



TOGETHER
for a sustainable future

OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.



TOGETHER
for a sustainable future

DISCLAIMER

This document has been produced without formal United Nations editing. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations Industrial Development Organization (UNIDO) concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries, or its economic system or degree of development. Designations such as “developed”, “industrialized” and “developing” are intended for statistical convenience and do not necessarily express a judgment about the stage reached by a particular country or area in the development process. Mention of firm names or commercial products does not constitute an endorsement by UNIDO.

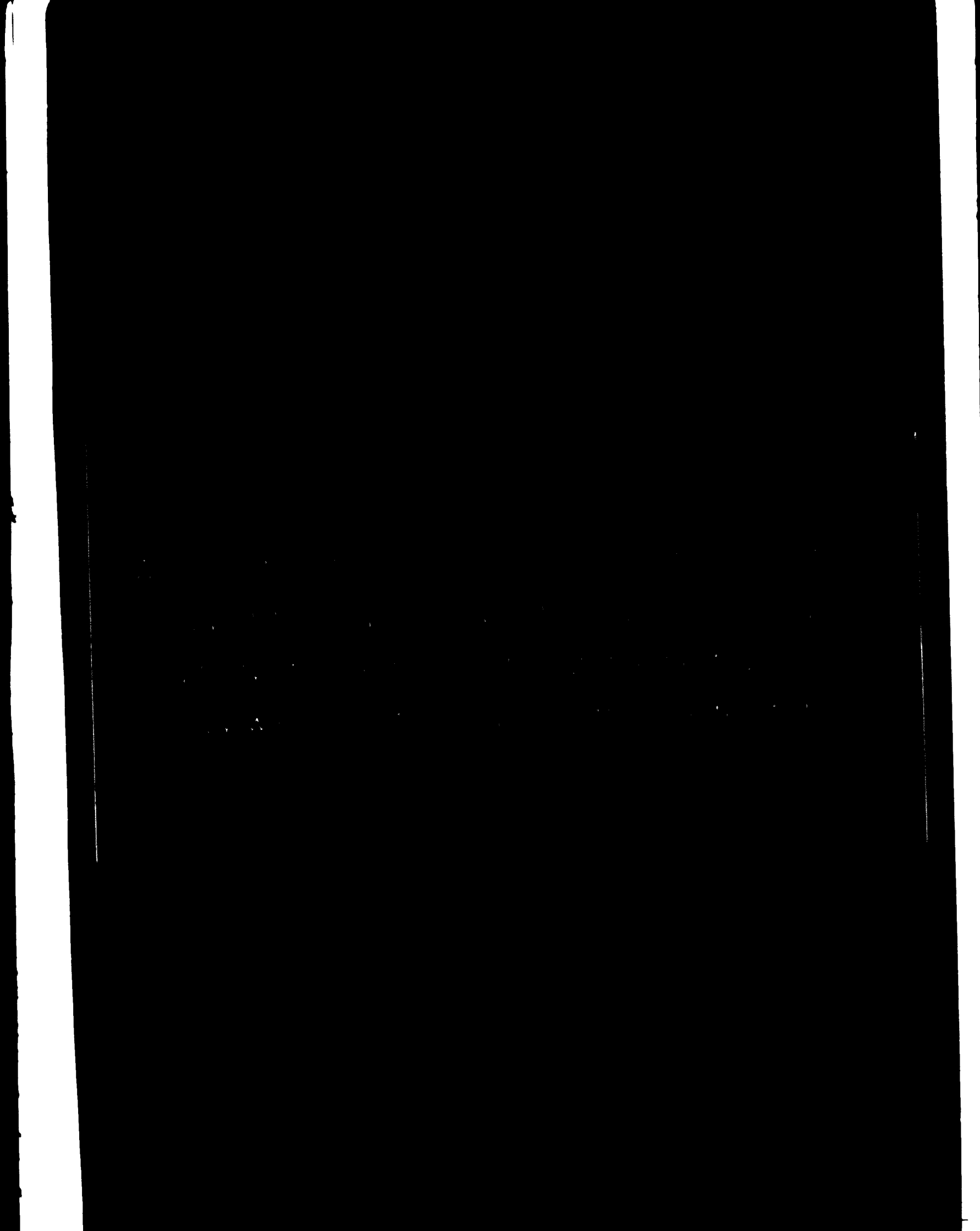
FAIR USE POLICY

Any part of this publication may be quoted and referenced for educational and research purposes without additional permission from UNIDO. However, those who make use of quoting and referencing this publication are requested to follow the Fair Use Policy of giving due credit to UNIDO.

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org



mb

07729

United Nations Industrial
Development Organization

Distr.
RESTRICTED
UNIDO/IOD.108
9 August 1977
English

**DEVELOPMENT OF AGROINDUSTRIAL COMBINES IN YUGOSLAVIA
AND THEIR ACTIVITIES IN DEVELOPING COUNTRIES**

YU/INT/77/080

Prepared by the Joint UNIDO-Yugoslavia Centre

16.77-6325

Explanatory notes

A full stop (.) is used to indicate decimals.

A comma (,) is used to distinguish thousands and millions.

The term "billion" signifies a thousand million.

References to "tons" are to metric tons, unless otherwise specified.

Use of hyphen between dates (e.g. 1960-1965) indicates the full period involved, including the beginning and end years.

References to dollars (\$) are to United States dollars, unless otherwise stated.

The monetary unit in Yugoslavia is the dinar (Din). During the period covered by the report, the value of the dinar in relation to the United States dollar was approximately US\$1 = Din 18.20.

The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

Mention of firm names and commercial products does not imply the endorsement of the United Nations Industrial Development Organization (UNIDO).

Agrarian development policy

The economic system of Yugoslavia is based on the principles of social ownership of the means of production, planning of economic and social development and certain elements, of the market economy. Agriculture plays an important role in the social and economic development of the country. It is intended gradually to socialize agricultural production, to further the development of agroindustrial combines and to promote co-operation between private producers and agroindustrial combines on a voluntary and mutually profitable basis.

The present economic situation requires greater agricultural production for several reasons:

- (a) The structure of domestic demand for agricultural products has changed and increased in volume;
- (b) The processing industry requires an increasingly large supply of raw materials;
- (c) Demand for food in the international market is increasing;
- (d) Larger and more stable reserves of food are needed.

The main elements in the development of the agroindustrial production of Yugoslavia are agroindustrial combines, co-operatives, business associations in agriculture and scientific and research institutions.

After the Second World War, particularly in the last 20 years, considerable progress was made in the production of food and in rural development. Yugoslav agriculture passed through three stages:

- (a) The period 1945-1955 was characterized by administrative management in agriculture and collectivization and, later, reorganization of co-operatives. The growth rate of production was low; investment was insufficient; and industry and the market remained underdeveloped;
- (b) The period 1955-1965 was characterized by increased production, larger investments, introduction of up-to-date machinery and technologies, development of agroindustrial combines, and the establishment of co-operation between private producers, on one side, and agroindustrial combines and co-operatives on the other;
- (c) In the period 1965-1975 an emphasis was placed on economy of production and improvement of supply for the domestic and foreign markets.

A comparison between the present stage of development of the agroindustrial complex and the situation in the period 1930-1939 shows that:

- (a) The volume of agricultural production has doubled;
- (b) The proportion of the agricultural population has decreased from 75 per cent to 33 per cent;
- (c) The production of the food-processing industry has increased by a factor of 10;
- (d) The industries of agricultural machinery, fertilizers, chemicals for plant protection and equipment for the processing industry have grown rapidly. Today, these industries not only satisfy the domestic demand, but also produce a considerable volume of exports;
- (e) The market for agricultural products has expanded;
- (f) A strong scientific basis for agriculture and the processing industry has been laid, which has led to original technical and technological solutions in food production.

Table 1 illustrates the growth of agriculture in Yugoslavia, 1930-1976.

Table 1. Growth of agriculture in Yugoslavia, 1930-1976

Crop	Production of staple crops (thousand tons)				Index (basis: 1930-1939)
	1930-1939	1946-1955	1956-1965	1966-1975	
Wheat	2 430	2 075	3 205	4 700	192
Corn	4 300	3 268	5 263	7 600	177
Sugar-beet	616	1 187	2 040	3 250	527
Beef	100	93	170	255	255
Pork	171	167	253	340	200
Poultry	47	40	65	120	255

Balance of foreign trade for food
(million dinars)

Year	Export	Import	Difference (+ -)
1956	4 123	7 096	- 2 973
1971	3 985	2 421	1 561
1975	5 259	2 133	3 126
1976	7 366	4 520	2 846

It can be seen that Yugoslavia managed to switch from being an importer to being an important exporter of food in a relatively short period.

Such vigorous growth of the agroindustrial complex resulted, to a large extent, from the rapid development of the system of education for all categories of agricultural and other experts, as well as from the research and development work and the application of the scientific results. Today, over 10,000 students attend the schools of agriculture in the country, and 53 institutes are engaged in research on agricultural problems. These institutes employ 1,150 scientists and research workers.

It is agricultural policy to stimulate food production by offering premiums and other incentives and guaranteeing prices. The production of wheat, soya, wheat, soya beans, milk, meat and the application of fertilizers have been subsidized in recent years as follows (million dinars):

1974	1 395
1975	3 281
1976	4 394

These expenditures have increased the production and the consumption of agricultural products.

The results obtained in agricultural production demonstrate the validity of the agroindustrial measures applied. To synchronize the overall development of the agricultural complex, production has remained directed.

Until a few years ago, plans for the development of agroindustrial combines and other agricultural organizations were based on the plans of the republics and provinces. Later on, the plans and measures agreed upon were based on the national plan. A plan for the development of agriculture was drawn up for the period 1973-1975, which increased the average annual expansion of production from 1.9 per cent in the period 1970-1972 to 3 per cent in the period 1973-1975. Production in the later period, in comparison with the former, increased by the following percentages: wheat, 8.4; corn, 15.1; sugar-beet, 21.1; sunflowers, 13.2; soya beans, 28.3; and tobacco, 23.2.

The increase in production was achieved through the introduction of quality seed materials and increased use of fertilizers and agricultural machinery. Progress was also achieved in animal husbandry and in the production of meat, milk and dairy products. The increase in production

was (percentage): beef, 16; pork, 3; mutton, 2; poultry, 21; and milk, 27.

A characteristic of the period 1973-1975 was the establishment of protective and guaranteed prices for staple agricultural products, based on the so-called principle of expenditure (production costs); introduction of premiums to enhance agricultural production; and provision of financial resources, both domestic and foreign, for developing the processing industry (sugar refineries, oil mills etc.).

The plan for the development of the agroindustrial complex for the period 1976-1980 has the following basic objectives: to satisfy the increasing demand for food, to decrease and finally eliminate the import of those agricultural and processed commodities that can be produced profitably in the country and to increase the export of food. By 1980 a production target is 45 million hectolitres of milk and 4.5 billion eggs. Other targets are (thousand tons):

Cereals	18,000
Sugar-beets	8,730
Oil crops	957
Vegetables	7,100
Fruits and grapes	3,416
Raw tobacco	101
Meat	1,286

An average annual growth rate of 4 per cent is planned for the agricultural production and 8 per cent for the processing industry.

The following aims of the plan are: intensification of agricultural production; improvement of arable land through drainage and irrigation; redistribution of land through leasing; further extension of arable land in the social sector, including purchases from private producers; further introduction of up-to-date machinery and technologies; development of scientific work and application of scientific and technical achievements; improvement of the work organization; increase in investments; change to the cultivation of high-yielding crops; and introduction of more productive breeds of cattle.

To provide conditions for achieving these rather ambitious targets, the plan regulates prices and premiums, the market and financing of production and supplies etc.

Role of agroindustrial combines

In early 1976, there were 868 agroindustrial combines and agricultural estates in Yugoslavia covering an area of about 1.5 million ha and having a cattle population of 355,000. The value of the assets is Din 35 billion and their output is valued at Din 15 billion.

The average area of an agroindustrial combine is 5,200 ha, whereas the largest combines possess more than 100,000 ha.

The agroindustrial combines can be broken down according to size as follows:

<u>Number of combines</u>	<u>Area (thousand hectares)</u>
119	1-2
44	2-2.5
117	2.5-5
69	over 5

The yields per ha at the combines are already high and are constantly increasing, as table 2 shows.

Table 2. Crop yields on agroindustrial combines
(t/ha)

Year	Wheat	Corn	Sugar-beets
1971	41.3	54.7	400
1972	37.4	56.7	464
1973	43.0	52.7	419
1974	49.9	58.2	453
1975	40.7	60.8	421
1976	51.2	53.4	470

Likewise, the average milking capability was increased at the combines from 3,779 litres in 1971 to 4,128 litres in 1975.

The number of agricultural machines owned by the agroindustrial combines is also constantly increasing. Today, they own 19,000 tractors, 7,700 harvesters and over 2,000 trucks. There is 192 hp per 100 ha of arable land. One tractor covers 50 ha of land, a harvester, 120 ha.

The main emphasis at the combines is on an increase in productivity and economy of production through the introduction of up-to-date technologies. Recent surveys have shown that the use of machinery has increased in crop production. The highest use is found in the production of sugar-beets (31 h/ha), followed by corn production (18 h/ha) and wheat production (12 h/ha). In cattle production, machinery has been increasingly used for milking, supplying water to animals, removing the manure, transporting cattle feed etc.

The highest productivity has been reached in the production of wheat, then of corn. It takes one hour of direct manual labour at the combines to produce the following (kg): wheat, 170; corn, 92; alfalfa, 45; and sunflowers, 27. It also takes 4-4.6 hours to produce 100 litres of milk and 16-18 hours to produce 100 kg of pork. The productivity of the combines is approaching the world's top performances; some combines have surpassed productivity in the most advanced agricultural countries.

The financial results at the combines in 1976 were better on the whole than in the previous year. At the same time, several basic indicators (volume of production, total income, realized income etc.) were better for the agroindustrial complex than for the other branches of economy. In 1976, the volume of production in agriculture was higher than the average for the entire economy by 2 per cent; total income, by 4 per cent; and realized income, by 7 per cent.

The first agroindustrial combines were established in the 1950s. From the beginning they were the major means of promoting the technical, technological and social transformation of agriculture in Yugoslavia. The work of the combines and the intensified production increased the efficiency and productivity of agriculture as a whole, facilitated the specialization of production and contributed to an increase of marketable goods. The combines successfully managed to incorporate into their operations basic agricultural production, processing and marketing. Their success also resulted from

co-operation with scientific and other institutions, although the largest combines have their own research departments and training services.

The combines incorporate over 200 processing factories (oil mills, slaughter-houses, sugar refineries, dairies, meat-processing plants, fruit and vegetable canneries etc.) and a marketing network of over 4,000 shops. Over 70 per cent of the total food industry of Yugoslavia is found on the combines.

The combines facilitate the efficient integration of agricultural production, processing industry and marketing, on a long-term basis. They are the meeting point of economic interests of all the participants in the chain of production from the producers of raw materials, through the workers in the processing industry, to those engaged in marketing. They affect the economy, since they take into account all factors affecting agricultural development. Even though the combines possess only 15 per cent of the total arable land of the country, they produce 46 per cent of the total marketable goods. For some products, however, the combines produce 70 per cent or more of the marketable goods.

The integration of production with processing and marketing at the combine makes possible the planning of development and production programmes, work organization, specialization, joint research work, joint purchase of materials, joint marketing and a more efficient utilization of agricultural experts and other workers. It also improves the utilization of available land areas and processing capacities, market conditions and use of raw material in processing and marketing.

About 85 per cent of the arable land in Yugoslavia is owned by private farmers. In the area of most intensive agriculture (north), the social sector (agroindustrial combines) owns 20-50 per cent of the arable land.

The social sector produces 40-70 per cent of the marketable crops of staples (wheat, corn, sugar-beets, sunflowers, fruits and grapes etc.) thanks to its high productivity, the application of up-to-date machinery and technologies, and the efficient organization of work. Thus, the social sector, particularly the agroindustrial combines, is the dominant element in the agricultural complex.

The agroindustrial combines have an immediate and positive effect on the production of the private farmers. In all agricultural regions, particularly in the most developed ones, numerous forms of co-operation in crop production between private farmers and agroindustrial combines have been developed. This co-operation, contracted for one or more years, is voluntary and protects the interests of both sides in the partnership. At the same time, it assists the private farmers to produce more food more economically and contributes to rural development. Such co-operation is particularly well-developed in the production of wheat, corn, sugar-beets, sunflowers, raising of hogs and poultry and breeding cattle. This co-operation is especially important for those combines that are unable to provide their processing plants with sufficient quantities of agricultural raw materials. These combines obtain the additional raw materials from the private farmers. The increasing application of up-to-date technology in the processing plants of agroindustrial combines means that more raw materials are needed, which, in turn, leads to a further enlargement of the agroindustrial combines. As a result, the types and forms of co-operation with private farmers have changed. In addition, many former agricultural co-operatives have merged with the combines to become their units of co-operation with individual farmers.

Certain experience was acquired in the process of co-operation, and a need evolved to combine the labour and assets of the social sector, in particular the agroindustrial combines, with the labour and resources of private producers to increase agricultural production. By using the experience, machinery and up-to-date technologies of the combines, private farmers have been able to expand their knowledge and to increase their living standard.

Tables 3 and 4 give some indicators of the development of co-operation between the social and the private sectors in crop production.

The results achieved are considerable, but they are only a part of the potential for further increases in food production. Only one fourth of the private producers in Yugoslavia co-operate with the combines and co-operatives. Therefore, more private producers could be brought into association with the combines, with the goal of increasing agricultural production, income, productivity and the living standard in rural regions.

Table 3. Co-operation in agriculture between the social and private sectors, 1962-1975

Year	No. of private farmers co-operating (1 000)	Services (1 000 ha)			Supply (1 000 tons)			
		Ploughing	Planting	Harvesting	Wheat seed	Corn seed	Fertilizer	Chemicals
1962	730	937	222	150	169	4	588	6
1967	872	931	282	305	86	14	999	12
1972	588	399	307	316	67	18	1 067	9
1975	527	424	261	255	72	13	1 143	11

Table 4. Co-operation in animal husbandry between the social and private sectors, 1962-1975

Year	No. of private farmers co-operating (1 000)	Animals supplied to private producers (1 000)			Supply of feed concentrate (1 000 tons)
		Cattle	Hogs	Poultry	
1962	244	144	763	427	102
1967	279	367	1 078	9 838	343
1972	287	422	1 479	23 208	573
1975	312	419	1 690	36 849	625

Co-operation with developing countries

Because of their achievements in production and their broad technical and technological experience, the combines have been able to participate in several projects concerned with food production in developing countries.

The Yugoslav model of agroindustrial combine has, in view of its achievements in food production in Yugoslavia, aroused an understandable interest in the developing countries. Various countries have expressed the wish to become familiar with this model, and Yugoslav assistance has been requested in developing agroindustrial complexes in these countries.

As a result of this interest, Yugoslav organizations have been increasingly engaged in projects dealing with food production, transfer of technical and technological knowledge in food production, processing, transportation and storage, training of experts, provision of water, construction of agricultural settlements, improvement of land, protection of crops and livestock and, finally, the building of complex agroindustrial combines.

The major initiative in the co-operation with developing countries has been taken by the agroindustrial combines, which, employing Yugoslav experts from other fields, in particular the manufacturers of agricultural equipment, participate in projects to improve land; and to plan, build and organize agroindustrial combines, farms for meat and milk production, fruit and vegetable canning factories, silos, slaughter-houses, dairies and fish-processing factories. The results of these projects are impressive: 60 t/ha of corn and over 50 t/ha of wheat were produced in the Sudan and the yields of sunflowers were quadrupled in Iran. The Yugoslav experts apply the most recent scientific achievements in their work, introduce new crops and develop new varieties and high-yielding hybrids.

The agricultural combine "Belgrade" is building in Iraq, in co-operation with other Yugoslav organizations (for instance, Dunav-Tisa-Dunav, from Novi Sad, which is in charge of soil reclamation and the building of a hydro-system), a complex of agroindustrial combines (Dujaila) covering 75,000 ha of arable land. The combine Belgrade also undertakes similar projects in Algeria, Mexico, Peru and Venezuela. The Agricultural and Food Processing System, Osijek, is engaged in research work and agroindustrial projects in Algeria, Ethiopia, and Sudan, "Emona", Ljubljana, is involved in the production of coffee and other tropical crops in the Central African Empire. These and other combines, contracting companies and equipment manufacturers have been

engaged in surveys, designs and supply of engineering and equipment for slaughter-houses and meat-processing plants, fruit and vegetable canneries, sugar refineries, oil mills, pastry and confectionary factories, refrigeration plants and storage houses in Egypt, India, Libyan Arab Jamahiriya, Mali, Morocco, Sri Lanka, Togo, Uganda, Venezuela, Zambia and other developing countries.

Yugoslav manufacturers of agricultural machinery and irrigation equipment are also involved in projects in developing countries. They export dredges, bulldozers for clearing and levelling, tractors, universal combines for wheat, corn, sunflowers and rice, accessory machines for cultivating soil, irrigation pumps, transport vehicles, agricultural aircraft and feed-processing plants, as well as machines for cultivating and harvesting fodder crops, machines for applying chemicals and silos for storing small grains and fodder crops. Yugoslavia also exports meat, bone and fish meal plants, convenience-food plants and self-service shops with all facilities.

Yugoslav companies have built water supply networks (dams, irrigation systems, provision of water in desert areas by drilling, etc.) in Iran, Iraq, Libyan Arab Jamahiriya, Morocco, Panama, among others. Yugoslav scientific institutes are introducing various crops and providing seeds in several developing countries; sunflowers and corn are being introduced in Iran, Iraq, Libyan Arab Jamahiriya and Sudan.

The co-operation between Yugoslavia and developing countries in this field is conducted on a commercial basis, which has included extension of long-term partial credits and technical assistance. Recently, more developed forms of co-operation have been introduced, for example, joint ventures (e.g. production of coffee in the Central African Empire and fertilizer production in Ghana).

Yugoslav experts are working in various developing countries on the basis of bilateral or multilateral technical assistance arrangements. A number of foreign experts are carrying on regular studies in Yugoslavia or are undergoing specialized training in agriculture and food processing. There are specialized centres in the country for the training of all categories of agricultural experts from developing countries.

Summary

Considerable results were achieved in the development of agriculture and the food-processing industry in Yugoslavia in the post-war period, particularly in the last 20 years. The volume of production and yields increased several times, while the quality and assortment of agricultural products improved. The development of agriculture was accelerated by the growth of the processing industry and other related industries (agricultural equipment, fertilizers, chemicals for plant protection, food-processing equipment etc.), the establishment of a strong scientific and research basis and the application of scientific results in practice, and the expansion of the domestic food market, and exports. The economic policy of the country and the social and economic progress stimulated agroindustrial development.

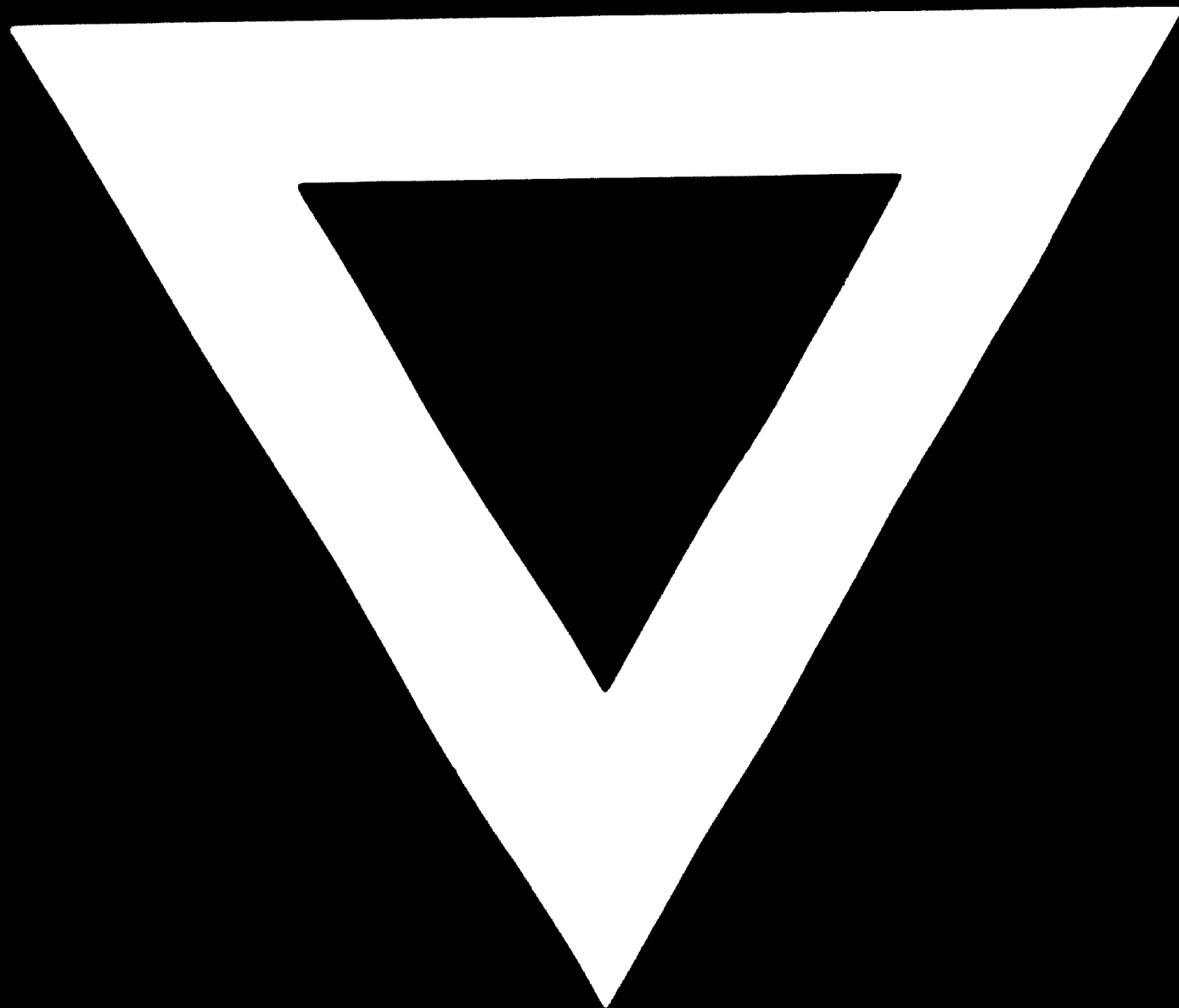
Agroindustrial combines are the driving force in the development of an agroindustrial complex. They incorporate all technical, technological and economic functions - primary production, processing and marketing. The combines have achieved significant results in the increase of production and yields, organization of work, modernization of production processes, practical application of scientific achievements etc. The basic objectives of the combines are: high economy of production; the most economical utilization of land, machinery and workers; and high productivity.

In addition to the positive results achieved in their own production, the combines have been successful in developing co-operation with private producers. Today 300,000 private farmers co-operate with the combines. Different forms of co-operation and association have increased the production and income of private producers, which, in turn, has raised their living standard. These forms of co-operation also bind economically the social and private sector in food production.

The plan for the development of the agroindustrial complex (covering the period 1976-1980) and the present social relationships have created even more favourable conditions for further development of agriculture, agroindustrial combines and co-operatives, as well as for co-operation between the social sector and private producers.

Several years ago, the agroindustrial combines and other organizations began to participate in projects in developing countries. The intention of the combines is to use their experience and knowledge of technologies and work organization to increase food production in these countries. The results obtained so far are encouraging. However, conditions are favorable for more intensified and diversified co-operation in development of agroindustrial complexes in developing countries, and interest in such co-operation on both sides exists.

C-723



79.01.16