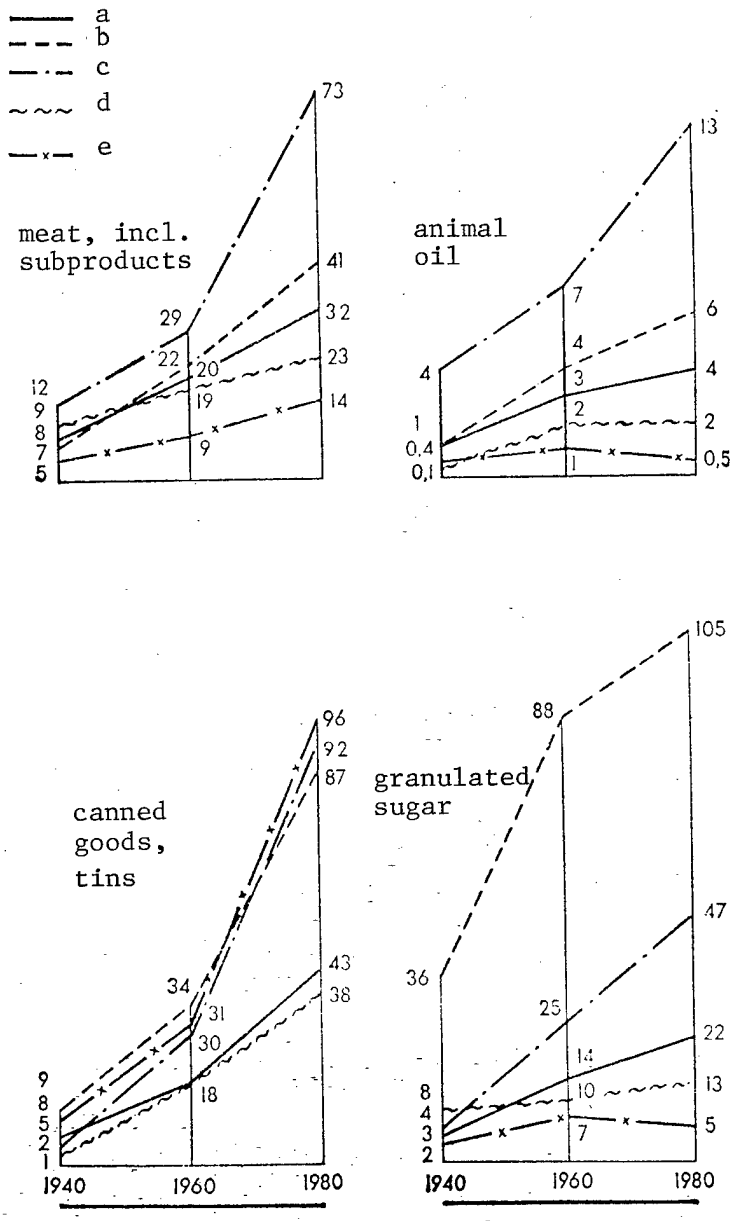
LINES FOR THE PORTRAIT OF THE UNION REPUBLICS*

Educational Level for Union Republics Calculated per 1,000 Employees in the Republic Economy, Having a Higher and Secondary Education:



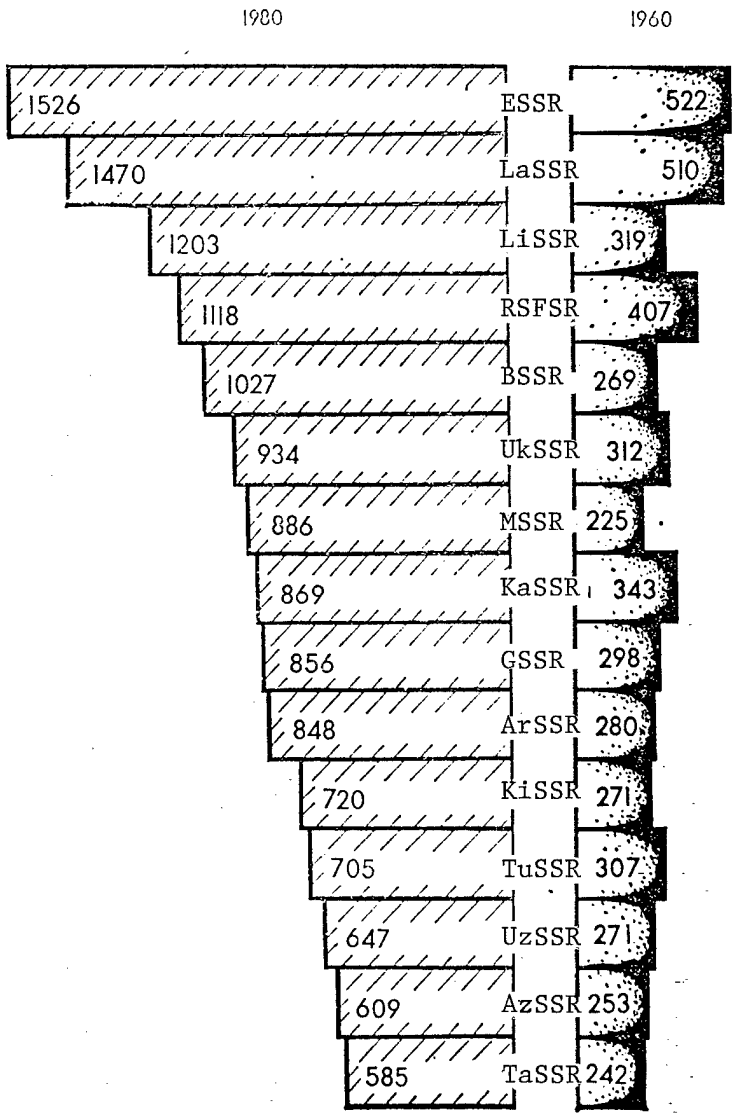
* End. For the beginning of the selection of statistical materials devoted to the 60th anniversary of the formation of the USSR, see issues No 7, 8, 9, 10 and 11 on the inside cover.

Production of Food Products by Groups of Union Republics, kg per Capita

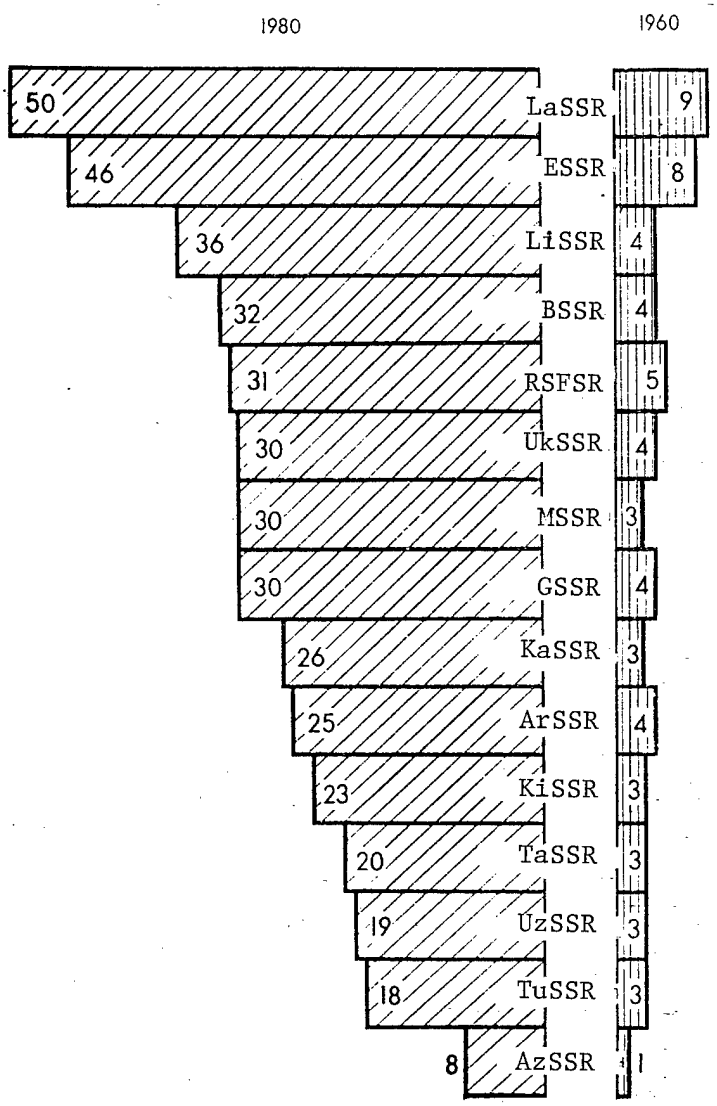


Key: a--RSFSR
b--Ukraine, Moldavia
c--Belorussia, Baltic republics
d--Central Asia, Kazakhstan
e--Transcaucasia

Retail Commodity Turnover of State and Cooperative Trade, Including Public Dining, by Union Republics, Rubles per Capita in Current Prices

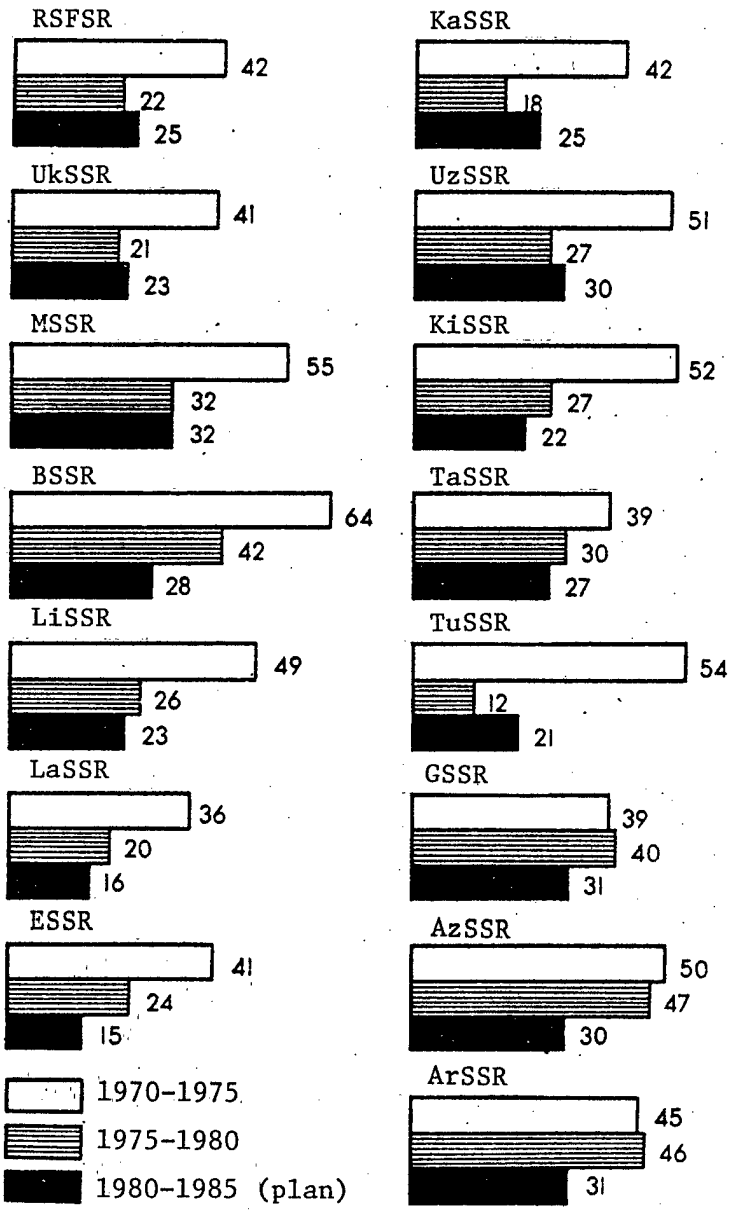


Volume of Domestic Services for Population by Union Republics, Rubles per Capita, in Current Prices



[Inside Front Cover]

Growth Rates of Industrial Production by Union Republics, %



10272
CSO: 1820/57

FISH INDUSTRY MINISTER INTERVIEWED ON DIETARY IMPORTANCE OF FISH, 200-MILE LIMITS, PISCICULTURE

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 103-111

[Article with V. M. Kamentsev, USSR Minister of Fish Industry, by Doctor of Economic Sciences, Prof D. D. Moskvin: "The Paths of Development"; date and place of interview not given]

[Text] [Editor's Introduction] The May (1982) Plenum of the CPSU Central Committee approved the USSR Food Program for the period up to 1990. It is aimed at carrying out the task posed by the party of utilizing the increased economic potential of the nation to bring about in the shortest possible time a stable supply of the population with all types of food and to substantially improve the structure of the Soviet people's diet by the most valuable food products.

A further rise in agriculture is the basis of the USSR Food Program. At the same time, in achieving this aim a major role should be played by the nation's fish industry. The program has outlined measures to achieve a production of edible fish products in 1985 totaling 4.2 million tons and in 1990, 4.3-4.5 million tons, for canned fish respectively 3 billion can units and at least 3.2 billion can units.

Our readers will recall the large selection of materials devoted to the food program (see EKO, No 6, 1982). In it, in particular, was an article on the tasks of the fish industry. This issue tells in more detail how the workers of the sector will carry out the tasks confronting them.

EKO: Vladimir Mikhaylovich [Kamentsev], we would like for you to first tell about the place of fisheries in the food balance, about its role in the national economy as a whole and about the paths which the fishermen will follow in the 11th Five-Year Plan.

V. M. Kamentsev: The nation's fisheries have been assigned a major role in carrying out the tasks posed by the Food Program of further improving the supply of food products. The sector supplies more than 20 percent of all animal protein produced in the nation. Fish and other seafood products provide not only protein, but also fats, minerals and vitamins. The fish industry supplies it products to 55 national economic sectors. In addition to a broad assortment of edible food products and canned goods, our sector produces such very valuable medical agents as fish fat, as well as fish meal for agriculture, furs, the skin of marine animals and so forth.

From 1950 through 1975, the catch of fish and sea products rose by more than 6-fold, from 1.7 to 10.4 million tons, the output of edible fish products by more than 4.6-fold, the production of canned goods by 4.5-fold and the output of feed meal by 34-fold. Annual per capita fish consumption has increased from 7 kg in 1950 to 17 kg in 1980, that is, by 2.4-fold. From 1950 through 1981, labor productivity in the sector rose by 5.1-fold.

At present, our fisheries are primarily the large fleet. It is responsible for more than 70 percent of the sector's fixed capital. The fishing fleet provides the catch of 90 percent of the fish and sea products, 85 percent of the edible products, almost one-half of the total output of canned goods and virtually all the fish meal.

The accelerated development of the fishing fleet started in the postwar period, when upon a party and government decision an abrupt turn was made from passive coastal fishing to active deepwater fishing. Over the three decades, the number of large self-propelled vessels has risen by more than 6-fold, the total power of their main engines has risen by approximately 5.6-fold, ship refrigeration capacity by 10-fold and productivity of the freezer units by 75-fold.

Over the last 15 years, the processing of the catch has been shifted to the vessels. Such a decision has proven fully effective as the catch destined for producing edible and industrial products is better and more fully utilized than with any other system. The equipping of the fishing vessels with freezing equipment as well as the facilities for mechanizing and automating the processing and dressing has provided the opportunity to greatly increase the dressed output of fish, to produce canned goods and preserves as well as expand and improve the assortment of fish products.

The ship builders have given us an entire range of fishing boats, refrigerated transports and floating fish processing plants. The composition of the fleet has been continuously improved with obsolete equipment being written off and replaced by more modern vessels. These have been built both at Soviet yards as well as at the yards of Poland, the GDR and other countries.

The shore facilities have also been developed in parallel with the fleet and this is indispensable for fleet operations. There are specialized fishing seaports, scores of ship repair yards and docks, floating shops and technical service centers. The shore facilities are very extensive. These include crating and packaging enterprises and fishing gear factories, fish canning combines and machine building plants, design and scientific organizations and much else.

The sector includes fishing kolkhozes which provide one-quarter of the Union catch. As a rule, a modern fishing kolkhoz is an economically strong business with its own coastal and deepwater fleet, fish processing, a ship repair and other auxiliary types of production.

The kolkhozes provide the nation with virtually the entire volume of sturgeons and salmon caught as well as many types of valuable lake and river fish. In addition, the kolkhozes raise around 20,000 tons of pond fish and their processing shops produce over 240 million can units of canned goods. Over the last 15 years, the kolkhozes have done extensive work to concentrate production and interkolkhoz associations have been set up.

The next stage is the formation of mixed-type enterprises on the basis of an association of state and cooperative-kolkhoz ownership.

For us the kolkhoz system is a total of not only production, but also social problems running from the building of housing and cultural-service facilities to the choice of in what direction the development will be for the kolkhozes which are most dependent upon ocean-going fishing.

In the 11th Five-Year Plan, the nation's fisheries have been confronted with the task of increasing the output volume of edible fish products, including canned goods, by 10.8 percent. We should focus efforts on further improving fishing and ensure a rise in fish production in the pond, pool, lake and other fish-raising farms. Due to the intensification of fish raising, pond productivity should rise by 1.5-fold while the more rational utilization of the fish supplies will increase the fish catch in freshwater bodies of water by 35 percent. The full utilization of fish raw materials is a major task for the sector during the 11th Five-Year Plan. At least 75 percent of the fish catch will go for producing fish products and here 40 percent will be produced in a dressed form using virtually all the waste products.

EKO: In recent years, major changes have occurred in world fishing involving the introduction of the 200-mile limits. How has this reflected on our fishing fleet and on the catches?

V. M. Kamentsev: You have touched on one of our most serious problems. In actuality, over 100 states have introduced these limits. The new international fishing conditions have required a fundamental change in the economic and technical policy of the sector. Along with seeking out new forms of collaboration with foreign nations, the sector has been oriented, on the one hand, at developing coastal fishing and, on the other, at exploiting new fishing grounds in the open world ocean. This involves a sharp rise in labor intensiveness, energy expenditures to locate and catch the fish as well as major changes in the designs of the vessels, fishing gear, fishing methods and the entire organization of fishing operations. The development of new fishing grounds and new objects of fishing has naturally meant a rise in expenditures on producing the product and a lowering of production efficiency.

Even before the introduction of the 200-mile limits, our nation took measures to develop fishing in the open seas. Significant supplies of commercial fish were found in studying the regions lying outside the 200-mile zones. New, more progressive fishing gear and devices were developed.

Of course, there are and will be difficulties involved with the restrictions on fishing. They are due not so much to the size of the catch as to the specific composition of the fish. The dropping of the trawls to greater depths cannot help but tell on the assortment and the purchaser will be aware of this.

During the current five-year plan, a significant portion of the catch will be made up of pelagic and deepwater fish and sea products such as putassu, grenadier, Atlantic saury, tuna, squid and so forth. According to the forecast of the sector's head institute, the VNIRO [All-Union Scientific Research Institute for Marine Fisheries and Oceanography], the catch of deepwater products can be around 570,000 tons a year.

EKO: New fish is certainly a difficult thing both for the production engineers and for any housewife....

V. M. Kamentsev: The changes in world fishing are naturally being felt in the broadest range from shipbuilding practices to our dining table. There is no "bad" fish, rather it is a question of knowing how to prepare it and a good housewife knows this. All that is caught is a balanced raw material for producing food and other products necessary for the national economy.

The particular features of our sector are such that the opportunities for the mass catching of even new fish species have outstripped the technical questions of introducing the unusual raw product. The laboratories still need some time for turning over the new methods to the industrial enterprises.

Hence, the important task confronting the specialists of the sector in the current five-year plan: to organize the output of high-quality products from the caught raw materials, to make it up attractively and to advertise it actively. The conducted research and technical experiments indicate that from the nontraditional types of fish it is completely possible to produce filets, the whole carcass, fish stuffing, canned goods and certainly various sorts of cooking products.

EKO: Up to now we have virtually not touched upon the problems related to the shore enterprises. What must be done here?

V. M. Kamentsev: First of all, I would set apart the problem of ship repairs as a particularly urgent one. The lack of the necessary amount of appropriate capacity has caused stoppages of ocean-going trawlers, factory ships and refrigerator ships and has led to losses of many thousands of tons of fish. If one adds to this that during the current five-year plan we must modernize a portion of the large-tonnage trawlers which have been in service 12-16 years, the difficulties are apparent.

In order to overcome them, with minimum capital investments it is essential to expand the capacity of the ship repair yards. But this is only one of the ways. A second and equally important one is to increase the shift factor at the yards and presently this reaches scarcely 1.2. A third way is to introduce a dynamic system of ship maintenance and repairs and scientists are at work on this. This is based upon an accurate assessment of the technical state of the ship elements and repair not blindly, according to standard documents, but rather in accord with the technical state of the specific vessel. This state is calculated on a computer and is dependably forecast.

EKO: Please tell us about the state of affairs in the inland bodies of water.

V. M. Kamentsev: In 1980, some 440,000 tons of fish were caught in the inland freshwater bodies of water and this is double the level of 1950. Certainly the main thing is to preserve and intensify this trend. Over the three decades, the production of pond fish has risen by 26-fold, but this is far from the limit.

At present, the policy has been set of developing new methods of aquaculture. The scientists are working on the development of an industrial type enterprise using hot water and with capital investments of approximately 3.5 million rubles and a minimum necessary area of 1 hectare, this would produce 2,000 tons of carp a year. The repayment for such a farm would be 6.6 years in raising carp and 1.6 year in raising trout. We have set ourselves the task during the current five-year plan of testing out experimental industrial aquaculture enterprises with a capacity of 250 tons of fish a year and to begin building such complexes.

The ministry is undertaking measures to increase the productivity of our nation's inland bodies of water. As a result, the total sturgeon catches, for example, have averaged for the nation some 26,000 tons in 1978-1980 and this is the highest catch over the last 60 years. An extensive program for preserving the riches of these bodies of water has been outlined for the 11th Five-Year Plan. But still the problem of industrial aquaculture is one of the major ones.

EKO: Fisheries have a very extensive network of firm stores. What is their role?

V. M. Kamentsev: I would answer this question by pointing out what has been done to develop in large cities and industrial centers fish processing complexes and combines designed for a daily output of from 10 to 85 tons of a broad range of various fish products in convenient small packaging. These are already operating in Minsk, Donetsk, Volgograd, Kemerovo and other cities. Our aim is to supply the population with good products.

A firm store is not only a display window for the sector. As an unique laboratory in studying and shaping consumer demand, it has been given an important role in strengthening the economic ties between production and trade, in upgrading the assortment, improving the quality of fish products and broadly popularizing and advertising the new products.

EKO: What new will the present five-year plan bring in the organization and management of fish production?

V. M. Kamentsev: Our sector has adopted 13 comprehensive specific programs, including "Pelagial," "Squid," "Krill," "Salmon," "Pond," "Lake" and others. Their implementation will make it possible to rationally utilize the money allocated for science, to concentrate the funds in the main areas, to improve the coordination of the activities of the institutes and design organizations and bring about the more complete and rapid introduction of scientific research, production and design developments.

We are paying particular attention to social questions and in particular to improving the working conditions at enterprises, to building housing and cultural-service facilities, to the training of personnel, to eliminating the causes of turnover and so forth.

Increased production efficiency, the more rational utilization and saving of all material resources directly depend upon a further improvement in the management mechanism. We are planning to carry out great work in this area primarily in generalizing the work experience of the enterprises which have converted to the indicator of normed net product. The brigade form for the organization and encouragement of labor will be improved and in the fishing industry this has already been employed for a long time and on a broad scale.

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CSO: 1820/57

PROGRESS IN FRESHWATER PISCICULTURE REVIEWED

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 112-116

[Article by Candidate of Economic Sciences A. I. Zaytsev, general director of the All-Union Scientific-Production Ass ociation for Pisciculture, and A. M. Romanov, director of the affiliate of the Institute for Advanced Training of Employees and Specialists of the Fish Industry in Moscow: "The Levers of Market Pisciculture"]

[Text] We are all aware that freshwater fish caught in lakes, rivers and reservoirs or raised in ponds, tanks, pools and commercial installations is particularly popular with the public. In the Food Program adopted by the May (1982) Plenum of the CPSU Central Committee, an important place has been assigned to producing this fish. The program states: "On the basis of intensifying pond fish raising, to increase over the decade the production of market fish on the fish raising farms by approximately 3-fold.

Over the past decade, the production of pond fish has risen from 62,500 tons in 1970 to 153,000 tons in 1980, that is, by almost 2.5-fold. As we see, the set task is difficult, but feasible.

During the current five-year plan we intend to complete tens of thousands of hectares of new pond area, to reconstruct many of the existing fish farms, but chief attention will be paid to converting all pisciculture to a path of intensification.

According to the 1981 results, the output of market fish averaged 11.9 quintals per hectare for the nation. But this is not the limit. In the 11th Five-Year Plan, a whole series of brigades (Comrade I. K. Novikov from the Don Fish Combine in the Ukraine, Comrade F. M. Biley from the Transcarpathian Fish Combine, Comrade N. S. Kostenko from the Sinyukha Fish Farm of the RSFSR) has achieved a fish productivity of over 50 quintals per hectare.

In 1980, on 15.9 percent of the area of the foraging ponds on the pond farms of the RSFSR Minrybkhoz [Ministry of Fish Industry], fish productivity equaled only 3.5 quintals per hectare, and on 25.3 percent some 6 quintals per hectare. On the Ukrainian farms, on 31.5 percent of the foraging area, fish productivity was only 8.0 quintals per hectare. At the same time, the acquired scientific potential and the observing of the appropriate production methods would make it possible even now to bring fish output up to 18-20 quintals from each pond hectare.

The most important levers for increasing pond fish productivity are the breeding and hybridization of pond fish, the utilization of herbivorous fish in the polyculture, the obtaining of viable fish stock, specialized fish feed and feeding conditions, the intelligent operation of the pond stock, the prevention and treatment of fish diseases, the protecting of the water sources against pollution and so forth.

The activities of the All-Union Scientific-Production Association for Pisciculture (the VNPOR for Pisciculture) are concentrated on solving these problems of market fish raising. The association includes the All-Union Scientific Research Institute for Pond Fisheries (VNIIPRKh), design organizations and farms for the production of young and market fish.

Scientists have worked out and tested a production system for raising fish stock for various pisciculture zones and this provides a stable 15-20 quintals of standard weight fingerlings per hectare with feed expenditures of 2.5-3.0 kg per kg of fish weight increase. The method of the early commercial reproduction of the larvae as well as the method developed at the institute for raising them to viable stages make it possible to extend the growing period by 10-20 days. The method of commercial carp raising has been widely employed and at present over 50 percent of the fish larvae is produced by this method in the nation. However, the raising of larvae has still not been mastered by all farms. Fluctuations in the yield are from 31 to 97 percent, so the mastering of the raising methods by all farms could significantly reduce the shortage of stock and make it larger and more viable.

A further broadening of the raising of herbivorous fish is a major reserve for increasing the production of pond fish. There are particularly significant reserves in the Ukraine, the RSFSR and the VRPO Azcherryba [Azov-Black Sea All-Union Fishing Industry Association], where their production could be increased by approximately 10,000 tons a year without any substantial outlays.

The questions of increasing the production of herbivorous fish have been incorporated in the comprehensive specific Amur Program. The main task in this program is to extensively organize the production of fish stock and new fish species for ponds and bodies of water in multiple use (reservoirs, lakes, estuaries, cooling ponds of power plants and so forth). For these purposes in 1981-1990 there are plans to set up a breeding farm, a reproducer farm with a capacity of 1,500 producers a year, 25 large plants for obtaining around 6 million larvae a year and 12 specialized fish nurseries at reservoirs.

Herbivorous fish in ponds do not require additional expenditures on combined feed and in natural bodies of water reach large size and good condition and are a valuable raw material for producing cured products which are a delicatessen item in wide demand.

Breeding work provides a tangible increase in production as just the introduction of the mirror carp has provided an economic effect of around a half million rubles for one fish farm of the Ryazan'rybprom [Ryazan Fish Industry] Association. Merely by improving the breeding qualities of the carps it is possible to substantially increase their growth rate and product quality.

For further expanding work in the area of fish breeding and genetics and for organizing breeding work with the fish in the sector, a breeding-genetics center has been organized under the VNPOR.

The demand for combined feed used for fish has been constantly growing. While in 1975, 675,000 tons of combined feed were consumed, at present the demand for this is over 1 million tons. It must be recalled that combined feed for livestock purposes is unsuitable for fish, it is irrationally expended and does not produce the necessary return. The special fish combined feed should consider the specific composition of the fish as well as their age.

The problem of combined feed for fish is being solved within the comprehensive specific Premix Program. The scientists are working out formulas for so-called starter combined feeds for the larvae of carp, salmon and sturgeon, the production feeds for these fish of varying age as well as the methods for producing the combined feeds and feeding the fish.

A combined feed industry is being organized in the sector and this will make it possible to take into account the very delicate and specific requirements. Using a specially worked-out formula and production methods, production has been started for fish combined feeds at one of the granulated feed plants. The studies of the institute show that merely the finer grinding (bringing it to 0.6 mm) will significantly reduce the assimilability of the feed and reduce its requirement by approximately 10-20 percent. This shows the significant reserves in the area of feed utilization. The use of peat preparations in raising fingerlings and market fish also provides a definite savings in feed.

As a whole, the entire range of problems related to the further development of pond fish raising is being solved in accord with the comprehensive specific Pond Program.

The program envisages the establishing of a scientifically based system for managing pond fish raising in the nation. For this, fish raising methods will be worked out and introduced in terms of the specific natural-climatic zones and there will be progressive pisciculture-biological standards based upon advanced scientific and practical achievements. Experimental design work will be extended in creating and introducing more advanced machinery, equipment and instruments for mechanizing and automating the fish raising and catching processes in freshwater bodies of water. The quality of designing pisciculture enterprises will be increased considering the achievements of science and advanced experience.

The specific Pond Program should activate many internal reserves in pond fish raising and on the basis of reconstructing the enterprises, mechanizing the pisciculture processes and raising the overall production level, accelerate the achieving of the set goals. The tanks and pools play a major role in raising market pisciculture and in 1981 these produced more than 7,000 tons of fish. This exceeds the 1970 level by more than 40-fold, however, it is 2-fold below the possibilities.

With increased production of the granulated combined feeds, pisciculture will be more widely developed in industrial facilities with a self-contained water utilization system.

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CSO: 1820/57

WIDESPREAD USE OF 200-MILE LIMIT HAS REDUCED SOVIET FISH CATCH

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 116-121

[Article by B. G. Sokolov, chief of the All-Union Fishery Association of the Western Basin, and Candidate of Economic Sciences P. I. Gromov [posthumous] of Kaliningrad: "The Long-Term Program"]

[Text] What is a basin in the fish industry? In the west of the nation, this means the fishing ports located along the entire Baltic coast from Leningrad to Kaliningrad, the fleets of catching and receiving-transport vessels, the fish processing, ship repair, packaging and other enterprises, the scientific research and design organizations, VUZes and secondary schools. The entire complex is subordinate to one task of catching fish and sea products and producing a broad assortment of high-quality fish products.

Over the two decades that the basins have existed as the sole economic system in the region, they have proven to be a viable, dynamic form for organizing production. This has been confirmed in the reorganization of production management in the sector. Having been given the status of all-Union fish industry associations (VRPO) and having been brought closer to production after the elimination of intermediate levels, they have gained an opportunity to more successfully carry out many tasks. This applies also to the VRPO Zapryba [All-Union Fish Industry Association of the Western Basin], the fleets of which fish in the regions of the Atlantic, the Pacific, the Baltic and other seas.

When the question arises of ocean fishing, inevitably the changes come to mind which have occurred in its organization with the imposing of the generally 200-mile limits by the coastal nations. The necessity of special intergovernmental agreements and the introduction of quotas for the catching of fish have necessitated a major reorganization in fishing and have led to a certain drop in the catch and output of food products in the Western Basin.

Just how serious and long-term were the changes? There has been no unanimity in the answers to this question. Certain specialists have spoken of an inevitable drop in the catches and output of fish products in the basin. Others have asserted that the drop is a temporary question, the situation will stabilize and then, having mobilized the reserves, it will be possible to largely recover the lost positions. Life has shown the truth of the second viewpoint as over the last 2 years it has been possible to stabilize both the catch and the production of fish products and to fulfill the plans and socialist obligations. There is now greater confidence in the tomorrow of our region.

What has helped our ocean-going fishing fleet to fulfill the plan? The question is too complex to provide a brief answer to it. A number of factors have come into play, including the developing of fishing in the open ocean. Entire fleets are now operating where just 3 or 4 years ago this seemed problematic. Even recently hundreds of vessels crossed the ocean, many navigators observed the signs of fish in the midwater, but did not test them with fishing gear. Traditional notions were so engrained and the strength of inertia was so great that the possibility of fishing in the open ocean seemed a question for the distant future.

For a number of years, in our (as well as other) basin there has been the establishing and development of a fishing reconnaissance fleet. This has been necessitated by the growth of the catching fleet, by the increased number of areas where our vessels operated and by the need to prepare the raw material areas. At the same time, experienced specialists were trained. They were to show that fishing in the open ocean is feasible on a rather broad scale.

The studying of the seamounts can be considered the first step in developing the resources of the open ocean. Practice confirmed the possibility of catching deepwater fish. The joint efforts by the ocean's scouts, the designers, scientists and fishermen in our basin were crowned with success. Fishing gear and search instruments were developed and fishing personnel trained. In the course of the experiment, search-fishing expeditions were organized and these subsequently proved themselves also under different conditions.

Fishing in the seamount area is rather difficult. As a rule, experienced captains are assigned to the fishing vessels and they are able to organize fishing with a difficult bottom and are able to keep a deepwater trawl underwater with a high degree of accuracy. As one of the sailors put it, to operate in such a region is like moving the trawl over the roof of a house a kilometer below without damaging a single television antenna. The new fishing grounds which produce very valuable fish have become ordinary and familiar.

The next step was to tap the pelagic fish resources and to locate the fish populations the entire life cycle of which was confined to oceanic waters. Then followed search and fishing expeditions in which a search was carried out over large bodies of water by the joint efforts of vessels from the Zaprybpromrazvedka [Western Fish Industry Reconnaissance] Administration and the fleet bases and by large detachments involving scientific groups.

There are reserves which do not depend upon market conditions in world fishing, but can have a substantial impact on increasing the output of fish products. In the 11th Five-Year Plan it is essential to balance the capacity of the catching and receiving-transport fleet of the VRPO Zapryba in order to overcome the difficulties in transporting the frozen fish products from the fishing grounds and related to the increased average distance of transporting the products from the fishing areas and to the halting of the deliveries of refrigerator transports and tankers to the basin. There are also difficulties in receiving fresh fish from medium-sized trawlers. Of course, time is needed to fill out the basin's fleet with refrigerated transports. All measures are being taken to save in the hold capacity of the refrigerator vessels. A policy has been set of increasing the output of filet from sea-dressed fish and at reducing the freezing of fish in "blocks" on the trawlers. The effect should be a major one as the buyer receives a better product and we will cease transporting along the entire transport chain (vessel--refrigerated railway car--refrigerated truck) what is usually considered kitchen wastes, in processing these at sea into fish meal and fat. However, with the constant overfulfilling of the quotas by the crews for producing dressed fish at sea, the proportional amount of this product is still slight.

What must be done in order to increase the share of dressed fish and to reduce the output and transporting of the notorious "blocks"? First of all, it is essential to change the evaluation system whereby the delivery plan is approved for the total weight of caught sea products. A paradoxical situation develops where the more valuable food products produced at sea and the greater the savings in hold capacity of the refrigerator transports in transporting over many thousands of miles, the less the volume of output for food products and the fulfillment of the plan is reduced for one of the basic indicators for the effectiveness of our work. This has repeatedly been taken up at conferences, sessions and in the press. We are hopeful that the question will be settled.

The development of ship repair facilities has lagged behind the needs of the fleet. Obviously in the 11th Five-Year Plan a substantial expansion of the sector's ship repair enterprises located in the basin is not expected.

Here, in our view, we must begin first of all to improve the planning system. At present, the volume of ship repairs is set in terms of gross product, that is, with the incorporation of the value of the equipment to be installed on the vessels, the materials and so forth. The ship repair yards, in not keeping within the repair times and in not fulfilling the normed daily output, nevertheless meet the plans and receive the full amount of the economic incentive funds. It is essential to change the existing system and focus the collectives at the ship repair enterprises on intensifying production. This means introducing the progressive flow-position method of ship repairs and increasing the shift coefficient which even at the best yards in the basin does not exceed, as a rule, 1.2-1.3.

In 1978, the flow-position method began to be introduced at the Svetlovskiy Ship Repair Yard in Kaliningrad Oblast. Over 70 days were saved in hauling out the first of the large-tonnage tawlers. Since this time, the enterprise has reinforced its success, albeit not without difficulties. While previously daily output in the overhauling of large-tonnage trawlers did not exceed 600 norm-hours as an average (with a plan of 1,000), at present it is rarely below 1,200 and in individual instances reaches 1,500 norm-hours. However, this experiment is spreading slowly.

In the 10th Five-Year Plan, a policy was established of the fullest utilization of fish raw materials for food purposes and much has been done in this regard. However, much still remains to be done. In comparing the work of our production associations, we see that the difference in the amounts of unprocessed fish going for food purposes in individual periods reaches several percent, each of which is the equivalent of thousands of tons of fish products.

At one time, the VRPO Zapryba successfully increased the output of canned goods. By 1979, this had reached 578.4 million can units. In 1980, we were to produce more than 631 million units, however the plan was then reduced to 490 million due to the reduction in the fleet, the writing off of a number of small vessels and difficulties in tin plate. All the same, in 1980, around 530 million units were produced.

The VRPO Zapryba includes 16 fishing kolkhozes of Latvia, Kaliningrad Oblast and Lithuania. They produce a commodity product of more than 50 million rubles a year. They must ensure the rational utilization of the fish stocks in the Baltic and the bays, they must expand the production of canned goods on the kolkhozes (chiefly delicatessen ones), as well as smoked and sun-cured fish and convert fishing to a commercial basis.

A group of scientists from the Kaliningrad Technical Institute for the Fish Industry and Fisheries has proposed and is working out the idea of setting up large specialized fish-raising farms with a self-contained water supply cycle. The growing of valuable fish on an industrial basis with a high level of production mechanization and automation will make it possible to be less reliant upon unfavorable natural factors.

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SOVIET FISHING FLEET NEEDS MORE HIGHLY TRAINED PERSONNEL

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 122-125

[Article by Candidate of Economic Sciences, Yu. S. Matochkin, director of the Institute for the Advanced Training of Executives and Specialists of the Fish Industry in Kaliningrad: "On the Personnel of the Fish Industry"]

[Text] The personnel structure in fisheries is rather complicated. This includes the crews of the fishing fleet, the workers of the inland bodies of water, the ship repair and packaging enterprises, the net making factories, the fish processing complexes and trade facilities, the scientific research institutes and design bureaus and schools. Also heterogeneous is the class structure of the personnel in the sector: the proportional amount of kolkhoz fishermen is around 20 percent. The problems of utilizing and training the personnel are determined both by the general trends related to the labor resource shortage as well as by the particular features of the sector's development.

Up to the year 2000, the basic volume of the fish catch will come from the areas of oceanic fishing. There will be wider use of new, high-powered fishing vessels equipped with highly productive fishing gear, production equipment and satellite navigation facilities. For this reason the training of highly skilled specialists is assuming important significance.

A modern large-tonnage ocean-going trawler is a factory ship and it should be run by persons with an engineering education. Regardless of the significant increase in the number of specialists with a higher education (by 4-fold over the last 20 years), in the VRPO Zapryba [All-Union Fish Industry Association for the Western Basin], for example, just one-half of the captains of the large-tonnage vessels has a higher education. There is approximately the same situation in the group of senior ship engineers. In the fleet of the VRPO Zapryba, a significant number of workers holds engineer and technician positions: 28.6 percent of the first mates for production (production engineers), 58.3 percent of the fish processing masters and 65 percent of the fishing masters.

Obviously, we must revise the plans for training specialists of the various categories and again carefully study the nomenclature of positions which should be held by specialists with a higher and specialized secondary education. For example, the sector is training mechanical engineers for commercial fishing, however, they are not always efficiently utilized. The nomenclature provides that on the large freezer (autonomous) trawlers, the fishing first mate (the senior trawling master) should have engineer training, but in order to hold this position it is essential to work as a fishing master or as a catcher-sailor. Many

young engineers of commercial fishing prefer to work on the shore in the sections, scientific research institutes, design bureaus and so forth. As a result, the proportional amount of job-trained workers among the catchers has virtually remained unchanged over the last 10 years. In order that the skill level of the fishing masters be higher, obviously we must increase the graduating of medium-skilled specialists as their work does not require engineer training.

A similar situation has developed with certain other categories of specialists. A realistic way for satisfying the demand for specialists is to seek out a rational balance for persons with a higher and secondary education, but not by increasing the overall admission to the VUZes and technical schools the amount of which has not changed during the 11th Five-Year Plan.

The training of highly skilled workers also requires significant attention. Unfortunately, the navigation schools of the Ministry of Fish Industry [Minrybkhoz] and the vocational-technical schools for state vocational training graduate approximately as many workers as engineers and technicians although the demand for the former is only 11 percent satisfied. These specialists are particularly essential in the fleet as from the first days at sea difficult duties are entrusted to them of ensuring ship safety and carrying out production assignments.

The territorial distribution of the specialists also requires further improving. Even now, the Far Eastern Basin, in terms of its catch holds a leading place in the sector, however here there is the lowest proportional amount of engineers, some 49 per 1,000 workers (in the Western Basin the figure is 72). The graduates from the VUZes of the European part of the nation, having been sent to the east, do not always remain here. Among the leaders of enterprises in the Far Eastern Basin only 60.5 percent are graduates from the VUZes of the Far East and Siberia. A decision has been taken to open up a Higher Naval Engineer School in Petropavlovsk-Kamchatskiy. Along with the Far Eastern Technical Institute for the Fishing Industry and Fisheries, the new VUZ will provide the sector with local specialists.

One of the forms for the territorial redistribution of personnel is the relieving of ship crews on the fishing grounds in a manner similar to the watch method. In the fishing industry fleet, this method has been successfully employed for several years. Repair facilities have been organized in many foreign ports. Upon completing a trip the vessels are turned over to the repair and relief crews while the crew flies home for rest and partial replacement.

The increased amount of fishing in the Far East significantly exacerbates the problem of providing crews for vessels which have just been commissioned. At the same time, rather experienced personnel has been created in the Western Basin.

Hence the following proposal. It is completely possible to send vessels from Zapryba to the fishing grounds of the Far Eastern Basin with the subsequent relieving of the crew in one of the Far Eastern ports. It is no cheaper to transport crews from the Atlantic to Kaliningrad than from Vladivostok. In addition, the costs of transporting one crew member by aid in this instance is reduced by almost 3-fold. Such a variation would make it possible to maintain the personnel and reduce expenditures on creating sociocultural facilities in the eastern regions.

The effective use of the sector's specialists depends upon improving their working conditions and the attractiveness of the job. In 1979, the working conditions were improved for almost 20,000 persons. However, the problem has not yet been solved as only 32.5 percent of the workers perform their work by fully mechanized and automated methods and there is a significant proportional amount of manual labor for the fishermen in the inland bodies of water. The sailors of the fishing fleet remain at sea for a long time and work under increased noise and vibration conditions. As a consequence of this the personnel turnover in the sector is higher than as an average for the national economy and this is particularly so in the Far East.

Personnel stability depends also upon the availability of housing and nurseries and socio-cultural facilities. The wages of the crews do not fully meet the new fishing conditions and the guaranteed portion does not exceed 25 percent of the earnings as an average and this is clearly insufficient.

We are seeking out ways to increase labor productivity. In addition to raising the level of mechanization and automation and improving working conditions, the introduction of the Shchekino method would be very important. Unfortunately, extensive attention has been paid to this only in recent years. The first results confirm the possibility of extending the Shchekino experience to the vessels of the fishing fleet. In 1980, the refrigerator transport "Skalistyy Bereg" from the Mortransflot [Marine Transport Fleet] Administration and the Komsomol-youth collective from the trawler "Grigoriy Poluyanov" from the Kaliningrad Trawling Fleet Base converted to operating with a reduced crew. The crew which was reduced by 6.5 percent fulfilled the trip quota for catching fish by 110 percent, for producing commodity product by 121 percent. Work in this area will undoubtedly be continued.

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CSO: 1820/57

WARM-WATER DISCHARGES FROM POWER PLANTS USED FOR PISCICULTURE

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 125-133

[Article by Valeriy Lokonov, correspondent of the newspaper KUZBASS from Belovo in Kemerovo Oblast: "Fans of Warm-Water Fish Raising"]

[Text] It is not difficult to find the subsidiary fish farm of the Order of Honor Badge Belovo GRES. One has merely to drive to the edge of the power workers' settlement of Inskoy, then travel 4 or 5 km along the discharge channel of the plant, turn left and then in a peaceful bay of the Belovo "sea" you will see walkways on pontoons with tanks along both sides. This is the nursery division of the plant's subsidiary fish farm. A little farther on is the foraging division. Precisely here is raised the carp which subsequently shows up on the menu of the GRES dining rooms and buffets and in the stores of all Kemerovo Oblast....

The GRES fish farm is not yet 4 years old as its beginning goes back to November 1978.

Initially, there was the idea. The GRES director, Hero of Socialist Labor Petr Antonovich Druz' saw at his Kostroma colleagues how they utilized the warm water at the local plant for raising fish. And the idea arose of why not try to raise such fish as carp and trout in Siberia? They began to develop the subsidiary farm rapidly. The first three pontoon tanks with an area of 300 m^2 were made and set up in the discharge channel of the plant just in November 1978. Then from the pond farms of the Kuznetsk Basin they shipped in 300,000 carp fingerlings and from Leningrad Oblast 30,000 rainbow trout fingerlings. They were all stocked in the tanks for experimental raising.

"I am a supporter of sound subsidiary farms," said the director of the Belovo GRES. "If you are going to organize them, then organize them properly, on the basis of scientific research and recommendations with good technical equipping. There is not much benefit from dwarf farms and we need market fish. Naturally we did not intend to stop with these 300 m^2 of water. Moreover, our idea was supported in the party obkom. In December 1978, the CPSU Obkom, on the basis of our experimental warm-water fish section, conducted a seminar with responsible workers from the RSFSR Minrybkhoz [Ministry of Fish Industry],

the State Scientific Research Institute for Lake and River Fisheries (GOSNIIORKh), the secretaries of the party gorkoms as well as the leaders of oblast thermal power plants and industrial enterprises using warm water in the production cycle. The seminar examined the measures related to the accelerated development of the farms raising market fish in the oblast's bodies of water."

At the Belovo GRES these measures and scientific recommendations were approached seriously and decisively. They did not wait for the designers to get to work. (Incidentally, the design documents for the construction of the subsidiary fish farm are still not ready!)

"Don't think that we were working in the dark," continued P. A. Druz'. "Our study group which was concerned with working out the preliminary technical documents for building a tank fish farm with an area of 5,000 m^2 included hydraulic engineers, thermal engineers and construction workers. We literally plodded through the snow around the Belovo "sea" looking for the best, quietest place. And we found it."

The fish farm was built by the forces of the enterprise and with enterprise funds. No allocations or limits were provided for it. In truth, both the party obkom and the oblispolkom constantly kept watch over the construction of the GRES "fish shop" and helped with building materials. It took just 4 months--February through May--for the power workers to build the subsidiary fish farm on 5,000 m^2 of water. The work involved the manufacturing of 55 pontoon sections, 3 shore units were installed for the storage and distribution of 60 tons of feed, a shore pier was built from large rock and gravel, 2 hydraulic works were built for bringing the warm water from the discharge channel into the farm area and so forth.

The year 1979 was the first year that the "fish shop" of the Belovo GRES worked. The first 50 tons of carp and 5 tons of trout became the award for the pioneers of warm-water fish raising in Siberia.

In the following year, when the area of the farm was increased up to 12,000 m^2, the plant's fish raisers produced 400 tons of carp.

It is said that any beginning is hard. The start of the fish farm at the Belovo GRES was no exception. These difficulties were of a most diverse s ort. Some of them could be handled by our own forces while others not.... Incidentally, everything was resolved.

The fish raisers at the plant have worked and are now working in close contact with scientific co-workers of the GOSNIIORKh a group of which is headed by Andrey Minovich Sakharov. Suddenly the research showed that in the farm water there was little dissolved oxygen and the flow of water was clearly insufficient. The fish were beginning to suffocate. It was essential to find ways for providing a high oxygen content. The search turned into a major industrial experiment. Finally, they decided to locate the fish farm in a new place, not far from the mouth of the canal where all the water was released. There was completely sufficient oxygen in the water and its rate of flow was within the required limits. In truth, the move was a great undertaking. It was essential to put up another pier, to move the pontoons, disassemble the tanks, make new ones, weld them and so forth. All of this was again done by the plant's workers and within a month.

But then there was the problem of problems--feed. The question was what to feed the fish and this still remains one of the main ones on the fish farm.

The GRES fish required 2,000 tons of feed a year. The USSR Minenergo [Ministry of Power and Electrification] was able to locate only 370 tons. The RSFSR Minrybkhoz allocated the subsidiary farm more than a thousand tons through Kemerovorybprom [Kemerovo Main Administration for the Fish Industry]. This was supplied by the combined feed plant at the Chistogorskiy Pig Complex which is near Novokuznetsk. But, in the first place, until recently the Chistogorskiy feed was, to put it frankly, far from high quality as the meal content in it approach 40 percent. But the fish eats granules. The meal remained almost untouched, it polluted the water and removed oxygen. In truth, after energetic intervention by the power workers, the sistuation at the plant somewhat improved and the quality of the feed became better. But there still is too much "mealy" feed at the farm and this must be reprocessed by our own forces.

Secondly, even this feed is delivered irregularly and in an insufficient amount. There were instances when the fish had nothing to eat. And immediately the weight increases dropped. And this could reach 10 tons a day!

The relationships between the subsidiary fish farm of the Belovo GRES and the RSFSR Minrybkhoz until recently were rather anbiguous. Through Kemerovorybprom the ministry supplied the farm with feed and allocated the young fish stock and the necessary equipment. But what did it obtain in return? Actually nothing. But not because the power workers were so "greedy" but because the fish obtained on the farm was not part of the plan of the Minrybkhoz as there was no labor by the workers of Kemerovorybprom in growing the carp.

In 1982, a temporary way out of the situation was found. The RSFSR Minrybkhoz provides the farm with feed and equipment. The power workers on their farm created by their own efforts together with the personnel of Kemerovorybprom raise the fish and a certain portion of this is included in this association's plan. Thus, a new type of intersectorial cooperation exists. But is this only a positive thing if the alliance itself has given rise to new problems both with the human and technical resources?

"We feel that this temporary system for our relationships should be changed," says P. A. Druz'. "Why not make the feed directly available to the USSR Minenergo and it in turn would supply the subsidiary fish farms? But they say this is impossible and that is the end of it. But why this is impossible no one can explain. Certainly we ultimately are doing the same thing, we are jointly carrying out the tasks of the Food Program."

One other problem. Last year, someone seriously considered turning over the plant's subsidiary farm to Kemerovorybprom since the farm had supposedly outgrown the limits of a subsidiary farm. It is quite true that in 1981 the power workers raised 720 tons of carp and Kemerovorybprom, in examining the prospect of obtaining the fish farm of the GRES as part of its own system, planned to raise just 350 tons of carp in the following year of 1982. Even judging from this indicator does it make any sense to transfer the fish shop to other hands?

"I am profoundly convinced that the subsidiary farm should not be turned over to anyone," stated the director of the Belovo GRES, P. A. Druz', on this question. "It is most essential to utilize the capabilities of the large, highly organized enterprise. This is the essence of the problem. So as not only in the basic indicators, but also in the operation of the subsidiary farm one would see the initiative of that enterprise to which the farm belongs. Just look what happens. At present, those who are employed in the 'fish shop' have the

same goods and benefits as all the basic production workers. We make exceptions for no shop. If it is essential to send a person to the subsidiary farm, then we do this. The fish shop is not our orphan, but our own, even difficult child. Let me give an example. In the middle of night I was awoken as the fish was suffocating. The director himself spent the entire night at the 'sea' and was able to organize the people immediately. It took hours. The fish was saved. But now let us assume that this had happened on a farm belonging to the Minrybkhoz. Possibly we could have helped. Only I am afraid that our help could not have been required....

"As for the personnel of the 'fish farm,' if they had been deprived of our benefits they would have scarcely remained working on the farm.

"I repeat: the subsidiary farm should be large and profitable. I feel that this year, having raised approximately a thousand tons of carp, we would operate with a profit. Certainly we have almost equaled such a farm as the subsidiary shop of the Kostroma GRES in raising fish and this is managed by the RSFSR Minrybkhoz. For now we are the only ones in the USSR Minenergo to have the status of a subsidiary fish farm at an enterprise. It is a matter of honor for us to equal the enterprises of the RSFSR Minrybkhoz."

Let us not view these words by the director of the Belovo GRES as boasting or as an exaggeration of his abilities. The subsidiary fish farm at the plant is now actually capable of competing successfully with the state fish-raising enterprises. In terms of the volume of commodity product, its output per unit of production area and feed consumption per ton of weight increase, it today is one of the best warm-water fish farms of the RSFSR.

However, this does not mean that the farm has no unsolved problems. The farm chief, the recent graduate from the zoological engineering faculty of the Novosibirsk Agricultural Institute, Oleg Petrovich Kislov, has mentioned a mass of problems which must be solved immediately. Let us take up only the most important.

Quite near the subsidiary farm are the vegetable gardens of the Belovskiy Sovkhoz. Twice a year, in the spring and summer, the fields are treated with strong chemicals. Of course this is an essential thing. But in treating the fields they do not always observe the safety zone, according to the water legislation. Incidentally, there is a special instruction from the Kemerovo oblispolkom on this question. Alas, the sovkhoz does not observe the safety zone. In windy or rainy weather, the toxic chemicals fall into the water and as a result of this the fish die. Up to now they have not been able to pursuade the sovkhoz leadership of the need to observe the safety zone.

Then there is the feed problem. Yes, the quality of its preparation is better, but not so much as to eliminate this question from the agenda. But what about the steadiness of supply?

"Last year," said Oleg Petrovich, "we received 800 tons of feed when the fish had already been sold and essentially there was nothing to feed. At the same time when the feed was extremely essential the plant halted its deliveries. It is essential for us to keep within those 100 days which are the time the carp is raised."

We would point out in passing that at the plant's fish farm much has been done to improve the feed process itself. Previously the fish were fed by hand. At fixed hours the workers moved along and with jars scattered the feed into the tanks whether the fish wanted to

eat or not. It took 45 men to feed the fish and they were fed only during the day. The costs of such a method were high both in the employing of a large number of workers, the polluting of the water and most importantly the fish was not always satisfied. With the increased capacity of the farm the very process of feeding became a problem. Then feeders of the reflector type or simple "reflexes" which were somewhat like upside down milk cans. A metal rod extends into the water from the narrow part of the feeder. A fish, in becoming hungry, shakes it and granules fall from the "reflex" into the water. The feeders are filled twice a day and the feed is distributed by a light T-16 tractor. Probably the "reflexes" are in some ways imperfect as it was impossible to have them judged on other farms and they quickly got a bad reputation. But at the Belovo GRES they showed enviable restraint, finding much worthy of attention in the new reflex feeders. Now on the farm all the tanks are equipped with "reflexes." There is the obvious benefit that labor expenditures have been reduced, the feeding process has been fully mechanized with the fish eating as much as is needed; the daily weight increases have gone up, the feeding conditions have been stabilized and the fish eats around the clock.

As for the poor quality granulating of the feed which is still a problem on the farm, the separated mealy fraction will be processed into granules using its own granulator.

The farm must obtain its own fish stock. Previously the fingerlings were delivered from the Skoryupinskiy pond fish farm. They were obtained late and were of poor quality. The construction of their own incubator shop became an urgent need.

"Unfortunately," said the chief of the subsidiary farm, O. P. Kislov, "the construction of the shop does not depend on us. The workers of the Kuzbassenergostroy [Kuznetsk Basin Power Construction] Trust sunk the pilings but then construction was halted. But we decided not to wait for good weather. We ourselves built a small temporary incubation shop, even just for the summer. And we run our experiments in it."

"Of course," continued Oleg Petrovich, "with the completion of a permanent incubation shop, much can change: the working conditions for the employees will improve and the opportunity will arise to begin work on obtaining young trout. In September the selling of the carp begins and the freed tanks could be stocked with young trout. Particularly as we already have a spawning stock for this fish. Then we will have warm-water carp in the summer and trout in the winter."

At present, in the temporary shop they have already carried out the artificial incubating of the eggs. Practical aid has been provided by the co-worker of the GOSNIIORKh, A. M. Sakharov. The eggs are removed from the females, they are fertilized and then placed in a Weiss apparatus. Two or three days later, the larvae begin to hatch. Then they are stocked in the pond. More than 2 million larvae have been stocked in two ponds.

The problem of obtaining young fish on the subsidiary farm of the Belovo GRES is close to a positive resolution. It is a question now of building the permanent incubation shop.

The personnel problem is also awaiting its resolution.

"I need not recall again that the subsidiary farm does not have enough personnel," said O. P. Kislov, "they are lacking everywhere, in basic production too. We now appear to have enough, more than 50 of our own workers and 40 persons from Kemerovorybprom. But there are only 5 or 6 persons who work reliably. In the summer we are given school

children, students and pupils at the vocational-technical schools. But the contingent of our own workers, it is no secret to say, is far from ideal. How can they be kept on the subsidiary farm? The main question of housing cannot be solved by us. Even we are forced to hire only bachelor specialists as there is room in the dormitory, but no apartments. In the settlement itself, very little is being built and those who leave the plant keep their own apartments. "I am not saying that we are viewed just as a subsidiary farm. On the contrary, we do not resent the attention shown by the plant's leadership. The question is that we must put our heads together to create a stable strong worker collective in the fish shop."

Warm-water fish raising is a very young sector. Its start goes back to the 1970's. But it is a promising sector.

"Just compare the figures," said O. P. Kislov. "In 3 months a carp in a tank where the water temperature is constantly kept at a level of +25--+30° grows to a kilogram and more. But in natural or artificial ponds in Siberia, the figure is just to 300-400 gm. A warm-water farm is highly concentrated as a quintal of fish is concentrated in 1 m^2 of tank. This is its productivity. At best, the ponds of our oblast produce 5 quintals of fish per hectare and in some years, just 3 quintals. In truth, in the Kuban they obtain 20 quintals per hectare and in Uzbekistan even 60. But this is not Siberia! The warm-water pisciculture does not depend upon the weather and it always guarantees a high fish output."

In 1982, the fish farm of the Belovo GRES planned to produce a thousand tons of market fish. It is an impressive figure. A biologically sound limit has already been reached on an area of 1,300 hectares. For improving the body of water (the Belovo "sea" is man-made and shallow) there has been a decision to release in the water the herbivorous silver carp. It has successfully adapted in the Belovo "sea" and one can now even think about catching it. Generally speaking, another 100 tons of additional product could be obtained from the "sea" without any expenditures. If we add to this the 100-200 tons of trout, this undoubtedly will improve the economy of the subsidiary farm and make it profitable.

Any subsidiary farm causes problems for an enterprise. Particularly one such as warm-water pisciculture where the Belovo power workers, the pioneers in this area, had to encounter so many unforeseen obstacles. They have needed tenacity to overcome them. At present, you can always find carp dishes on the menu of the GRES dining rooms and buffets or try a rich soup. Each month, the plant receives 1.5 ton of fish grown on its own waters by its own hands. In the near future, the mirror, scaled and silver carp and other fish will appear in the stores of the oblast.

In his report at the May (1982) Plenum of the CPSU Central Committee, L. I. Brezhnev said: "It would be possible to more fully utilize the capabilities of the enterprise subsidiary farms. Each industrial enterprise and each organization capable of managing such farms should, as a rule, have them. For these purposes the industrial enterprises and organizations must be allocated the necessary area of agricultural land. A good effect can also be obtained from using bodies of water which exist at many enterprises for producing fish. These problems must be solved quickly, boldly and with initiative. This can immediately produce noticeable results."

So the power workers of the Belovo GRES have solved the problem of warm-water pisciculture "quickly, boldly and with initiative." The results, as we can see, are truly noticeable. At present, the Belovo GRES is known not only as the most economic among the plants of the same sort in the sector (it has the lowest proportional fuel expenditures for

the generating of electric power), but also as an industrial enterprise which has successfully solved far from simple questions of the Food Program. For precisely the successful solving of these questions, P. A. Druz', O. P. Kislov and the farm worker M. D. Voytenko along with the best production workers of the Kuznetsk Basin have received oblast prizes.

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CSO: 1820/57

DEVELOPMENT POTENTIAL OF FISHING INDUSTRY IN SOVIET FAR EAST

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 134-148

[Article by Special EKO Correspondent Zamira Ibragimova: "On the Fishermen and the Fish; From the Results of an Economic Expedition to the Far East"]

[Text] In the course of an economic expedition to the Far East which was organized by the Siberian Division and Far Eastern Scientific Center of the USSR Academy of Sciences, its participants studied the problems of the economic development of the Pacific's resources and the development of the productive forces of the coastal regions. These problems are diverse and include: both the organizing of a major national center of nonferrous metallurgy based on the deposits of the volcanic belt stretching from the south of the Maritime Kray across Kamchatka, the Okhotsk coast and Chukotka to the north, the creation in the Far East of a new oil and gas region, the development of sectors for the "regional" specialization of construction and the utilization of the recreational resources of the Far East....

But still the main thing in the Pacific economy is the fish industry. And the Far East is responsible for 40 percent of the national production.

The Effect of Comparison

The high nutritional qualities of fish are well known. As an average fish contains 17-18 percent protein or as much as in meat; at the same time, in fish as an average there is less fat, just 4-6 percent, in comparison with 20 percent in meat. For this reason the caloric value of fish products is 3-4-fold less than meat products. But the most essential thing is the presence in fish of irreplaceable amino acids and physiologically active substances which maintain and strengthen human health.

Even now fish products play a noticeable role in the diet of our people. On a per capita basis, in the USSR 17.6 kg of fish are consumed per year (for meat the figure is 58 kg). In order to come closer to scientifically sound nutritional standards, there must be a substantial increase in the consumption of animal protein and this is the key task in the entire Food Program adopted by the May (1982) Plenum of the CPSU Central Committee.

Certainly in carrying out this task the main role will be played by the development of livestock raising and primarily by increasing meat production. It is generally realized that a solution to this problem will not come easily. In order to properly feed the livestock,

primarily in terms of protein, there must be a substantial expansion and reorganization of feed supply. It is essential to set up large livestock complexes, to increase the number of head and raise the productivity of the animals. All of this requires major resources. At present, the cost of a kilogram of meat substantially exceeds its retail price and in selling meat at the retail price the state provides a subsidy running into many billions of rubles. At the same time, great capital investments are required and over the years of the Tenth Five-Year Plan around 60 billion rubles were invested into meat production in the nation.

Fish products, if these are compared with meat, cost significantly less. While as a whole meat production, with the existing retail prices, involves losses for us, fish production is profitable.

The high effectiveness of fish products is easily explainable. The state does not need to make expenditures on a feed supply for the fish as this is taken care of by the bioresources of the world ocean; expenditures involve only the catching of the fish and these are relatively low.

Among all fishing areas, the highest concentration of fish and sea products is located in the Pacific, particularly in its shelf zone. Our nation possesses an enormous shelf along the Far Eastern coast. According to estimates of the Pacific Scientific Research Institute for Fisheries and Oceanology (TINRO), on the Soviet Far Eastern Shelf each year it would be possible to catch up to 4 million tons of fish. Approximately an equal amount of fish could be taken in the open Pacific and off the shores of Antarctica as well as within the 200-mile limit of other nations (with their agreement). In addition, by mariculture, it would be possible to bring the production of sea products off the Far Eastern coast up to 1 million tons (Japan even now produces around 2 million tons a year). It would be possible to significantly increase the salmon catch by their artificial reproduction.

Thus, the total production of fish and sea products in the Far East over the long run could be doubled and tripled in comparison with the existing level and thereby make a major contribution to solving the most difficult task of the USSR Food Program, that is, supplying the population with balanced animal protein.

On the Movement in Preobrazheniye

We commenced our expedition from the south of the Maritime Kray, where the basic centers of the fish industry are concentrated. One of them is the settlement of Preobrazheniye.

Preobrazheniye, Lazovskiy Rayon of Maritime Kray. The base of the trawling fleet. In the office of the chief was a map and on it the ordinary paths of commercial fish were marked with colored arrows having blurred ends.

The fishing grounds of the base include virtually the entire world ocean. This sounds rather boastful, but this is the case and one must become accustomed to the great ocean and a handful of catchers. Some two-thirds of our planet is covered by water (one recalls the impressions of the cosmonaut C. I. Sevast'yanov: "In an orbital flight, in looking down at the earth one sees water, water and water") and then there is the tiny shore point which supplies and waits for the catchers and receives the catch. It will always seem thus. Each individual catch center will seem small and insignificant both against the background of the ocean itself as well as against the background of the aggregate results. But the "catching nets" of our economy have been put together precisely from such small centers.

The base for active sea fishing appeared in Preobrazheniye in the 1950's. In the plan the basic place is held by the West Pacific sardine, the walleye pollock and greenling. Over a year the base produces a commodity product valued at 125.64 million rubles. This plan should be met with a personnel of 5,400 men but in fact 5,100-5,150 are employed. The shortage of 300-350 men is permanent. Of course, there are not enough fishermen and processors. Around 40 percent of the employees are outsiders, persons from elsewhere, "fishermen from the continent," from the western regions of the nation and from Siberia. The chief of the base Yuriy Anatol'yevich Bessonov describes them thus: "In recent years the contingent of fishermen--processors has noticeably changed. One-fifth of the newcomers is persons with a higher education. They come for two years, they earn 500-600 rubles a month and do a good job. We have a training center and here they receive the necessary skills for the uncustomary job and...we are content with them. On none of the factory ships has there been any instance of failures. And they spend 150 days at sea."

It would be impossible to get by without the newcomers. Moreover, in the 12th Five-Year Plan the situation will become more acute (as in the nation as a whole). And here also we enter a situation which we are familiar with in other regions of the country. The problem is not that there are no people, there are. They fly in 2,000 or more to the ocean fishermen settlement, they willingly set to sea, they work willingly in a job which society has not prepared them, they receive their well earned wages and say farewell. A third or even one-half of them would willingly remain because this life is more to their liking than any job in a city office or institution. But there is no place for them. Some 1,200 workers of the base (almost one-quarter) are waiting for housing. Some 660 children are waiting their turn for a nursery. The secondary school works on three shifts.

In Preobrazheniye there is a construction organization with all sorts of trucks and other equipment. It is said that in a year this organization could put up two 60-apartment buildings. But only one is built as there are no building materials. The construction of the port of Vostochnyy is tangibly felt throughout the kray as the priority project has taken all that it can. The second thing lacking is again personnel. They are to be found, they can be hired, they work until they receive an apartment and then leave to fish as the wages of a construction worker are one-half the amount. Hence, initially the fishermen retrains as a construction worker (there can be no question of the level of professionalism here, that is not the point), he waits for an apartment and then immediately goes back to fishing. The reduced status of the construction workers is also the foundation for the hopeless lines for a roof over one's head. There are enough persons wishing to live in Preobrazheniye. The ocean, nature and the gardens--these attractions of the coast each year will only grow in value and those who settle here (almost one out of every two inhabitants of the settlement has his own car) know how to extract all the pleasures from such diverse living conditions.

Here in Preobrazheniye we first encountered the problem of "sea cabbage" [algae of the genus Alaria]. Oh, this fine and enticing idea of creating "fields" and "farms" in the sea! The benefit of this requires explanation. Sea cabbage or laminaria contains potassium, sodium, sulfur, magnesium, silicon, phosphorus, calcium, iodine, iron, promine, boron, aluminum, strontium, manganese, zinc, arsenic, vanadium, rubidium, cobalt, nickel, molybdenum, cadmium, titanium and radium.... Copper, antimony, lead, gold, chromium and certain other elements have also been discovered in it. There is 9-10-fold more magnesium in sea cabbage than there is in seawater, 17-fold more sulfur, 13-fold more bromium and so forth, and so forth. In the special literature we find statements also that the world for a long time now with some success has been endeavoring to obtain certain rare chemical elements from algae, there have been attempts to produce paper and, of

course, many nations have for a long time widely used laminaria as a food product. In Japan, they say, more than 300 dishes are prepared from sea cabbage. Incidentally, entire books have been written about algae and it is not our job to retell their content, but here is one terse assessment of this resource deriving from these books: sea cabbage is the most valuable alga for our economy.

Mariculture has also been given to the fishermen of Preobrazheniye. They now have the cabbage planted on 6 hectares.

What sort of experiment is this?

As yet there is little positive. The discussion of mariculture has been underway for a long time, but the matter has not reached its real heights. For now, the cost of a quintal of a cabbage is twice the amount of its sale price. Everyone says "we must, we must," but virtually no money is given for this question, it has no effective basis and this, of course, does not help its development. But there are great prospects.

Hence, let us endeavor to sum up: although the fishing conditions are changing toward greater complexity, the raw material reserves do not cause alarm, mariculture is in an embryonic state and economically is a loss, however....

These are still not conclusions, but just observation.

But let us remember the people, the people who are and who are lacking, these very people of Preobrazheniye. The Preobrazheniye situation, without exaggeration, can be called typical for the coast.

The "Catching--Processing" Balance

Sakhalin. The Kholmsk Base of the production-transport fleet and the Nevelsk Trawling Fleet Base. One plant is engaged in processing the fish and the other in catching.

In Kholmsk. The fleet at the base consists of the fish processing vessels and the towed-transport fleet. This includes five cannery ships which produce 24 types of products. In 1980, the ship sold 368 million rubles worth of product. The profit comes basically from the West Pacific sardine and the pink salmon. The number of employees is slightly more than 10,000 persons, including 7,500 at sea and the remainder on shore. A little more than one-half of the employees is women. The share of manual labor is approximately 70 percent. By the end of the new five-year plan, the mechanizing of the laying of the product in the cans will make it possible to release 850 persons.

"We live off the newcomers, starting from the Ukraine and wherever you want. The people come here to earn. The average earnings for the base last year were 490 rubles, while in Odessa the average wage is 290. We have nothing to retain the personnel here. We can still attract them through friends and acquaintances, but there is nothing to hold them!"

Then comes the explanation which is essentially familiar to us: during the five-year plan they should complete 60,000 m^2 of housing, but even now it is obvious that scarcely one-half will be finished. The most acute problem is to quarter the newcomers and provide comfort and independence. A vacation facility for between trips is also needed. The base is endeavoring to so organize fleet operations so that the people would have at least

a little time to "get their feet on the ground" and rest for 3 or 4 days on shore between trips.

But in Kholmsk they talk most about the nature of the work done by the fish processors which is predominantly manual. Unfortunately, Soviet industry produces virtually no equipment and machinery capable of substantially easing the work of a person in dressing the fish.

In Nevelsk. The base is a specialized catching enterprise with 5,000 employees. Turnover is high. The reasons? All the same. Let us not repeat them. Nevelsk is a fishermen's city, a city born out of the fish industry. Exclusively. (In contrast to Kholmsk which is called the "gates of Sakhalin.") There is a waiting list for housing, a waiting list for the nursery and so forth. But there is one feature different from the others: there is a reserve of labor resources with 2,000 women not employed in social production. Fishing is a male undertaking.

Fish processing was removed from Nevelsk in 1977. The catchers consider the reorganization a mistake. The chief of the Nevelsk Base, Anatoliy Viktorovich Goryunov, has said: "We ended up the broken links of a single chain. The work for the management personnel was obviously made easier but on the other hand fleet operations deteriorated sharply. The factory ships take from us what is most convenient for them, what is easier to process."

Certainly it is one department: the fish industry. Specialization and the deepening of this are, as they say, an imperative of the times. A catching shop and a processing shop... seemingly this would be logical. But what logic can explain the fact that 1,500-2,000 women fly into Kholmsk from the Ukraine and the Volga area to process the fish while 2,000 women in neighboring Nevelsk need a job and the problem of employing the women is considered here one of the urgent social problems?

The Plan and the Ocean

Sakhalin. Korsakov, the ocean fishing base. This is a base "with a complete cycle" both catching and processing in the same hands. They assert that they work more steadily here than in the related enterprises.

The situation with housing and nurseries is no better here than anywhere else, so let us talk about the fleet.

The bases chief, Valentin Mikhaylovich Burkov has said: "Last year, our BMRT [large freezer trawler] produced 10 million rubles of profit, the super-trawlers broke even, while hunters had 15 million rubles of losses. As you can see, the BMRT are still the most profitable vessels, but the shipbuilding yards have given up producing them. We feel this is premature."

Thus, many vessels are unprofitable. This specific conclusion from the economics of the Korsakov Base follows from the catching conditions and the existing organization of the entire process of processing, transloading and shipping the products. In particular, there is the factor that: "From the 43d parallel the ships travel to be transloaded to the 25th. This takes 5 days and to go round-trip is 2 weeks."

In the world of "fishing gear," the world of the seiners, trawlers and super-trawlers, the scale for evaluating the merits of the equipment by man has a clear starting point: how to catch more with the least expenditures. Today trawling is the basic method of catching fish and this provides around three-quarters of the Union catch. At the Korsakov pier we visited both the BMRT and a super-trawler.

A BMRT is a vessel used predominantly in the temperate latitudes. The fishermen are basically satisfied with these vessels. They are economic (we have just mentioned this), they are mobile, with excellent living conditions and with reliable range, production and life support. But there are also complaints against them. The power of the propulsion units of the BMRT (as a rule, around 2,000 hp) is low. "The trawling speed is slow and it could be 1.5-fold more. For example, you cannot catch mackerel at that speed." (And I recalled that in Preobrazheniye we had been on an ST or seiner-trawler, where for the first time I heard about the "nimble-footed" mackerel. On the ST, they also complained: "We cannot catch up with a school of mackerel as we do not have enough power. Generally speaking if a fish is fast, we can only get what we can...")

A BMRT has a fish processing shop and this completely processes all the wastes into meal and 100 tons of meal are produced from 500 tons. For 150 days a year, the shop works around the clock. The so-called transloads happen once every 20 days, that is, there are three transloads in 2 months if one does not have to "run" across scores of latitudes for this.

The concerns of an RTMS (freezer super-trawler) differ from the concerns of the BMRT. We were onboard the East German-built "Novo-Orenburg" which had been in full service for a year. The catches of a "super" are 1.5-fold more than on a BMRT due to the trawl capacity. But the mackerel brought a lot of trouble for the "super," too: "At first, we couldn't catch any mackerel as we didn't know the speed, we had to catch up with the fish and we were unfamiliar with this. But later on we learned."

But why the losses?

They explained:

"We operated in an area where the depths are great and the bottom is uneven. The fish was large, spawning and very mobile. Our vessel is dependable, its seaworthiness is good, but the losses depend upon the fishing situation. These vessels also need grounds where they could demonstrate their full capacity! We are still working an area, as the specialists say, that is, dying out...."

The conversation switched back to planning, forecasting and management. We returned to Burkov:

"How is a plan created? A great guess! They plan 10 species of fish for us and we ourselves know about them from the books.... Not one of these species has been assigned to a fishing grounds. The planning should start with the enterprise. Our proposals differ noticeably from the plan. Forecasting which is the most important question for the fishermen also needs improving. The forecasts, unfortunately, do not always coincide with reality and this does not reflect best on our work. As for the future.... For now science knows very little about our ocean."

In skipping ahead, let us add to the Sakhalin the Kamchatka impressions which relate directly to the questions of concern to the Korsakov fishermen. In acquainting the members of the expedition with the areas, achievements and problems in the economy of Kamchatka Oblast, the first secretary of the party obkom Dmitriy Ivanovich Kachin stated decisively that the planning of the fish catch was not to their liking. The principle of current planning was obsolete.

We will come back to the fish, but only after a talk about the fisherman.

Shore Concerns

The Kamchatrybprom [Kamchatka Fish Industry] Association includes 13 plants, 3 fleet bases, a tin can factory, a maritime agency and the firm store "Fish."

The first thing they began talking about is, alas!, housing and more housing.

For example, at the base of the refrigeration fishing fleet a person receives an apartment after 12 or 13 years of work.

When they had unburdened themselves a little, they moved on to production: the shore facilities are poorly equipped, there is a lack of transport fleet ("There is virtually nothing to ship the fishing season cargo"), small refrigerator ships are needed (in the future, possibly, even on an air cushion) in order to collect small lots of 50-100 tons from kolkhoz fishermen on the rivers. For squid there must be a special fleet with mechanized methods of mass catching and from science, a more precise forecast.

A specifically Kamchatka problem is the salmon which lives in thousands of streams. An interkolkhoz association is part of Kamchatrybprom and its main task is to figure out whose reliable hands are to promptly to deliver the golden fine fish, to whom and how? There were 75 receiving points and only 12-13 remain. Within the association are 11 kolkhozes and they are all profitable (in contrast to the super-trawlers), but the amount of profit depends upon the fishing season and even more upon organizing the shipping of the catch. "Shouldn't the fish be picked up at least once a week from the fishing grounds?" asked the representative of the kolkhoz fishermen rhetorically, in ardently persuading those present that the kolkhoz fish cost the state less than the state catch. If only the kolkhozes were supported with a transport and refrigeration fleet, then they would only benefit from this, that is, both the kolkhoz members and the state.

The fishing port of Petropavlovsk-Kamchatskiy is also an association of 12 production subdivisions. They all service the fishing industry vessels. Here the problem of ship repairs is foremost. In Kamchatka, where the fishing industry is the basis of the economy, the shortage of ship repairs is around 30 percent (according to official data). Incidentally, this is spoken of everywhere, but for the fishing port the organization of ship repairs is a life-and-death problem.

The so-called MRTO or intertrip technical servicing, is a major calamity for the port workers: "We have nowhere to carry it out, there are neither shops nor machines. We have been waiting for three five-year plans...."

Here I recalled a talk with the deputy chief of the port of Vostochnyy, Genadiy Prokop'yevich Zhebelev: "The port system unfortunately is weak. Shipbuilding is an expensive thing,

large vessels (super-trawlers, factory ships and mother ships) cost from 10 to 20 million rubles and they stand idle in the ports half of the time. Some of our people returned from abroad and were amazed to see that half of the piers in Antwerp were empty! Why were they amazed? That is how it should be. It is the job of a ship to set to sea. It is the job of the port not to let it stand idle and to process any vessel at any time, quickly and efficiently."

The Decisions are Obvious

It is time to reinforce our own observations and sensations, our notepad sketches and entries with the opinion of a competent person.

Yuriy Yakovlevich Krasnopol'skiy is the deputy general director for economics at the Sakhalinrybprom [Sakhalin Fish Industry] Production Association. His words: "Let us talk about major problems. The routine tasks of fulfilling the monthly plan, the quarterly or annual one, with all their urgency and with all the burning timeliness, have their roots in the same long-range problems. We often forget this and for this forgetfulness we pay for with a difficult 'up-to-the-minute' life which, unfortunately, is sometimes endless.

"The first is the development of the shore enterprises. With the establishing of the 200-mile limits, the fish resources themselves began to necessitate our rapid development of the shore facilities. How should one understand this? A single production chain from the bioresources of the 200-mile limit to the output of finished products.

"Here there are great opportunities. Primarily in the questions related to processing. It is essential to broaden the assortment so that in increasing the absolute volume of product output, its structure is also improved qualitatively. Unfortunately, out of inertia, predominantly what is customary is employed. Expanding the assortment is an essential reason for the development of the shore facilities (this problem must not be confused with fish processing at sea or with the problems of receiving, the mother ships or factory ships).

"The problems of our shore facilities are related to an incorrect, short-sighted decision. If one compares the work of the shore with the factory ships, the shore loses but such a comparison is basically invalid. They are two completely different functions! Both are essential. As is sometimes the case, we have excessive worries over the question that one impedes the other. For this reason, the shore facilities now need a major improvement with a reduction in personnel turnover, an increase in the technological level and the level of mechanizing labor-intensive processes as well as a substantial modernization of the equipment.

"But it is also worth mentioning something else here. Our ancestors were smart people: the shore processing bases were located in those areas where the fish ran; this smart placement required fewer expenditures and troubles.

"The second is ship repairs. Surprisingly, up to now proper attention has not been given to this question. One yard is directly subordinate to Moscow, the other, on the other side of the fence, to an enterprise which is responsible for the plan. With an acute shortage of ship repairs in the Far East, what does exist has been organized in far from the best manner, as they say, as it developed historically. The misfortune is that everyone has become accustomed to this. It seems that there could be no other way. The ship repair problem merits the most serious and objective analysis and here there are important economic

aspects (many questions are related to incentives) as well as managerial ones (sometimes excessive centralization which impedes the solving of production problems efficiently and flexibly) as well as technical organizational ones (advanced forms for organizing ship repairs themselves).

"The third problem is transport. The specific features of the Far East require their own approaches to the solving of transport questions which are distinct from the models which have come into being from the Western regions of the nation. But the Western models are mechanically transferred to the Far Eastern regions and this leads to a situation where the stoppages of ships loaded with held-up cargo have become the norm. For this reason the fishing fleet loses an average of up to 20 percent of its operating time. Under such conditions is it possible to carry out a policy of intensifying production? In Kamchatka, the canned goods are stored for an excessively long time and the salt-cured products bide their time. If the products could be shipped from the Kurils after 6 months of storage, we would consider this an accomplishment. And because of this there are the problems of the grade, the quality indicators and many other indicators as well.

"What should the solution be? Seemingly, this is an elementary thing. There are standard transport vessels, the 1,500's. Four or five of these vessels should be provided to the enterprises of the base fleets of the production associations and then this knot would be half undone. But no! Everything has been centralized at Vostokrybkholodflot [Eastern Fishing-Refrigeration Fleet] and in Dal'ryba [All-Union Fish Industry Association for the Eastern Basin] and this in principle deprives the transport operations of maneuverability.

"Fourthly, there is the mechanization of labor-intensive processes. The Far East provides 40 percent of the volume of Soviet fish products. Here the product assortment, even the existing assortment, is unique. The desired future would be to increase the volume and broaden the assortment. But the labor intensiveness of the work, particularly at the shore enterprises, is an impediment. Even now one cannot speak about the mechanizing of a single process or operation. Standard lines and standard production processes are needed. In the Far East, there is not a single major plant which would be capable of these tasks. In each association there should be a plant which is working to mechanize the labor-intensive processes. Or some Union specialization aimed at these questions. Unfortunately, as yet there is nothing.

"The fifth is the social problem. Nothing will develop without solving the social questions.

"The reserves are obvious. We must more boldly overcome the existing notions of management methods."

An Explanation of Doubts

Housing, the shore facilities, the fleet.... But what about the fish? The reason, frankly speaking, for all the trouble?

Far from everyone is confident of the raw material sources. Much more frequently the fishermen almost everywhere interject into conversations, as if something self-understood, words like "because of the impoverishment of the raw material supplies..." or "the fishing situation is constantly deteriorating," so the question of the state of the stocks as a whole causes concern and requires explanation.

The depletion of the traditional fishing grounds is occurring for various reasons, but this is pointed out by everyone who in one way or another is involved with catching the fish.

But scientists feel that in the Pacific Basin from the viewpoint of raw material supplies, our nation each year could catch up to 10 million tons of fish.

How to reconcile this, such optimistic prospects and the specific sensations of limited possibilities?

The problem is that commercial fishing as yet covers only 20-25 percent of the oceans area. The fish catch is concentrated only on several mass species of fish, but the broad range of species found on our own shelf is as yet not caught. As has been said, the possibilities of mariculture are not being employed. Moreover, fish, as is known, can be raised. Everywhere, the fishermen, from the maritime to Kamchatka, spoke about the necessity of "developing fish raising."

Salmon Farms

The island of Iturup. The Kuril Pisciculture Plant. This plant has been operating since 1946, and then, 30 years ago, it brought around 5,000 young fish "into the world." In 1981, the figure was 133 million young pink salmon. Of course, the plant has been reconstructed and the "shop" enlarged as otherwise such volumes would be impossible, but the reconstruction has somewhat altered the fish raising conditions. Previously the enterprise used a ground water supply, but now 80 percent is from the river while in the opinion of the specialists it would be better to bring the water from underground. The salmon love purity and underground water best meets these requirements. One other consideration: possibly it is not essential to have large fish-raising enterprises. Possibly it would be better to have more small ones around natural spawning grounds and it is easier to "feed" the small ones with groundwaters. The efficiency of the work done by the fish raisers is reckoned by tagging. The average indicator for the return to the Kuril plant of 5 percent is considered very high. These are figures disputed by many. On the coast, we repeatedly met skeptical smiles in talking about the successes of fish raising. Why intervene into something that nature itself does well? The fish raisers answer this question, it must be said, either avidly or tiredly. This is obviously not the first time that they must account for the utility of an annual expenditure of 237,000 rubles (the annual estimate of the plant) and the labor of 54 persons (the plant staff).

"Because of our plant, the fishermen have ceased counting the good and bad fishing years. Certainly the salmon knows even and odd years and now whatever the year it is a good one as by artificial raising we eliminate all the negative factors from the natural conditions such as the autumn flooding, the winter icing and so forth. In our work, we aim for natural conditions, but with an improvement of them, as in any 'domestication.' But imagine that you had dispensed with the chicken house and now your chickens lived in the brush. How would you gather your eggs? Hardly. You would be lucky to gather one-half of what you gathered in the chicken yard. There is the same picture with salmon. Never under natural conditions would one fish produce 1,500 eggs, but for us this is the standard."

In actuality, close to the fish-raising plant the catches for many years have been both abundant and stable.

In defending her job, Anna Ivanovna Kulakova, the chief fish raiser at the plant and enthusiast of fish raising, spoke with profound conviction:

"Doubts about our work only cause harm. The experiments have been underway for a long time and even Krasheninnikov two centuries ago tried to raise fish. But there are enough experiments and enough doubts: fish raising is the future of fishing. Some 80 percent of the catch in the region is our fish, fish raised by us! A ruble spent on a pink salmon produces approximately 10 rubles of profit. One to ten!"

The people of Kamchatka see colossal prospects in fish raising, but they feel that for achieving the desired and possible results "everything must be put the right way round." It is essential, they feel in the Kamchatka Division of TINRO, to develop a fish-raising technology and along with the fish-raising plants build plants to produce feed (there is a great formula for feeding and the experiments have been successful), and the young must be fed in tanks with salty water (a way where the Canadians have succeeded). In a word, these are technical matters, but such an approach differs fundamentally from what we are now actually doing.

In Kamchatka, in the "salmon country," they speak most expansively about fish raising: up to the year 2000 they must build, as a minimum, 10 plants, raise the young, feed it and carry out rational fishing.

After the "Roundtable" of Seminars

Possibly, it would not be excessive in this text to give fragments from seminar discussions in their verbatim appearance, where one would encounter various aspects and levels of knowledge and ideas about the subject of discussion. Possibly the reader will hear his own arguments, his own doubts and then will feel a member of one of the expedition's exercises....

"The bioresources are essentially not utilized by the Soviet Far East. Approximately one-half of the resources is used within the 200-mile limit of our nation and in the open seas a little more than 10 percent."

"The main problems lie in disproportions. Large amounts of money have been invested into developing the fleet and incomparably less into developing the infrastructure of the fishing industry. The fleet has also been developed one-sidedly, that is, toward an increase in capacity, without considering the changing fishing conditions which require also small vessels for the coastal zone as well as transports of varying tonnage."

"The idea of the inexhaustibility of the ocean's resources has not been of the best service. The stocks for certain species of food fish have been significantly reduced. Are there other types of resources? Of course there are. For example, we do not catch the so-called "leda" but it is completely suitable for producing cattle feed. Krill.... Whatever one's attitude, it would make it possible to solve many of our problems. It is essential to catch krill, although the price for it is still high: 10 rubles a kilogram.

"As of now, active fishing has been restricted to shelf waters, and we catch only 12-10 percent of the total take in the open sea. It is essential to prepare to search out new fishing grounds in the open ocean. For example, the stocks of the Arctic have been completely unexplored and little is being done in this regard."

"In time, obviously, at least beyond the year 2000, fishing will be replaced by fish raising and marine livestock raising. The most realistic and desirable fish species for raising is the salmon. The return averages 3-5 percent. Clearly the return in artificial spawning

grounds is higher than in natural ones. Attempts to feed the fish in coastal waters would noticeably increase the percentage of return to 10-15 percent. TINRO has worked out the Salmon Program and it must be hoped that its implementation will substantially advance our fisheries."

"The production of canned fish must be reduced and a policy set of producing fresh, salted and frozen products. The fish combines should be equipped with large refrigeration capacity and the canning of fresh fish is the yesterday of the 'ocean's conveyor'."

"I am in favor of utilizing the best of foreign experience, but I am against following it blindly as our traditions and conditions are different. How can we avoid canned goods when we catch 40 percent of our fish in the east of our land and we must feed the West? Of course, the production of canned goods must be reduced, but it would be dangerous to become infatuated with this. It must not be forgotten that these for a long time to come will remain an important element in the diet of our nation...."

"There can be no question of whether we must increase the output of fish and sea products. We simply must increase the output. When? By what means? In what sequence? These are all questions for science. But we do not have any 'ocean economics'! Nothing has been calculated and there area no serious figures for even one question. How should we construct a strategy? A concept?"

Preliminary Results

Here are the conclusions reached by the members of the expedition.

"Fisheries are at a turning point.... A mere continuation of the existing trends can lead here to a decline in the rates. There must be a new strategy and this means a changeover to the forming of a highly developed fishing industry complex. For fish, our knowledge about the stocks is much more accurate and much more complete than for other types of resources. The forecast for the resources is generally speaking clear and we possess certain knowledge for an initial elaboration of the future. Now it is important to focus on a reorientation of management. We basically catch the large-tonnage species. Even the kolkhozes evermore noticeably are focusing on the 'gross.' This trend lacks any prospect. There must be a refocusing on assortment and on broadening the use of the inner shelf for these purposes. This requires a rebuilding of the fishing fleet, an improvement of the search instruments, the imposing of very rigid quotas by species, dates and so forth. All of this involves natural measures related to the systematizing and rationalization of fisheries.

"The effectiveness of fish raising is high, however calculated. With any permissible error, this is the way of the future. One has merely to review the catches over the years in the area of the Kuril plant: they have not fluctuated! But an even broader program is needed.

"Of course, there must be a broadening of mariculture. There are possibilities for this.

"But the policy of fish raising is possible only with a change in the existing trends. If one follows the 'gross,' that is, operates from the standpoint of tonnage and rubles, then that is the end of the walleye pollock and so be it! But if the focus is put on assortment and quality, then there must be pisciculture, mariculture, marine livestock raising and small-tonnage catches. Here everything makes economic sense.

"The real orientation is a difficult undertaking. In particular, it is essential to reorganize the entire 'shore' system. The primary goal of such a reorganization is to sharply reduce the time of unloading and repairing the ships. The funds allocated for the fishing industry must be redistributed. At present, they basically go for the fleet. They should go for creating and developing the shore facilities as well as for mechanizing the processing.

"We have seen how, for example, red caviar is produced, just as it was decades ago. Is it right that in Kamchatka, the nation's basic salmon source, the ships have virtually nowhere to dock?! What is the production level at the individual fish combines, in the most, so to speak, fishiest places? Where, in what other national economic sector would we permit the maintaining of such a high level of manual labor? The attitude toward this sector must be changed, this is clear.

"Generally speaking, one must adopt a 'tree of goals,' determine the priority of each branch and seek out competitive variations."

The expedition is ended. The impressions, data, reflections and arguments can be fitted into a system where there is room for everything. The time for action has arrived.

Here it is impossible to overestimate the importance of the Far East with its unique and diverse resources. There must be statewide measures to increase the region's contribution to the national economy. A program of national importance is needed. The thoughts of scientists should be working to design an optimum management system.

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CSO: 1820/57

HYDRAULICS AIDS IN COAL MINING

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 149-153

[Article by Candidate of Economic Sciences V. D. Rechin from the Institute for the Economics and Organization of Industrial Production at the Siberian Division of the USSR Academy of Sciences, Novosibirsk: "The Creator of Technology"]

[Text] Our reader knows him. V. S. Muchnik is the hero of the essay by I. Ognev "The Fate of Technology."[1] The essay evoked many responses and the readers have called it among the best materials of the year.

V. S. Muchnik willingly wrote for our journal as obviously he was attracted by the opportunity to voice his ideas to an unprejudiced audience and to hear the opinion of readers. As a total he published around 200 works, including 5 (with an article in this issue) in EKO. The first of them "The Management of Technical Progress in a Sector" was in the very first issue of the journal in 1970. All the subsequent ones have been devoted to examining the patterns of scientific and technical progress and to searching for the methods of controlling this. He devoted the last 10 years of his life to working on this problem, one of the key ones in economic science.

All the years prior to this were dedicated to coal.

The coal industry is more than 200 years old. The world presently mines more than 3 billion tons of coal and the USSR produces more than 600 million tons. And virtually by one method, the mechanical which started with a pick axe. Later on, year by year, decade by decade, machinery and equipment spread into the mines and pits. In the place of the pick axe came jackhammers, coal cutting machines, combines and mechanized complexes; in the place of hand hauling of the coal came conveyors and electric locomotives; in the open pits came excavators, dump trucks and so forth. There was a rapid development of mechanical coal mining, but the basic technological idea remained unchanged.

Only in the 1930's did a fundamentally new technological idea arise, and along with it a new method of coal mining. Hydraulic.

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[1] See EKO, Nos 2, 3, 1980.

The idea came to a student at the Leningrad Mining Institute, Vladimir Muchnik. He described this in his diploma project and successfully defended it in 1935. Since then, it became the main cause of his life.

His proposal was to turn water from the enemy of the miners into an ally. With the aid of water, the coal would be cut and transported right up to the consumer. The appearance of the mine would change and most importantly all the technical and economic indicators would improve. For example, labor productivity of the miners would rise by 2-3-fold, costs would decline, fewer capital expenditures would be needed and working conditions would be noticeably improved. There was one reason: the hydraulic mine would be much simpler than a conventional mine. Or, as V. S. Muchnik later formulated in the theory elaborated by him for the method, the process would become one involving few operations. In actuality, the number of production operations was reduced by 3-5-fold and more.

The new method possessed enticing prospects. However, the person who is familiar with the history of the introduction of innovations knows that their enticing qualities in and or themselves do not mean the beginning of the broad employment of a technological innovation.

Initially the fate of the hydraulic method and along with it that of its author progressed rather fortunately. In the second year of his career V. S. Muchnik was summoned from the mine and transferred to head a laboratory at the Donets Coal Institute. Two years later, the world's first hydraulic mine was put into operation. In 1940, the decision was taken to build 10 hydraulic mines and hydraulic installations at conventional mines while Muchnik, a 27-year-old engineer, was to head the All-Union Gidrougol' [Hydraulic Coal Mining Office] which was to conduct the experiments as well as design and build the hydraulic mining installations.

The war prevented the plans from being carried out. The Nazis also destroyed the first hydraulic mine.

Engr-Capt Muchnik began the war in July 1941 and was demobilized in the end of 1944. From the front he traveled immediately to Prokopyevsk in order to head up the Kuznetsk NIIUgol' [Scientific Research Institute for Coal].

Although the job of the institute was to provide scientific services for the Kuznetsk Basin, V. S. Muchnik devoted more and more time and energy to the new method of coal mining. For this, he was removed from the position of director. In 1955, the decision was made to create the All-Union Scientific Research Institute for Hydraulic Coal Mining in Novokuznetsk. It was headed by V. S. Muchnik who by that time was already a doctor of technical sciences.

An interdisciplinary institute.... What director would not dream about this? How many speeches were made and how many articles were published about what precisely such an institute required for solving the problems of technical progress! But are there many such institutes today? And what about 20-25 years ago?

Muchnik was able to organize an institute which brought together scientific and engineering units which consisted of 26 laboratories as well as a design unit which designed all the hydraulic mines of the Kuznetsk Basin, Donets Basin and Karaganda Basin. The institute also included: an experimental machine building plant which produced virtually all the

non-standard equipment for the new method, experimental shops, a computer center with one of the first computers in the sector and, finally, a starting-up administration which had a permanent staff of around 100 specialists with the duty of starting up all the newly built hydraulic mines, bringing their indicators up to a level close to the designed and developing the fundamentally new machines under production conditions. To the list one must also add the hydraulic mining chair which was set up and headed by Prof V. S. Muchnik and the corresponding department in the Siberian Metallurgical Institute (SMI) which began the training of spcialists in the new area.

A system was organized which ensured the all-round development of the new technological area. It was not too large, just 1,000 men, but this was 1,000 like-thinkers, persons who felt that for them there was no higher goal than contributing to the success of the new method. In and of itself, such a collective was an enormous achievement worthy of special study.

Due to close contact with the institute, the new enterprises quickly improved their technical and economic indicators. The first mine in the Kuznetsk Basin, a small, or more accurately, the smallest one in the basin, the Polysayevskaya-Severnaya, in the 10th year of its life (1962) demonstrated an output of over 100 tons per worker per shift with a cost of a ton of coal of a little more than 6 rubles. These are figures which any mine could now be envious of.

Later large, hydraulic mines such as Badayevskaya-Severnaya No 2 have reached a level of labor productivity of around 300 tons a month as an average over the year, that is, approximately 6-fold higher than the national average for the underground method of coal mining. The Soviet hydraulic coal mining method began to be employed in Poland and Czechoslovakia and in Canada and the FRG, in Japan and many other nations.

In 1972, the USSR reached the largest volume of hydraulically-mined coal, more than 10 million tons (in 1981, 9 million tons). Average labor productivity at the hydraulic mines of the Kuznetsk Basin over the 5 years by 1971 had risen by 1.7-fold and were more than 2-fold higher than in the conventional-type mines with the same mining and geological conditions. Output at the hydraulic mines continued to grow right up to 1977 by almost another 1.7-fold and exceeded "in round figures" 150 tons a month. In a situation where the coal industry was noticeably reducing average labor productivity, regardless of the increase in the proportional amount of coal mining from open pits, such results were of particular importance.

The new method more and more clearly and irrefutably demonstrated its capabilities and advantages, including a rapid improvement in the quality economic indicators such as labor productivity, costs and so forth. But unfortunately, it spread very slowly.

By that time research had led Vladimir Semenovich [Muchnik] to disclose certain common patterns of technical progress and the methods of controlling this.

More and more he became engulfed in the theoretical problems of technical progress. And he reached the conclusion that hydraulic methods were only a particular instance of the natural processes of technical development. The 200-year-old period which had been opened by the Industrial Revolution would be replaced by another, equally revolutionary one. Instead of a further division of labor in the course of separating and mechanizing individual operations there would be a move toward their combining and a changeover to production systems involving few operations and stages. In ferrous metallurgy this was the direct

reduction of iron in skipping the blast furnace process. In the cotton cloth industry, this meant the production of nonwoven materials. And so forth in all production sectors. Not only the production methods would change, but also the quality of the product and the system of organizing and controlling production. The multiplier effect would provide an opportunity to revolutionize labor productivity.

"...A 15-20-fold rise in labor productivity," wrote Vladimir Semenovich in his last article (EKO, No 10, 1981), "is a reality which now seems fantastic." But he did not write his book on technological economics, as the author called the new theory. He was unable to. In December 1981, he passed away.

...He lived a difficult, but enviable life. He was able to see the implementation of his ideas. A new technological process in the coal industry was created and proved its effectiveness. This has immortalized the name of its creator.

The world knows the Frenchman Martin and the Englishman Bessemer. They developed a new method of steel casting. We feel that the same recognition is due the person who created the second production system in the sector's history.

He was extremely humble and unprepossessing. Not everyone knew him in Akademgorodok, but the world mining science and coal industry knew him. His name will enter economic science. The contribution of V. S. Muchnik to analyzing scientific and technical progress still awaits its assessment.

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CSO: 1820/57

DEVELOPMENT OF 'METASYSTEM' FRAMEWORK FOR TECHNOLOGICAL CHANGE

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 153-166

[Article by Doctor of Technical Sciences V. S. Muchnik (posthumous) from the Institute for the Economics and Organization of Industrial Production under the Siberian Division of the USSR Academy of Sciences, Novosibirsk: "The Integral Effect of Technological Changes"]

[Text] The present-day scientific and technical revolution [STR] is primarily a technological revolution occurring against a background of the ongoing development of mechanization. Production mechanization still has substantial reserves, but a change in the very method of effecting the subject of labor is assuming ever-growing significance. The greatest reserves are to be found precisely here. And the most substantial changes in the economy, we feel, will be related precisely to the technological processes.

For this reason a concept of **technological economics** becomes valid. It should investigate the particular features in the evolution of the present-day production apparatus and analyze the possible strategies for controlling scientific and technical progress.

The attempts already made at such technological-economics analysis[1] indicate that the present-day opportunities for improving technologies, in being combined with the mechanizing of mental labor on the basis of computers, make it possible to forecast an abrupt rise in the indicators or a sort of **technological-economics "explosion."**

At the same time, it must be realized that such a "explosion" will not start spontaneously. In terms of our economy, this means a skillful combining of the possibilities opened up by the STR with the advantages of planned socialist management. If these possibilities and advantages are correctly utilized, then it can be boldly stated that we stand on the threshold of fundamental changes in production and at the sources of a long-range trend for increasing the growth rates of social labor productivity.

Technological economics views technical progress as the resultant of the dynamics of four basic **production components:** the technological, product quality, production control and product utilization.

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[1] V. S. Muchnik, "The Technological Revolution Transforms Production," EKO, No 2, 1979.

The Technological Component

The basis of the **technological component** is the **unified technological system** or UTS (for example, hot forging of metal). This transforms the subject of labor (metal) into a product suitable for further production (and in certain instances also non-production) consumption. The UTS is an aggregate of basic operations (cutting, heating, tempering, cleaning), support operations (the delivery of the blast to the furnace, the delivery of coal and so forth), auxiliary operations (turning over in the zones of effect) as well as transport operations which are grouped around the main one. A change in the main operation (for example, cold extrusion instead of hot forging) leads to a transformation of the entire UTS.

The aggregate of unified technological systems forms a **metasystem** which repeats the principles of the UTS on a higher level. The metasystem produces an end product destined for consumption by other metasystems. The hot forging taken as an example is part of the metasystem of metallurgical production, where the main UTS is the blast furnace smelting of pig iron while the basic UTS are coal mining, ore mining, steel casting, pouring, reduction, rolling or forging and so forth; the auxiliary operations include the production of fluxes, refractories, the delivery of oxygen for the blast and so forth. At each stage (conversion) there are all new transformations of the subject of labor, metal. But the blast furnace process, the conversion of ore into metal, remains the main technological process of the metasystem.

An analysis of the properties and features of the technological component has disclosed that historically the development of technologies has occurred in two stages. The first stage is the **multioperation** one which in a majority of sectors has continued up to the present, where the development of technologies has occurred by improving the numerous labor operations in maintaining their composition in a conservative form. It is scarcely possible to achieve a radical resolution of the fundamental problems of the present-day economy by improving the multioperation technologies.

The second stage is the so-called **few-operation and few-stage** one, where rapid growth of labor productivity is achieved by breaking up the very structure of the unified technological systems and operations in the metasystem. Few operations in the technological systems and few stages in the production metasystems become the crucial condition for improving it [production], where a rise in live labor productivity is accompanied by a reduction in product capital intensiveness. In essence, it is a question of initiating a technological-economic "explosion" with a changeover to the strategy of saturating the national economy with highly efficient integrated technological systems. For working out, designing, building and starting up of enterprises which reach the set technical and economic indicators and operate on fundamentally new technologies, it has been proposed that a separate large state organization be organized capable of heading the industry of producing the new generation of technological systems. The basis for such an industry could be created from a portion of the presently existing and inefficient scientific research institutes, design bureaus and organizations as well as certain industrial enterprises.

Even profound operational **transformations** do not exhaust the potential of the technological production component. With the growth of fundamental and applied scientific knowledge, the possibilities of the technological component are determined not only and not so much by the **operation effects** on the subject of labor and their reorganization as by the **interoperation and extraoperation processes** in maintaining or even reducing the composition of technological operations. The growth of product output will then substantially outstrip the material and labor expenditures related to the operation effect itself.

Among the extraoperation effects we would put a method for changing the physical, biological or economic characteristics of a subject of labor whereby these are achieved without intervention into the structure of the technological operations. For example, in the chemical industry this is the use of catalysts, in the food industry the employment of enzymes which accelerate production processes by several-fold. The raising of fish in warm water accelerates its reproduction by 4-fold and increases the yield per m^2 of pond surface by 8-10-fold. The effect of the extraoperation processes is manifested, for example, in the process irradiating of wood with gamma rays and as a result the wood fundamentally alters its physical and technical properties. The irradiating of water insulating with a flow of elementary particles increases wire heat resistance by 2-3-fold and so forth.

Among the extraoperation effects one must also put the method of obtaining rolled products in an adjustable rolling mode. The strength properties of the metal are sharply improved. Indicative has been the appearance of such extraoperation technologies as the growing of monocrystals with unique properties (for example, vanadium) based on plasma technology.

The extraoperation effects play a special role in biotechnology. According to the data of Academician A. Bayev, in the organism of a cow weighing 0.5 ton, over 24 hours 0.5 kg of protein is formed. Over this same time, 0.5 ton of bulk yeast synthesizes 50 tons of protein substances the incorporation of which in the rough feed increases its assimilability by 2-fold. Thus, a ton of yeast saves 5-7 tons of grain. A coal growth agent from brown coal humic acids in a dose of thousandths of a percent increases the vegetable yield by 30-100 percent and accelerates the growing season of early vegetables and grain by 10 days.

The incorporation in the technological chain of additional operations which provide an effect far surpassing the additional expenditures becomes the basis of interoperation effects. Examples here would be the infrared irradiating of seed before planting which influences the germination rate and yield, the vacuuming of steel before rolling which improves its quality properties by removing harmful impurities, secondary methods for intensifying oil output (for example, by using surface-active substances) and so forth. Often the interoperation effects become such a part of the technological chain that they become an inseparable part of it.

An example of a combined extra- and few-operation effect is provided by the ore mining system which was developed by scientists from the Mining Institute of the Siberian Division of the USSR Academy of Sciences in cooperation with miners from the Tashtagol Mine. It was possible to draw up an optimum system for blasting work with such a positioning of the holes and the distributing of the blasting charges in them that the output of so-called outsize in the blasted bulk drops virtually to zero. The technological chain has been shortened by the operation of crushing the outsize which is one of the most labor intensive. Here there is a typical extraoperation effect: the effect has been achieved without altering the technological operations of drilling, loading the charge and blasting.

The elimination of the outsize provided an impetus to transform the operation of ore production with the loading of it into the hopper cars by the vibration method. Vibration-based output is also an example of an interoperation effect with a change in the content of one of the operations. The extra- and interoperation effect made it possible to triple output in underground work, reduce the injury rate and improve production efficiency.

Product Quality

The product quality component in technological-economic analysis reflects the fact that a product is produced actually for the sake of its consumer properties or utility in production and nonproduction consumption. Labor productivity depends, strictly speaking, not on only one factor, that is, the bulk of the product calculated per unit of labor expenditures, but rather upon the aggregate of the product consumer properties and upon quality. A product's consumer effect can be represented by the product of its quantity by the quality indicator such as: strength, wearability, caloric value, combustion heat and so forth. In this sense an improvement in one of the product's properties (and not only an increase in its output) means a rise in labor productivity.

The range of a product's consumer properties is usually restricted by a small number of the most essential ones. For example, for motor vehicle building this is the running of the vehicles in kilometers until the first major overhaul. If the life of trucks was increased from 150,000 km to 450,000-500,000 as achieved in world practice, even at the price of increasing their cost by 1.5-fold, the national economic effect would ultimately be virtually equivalent to a doubling of labor productivity for the motor vehicle builders.[2]

A rise in product quality influences the end economic effect and the expenditures of resources. Thus, the alloying of steel and the heat treating of rolled metal lead, on the one hand, to a reduction in metal consumption by 50-60 percent, and on the other, to increased reliability of the products, to reduced expenditures on repairs and spare parts, to a shortening of stoppages and, consequently, limits the need to broaden product output. An analysis of the impact of reliability on improving the indicators of a technological system indicates that labor productivity, for example, grows by 2.5-3-fold while proportional capital outlays are reduced by 10-15 percent.

For fully assessing the result, it is essential to measure the integrated influence of the changes in the primary technological process and in product quality. In ferrous metallurgy, miniplants with direct reduction of the iron in electric furnaces and steel casting in continuous casters show a growth of labor productivity of approximately 3-fold in comparison with large integrated mills which utilize a traditional technology. The alloying and heat treating of metal reduce the demand for it and labor expenditures by another 1.5-1.6-fold and as a final total by 4.5-4.8-fold. The additional expenditures on alloying and heat treating as well as the production of alloying elements are covered many-fold by the savings from reducing the demand for iron ore, coke and other charge materials.

Management

Improving the **management component** in automating production also leads to a multiple rise in labor productivity. Thus, machines with numerical programmed control raise output by 2-3-fold. Their combining into sections and shops equipped with microprocessors and minicomputers under the control of a central electronic computer means the full automating of production with increased labor productivity by another 1.5-2-fold. In actuality, the equipping of the snap-flask molding line in foundry production at the Volga Motor Vehicle

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[2] The lengthening of operating life would be fully felt only after the complete replacement of the present trucks by more durable equipment (editors' note).

Plant with vibropress and sandblasting units instead of shakers increased output by approximately 2-2.2-fold. The high reliability of the technology creates prerequisites for organizing automatic control of the process with another 2.5-3-fold increase in productivity. The integrated effect reaches a 6-fold growth of labor productivity. Automatic attachments for monitors in the underground hydraulic coal mining system provide an increased labor productivity for the workers of a clearing face of approximately 2.5-fold in cutting.

Product Utilization

In terms of its importance, this component is similar to the quality component. The problem is that not all the useful properties of a product tell directly on material and labor intensiveness or reduce the required amount of it. Certain product qualities can be assessed only by the consumer. For example, this is the shape of rolled metal, the weldability of steel, the transparency of optical glass, the reliability of articles and so forth.

Thus, the increased output of light metal structural elements may not cause a shift in efficiency in metallurgy itself. On the other hand, in the related metasystem of "Construction," their use reduces the time of erecting buildings and structures to 1.5-2-fold and lowers metal consumption. Thus, the previous expenditures provide for the building of a larger number of edifices.

An indicative example is the erecting of an industrial structure's combine where they succeeded in fully realizing the potential of the utilization component. At the construction site it is possible to organize conveyor-line assembly using the ready-made building interfloor slabs manufactured by the Chernogorsk Plant of Glavkrasnoyarskstroy [Main Krasnoyarsk Construction Administration]. In employing light partition elements like the "sandwich panel," it is not difficult to turn a construction site into an installation one. As a result, labor productivity of the construction workers grew by 3-fold although the rolled metal for the slabs was from commercial steel with a yield point of just 23-25 kg per mm^2 with a sheet thickness of 1.9 mm instead of the possible 0.6-0.7.

The raw material problem undergoes unique refraction from the positions of technological-economic analysis. The search for a universal raw material promises substantial results. From this it would be possible to obtain materials needed in many production sectors. Such materials are already known, they are being industrially produced and ever-new spheres of use are being disclosed. These are polymer materials with a composition structure, polymers with fillers and so forth. In terms of many of their properties, polymers, as structural materials, surpass nonferrous metals: they are light and easy to process as they cast, press and stamp well. In terms of strength performance, polymers approach steel and in many instances can replace rolled sheet. Oil and gas are the raw material for producing polymers, however in the long run obviously coal will become the universal resource as its reserves are sufficiently great to satisfy all needs within the foreseeable future. Polymers have opened up the way to obtaining materials with unique properties; the successes of coal chemistry will ensure progress along this path.

The radical transformation of structural materials which started with the industrial production of composition and filled polymers marks a new stage in technological-economic development. It can be asserted that in the future, universal polymer materials with a broad range of unique properties will play in the economy the same role which iron played at one time in replacing stone and bronze. The use of polymers in machine building and construction will sharply increase production efficiency in the sectors of the investment

complex and will broaden the opportunities of capital investments into the national economy. From the standpoint of technological economics, the production of new materials for the capital-forming sectors is **the area of the greatest efficiency.**

The Interaction of the Components and the Prospects of Production

Production and the utilization of production products represent, thus, a single technological-economic process with a common structure of the components and an integral effect from their transformation. Consequently, it can be considered that each of the components extends its influence to the entire metasystem, that is, it possesses **the property of universality** in relation to the metasystem.

In actuality, the use of few-operation technology as part of the UTS leads to a reorganization of the entire metasystem into few-operation, few-stage production. For example, the transformation of the quality component, like the product utilization component, not only means greater efficiency in the metasystem, but also tells on the results in the functioning of the entire **technological conglomeration.** Thus, the quality of rolled ferrous metals (in its strength performance) ultimately determines the efficiency of the metallurgical metasystem and the entire conglomeration. Controllable rolling has made it possible to triple metal strength and from a ton of steel it is now possible to manufacture almost 3-fold more equally-strong beams. Consequently, much less ore, coking coal, iron and energy go into a unit of product.

The property of universality opens up remarkable opportunities for the interaction of the component, primarily as concerns the savings of labor. As experience shows, the transition from multioperation technology to one with few operations provides a 2.5-3-fold rise in labor productivity.

Technological reorganization creates favorable conditions for improving the other components. The fewer the operations and stages in manufacturing, the simpler, for example, the automatic control system and the faster its organization is possible. Automation provides, according to the most conservative estimates, another 3-fold reduction in labor expenditures.

An evaluation of the integral effect from technological changes (according to the index for the growth of labor productivity) is based upon the average efficiency indicators for improving the individual components: by 1.5-2.5 for the technology component; by 1.4-3 for the product quality component; by 1.5-3 for the control component; by 1.5-2 for the product utilization component.

The overall effect can be achieved in accord with the idea of the property of the universality of the components, that is, $2.5 \times 3 \times 3 \times 2 = 4.5$.

In fact, even if the efficiency index of each of the components over a 10-year period of realization equaled not 2-3, but only 1.4-1.5, then the average annual increase rate of labor productivity would be no lower than 12-15 percent.

The time has come to become accustomed to the idea of the feasibility of such growth rates for labor productivity. There are already examples of this as recent models of equipment provide a 5-10-fold rise in output. While at a brick yard with the mechanizing of basic operations annual output per worker is ordinarily 100,000 pieces, at the automated plant in Kolpino (Leningrad Oblast) it has reached 960,000. The high indicators owe their

occurrence to the interaction of the components and for this reason it is not sufficient to pay attention to the transformation of just one or two of them. The attack must be made against the entire component front.

In the course of developing the production components, a unique "dialogue" among them is initiated. The improving of one component prepares the prerequisites for the successful transformation of a related component and vice versa. Here positive feedback arises.

Thus, the transformation of the technological component into one involving few operations not only raises its intrinsic efficiency, but also forms a situation favorable for utilizing the opportunities to improve the production control component, for example, in its automated version. The effect from the interaction of components becomes apparent. The automating of shop management encourages, in turn, the technological unification of the production lines. As a result, a system of automated control is formed for an individual enterprise and even groups of them.

The interaction of the technology and control components is so close that they comprise a single system which enters into a dialogue with the quality component. The improving of the quality component in the course of the dialogue leads to a reorganization of the entire technological conglomeration, for example, to the rise of two-stage metallurgical-machine building production.

In actuality, due to the metal-physics methods of strengthening, metal quality has been consistently rising and for this reason one must expect a substantial reduction in the metal intensiveness of products. Theoretically the breaking strength of iron can reach 900-1,000 kg per mm^2, but in fact the strength of commercial mass produced metal is 25-35 kg per mm^2. According to forecasts by specialists, over the next 15-20 years, one must expect the output of mass rolled products with a strength limit of 80-100 kg per mm^2. This will become an impetus to reorganize metallurgy and machine building into a two-stage technological metasystem.

The future of production is a unification of steel casting in electric furnaces with single-stage technologies for manufacturing machine parts employing detail-rolling mills, the methods of powder metallurgy, precision casting, radial metal reduction and so forth. A new type of enterprise will arise where the few-operation and few-stage production technologies for high quality metal combined with its rational utilization in the machine building technologies will produce an increase of scores of fold for labor productivity.

The prototypes of such enterprises could be the shop for locomotive and railway car axles in Dneprodzerzhinsk and the steel rolling mills and shops producing high precision shapes. Each 1,000 tons of high precision rolled shapes from the Cherepovets Steel Rolling Mill saves 700 tons of metal and the labor of 500 machinists.

Japan in 1977 began to build an automated machine building plant for series production of products. The plant included a production shop, a section for inspecting materials and stock as well as technical services. The shop was to machine 2,000 parts in batches of from 1 to 25 pieces and assemble 50 types of products (spindle heads, gear boxes, engines and so forth) in operating around-the-clock. The production processes included automatic forging, heat treating, inspection, assembly and painting. Control was provided from a center equipped with a high-powered computer. The number of employees was 10 persons

while a traditional production line for carrying out a similar production program would have required around 750 workers. [3]

The dialogues of the production control and product utilization components inevitably lead to the formation of integrated fuel-energy, agroindustrial and other complexes. Thus, profound changes in the spheres of social production become the result of the dialogue interaction of the components.

Let us turn to the coal industry, where labor productivity in recent years has shown a steady trend toward a decline as a consequence of the traditional views of developing production by the full mechanization of a multioperation technology. At the same time, our nation has developed a few-operation technology for underground hydraulic coal mining and this is employed in many industrially-developed nations. The Fourth Section of the "Basic Directions for the Economic and Social Development of the USSR for 1981-1985 and for the Period Up to 1990" adopted by the 26th CPSU Congress draws attention to the "effectiveness of hydraulic coal mining as well as the transporting of coal through pipelines." Hydraulic coal mining has been developed as a few-operation technology with the main operation of hydraulic breaking and single-operation mechanical and hydraulic extraction combined with hydraulic transporting and lifting of the coal.

At the Yubileynaya Mine No 2 in the Kuznetsk Basin an average monthly output of 250-300 tons per worker in mining has been achieved in comparison with 80-85 tons at regular mines with conventional technology and 120-140 tons at the best fully mechanized large mines.

One of the key conditions in the functioning of the production elements of the "hydraulic mine" system is the quality of the reusable process water. It has been established that the productivity of hydraulic breaking and the reliability of equipment operation depend greatly upon the solid particle content in the reusable water. Water purity (not more than 5 gm of solid particles per liter) makes it possible to bring the pressure up to 160 atm and this increases the productivity of hydraulic breaking and the face itself by 2.5-3-fold. At the same time, there is a broader range for employing faces without the reinforcing of the clearing space while the period of dependable operation of the equipment (monitors, pumps and fittings) is increased by 3-4-fold. Ultimately, this leads to an output of up to 400-500 tons per worker per month. Increasing production reliability opens up the prospects for automating the technological system and increasing output up to 1,000-1,200 tons.

Water purity is provided by one of the operations in the system with the intermediate tanks being enlarged to the sizes of settling ponds employing coagulants (polyacrylamide). Thus, a combination of the interoperation (the settling pond) and extraoperation (coagulant) effects creates prerequisites for raising labor productivity by 10-15-fold in comparison with mines having traditional production methods.

However, it must be recognized that the designated technological innovations have not been widely employed at the hydraulic mines. Traditional technological decisions have been taken, equipment has not been modernized and the level of labor productivity has begun to decline (although it remains higher than at conventional mines). A retarded

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[3] I. N. Trofimov, "Machine Tool Building and the Prospects of Automation (from Japanese Experience)," EKO, No 9, 1979, p 130.

renovation has led to a situation where obsolete technological methods have been employed in the reconstruction programs and the planned level of labor productivity is at times set below what has been achieved.

Without effective organizational measures it is difficult to expect a rapid change in the technological and other production components. Accelerated economic growth on the path of the scientific and technical revolution presupposes special organization and **specific programming** of the technological-economic shifts. The necessity has arisen of creating a **special subdivision** in the national economy and which would be derived from the sectorial management structure. Such a subdivision would be specialized in working out and developing new technological systems and hence the technological-economic transformation of all social production.

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AUTHOR'S LATEST BOOK UPDATES DISCUSSION OF FREEING UP OF LABOR FORCE

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 167-173

[Review by Candidate of Economic Sciences V. F. Kotlyarov from the Western Siberian Affiliate of the Scientific-Research Institute for Labor in Novosibirsk, of the book "Voprosy truda v SSSR" (Labor Questions in the USSR), by Ye. L. Manevich, Moscow, Nauka, 1980]

[Text] Some 15 years separate the new book by Ye. L. Manevich from his previous major work published in 1966.[1] The three 5-year periods are a rather long time both for the economy as well as for its researchers. What new has happened over the past period in the sphere of social labor, what are the trends in its development, have the author's ideas and viewpoint on the pertinent problems been confirmed, and has he made progress in solving them?

One can sympathize with the reader's desire to obtain answers to these questions in the foreword similar to the one in the 1966 monograph. However, now there is no such foreword. There is an introduction the contents of which to a significant degree is devoted to the nature of labor under socialism. In the 1966 book this was taken up in the special first chapter.

We feel that in certain chapters there is a somewhat over-simplified approach to the designated questions. In particular, this is inherent to the chapters "Labor Productivity" and "The Organization of Labor and Labor Productivity." Possibly this has been caused by a desire to set out the material as simply and accessibly as possible. However, we feel that this has not always been successful. In such an important section which could become the central one in the book, the reader will not even find mention of the problems of measuring labor productivity, the experiments conducted recently and the progressive changes which have been outlined in this area. There is no analysis of the dynamics of labor productivity. An even cursory review of the reasons for the slowdown of its growth rate is lacking.

At the same time, the impression is formed that having provided data on the five-year plans for the increasing proportional amount of product obtained from the growth of labor

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[1] Ye. L. Manevich, "Problemy obshchestvennogo truda v SSSR" [Problems of Social Labor in the USSR], Moscow, Ekonomika, 1966.

productivity and on the savings of manpower in recent years, the author is inclined to evidently consider this proof that the acuteness of the above-indicated problem to a certain degree has been eliminated. "The given figures," Ye. L. Manevich states directly, "show that our national economy is following the path of the intensive type of expanded socialist reproduction and a more rational allocation and utilization of the available labor resources." Possibly the author has in mind the first undertaken steps, but we feel that more proof is needed for such an assertion.

It would be possible to agree with the given statement if there had not been a decline in the growth rate of labor productivity and the number of employees. In actuality, even with the most insignificant rise in labor productivity and a minimum decline in the number of workers (for example, by one person) the entire increase in the production volume would have been obtained from a rise in labor productivity. However, we can scarcely accept this as an indication of the intensive type of reproduction. It is no accident that the recent party documents state that we as yet have not succeeded in shifting the economy to the intensive development pathy. If we are observing this process, it is in its very inception.

In the work a significant place has been given over to the problem of rationally utilizing manpower and to its release (the second section is "Manpower Reproduction"). In this regard it is interesting to refer to the 1966 book. What did the author assert in that period, have his ideas developed or have his views of the problem changed?

An undoubted achievement of Ye. M. Manevich has been the fact that at one time he was one of the first to raise the question of the need to manage labor resources. His proposal to improve their registration (the setting up of special organizations which would be concerned with finding jobs for employees) has acquired actual embodiment. At present in many of the nation's major cities there are the corresponding bureaus. The author correctly pointed out the presence, on the one hand, of a manpower shortage at enterprises and, on the other, a surplus. The author must be given his due for having rather convincingly established the need to attract and retain personnel in Siberia, in creating here the best living conditions and equalizing them in the various economic regions, releasing manpower by technical progress in all national economic sectors.

Ye. L. Manevich in his 1980 work also talks about these urgent questions. A new feature in it is the analysis of the existing demographic situation. In describing it as not quite favorable, he is in favor of carrying out a more active and at the same time unified demographic policy. Here in a polemical form but rather convincingly he shows the need to introduce a broad system of payments and assistance, particularly for families having two and more children.

In 1966, Ye. L. Manevich was one of the first to draw attention to the problem of the release of manpower. Since then, interest in this has increased substantially. In recent years, works have been published by I. S. Maslova, G. A. Baranenkova, Ye. I. Ruzavina, M. I. Dolishniy and others. Many articles in journals and newspapers have been written, particularly over the Shchekino experiment. Considering this, the reader can rightly expect major generalizations and conclusions from Ye. L. Manevich who stands at the springs of such an interesting direction. In actuality, the book does speak of the existence of an universal law for the release of the labor force as first formulated by the author in the journal VOPROSY EKONOMIKI in 1978. But the arguments to back up the existence of this law are not sufficiently convincing. Its formulation has not been preceded by a thorough analysis of the category "the release of manpower," the concepts of "real" and

"potential," "relative (conditional)" and "absolute" release as well as their relationship to the concept of labor productivity and the factors of its dynamics. Although the work gives interesting figures illustrating the ratio of the growth rates of labor productivity and the real release of the labor force in textile production, the link between the designated phenomena has remained, in our view, unexplained.

As the new book asserts, "the release of manpower is a consequence and a factor in the growth of labor productivity." In actuality, the real reduction in the number of employed caused by progressive changes in production is ultimately the result and consequence of increased labor productivity of the remaining workers. This is precisely how Ye. L. Manevich viewed it in 1966. As for the new edition, it is inaccurate. In and of itself the release of employees is not a factor in the growth of labor productivity. The persons released must initially be redistributed to vacant jobs, that is, the production structure and its organization must be altered. The latter precisely can raise the effectiveness of labor expenditures. But the release of the labor force can only contribute to a further rise in labor efficiency and only on a level of feedback which, incidentally, does not always work automatically.

It is also inaccurate to consider the release of the labor force and the saving of working time as one of the areas of the scientific organization of labor, along with the generally recognized ones. In actuality the saving of labor is one of the tasks of the organization of labor. This was stated with complete certainty in the recommendations of the All-Union Conference on the Organization of Labor (1967). While previously the author linked the presence of a reserve army of labor under capitalism with the action of the law of capitalist accumulation, now this is related to the action of the universal law of the release of manpower. Such a change is incomprehensible all the more as it is invalid. At present, the idea of the essence and content of the process of the release of the labor force has become firmly established. The statements of K. Marx on the saving of working time as a form for manifesting the growth of labor productivity have become axiomatic. At the same time K. Marx emphasized that "a smaller number of persons" and "a shorter time" are the same thing.[2] Incidentally, Ye. L. Manevich himself quotes the thesis of K. Marx on the identicalness of increased labor productivity and the saving of manpower, only the arguments are not carried out to their logical end. Their result could be the conclusion that the thesis proposed by the author on the existence of a universal law for the release of manpower, from the viewpoint of theory, is not completely sound. Obviously, the process of the release of the labor force could be more correctly viewed as a result of the action of a whole series of economic laws. Under socialism, in addition to increasing labor productivity, these are the basic economic law, the law of planned development, the law of socialist accumulation, the law of the change of labor, the law of socialist population, the law of distribution according to labor and others.

Of course, it cannot be said that the patterns of the real release of the labor force have been well studied. Quite the contrary. At present, many questions of the controlling of this process are not clear either on the theoretical or practical level (for example, accounting for the persons to be released, the working out of standard expenditures for the release; planning, forecasting, and optimizing of this process considering other sections of the economic and social development plans; an incentive system for reducing the number of employees and so forth). Ye. L. Manevich in his new work speaks about the need for

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[2] K. Marx and F. Engels, "Soch." [Works], Vol 47, p 381.

long-range planning in the process of release, the retraining of persons to be released, their material support and job placement. But these considerations are of a general nature. They were voiced in 1966 and have not undergone further theoretical study.

In analyzing the reasons which impede a real decline in the number of employees at enterprises, the most important of them has clearly not been sufficiently examined. We have in mind the capital investment practices which until recently actually encouraged extensive economic development by building new enterprises and, consequently, creating new jobs. This was tantamount to focusing not on the release of manpower, but rather attracting additional manpower. This actually happened and as a consequence there was a relatively retarded development of the operating enterprises. For this reason, the scattering of capital funds, the significant amounts of incomplete construction, the long, above-norm times for building the enterprises and reaching capacity, the low shift factor, the large amount of manual labor, the manpower surpluses with a shortage of it, excessive personnel turnover and so forth--all these are links in a single chain. It would have been better for the work to emphasize that the designated changes in the given area and the reorganization of the economic mechanism as a whole are aimed at eliminating the designated shortcomings and thus at accelerating the processes of the real release of manpower.

In the following two sections of the book, Ye. L. Manevich reviews the questions of improving distribution relationships and the transition to communist labor and distribution. On the theoretical level of the greatest interest is the attempt to establish the existence of a law for the compensation of manpower expenditures along with a law of distribution according to labor.

As for the law of compensation (this was mentioned for the first time by Ye. L. Manevich as far back as 1959), its existence up to now remains debated. In the literature the given viewpoint has not gained broad support. Ye. L. Manevich has continued to insist that the wage level is determined not by the law of distribution according to labor, but rather by the law for compensating for manpower expenditures. For this purpose the author has given new arguments (an attempt to establish the thesis of the presence of personal ownership of the labor force under socialism and a criticism of the theory of "residual distribution"). However, we feel that this is still insufficient. There must be a comparative quantitative analysis of the mechanism of action of each of the examined laws. The work does not contain this.

Related to the above-indicated problem in essence, is the old dispute over the prospects for the ratio of the wage fund according to labor and payments from public consumption funds. Obviously it must be recognized that Ye. L. Manevich was right in this dispute, having come out against an excessive (to the detriment of the wage fund) exaggeration of the role of such funds [public consumption] in the given stage of development. But the author has added little new to the argument in comparison with 1966. Moreover, there has not been a proper theoretical study of the attention-worthy thesis of establishing a direct dependence between the growth of individual wages and the growth of labor productivity.

Both last sections, like the first two, largely repeat the materials published in the 1966 book (for example, on the fate of the division of labor). In this regard a certain number of readers might legitimately question whether it might not have been better for the two publishing houses to come to terms and in the interests of the question publish the new work by Ye. L. Manevich as "a second revised and supplemented edition"?

Obviously, there were weighty reasons for not doing this. Actually, the author had to substantially update the statistical material and analyze the problems of labor in terms of the new, altered socioeconomic conditions. It was also essential to consider the measures related to the reorganization of the economic mechanism, to strengthen the arguments for the ideas posed, to come out against the erroneous (as Ye. L. Manevich feels) idea of introducing a payment for labor resources and so forth. Still room should have been found in the new work for at least mentioning the 1966 book.

Thus, the last page of the book has been turned. A contradictory feeling seizes us. "Well, what if," we say to ourselves, "the author has repeated himself a bit? Some have not read his first work. Well, what if not everything in the new work is beyond dispute? Who among us can claim absolute infallibility?" The book has already come out and has found and will find a reader. It has indisputable merits, including: rich factual material, a terseness of language and a polemical thrust. But the main merit of the work is the broad coverage of problems relating to labor economics and the attempt on a basis of their comprehensive review to look to the future. For this reason, we would not be too far off the mark if we said that the given monograph by Ye. L. Manevich, like the previous one, will serve as a desk reference for those interested in labor questions.

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BIBLIOGRAPHY LISTS PUBLICATIONS ON ECONOMIC, SOCIAL FORECASTING

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 173-175

[Review by Candidate of Economic Sciences M. L. Shukhgal'ter of the Economics Institute of the USSR Academy of Sciences, Moscow, of the bibliographic index "Nauchnoye predvideniye i sotsial'no-ekonomicheskoye prognozirovaniye. Ukazatel' sovetskoy i inostrannoy literatury, opublikovannoy v 1971--pervoy polovine 1976 gg." (Scientific Prediction and Socioeconomic Forecasting. Index of Soviet and Foreign Literature Published in 1971--First Half of 1976), published by the Library imeni V. I. Lenin and the Central Book Repository of the USSR, Moscow, 1981, 704 pages]

[Text] The Library imeni V. I. Lenin and the Central Book Repository of the Soviet Union have published a retrospective bibliographic index "Nauchnoye predvideniye i sotsial'no-ekonomicheskoye prognozirovaniye. Ukazatel' sovetskoy i inostrannoy literatury, opublikovannoy v 1971--pervoy polovine 1976 gg." It is the 11th in number. The 1st was published in 1968.

The index contains information on more than 5,000 Soviet and foreign publications, it is partially annotated and the descriptions of foreign works are accompanied by translations into Russian.

In compiling the aid, 55 major Soviet and foreign bibliographic publications and catalogs were utilized. In addition to monographs and articles published in Soviet periodicals, the compilers of the collection have analyzed 348 analogous foreign publications. This included not only literature received by the Library imeni V. I. Lenin, but also publications in the stacks of 82 other organizations including major libraries of our nation, the all-Union information bodies and so forth.

All of this has made it possible to create a reference which provides bibliographic information on all the basic forecasting problems.

The bibliographical information is strictly classified and for this reason it is convenient to use.

The index is better than the previous ones. The forecasting of the population and changes in the environment have been put under separate headings. Thematically the section devoted previously to the forecasting of the service sphere has been significantly enlarged. Now it encompasses all the nonproduction sphere. Certain other sections have been adjusted and enlarged.

The index opens with sections which give the basic works by the founders of Marxism-Leninism which in one way or another touch upon the methods of scientific prediction and the forecasting of social phenomena. Then come the decrees and other documents of the CPSU Central Committee and the Soviet government which deal with the problems of long-range planning and socioeconomic forecasting.

Then grouped together is the literature devoted to the general questions of forecasting, to the philosophical and methodological problems of scientific prediction and forecasting as well as to the specific forecasting methods. Then, in accord with the principle of "from the general to the particular," follow headings which include the literature on sociopolitical forecasting, the forecasting of the population, the environment and the ecological consequences of the impact of human society on the environment and lastly the forecasting of scientific and technical progress.

More than one-half of the entries in the index relate to various aspects of economic forecasting such as the development of the world economy and nations with different socioeconomic systems as well as the relationships of forecasting and planning. Related to this subject is the section which brings together publications devoted to the forecasting in various economic spheres.

The classification system within this section, in our view, needs certain clarifications. Here publications of a general national economic specialization have been brought together. At the same time, analogous publications have been brought together in the section "Economic Forecasting." It would have been better to shift a portion of the list of classification headings which contains the literature on individual problems of economic forecasting on the macrolevel to the section "Economic Forecasting," to call the following section "Forecasting the Sectors of Social Production" and within it establish the subsections: "Intersectorial Forecasting," "The Intersectorial Balance for the Production and Distribution of Products in the National Economy." "Forecasting the Development of the Material Production Sectors" and "Forecasting the Nonproduction Sphere." Such a scheme would make it possible to make the following bibliographic publications more logical and convenient to use.

We would like to point out one other shortcoming. Although the principle of lexical analysis of the titles and subtitles of chapters and texts has been used as the basis for selecting the literature, nevertheless the compilers have overlooked many important and foreign publications which bear directly on the subject of the index! Let me give several examples involving Soviet publications over the designated years. The creation of the material and technical base of communism is directly tied to the elaboration of forecasts and long-range plans for the basic areas of Soviet national economic development over the long run. However work on these problems is not found in the index.

For subsequent forecast studies of important significance have been the article by E. B. Yershov, Yu. V. Yaremanko and A. S. Smyshlyayev "A Model of Intersectorial Interaction" (EKONOMIKA I MATEMATICHESKIYE METODY, No 6, 1975) and the monograph by D. M. Palterovich "Planirovaniye potrebnosti v oborudovanii" [Planning the Demand for Equipment] (Moscow, Ekonomika, 1975). They also are not given in the index. The designated shortcoming could be overcome by using more accurate and adequate methods for selecting the literature. This would make it possible to make the bibliographic index an even more valuable aid for everyone who is interested in forecasting problems and is involved in working them out.

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ART OF BEING A GOOD LISTENER EXAMINED

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 176-182

[Article by I. P. Novikov prepared from materials in the journal MACHINE DESIGN: "Do You Know How to Listen?"]

> [Text] Learn to listen and you can benefit even from those who speak poorly.
>
> Plutarch

The ability to listen is a criterion of communicability. Research has shown that of us not more than 10 percent is able to hear out a partner calmly and effectively. It is usually considered that in establishing contact the main role is played by the speaker. But an analysis of communication shows that the listener is far from the last link in this chain.

Many people feel that to listen is to try to show great interest in the information of one's partner or to respond quickly to any turn of his speech. In so doing, the chief thought of the arguments either is missed by the listener or is distorted by his prejudiced opinion. Naturally, the speaker is disappointed as what he considered to be the essence of the reply was only a prompt response and cannot become the basis for a fruitful exchange of opinions.

The speaker "throws out" a certain idea or image which he wants to give to his partner. We hear it, in internally processing the information. If our viewpoints coincide then the reply will be in harmony with the statement. If the opinions are contradictory, we will speak in different tongues.

What we hear we present to ourselves visually, in interpreting the information and we then respond to it, in cloaking our response in a reply. If the reply is far from the original statement, then either the partners completely cease understanding one another or the mutual understanding between them is significantly weakened.

The recommendations which we would like to acquaint you with, plus a conscious desire to master the art of listening to one's partner, will certainly help establish good mutual understanding.

1. **Develop your abilities.** Endeavor to check yourself in an attempt to interrupt your partner. Before answering, allow him to have his say. By your actions emphasize that you

are interested in listening to him. If the obtained information is not enough for you, ask him to repeat or explain what is not completely understandable. Constantly assess your understanding of any statement.

2. Give you partner time to have his say. Many people think outloud and grope for their viewpoint and for this reason an initial statement is often merely a rough approximation of their basic idea. In order for a person to open up and express his idea completely, you should allow him time to have his say fully and not hurry. Do not emphasize by your behavior that it is too difficult for you to listen.

3. Show complete attention to your partner. An occasional nod, exclamation or comment at times is enough to emphasize your interest. If the speaker makes short pauses, don't interrupt and wait until he has collected his thoughts. If he speaks freely, allow him to have his say until you are certain that he is finished and is waiting for your reply. Then you can ask a question which would contain a clarification of certain details. Without fail the question should contain a hint of approbation of the voiced ideas.

4. Repeat the statement of the speaker. If your partner has already had his say, repeat the main point of his monologue in your own words and show an interest in what he had in mind. This will protect you against any ambiguities and misunderstandings.

5. Avoid hurried conclusions. This is one of the main barriers to effective communication. Refrain from hurried estimates and try to understand the viewpoint of your partner or the course of his ideas completely.

6. Do not focus attention on the conversational features of your partner. "What a slow poke!" "What a monotonous subject!" or "How boring!" A partner can evoke these ideas in us and for this reason we are too impatient in our conversation with him. If you consider yourself a good partner, you should not be distracted by the manners or expressive means which your partner employs. It is essential to perceive only that information which could add something to your knowledge and experience.

7. Respond calmly to your partner's statements. If one of the partners is extremely excited, this influences the perception of the second. Mutual understanding is even more impeded by excessive conviction of ones rightness or the others prejudice. In this instance emotional filters are tripped. A listener finds it hard to select the counterarguments to defend himself and finds moral support in a complete negation of all his partner is saying. A good listener always checks his excitement, he is not distracted by details, but rather searches for and finds the main idea, the essence of the statement and the basic content of the message.

8. Do not be hypocritical. Do not act affected. When it is already clear to us that the dispassionate, boring and uninteresting speech of our partner is completely devoid of useful information, we often begin to act affected: we show excessive attention to our partner, we gaze at him and we become distracted at the same time. Should our partner notice this, his ideas become confused and he loses the thread of his argument. One must not persuade oneself ahead of time that the conversation will be empty and uninteresting.

9. Do not become distracted. Everything distracts a poor listener: a siren in the street, a telephone call, the passing of people who can be seen through an open door. A good listener either sits so that he is not distracted or focuses his attention only on the words of his partner.

10. Search for the true meaning of your partner's words. Realize that not all information can be put into words. Words are complemented by a change in the tone and color of the voice, by facial expression, gestures, by movements and poses of the body. In carefully following your partner's speech, concentrate only to understand what he is saying.

11. Follow the main idea, don't be distracted by particular facts. If we concentrate our attention solely on the facts, misunderstandings occur because of this. A good listener analyzes what facts are secondary and which ones are the main fundamental ones. He weighs their information value, and compares one with another to understand what meaning is hidden behind them.

12. Don't monopolize the conversation. A partner who endeavors to hold a dominant position in any situation or who, as it seems to him, knows everything about the subject of the conversation is most often a poor listener. The "entrances" of his reason are so firmly closed that they do not allow any new ideas and thoughts. In any discussion he merely waits for an opportunity to oppose everything which runs counter to his convictions.

13. Adapt the pace of thought to your speech. The speed of thought is 3- or 4-fold faster than the speed of speech. When we listen to our partner, we are not passive: our brain is working intensely. A poor listener, in talking with a slow partner, allows himself to be diverted or even daydream. When his attention comes back "on," he discovers good-sized gaps in his memory and is tempted to return to what was said before. Here the effectiveness of perception is sharply reduced.

In order to gain an advantage over your partner, try to prepare your counterarguments while your partner is talking. Summarize all that has been said, weigh and assess the obvious, ask yourself whether you have selected the facts for analysis, whether your viewpoint is objective, and whether your partner is actually telling you the most important thing or has "swallowed up" the essence in the words.

For a more complete assimilation of the material, we offer the readers the following questionnaire.

Variations of situations	Situations causing irritation and annoyance
1. My partner does not give me a chance to have my say. I have something to say, but no opportunity to get in a word. 2. My partner constantly interrupts me during the talk. 3. My partner never looks me in the face during the conversation and I am not certain whether I am being listened to. 4. A conversation with such a partner frequently causes a feeling of a waste of time. 5. My partner is constantly fussing: the pencil and paper are more of a concern to him than my words. 6. My partner never smiles. I have a feeling of awkwardness and anxiety. 7. My partner always distracts me with questions and commentaries.	

Variations of situations	Situations causing irritation and annoyance
8. Whatever I say, my partner always dampens my ardor. 9. My partner always tries to refute me. 10. My partner twists the meaning of my words and gives them a different content. 11. When I ask a question, my partner puts me on the defensive. 12. Sometimes my partner questions me, in appearing not to have listened. 13. My partner, without having heard me out completely, interrupts me only to then agree. 14. In a conversation my partner is concerned with extraneous things: he toys with his cigarette, he wipes his glasses and so forth and I am firmly convinced that he is being inattentive. 15. My partner draws conclusions for me. 16. My partner always tries to get a word in my story. 17. My partner looks at me very attentively, without blinking. 18. My partner looks at me as if judging. This is disconcerting. 19. When I propose something new, my partner says that he had thought of the same thing. 20. My partner overplays it in showing that he is interested in the conversation, he nods his head and agrees too often. 21. When I speak about something serious, my partner interjects funny stories, jokes and anecdotes. 22. My partner often looks at his watch during a conversation. 23. When I go in the office, he puts aside everything and focuses all attention on me. 24. My partner behaves as if I was preventing him from doing something important. 25. My partner demands that everyone agree with him. His every statement ends with the question: "Don't you think?" or "Don't you agree?"	

Note the situations which cause dissatisfaction or vexation and irritation in you in talking with any person, whether your comrade, fellow worker, immediate superior, leader or simply an occasional conversation partner.

Having filled out all the points of the questionnaire, sum up the result: count the percent of situations which cause annoyance and irritation.

Analyze the obtained data.

Assess your ability to listen to a partner.

Now it is possible to sum up the results.

With 70-100 percent you are a bad partner. You must work on yourself and try to learn to listen.

With 40-70 percent you have certain shortcomings. You are critical of statements and you still lack certain accomplishments of a good listener: avoid hurried conclusions, do not focus attention on the manner of speaking, do not act affected, seek out the concealed meaning of what was said and don't monopolize the conversation.

With 10-40 percent you are a good partner, but sometimes you refuse to fully understand your partner. Repeat his statement politely, allow him time to bring out his thoughts completely, adapt your pace of thinking to his speech and you can be certain that it will be more pleasant to be in contact with you.

With 0-10 percent you are an excellent partner. You know how to listen. Your style of communication can become an example for those around.

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INDEX OF ARTICLES PUBLISHED IN 'EKO' IN 1982

Novosibirsk EKO: EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA in Russian No 12, Dec 81 (signed to press 2 Nov 82) pp 183-190

[Index of articles published in the journal EKO in 1982]

[Text]

THE SOVIET PATENT. WHAT SHOULD IT BE?

SOCIOECONOMIC PROBLEMS OF LABOR

The Evaluating and Encouraging of Labor

LABOR RESOURCES OF A REGION

MAN IN THE NORTH

A COLLECTIVE ORGANIZATION: THE TIME OF DEVELOPMENT

Personnel Work

MANAGEMENT SYSTEMS AND METHODS

Once Again on the Computerless UIS

Business Games and Education

WE POSE THE PROBLEM

THE PRODUCTION LEADER: HOW TO TRAIN HIM?

THE EXPERIENCE OF LEADING ENTERPRISES

Where Elektrosila is Strong

The ZIL [Motor Vehicle Plant imeni Likhachev]: **An Alliance of Science and Practice**

THE ENTERPRISE: DAILY ACTIVITIES FULL OF PROBLEMS

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