REVIEWS

The growth of cereal production in the ČSSR

On the world-wide scale year by year there is a growing demand for crops securing human nutrition. This trend is reflected to the maximum extent above all in cereals which, besides direct consumption, also affect the growth of livestock production. Also in the ČSSR cereals belong among the most important crops, holding a considerable position both in agricultural production and in the whole national economy. They are grown on 54 % of the crop area, their production affecting substantially the results of both crop and livestock production. They participate in the volume of rough crop production by about 40 % and on the overall volume of rough agricultural productin by about 15 %.

In the post-war years Czechoslovakia achieved essential success in the production of cereals; this branch is one of the most successful and its development was the most progressive. Whereas in the course of the First Five-Year Plan (1951—1955) the average annual production was 4.8 million tons and in the 3rd 5YP (1961—1965) 5.9 million tons, in the 6th 5YP (1976—1980 it was more than 10 million tons and in the 7th 5YP (1981—1985) even 10.9 million tons of cereals, i.e. an increase more than two-fold. The growth of cereal production exceeded in many respects the original expectations and the increased cereal production contributed thus signific antly to the overall development of agriculture, above all from the viewpoint of the growth of livestock production. The overall cereal production has grown throughout the whole post-war period, nevertheless the decisive turn occurred in the latter half of the 1960s and above all in the 1970s. The increase in cereal production was made possible above all due to the growth of the hectare yields, whereas the areas increased only slightly. The development of hectare yields of cereals has an ever rising trend, even through it is more or less irregular, above all due to the dependence on meteorological conditions. A considerable effect in the rise of hectare yields was that of above all fertilizers applied per unit area. Besides the chemization of agriculture, a con-, siderable importance in increasing hectare yields had a gradual introduction and use of new effective varieties of cereals.

Thus, in the course of 35 years, the hectare yields of cereals in the CSSR increased more than two-fold. From the original 1.85 t . ha^{-1}) in the period of 1951—55 they increased to almost 4 t . ha$_{-1}$ (3.84 t . ha^{-1}) in the period of 1976—80 and to 4.31 t . ha^{-1} in the period of 1981—85. By the results achieved in the intensity of crop growing Czechoslovakia thus belongs among the foremost countries in the world. Before the CSSR there are mostly only countries with considerably better agroecological conditions.

The growth of hectare yields of cereals was not a straight-line affair, it was marked by relatively great variations. It is interesting to note that the greatest differentiations were recorded in relatively recent time. In the period of 1976—80, when the difference between the highest hectare yield in 1980 and the lowest one in 1979 was 0.69 t . ha^{-1}. In the period of 1981—85, when this difference was even higher, between the highest yield in 1984 and the lowest one in 1981 it was even 1.13 t . ha^{-1}. From these figures it is possible to draw a conclusion that with the development of cereal production and with the growth of their hectare yields there also occurs the growth in the differentiation of yield in the individual years. The absolutely lowest inter-year changes and thus also the differentiation of the hectare yields were achieved in the period of 1961—65. The reason was the stagnation of cereal production and, generally, the stagnation of the whole agricultural production in that period. In those years and in none of the individual years hectare yields of cereals increased above the yield achieved in 1960 which, up to that time, had been the highest.

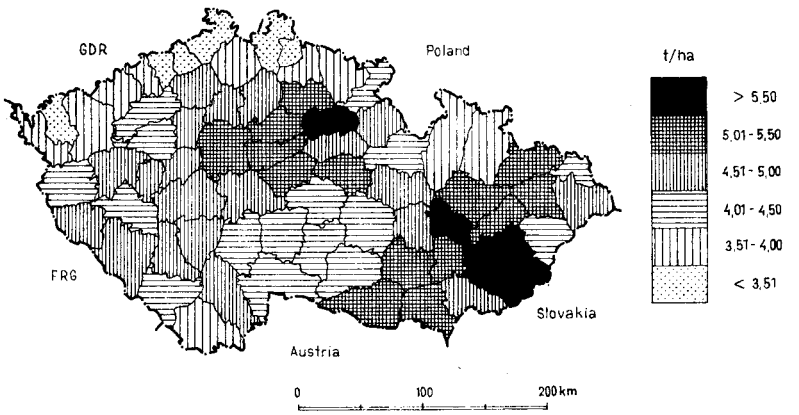
Analyzing the development of the hectare yields of cereals it is interesting to note which years were favourable from that viewpoint and which were unfavourable. As favourable years can be denoted those in which the hectare yields increased, i.e., when the yield in that particular year exceeded the hitherto highest hectare yield of cereals. In that sense they are the following years: 1966, 1967, 1968, 1969, 1971, 1973, 1974, 1977, 1980, 1983 and 1984. On the other hand unfavourable years can be considered those in which there was a substantial drop in hectare yields. On the basis of this, the following years can be considered unfavourable: 1964, 1965, 1970, 1976, 1979 and 1981. Particularly unfavourable was the year 1979 in which the yield of cereals dropped by almost 15 %, and the year 1981 — drop by 13 % and the year 1975, a drop by more than 10 %. On the other hand it is necessary to note that despite the above changes cereals — as compared with other crops (such as potatoes, sugar-beet) are characterized by a relatively high stability of the hectare yields. The most important factor of those inter-year changes can

be considered changes in meteorological conditions in the individual years which essentially affect the level of crop production.

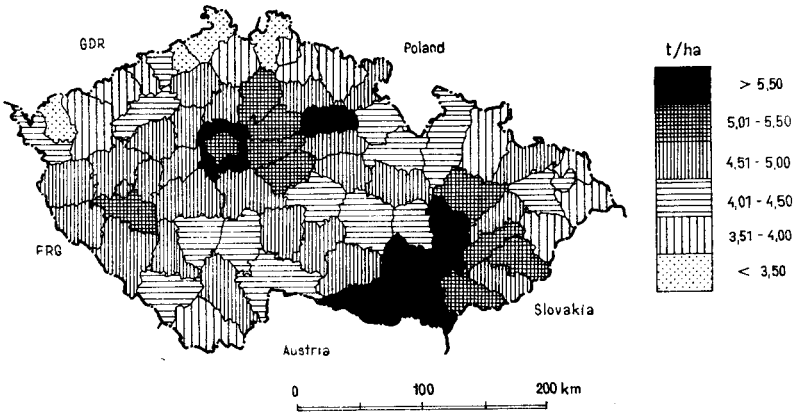
The overall increase in hectare yields of cereals in the past period in the CSSR was made possible above all by introducing new, more effective varieties (particularly the Soviet varieties of wheat), by the growth in the consumption of fertilizers and pesticides, by applying suitable agrotechnology and the proper growing principles and, generally, by utilizing the latest information of the development of science and technology. Thus, V. Špaldon (2) states the following share of the individual production elements in increasing the hectare yields of the winter-wheat): varieties 43.7 %, fertilizing 36.3 %, term of sowing 12.5 %, and the seed 7.5 %.

An important role in increasing the hectare yields of cereal, but also in the overall rise in cereal production, was that of the change in the structure of the cerals grown. In the past period the share of growing wheat and barley (i.e., cereals with higher hectare yields) increased at the cost of growing rye and oats (where so far a lower yield is obtained and the increment in yields was not so abrupt).

Despite considerable success in increasing the hectare yields of cereals in the CSSR, there still exist great reserves. From different analyses (3) it follows that the yield potential of varieties grown in this country is utilized by only 60 %. This is also witnessed by information and experience of some foremost agricultural enterprises which achieve yields of 6—7 t per hectare, in



Cartogram No 1. The hectare yields of cereals in 1984 according to the districts of the CSR



Cartogram No 2. The hectare yields of cereals in 1985 according to the districts of the CSR

Table 1. The hectare yields of cereals in 1984 and 1985 according to the districts of the CSR

Year 1984	District	Yield t . ha^{-1}	Year 1985	District	Yield
1	Kroměříž	6.21	1	Prostějov	5.93
2	Gottwaldov	5.87	2	Brno-Country	5.86
3	Hradec Králové	5.76	3	Prague-West	5.70
4	Prostějov	5.60	4	Vyškov	5.68
5	Uherské Hradiště	5.57	5	Znojmo	5.64
6	Vyškov	5.47	6	Prague-east	5.64
7	Kolín	5.44	7	Břeclav	5.57
8	Olomouc	5.43	8	Hradec Králové	5.52
9	Přerov	5.39	9	Kolín	5.43
10	Znojmo	5.36	10	Kroměříž	5.42
11	Prague-east	5.27	11	Prague-town	5.35
12	Brno-country	5.27	12	Gottwaldov	5.29
13	Kutná Hora	5.24	13	Nymburk	5.20
14	Břeclav	5.23	14	Plzeň-south	5.17
15	Opava	5.22	15	Kutná Hora	5.10
16	Prague-west	5.16	16	Hodonín	5.08
17	Plzeň-south	5.16	17	Olomouc	5.07
18	Chrudim	5.15	18	Mladá Boleslav	5.02
19	Nový Jičín	5.11	19	Litoměřice	4.95
20	Jičín	5.09	20	Opava	4.88
21	Prague-town	5.03	21	Chrudim	4.88
22	Nymburk	5.02	22	Jičín	4.86
23	Mladá Boleslav	5.00	23	Třebíč	4.86
24	Ostrava	4.99	24	Domažlice	4.84
25	Litoměřice	4.97	25	Strakonice	4.82
26	České Budějovice	4.91	26	Mělník	4.80
27	Hodonín	4.90	27	Příbram	4.80
28	Pardubice	4.88	28	Kladno	4.78
29	Domažlice	4.85	29	České Budějovice	4.78
30	Kladno	4.82	30	Rokycany	4.78
31	Beroun	4.67	31	Beroun	4.77
32	Svitavy	4.67	32	Pardubice	4.76
33	Příbram	4.66	33	Svitavy	4.76
34	Rokycany	4.66	34	Přerov	4.72
35	Strakonice	4.65	35	Uherské Hradiště	4.71
36	Klatovy	4.63	36	Tachov	4.71
37	Benešov	4.57	37	Klatovy	4.65
38	Písek	4.57	38	Benešov	4.62
39	Plzeň-north	4.56	39	Náchod	4.57
40	Blansko	4.56	40	Jihlava	4.57
41	Mělník	4.55	41	Rakovník	4.55
42	Rychnov n. Kněžnou	4.55	42	Plzeň-north	4.53
43	Frýdek-Místek	4.51	43	Pelhřimov	4.51
44	Jihlava	4.50	44	Písek	4.48
45	Třebíč	4.49	45	Havlíčkův Brod	4.48
46	Tábor	4.49	46	Prachatice	4.47
47	Tachov	4.46	47	Tábor	4.44
48	Havlíčkův Brod	4.43	48	Žďár n. Sázavou	4.42
49	Rakovník	4.42	49	Rychnov n. Kněžnou	4.41
50	Náchod	4.39	50	Nový Jičín	4.33
51	Louny	4.37	51	Blansko	4.30
52	Ústí n. Orlicí	4.32	52	Ústí n. Orlicí	4.25
53	Jindřichův Hradec	4.31	53	Louny	4.21

Table 1 — continuation

Year 1984	District	Yield t . ha^{-1}	Year 1985	District	Yield
54	Karviná	4.29	54	Jindřichův Hradec	4.15
55	Pelhřimov	4.18	55	Teplice	4.15
56	Prachatice	4.17	56	Šumperk	4.09
57	Žďár n. Sázavou	4.14	57	Ostrava	4.06
58	Vsetín	4.04	58	Cheb	4.03
59	Český Krumlov	3.93	59	Český Krumlov	3.96
60	Šumperk	3.91	60	Karlovy Vary	3.90
61	Trutnov	3.89	61	Semily	3.90
62	Cheb	3.84	62	Frýdek-Místek	3.84
63	Chomutov	3.76	63	Trutnov	3.81
64	Česká Lípa	3.67	64	Česká Lípa	3.80
65	Most	3.66	65	Jablonec n. Nisou	3.74
66	Semily	3.64	66	Vsetín	3.68
67	Bruntál	3.64	67	Chomutov	3.66
68	Karlovy Vary	3.55	68	Karviná	3.64
69	Teplice	3.43	69	Most	3.64
70	Liberec	3.06	70	Bruntál	3.63
71	Děčín	2.90	71	Liberec	3.41
72	Sokolov	2.88	72	Sokolov	3.39
73	Jablonec n. Nisou	2.80	73	Děčín	3.20
74	Ústí n. Labem	2.78	74	Ústí n. Labem	3.18

some cases even higher than 10 t. Under current field conditions, however, only 1/5—1/4 of the potential amount is achieved. Further, there are relatively considerable differences in the hectare yields among the individual agricultural enterprises as well as among the whole districts. The yield differentiation among the individual districts in the course of the years 1976—80 was as much as 3.7 t per hectare, and in 1981—85 3.5 t per hectare.

Of interest is also the comparison of the consumption of fertilizers in relation to yields. Thus, in the South Moravien Region the increment of 1 kg of nutrients increased the production of cereals in the course of ten years by 17 kg each year, whereas in the Central Bohemian Region only by 6 kg and in the West Bohemian Region only by 2 kg. This fact fully testifies on the one hand the difference in the effectivity of utilizing fertilizers, on the other hand different technological level and discipline, but also further reserves available in growing cereals (1).

Great space differences can also be followed comparing the individual years (see cartograms No. 1 and 2). In the map supplements hectare yields are pictured for the years 1984 and 1985, according to the individual districts in the CSR. In them one can observe that the essentially chief production regions of cereals in the CSR (the Moravian basins, the Elbe basin) take up the first positions also as the height of hectare yields is concerned, but the sequence of the individual districts changes conspicuously every year. Whereas in 1984 the highest hectare yields exceeding 5.5 t . ha^{-1} were achieved above all in the districts of East Moravia (Gottwaldov, Uherské Hradiště, Kroměříž) and in the districts of Prostějov and Hradec Králové, in 1985 above all the district of South Moravia appear in this category (Znojmo, Břeclav, Brno-Country, Vyškov), the two districts of Prague, and again the districts of Prostějov and Hradec Králové. Thus, the latter two districts are the only ones that appear in the first group all the time.

On the other hand, in the group of districts with the lowest hectare yields there regularly appear the frontier districts of the North Bohemian Region, particularly Děčín, Ústí nad Labem and Liberec, in 1984 also Jablonec nad Nisou and Teplice and the worst producer in West Bohemia, the district of Sokolov.

Thus, great reserves still exist in different results of agricultural enterprises as well as whole districts operating under approximately equal natural conditions. Therefore every agricultural enterprise, every district must — depending on its climatic and soil conditions — try to make all intensifying factors and scientific knowledge assert themselves to further help increase the production of cereals. It is also necessary to utilize more the yield potential of the individual variants.

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A. Věžník

Cooperation of Soviet and Czechoslovak Geographers at Svalbard

The Norwegian Arctic archipelago Svalbard belongs to territories of considerable interest for workers in many branches of science, including geography. The archipelago is considered to be a key region for the study of the regime of glaciation in the whole Euroasian sector of the Arctic. The Institute of Geography of the Academy of Sciences, USSR, carries out broad activity there. The activity hitherto of its glaciological expedition can be divided into three periods, two of them being delimited by the years 1965–1967, 1974–1985, the third since 1986 up to the present. In the two former periods the research activities were oriented to acquiring information about the composition, regime and evolution of the glaciers of the archipelago, employing the most modern methods of geophysics and geochemistry. The most important problems were the determination of the thickness of the glaciers and the relief of the underlaying terrain by the method of radiolocation, the clarification of the structure of the glaciers and their hydrothermic situation by means of deep drillholes and a comprehensive study of the glacier core (temperature, structure, isotopic and chemical composition of ice). The regime and the evolution of the glaciation were studied in time scales from a century to 100,000 years. The result of the research activity of many years are two monographs (Troitsky, L. S., Zinger, E. M., Koryakin, V. S., Markin, V. A., Mikhaliov, V. I.: Glaciation of the Spitsbergen (Svalbard). Nauka, Moscow 1975; Glaciology of Spitsbergen, ed. by V. M. Kotljakov, Nauka, Moscow 1985). The fundamental regularities of the archipelago glaciation of the above research activities can be summarized as follows:

A. The concentration of the chief mass of glaciers into the peripheral parts of the Isle of Spitsbergen and a relatively weak development of glaciation in its central part is conditioned by the growth of the continentality of the climate, above all by the diminution of the winter precipitation and the rise of summer air temperatures, which is in connection with the regime of atmospheric circulation (prevailingly western transfer of air masses along the Iceland-Kara trough). Connected with this are also further characteristics of the glaciation, such as the distribution of the zones of accummulation, ablation, peculiarities of glacier fluctuation, etc.

B. On the basis of radio-echo sounding it was determined that the maximum thickness of valley glaciers reaches 200 m, of large mountain ice caps 350–500 m, glacier plateaus and glaciers of the plains of the island of North-East Land 600 m. The underlying beds of glaciers lie below the sea level, filling considerable parts of fjords and bays, but also of channels. Overall stores of ice at the archipelago amount to about 7,600 km^3 (i.e. 30 % of the volume of glaciers on the islands of the Euroasian sector of the Arctic).

C. By deep thermal boreholes were established cold, warm and two-layer glaciers. In the latter-mentioned type the upper part is cold, the lower one warm (near the pressure thawing point of ice), containing water in the liquid state. From the inside warm and also two-layer glaciers yield water also in the course of winter, which results in the periglacial icing fields. The winter discharge from the glaciers, which is of great importance for providing water for the settlements, varies from 1 to 2 l . s^{-1} at small glaciers to 100 l . s^{-1} at large glaciers.

D. The study of the balance of the glacier mass in the period of 1975–1985 indicates a prevailingly negative balance, the same as in the whole of the 20th century, which results in the retreat of most glaciers of the archipelago. Since the beginning of the present century, the glaciated area has decreased by about 2,150 km^2 (i.e. by 6 %), the ice volume by about 600 km^3 (i.e. by 8 %). With an overall retreat of glaciers, in about 50 glaciers, on the other hand, a remarkable advance has been observed, in which some large glaciers increased their length by 7–10 km (the Brårsvell

Glacier even by 21 km and an area of 500 km²). It was calculated that if the present conditions persist, some small valley glaciers (such as Bering and Aldegonda) would thaw altogether in 70–100 years.

E. The study of ice cores from deep drill-holes has enabled the reconstruction of climatic conditions in the course of several centuries to be made. A relatively warm climate, similar to the present one, ruled the 16th century. In the 17th–19th centuries there was a cooling in the archipelago (Little Ice Age), which resulted in a mass advance of glaciers. At the end of the 19th century warming set up which culminated in the 1920's to 1930's. The onset of glaciers was also established for the periods 7,800, 4,500 and 2,500 years ago, which is in good correlation with the colder periods established by the reconstruction of the vegetation in holocene peat-bogs. On the basis of thermoluminiscence and radiocarbon dating of old moraine and marine sediments traces of three glaciations and three marine transgressions were established in the late Pleistocene (for the last 100,000 years).

In 1986 the Institute of Geography opened the third stage of research activities including the following topics:
– the determination of connections of the balance of glacier mass with the parameters of the atmosphere and the ice of the surrouding seas,
– the study of the internal processes in glaciers,
– the reconstruction of glacioclimatic conditions of the last 1,000 years,
– the establishment of the natural geochemical background and the degree of anthropogenic pollution of the environment on the archipelago,
– paleoglaciology of the archipelago in the Pleistocene and Holocene,
– the study of periglacial processes on the archipelago and their connection with glaciation,
– engineering-glaciological research,
– mathematical modelling of glacial processes with the objective of forecasting the development of glaciation at the beginning of the 21st century.

At the same time the expedition sees to newly carried out biogeographical and ecological research activities with the aim of elaborating a theory of operation of arctic geosystems, studies of mechanisms of renewal of arctic ecosystems affected by the activities of man, including the elaboration of recommendations for their recultivation.

These toasks were projected also to the 15-member geoecological expedition of the Institute of Geography of the Academy of Sciences, USSR, in 1988, working under Prof. E. M. Zinger (head of the expedition) and Dr. L. S. Troitsky (scientific head of the expedition), in which, besides glaciologists and geomorphologists, also specialists were represented from the branches of botany, zoology, and ecology.

In the period of 15 June to 24 August also three workers of the Department of Geography, Faculty of Science, J. E. Purkyně University, Brno, worked within the Soviet expedition. They were Asst. Prof. RNDr. Rudolf Brázdil, CSc. (climatology), Asst. Prof. RNDr. Milan Konečný, CSc. (geomorphology and cartography), and RNDr. Pavel Prošek, CSc. (climatology). The Czechoslovak part of the expedition was working under the auspices of the rector of Brno University, Prof. PhDr. Bedřich Čerešňák, CSc. The geographers from Brno linked up their work with their research activities within the Polish-Czechoslovak geographical expedition in 1985 in the region of Werenskiold Glacier (see Scripta Fac. Sci. Nat. Univ. Purk. Brun, Vol. 17, Geographia, No. 2, Brno 1987) and solved the following research topics:

A. *The study of the glacier ablation with respect to the parameters of the boundary layer of atmosphere and the energetic balance of its active surface*

In the upper part of the glacier East Grønfjord (φ = 77°52′ N, λ = 14°22′ E, H = 441 m a.s.l.) measurements and registrations of fundamental meteorological parameters and components of the energetic balance were carried out at synoptical terms. Every day the density of snow and the height of thawing were measured, which was also measured in the longitudinal and transversal profiles through the glacier. In the course of the whole period changes were followed in the structure and density of snow and the water reserve of the snow cover.

B. *The local climate of the glacier*

Besides the station in the upper part of East Grønfjord Glacier its climatic conditions were studied on the basis of data about air temperature and humidity and atmospheric precipitation on another two stations situated in the middle part of the glacier and at its terminal moraine.