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**LONG-RANGE AGRO-INDUSTRIAL  
DEVELOPMENT PLANNING WITH  
PARTICULAR REFERENCE TO THE  
AGRO-INDUSTRIAL COMBINE "PELAGONIJA"**

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## Introduction

Taking the constantly increasing demand as a starting point and the occasional shortages of food products in Yugoslavia and the world, long-range planning of future requirements and food production is essential if the growing demand is to be met, employment opportunities are to be increased, and the long-range development objectives of the enterprise and national economy are to be established.

Taking the example of the agro-industrial combine "Pelagonija", this paper will attempt to show how development hitherto has been programmed and realized, as well as the combine's future development trends.

## Background data

The combine was established in mid-1963, and now has 10,000 hectares of arable land, of which 97% is located in a 2-5 kilometre strip some 32 kilometres long in the Bitola part of the Pelagonija plain.

The Pelagonija site is situated some 650-700 m above sea level and has a temperate continental climate. The mean annual temperature varies from 11.2 to 11.8°C, and the sum temperature of 3,900 to 4,600°C satisfied crop requirements. Average annual precipitation is 634 mm; it is unequally distributed throughout the year. Especially low rainfalls are recorded during the summer months (July and August), the main months of vegetation for spring crops. Spring droughts have become more frequent (every third year on the average), which is dangerous for winter crops (wheat), and autumn droughts occur which hamper autumn sowing and the preparation of the land for spring sowing.

Investigations have shown that the Pelagonija land is characteristic for its varied pedological structure, comprising alluvial-delluvial types, and is suitable for agricultural production. Fertility is considerably increased by systematization, calcification, humification and other agricultural measures.

Communications are satisfactory. The production area is linked with the industrial complex via roads with a rail link from the industrial complex.

On an average, the combine employs 2,600 workers annually, of which 1,960 are permanently employed and 640 are seasonal workers. The professional personnel structure is satisfactory: 88 employees are holders of university degrees, 69 have diplomas, 275 enjoyed a secondary education and 646 are skilled workers.

The combine comprises eighteen basic units: four crop production units, three livestock and poultry production units, one fishpond, six processing factories, a transportation unit, a section for co-operation with individual agricultural producers, unit for domestic and foreign trade (the combine's commercial section), a unit for wholesale and retail trade in food products and household goods with thirty-four stores in the town and thirteen shops in villages around Bitola.

The combine's common services are run by several units and sections which carry out the planning, development, and financial and legal functions on behalf of all the basic units in the combine (see sketch in Annex 1)

#### Implementation of the long-range development plan 1963 - 1973

Following the increasing demands and conditions conducive to agricultural development, the 1959-1962 period was characterized by an intensification of agricultural production. In that period, the first large agro-industrial combines were established in Yugoslavia.

In 1958, the construction of the first stage of a land hydro-reclamation scheme was completed on the Pelagonija Plain, which permitted the cultivation of 40,000 hectares of land which had previously been seasonally or constantly flooded. In order to utilize properly the reclaimed land, a sugar mill with a processing capacity of 150,000 metric tons of sugar beet per annum was designed and constructed. The mill entered operation in 1959 and 48,000 tons of

sugar beet were supplied by socially-owned<sup>1/</sup> and peasants' farms. In the following years, 1960 to 1962, owing to the shortage of sugar beet the mill processed 70,000 tons annually, only 47 % of its processing capacity, resulting in financial losses and low wages.

In 1958, after the above mentioned land reclamation was completed, some 2,450 hectares of cultivated land were allocated to the newly formed enterprise, the socially-owned agricultural estate "Pelagonija", and other parts of the reclaimed land were allotted to other socially-owned agricultural estates and farmers' co-operatives.

The production of sugar beet advanced with difficulties both on the social and private farms. Low-intensity production, irrigation problems and the lack of tradition in the production of sugar beet caused low yields and unprofitable production. The first successful results in the production of sugar beet were recorded in 1961 on the social agricultural estate "Pelagonija". In that year, on 470 hectares, the average yield per hectare was 41.3 tons, with 26 % net return. In the following year, the same organization had an average yield of 32.6 tons per hectare on 577 hectares with 20 % net return. This success was achieved thanks to the application of new methods and full mechanization in agriculture.

The achievements of the sugar mill on the social estate "Pelagonija", which at that time was still an independent enterprise were presented to other producers in both sectors, but to little avail. The solution was seen to be in the integration of agricultural and industrial production of a larger scale. In mid-1963 after long negotiations, the agro-industrial combine "Pelagonija" was established comprising the social agricultural estate "Pelagonija", (2,532 hectares of land and a dairy farm with 403 cows) the social agricultural estate "Radobor" (2,000 hectares of land and a dairy farm with 305 cows) and the sugar mill.

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<sup>1/</sup> In Yugoslavia there are two types of farms, distinguished by the form of ownership. "Socially-owned or "social" farms are large farms administered by its employees. Land and other means are social property i.e. they belong to Yugoslav society or the people. "Private" or "individual" farms are the property of the farmer and are not larger than ten hectares of arable land.

Within the framework of the newly established combine, four specialized production units were established: two crop production, one for livestock production and the sugar mill. The combine's common services (at that time the general directorate) were organized as a separate unit in which, apart from the usual administrative, financial and commercial section, a new planning and analysis department was set up. The first workers' council<sup>2/</sup> formulated and adopted the combine's new policy which in brief stipulated:

- i ) Production of the maximum amount of raw materials for the sugar mill and animal husbandry, as well as the further development of raw material production for projected food processing plant and the development of auxiliaries (transport);
- ii ) Accounting of gross revenue, costs and added value, the distribution of income and wages at unit level and the introduction of incentives subject to the achievements of the individual worker, units and combine;
- iii) Joint development plans and annual production plans, joint delivery of products at market prices, introduction of internal standards for raw materials, and co-ordination of main commodity flows.

The above principles guiding the mutual relationships of the basic units in the combine are still applied in a more developed form.

The combine's long-range development plan was adopted at the beginning of 1964. This plan was based on the development potential of both agriculture and the food processing industry in the Bitola region, taking into account reclaimed social property. Plan deadlines were not stipulated at the time, however, under present conditions the plan might be completed within a total period of fifteen years. From the experience of the first ten years of the combine it may be concluded that the development is on schedule and the plan may be completed within the next six years.

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<sup>2/</sup> Workers' council is a supreme body, elected by the employees, which administers a socially owned/Social/enterprise.



The basic aim of the development plan continues to be the further development of raw material production. Agricultural production is the basis for agro-industrial development. Experience shows that before starting the construction of a particular processing plant, it is necessary to investigate market opportunities and compute the profitability of production and the processing of the particular raw material. Parallel to the construction of the plant, a minimum scale of production of the raw material required for a profitable running of plant has to be reached. This increase in raw material production must be carefully planned and completed. If this is not the case, the initial years of operation would be followed by large financial losses.

#### Development of raw material production

Immediately after the combine was set up, a detailed programme for the production of the necessary raw materials was worked out. It was established that on the integrated area of 4,523 hectares, only 20% of the raw materials needed for the sugar mill could be produced on the condition that new agricultural methods were applied and the land partly irrigated. The social and private sector outside the combine could provide another 33% on the condition that co-operation be strengthened on the improvement of sugar-beet production in both sectors. Owing to the shortage of water the livestock fodder production plan assumed low yields per hectare and thus comparatively large production areas were planned. However, the sugar beet shortfall of 40% meant further losses in the sugar mill.

The raw material shortage in the sugar mill could only be overcome in expanded production on the combine, which entailed an increase in the combine areas. One possibility was to merge with several neighbouring agricultural co-operatives which wished to join the combine. Apart from this, a considerable number of farmers who were leaving the agricultural sector offered their land at favourable prices. In the first stage, 1964 - 1966, the combine increased its area to 7,000 hectares through mergers, purchases and consolidation. From 1966 - 1969, further integration increased this area to 8,100 hectares, and from 1970 - 1973, to

10,000 hectares.

The most important stage in the development of agricultural production is the first stage (1964 - 1966), in which the first good results were achieved. In that period, the organization and systematization of 7,000 hectares of partly cultivated land was carried out. A small irrigation system was constructed for 1,000 hectares. The design and construction of the agricultural improvements, road network and other projects, with minor exceptions, was carried out by the combine, thus saving a considerable amount of money and, more important, all the work was completed in the shortest possible time. Financing was effected by bank loans (80%) with repayment terms of 15 years at 2% interest. The combine participated with 20% as all the basic units had investment funds. Further improvements road network and economic projects in the second stage (up to 8,100 hectares) were carried out using resources from the production units. The following operations were completed in that period:

- I) mechanical excavation of the main drainage and widening of the irrigation canals, 62 kilometres long;
- II) mechanical excavation of detailed drainage network using narrow piping, 196 kilometres long;
- III) large-scale mechanical earth-levelling operations, moving some 2.86 million cu.m. earth;
- IV) construction of internal all-weather road network and link roads, 42 km long, several bridges and intersections;
- V) liming of 4,000 hectares of poor land (mud) and breaking up of 3,900 ha of virgin land;
- VI) construction of three weirs on nearby rivers and irrigation canals for 2,000 hectares of land, etc.

These operations solved the groundwater and drainage problems throughout the combine, permitting an increase in average yields of 25% to 35%. The irrigation problem was also partly solved and average yields on irrigated areas increased by 40% to 50%.

The liming operation ensured higher sugar content in the sugar beet. The site was divided into 30 - 50 ha plots; a canal irrigation network and roads were constructed.

In that period, the agricultural machinery and equipment on the combine underwent great changes. Today, the combine uses highly-productive tractors and complete production lines of domestic, European and American origin, which entailed considerable changes in agricultural practices. For example, the introduction of two shifts contributed to the creation of a modern agricultural worker who does not differ from the industrial worker. The optimum utilization of equipment and other means, and the programming of operations are carried out in a manner similar to industry. Agricultural production is industrialized and does not depend so much on natural conditions and this is **why** the fluctuations in yields on large modern agro-industrial complexes are much smaller.

The production and finances of agricultural production in the past ten years have been more satisfactory. The combine has won several prizes for its yields, especially for wheat, the yields being indicated in the tables below.

TABLE 1

Period	Number of years	Average yields kilograms/hectares		Index of growth 1961 - 63 = 100	
		Wheat	Sugar beet	Wheat	Sugar beet
1961 - 1963	3	3,225	29,056	100	100
1964 - 1966	3	4,770	32,307	147	111
1964 - 1969	6	5,015	37,068	155	128
1964 - 1973	10	5,106	40,250	158	138

TABLE 2

Average annual production of the combine:

Period	Number of years	Average annual production in tons		Index of growth 1961 - 1963=100	
		Wheat	Sugar beet	Wheat	Sugar beet
1961 - 1963	3	3,733	20,210	100	100
1964 - 1966	3	13,878	52,433	371	259
1964 - 1969	6	18,462	67,095	494	332
1964 - 1973	10	19,357	70,515	518	349

Most striking is the leap in hectare yields of wheat in the three-year period 1964 - 1966, which was somewhat lower in the following two periods. The increase in average sugar beet yields was the same in all three periods in which the irrigated areas were increased. The average wheat yields on the combine exceed the average yields for the region and Yugoslavia by 50 - 100 %, and the average sugar beet yields by 10 - 20 %, which points to exceptional achievements, especially in the production of wheat.

Total output also records a rapid growth, which is especially noticeable in the first stage when the cropland area increased from 4,532 hectares to 7,000 hectares. Total output was lower when cropland expansion was slower and average yields lower.

Development of co-operation with private farmers.

Co-operation<sup>/1/</sup> with private farmers became a combine activity as farmers' co-operatives became associates.

/1/ Collaboration between farmers and co-operatives or agro-industrial combines in the production of individual products, which is based on contracts signed by both parties, is called "kooperacija" -- co-operation, in Yugoslavia in the sense of collaboration.

As the agricultural areas of these co-operatives joined up to form production units, the combine set up a co-operation unit which covers a wide area of 27 villages with over 2,400 agricultural households and 9,300 hectares of land. The average area per household is only 3.8 hectares. Co-operation with individual producers is carried out on the basis of one-year contracts for joint production of wheat, sugar beet, sunflower and tomatoes for industrial purposes. The co-operation unit offers its members machinery services, and supplies them with seed, fertilizers, pesticides and know-how, all on credit. If necessary, the unit transports the products to market. Guaranteed minimum purchase prices are contracted, but the purchase of contracted products is carried out at market prices on the date of delivery.

Such short-term co-operation (one-year contracts) causes cyclical trends in production of some products, as the farmers determine their production plans on the basis of profits obtained in the previous year. Consequently, in the past few years, sugar beet production has ranged from 20,000 to 50,000 tons which reflected unfavourably on the operation of the sugar mill. Further development of this co-operation will be directed towards the establishment of long-range co-operation and the integration of private farmers in the management of the co-operation units.

With the co-operation of private farmers, the combine has greatly influenced yields and output per hectare on the private farming sector. Some private farmers have achieved yields per hectare similar to these on the combine, but on the average their yields are some 20% lower than the combine's yields.

#### Development of livestock production.

In the past ten years, livestock production of the combine has been characterised by a rapid growth of poultry production/production of eggs/ and a slow growth of cattle breeding. The average yield per cow (2,306 litres) has been increased to 3,860 litres, and annual beef production from 114 to 217 tons.

Although there is considerable potential in the combine for both dairy and beef husbandry, cattle breeding has developed very slowly. The main reason is the uncertain profitability of production owing to the great variation in input prices, despite the relatively high rise in prices for meat and milk. This notwithstanding with increased crop rotation (leguminous crops) and using industrial by-products (sugar beet pulp and brewery waste), the combine established a new modern farm for 1,200 high-yielding dairy cows at the end of 1973. The total number of cows will thus be 2,000, increasing the total annual output of milk by 4 million litres and beef by 350 tons.

#### **Development of the processing industry.**

Apart from the sugar mill constructed in 1959 and the dairy incorporated in 1970, the following plants were built from 1964 - 1973:

In 1964, a yeast and alcohol factory utilizing molasses, a secondary product from the sugar mill.

In 1970, mineral water and carbondioxide unit, using mineral water resources on the combine;

In 1971, an abattoir with a meat processing plant;

In 1973, a brewery and a feedstuff plant.

In this period, the sugar mill on an average processed 126,608 tons of sugar beet yearly, thus utilizing 84 % of its capacity or 37 % more than before integration. Further expansion of sugar beet production and the full utilization of the mill's capacity are objectives yet to be fully achieved, entailing the construction of a minor irrigation system without which the production of sugar beet in the social and private sector cannot be increased.

The feed-stuff plant (capacity of 45,000 tons annually) is centrally located with respect to raw materials, most of which is produced on the combine. The plant meets the present requirements of the combine and its environs.

Place and role of the combine in the economy.

In a relatively short period of time the agro-industrial combine "Pelagonija" has taken up an important position in supplying the urban and rural population of a broad area of Yugoslavia.

Its production of wheat, meat and milk satisfies the needs of 120,000 people, its dairy products and fish some 30,000 people, sugar 1,000,000 people, eggs 460,000 people, beer 600,000 people, yeast and alcohol 2,500,000 people and mineral water and CO<sub>2</sub> 800,000 people.

Its retail network meets the food and household products requirements of 40,000 people.

On an average the combine employs a staff of 2,000 permanent workers and 600 seasonal workers per annum, the employment figure increasing yearly by 5%. The average wages paid are above average rates in the Republic. The workers are purchasers/consumers of industrial products of other branches (textiles, leather, electromechanical, electronic, cars, etc.) as well as clients of the building industry (flats) and thus make a contribution to the development of these branches.

The advantages of agro-industrial enterprises are manifold. The direct relation between agriculture and industry provides a more rapid development of modern large-scale agricultural production and ensures production of agricultural raw materials at lowest prices. On the other hand, the food industry rapidly increases its production and with its by-products assists a more rapid development of livestock production.

Integration of the resources of industry, agriculture and trade enables the construction of optimum size plants in

livestock production and food industry.

The development of the food industry encourages private farmers in the country to shift from predominantly subsistence farming to specialized commodity production, thus intensifying their production and increasing their output, income and living standards. Labour for intensive agricultural production partly solves the problem of agricultural overpopulation.

The specialization and mechanization of agricultural production has had a great influence on the increase of productivity and the value of human labour.

The positive influence of agro-industry does not end here. With its rapid and successful development, the combine "Pelagonije" has quickly become a leading enterprise in the region and, no doubt, will be a main force behind the future development of agro-industry in the region. The construction of a complete irrigation system for 24,000 ha of flat agricultural area is in preparation, in which the combine's share is 10,000 hectares and that of the private sector 14,000 hectares. The experience of the combine hitherto in the organization of raw material production and agro-industry will be even more important in the efficient utilization of the above irrigation system which should be completed by 1980.

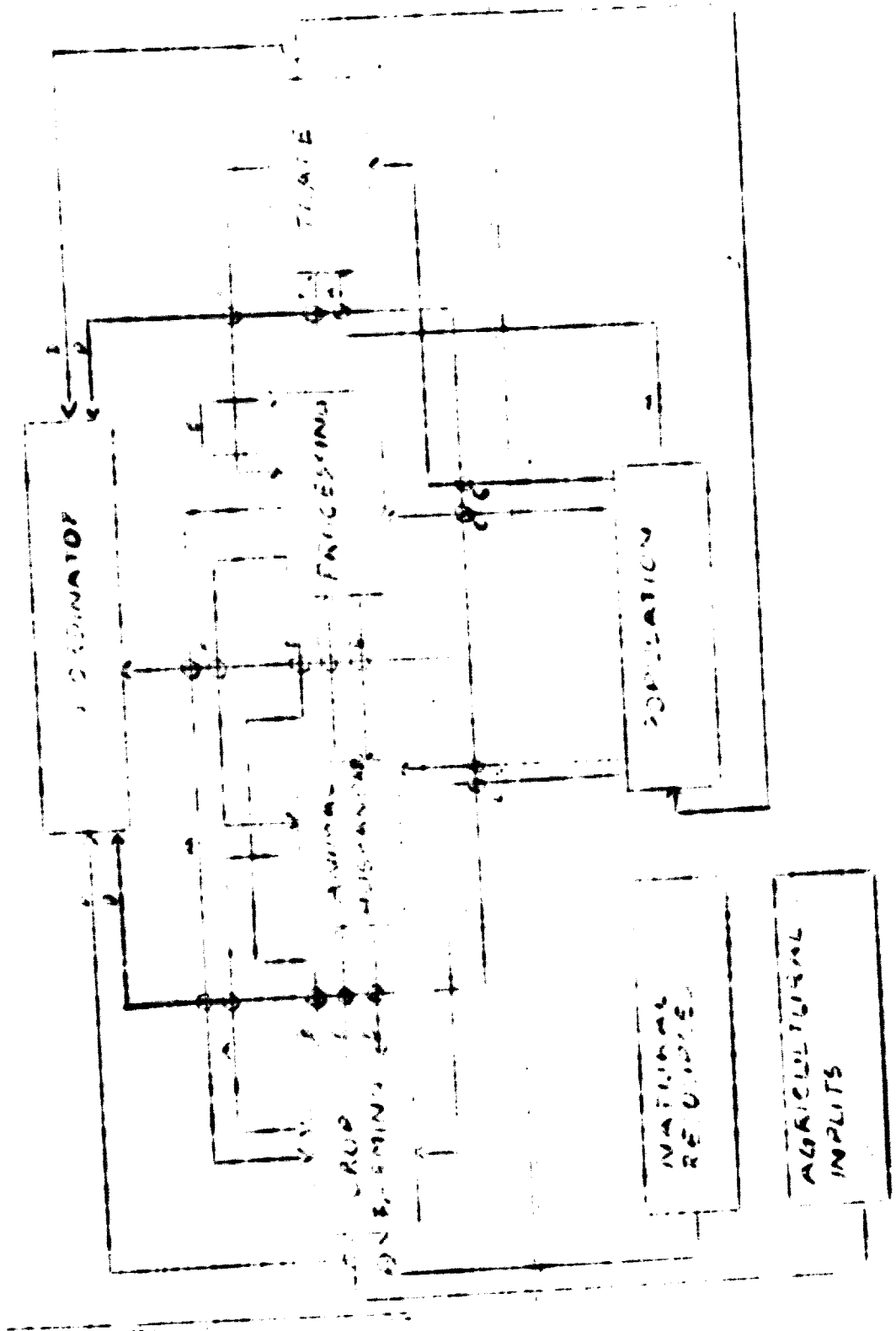


ANNEX I

Information and product flows on the Agro-Industrial Combine  
"Pelagonija" Bitola, Yugoslavia.

A = information on demand  
B = product flow

C = manpower  
D = co-ordination of flow



Legend

a) Information on demands: Basic information relating to population requirements gathered by marketing and submitted to the processing unit which establishes possibilities for its own production and indicates its raw material requirements which are submitted to the crop and livestock production sectors.

b) Production flow: Locally produced raw materials, semi-finished products, secondary products and finished food products food proceed as follows: crop farming supplies the animal husbandry and processing units with raw materials and returns secondary products (manure) to the farming unit. The processing unit supplies the trade with finished products (such as molasses) which are further processed into final products (yeast, alcohol) while secondary products, such as sugar beet pulp and brewery waste, return to animal husbandry in feedstuff. In the final analysis this flow culminates in trade supplying the population.

c) Population, apart from the above mention as the source of demand, also supplies labour which permits both present and future production.

d) Natural resources - land, water, climate and modern agricultural practices, techniques, technology and other means as well as labour are the basic factors for the development of the whole system.

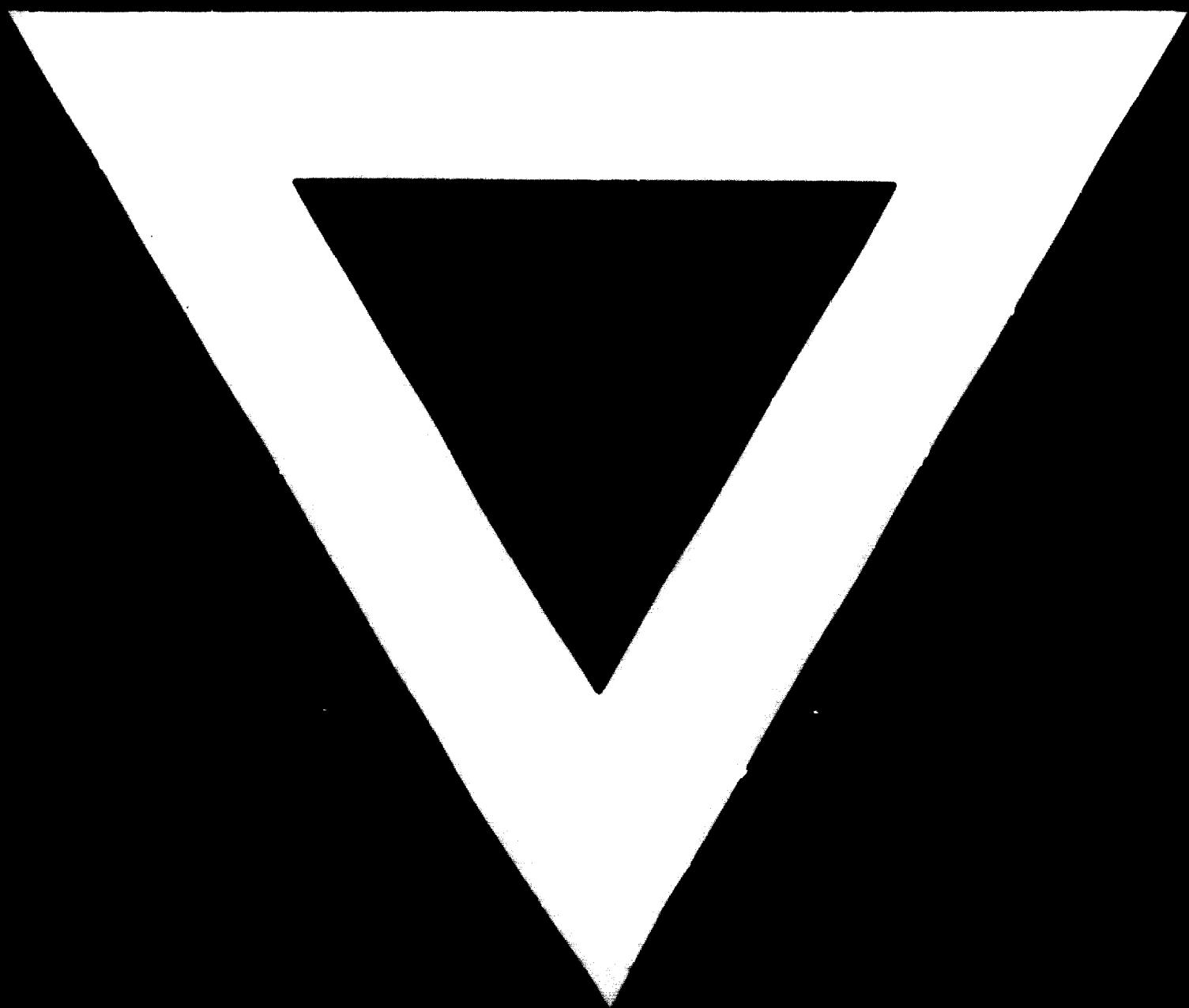
Interruption of flow may cause major or minor functional disruptions in the system and thus co-ordination is necessary, in order to bring together interests of associated units in the event of interrupted flow.

The main forms of co-ordination are: adjustment of long-range development plans and annual production plans, where the best solutions are sought both at unit and combine level; mutual agreements on prices and quality products, terms standards applied to transfer of commodities between units; adjustment of

requirements, distribution of manpower and means of transportation;  
internal arbitration, etc.

Co-ordinating bodies are: the central workers' council,  
the executive board and the director-general.





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