

## CHAPTER 9

# *Influence of Large-scale Farming Methods on Soil Exploitation in Czechoslovakia*

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### 9.1 INTRODUCTION

Agriculture takes up the largest share of land in Czechoslovakia: it covers approximately 54% of the entire land area (together with forestry, it affects 91% of the country's territory). Hence, as the major landscape-forming factor, it bears a great responsibility for the utilization and protection of the environment for future generations.

The essence of agriculture is its biological nature, i.e. the utilization of the productive ability of animate organisms (plants and animals), which represent the basic means of production. The entire production process in crop cultivation and livestock farming must proceed in harmony with the laws of biology, which to date are still insufficiently known, and man still cannot always use them correctly to meet his needs. To an important extent the production of plants and animals is affected by further factors, particularly technology and chemicals, which have a supplementary function and cannot yet supersede the actual biological production process, the essence of which is the unity of the productive organism and the productive environment.

The negative effects of wholesale technologies in crop and livestock farming can be summed up as follows. At the present stage of maximum application of the scientific and technical revolution in all production spheres, agriculture, too, is making a marked effort to introduce, wherever possible, industrial forms of large-scale production, in line with the principles of integration, concentration and specialization of production in order to attain maximum economic advantage. In that sense, highly efficient machinery and the massive use of chemicals dominate in crop cultivation and livestock farming, including melioration and land reclamation. This, together with an intelligent and comprehensive harmonizing with the biological principles of production, has brought great success in all branches of farming, particularly

initially. However, the rate of mechanization, use of chemicals and other factors in many ways outstripped the results of research and the possibility of a more thorough testing of findings in practical application. This is now leading to very serious worries over the disruption of the components of the natural and human environment, and in consequence also of the ecological balance of the entire biosphere. This is further aggravated by the impact of wholesale technologies used in industry, building and energy production, for example.

In some regions, the negative effects of mass-production techniques in agriculture and other production spheres are already reaching such disastrous proportions that they represent an imminent danger to the basic conditions of life and the independent existence of plants and animals, and thus, finally, also man and the entire biosphere. These damaging effects become manifest in the deteriorating quality of the basic natural components: water, air, nutrients, food and soil.

## 9.2 BRIEF HISTORICAL SURVEY OF FARMING

The Slav period of the country dates back roughly to the fifth century AD, when there was already a developed agriculture and a clan system. The fertile soil favoured population growth. Life concentrated in the clan villages, primarily in the plains cleared of forest in the river basins of the Elbe, Ohře, the lower Vltava, the lower reaches of the Berounka, Svatka and Dyje.

Towards the end of the tenth century, new villages began to form on the basis of neighbourly communities. At that time, the state of production forces in agriculture favoured individual farming; the primitive collective cooperation in the clan communities became a hindrance to economic initiative, and individual families left them to make use of new farming techniques. In the new communities, arable land and gardens were owned privately; woods, meadows and pasture land were owned jointly by the community.

In the ninth and tenth centuries, the annex-farming system was superseded by a fallowing system. Crop rotation was introduced: one field was laid fallow, the second was planted with winter crops, the third with spring crops. On the land belonging to a village, each farmer owned and tilled his own fields—the work was done concurrently by all—and the approach to one's field involved crossing the neighbour's land. The land was divided into as many lots as the village had farmers.

Woods were left standing only in localities where farming was difficult or impossible or where the soil was not fertile enough—on stony, dry, shallow or steep ground, in the hills or in the border mountains. Also, farmers avoided forests on shifting sands (the woods in the Elbe Basin), wetlands regularly flooded by the rivers, and the inaccessible swamps and swamp forests, such as existed, for example, in the South Bohemian Basin.

As late as the end of the twelfth century, the territory stretching from the Bohemian Forest down to Southern Moravia was covered by deep, swampy, virgin forest, flooded repeatedly each year by the waters of the river Lužnice. The greater part of the territory was covered with wetlands, moors, swamps and deep forests. Extensive land reclamation in these areas facilitated their use for farming and cultivation, and in the lowlands also for human settlements. The main role in this was played by the construction of a system of fish ponds which began at the beginning of the thirteenth century.

Under the feudal system, the settling of land formerly not farmed occurred in two ways: either by the growth of the rural population, or by a deliberate and controlled colonization, which started in the thirteenth century when foreign colonists came to the country. The colonists (primarily Germans) received better legal status than the Czech subjects. The Emphyteutic Law facilitated hereditary land ownership. The reverting of land to the Crown upon the owner's death was abolished.

The swift growth of towns, the development of trade, crafts and mining in the sixteenth century led to a rising demand for farm products. Agriculture could meet this only by extending the area under cultivation, primarily by further deforestation of the territory. At the time, roughly 45% of Bohemia was still covered by forests.

At the beginning of the seventeenth century, productivity and general farming standards were comparatively high and were not surpassed for another 200 years. For instance, the wheat yield in the most fertile regions amounted to 12 metric hundredweights per hectare.

Fruit and vine growing reached high standards and was extensive in climatically suitable regions—around Prague, at Mělník, Litoměřice and in South Moravia. Hops, too, were grown on almost all feudal estates, which also had their own breweries; but even in those times the typical hop-growing regions of today clearly emerged: Žatec, Louny, Rakovník, Ústí, etc.

The improved crop-rotation and crop-alternation systems, with constant cultivation and harvesting each year, exhausted the soil more than the old fallowing system had done. Fertilizing intensity was low. As a rule, only one-sixth of the fields were fertilized, i.e. manure was applied to a field only once in six years. In the first half of the nineteenth century, it was still usual to fertilize a field only once in six years, with 250–280 metric hundredweights of manure per hectare, i.e. equivalent to 42–47 hundredweights per hectare annually. The cultivation of arable land by the large estates of the day is shown on Table 9.1, which shows that the crop ratios remained virtually unchanged until the middle of the nineteenth century.

The yields of individual cereals in the period 1700–1850 are shown on Table 9.2: representative data are taken from the Třeboň Estate (South Bohemia) and the Lovosice Estate (North Bohemia–Elbe Basin). Taking into account the level of fertilization (if one can call it that) and of mechanization,

Table 9.1 Crop ratios on large estates (percentage of arable land)

Year	Cereals	Other; husks	Feed grain	Root crops	Fallow lying
1776–1800	63.3	2.3	4.6	2.0	27.8
1801–1820	64.8	2.7	6.0	2.0	23.5
1821–1840	65.8	2.8	7.6	2.9	20.9
1841–1850	60.2	4.1	13.2	3.1	19.4

these yields are remarkably good, which indicates the enormous amount of human labour which went into cultivation. On changing the *corvée* system and abolishing *seerdom* under Joseph II at the end of the eighteenth century, the feudal estates lost a substantial part of their labour and were forced to lease the land and entire farms to tenant farmers.

The crop rotation system of farming ceased to meet economic needs by the beginning of the nineteenth century and was substituted by a more intensive crop-alternation system. The period beginning with the middle of the nineteenth century is described as the 'agricultural technical revolution', because new technology (such as the steam engine, the threshing machine, the crusher, etc.) facilitated the introduction of new production methods. Until that time, unregulated water conditions in the soil led to waterlogging or sub-surface erosion of the land and prevented intensive farming. Therefore, land reclamation schemes were introduced, swamps and wetlands meliorated, rivers and streams regulated, and flood-dams were built along river banks.

These measures, carried out mainly in the beet-growing lowlands, led to rising crop production. This is evident from the increasing areas of root crops and feed-grains, which in Bohemia, for example, had amounted to only 8% in 1848, rose to 29.9% by 1875 and to 37.2% in 1937. The most marked change in the intensity of cultivation appears in the decrease of fallow fields from 21.6% to 4.8% in 1875, while by 1937 fallow-lying fields had disappeared entirely.

Table 9.2 Grain yields on large estates (tonnes per hectare)

Year	Třeboň Estate				Lovosice Estate			
	Wheat	Rye	Barley	Oats	Wheat	Rye	Barley	Oats
1701–1750	1.20	0.87	1.26	0.96	1.36	0.97	1.17	1.17
1751–1765	1.28	1.08	1.26	0.85	1.63	1.08	1.33	1.32
1776–1800	1.54	1.39	1.26	1.13	1.93	1.36	1.43	1.59
1801–1820	1.54	1.39	1.20	1.30	1.87	1.97	2.10	1.82
1821–1840	1.66	1.58	1.38	1.59	2.70	2.40	2.08	2.11
1841–1850	1.74	1.75	1.46	1.80	2.95	2.37	3.35	3.56

Table 9.3 Crop cultivation in Bohemia and Moravia (thousands of hectares)

	1790	1820	1841	1871	1883	1896	1910
Arable land	3 568	3 516	3 823	3 862	4 098	4 092	4 093
Gardens	78	including meadows			104	103	103
Perm. meadows	641	711	807	857	707	706	703
Pastures	627	619	658	715	423	418	412
Vineyards	32	32	17	24	13	13	12
Total farmland	4 846	4 938	5 305	5 458	5 345	5 332	5 323
Total woodland	1 974	2 286	2 282	2 254	2 291	2 294	2 307
Total non-farm land	1 111	707	344	219	295	305	301
<i>Percentages</i>							
Arable land	71.6	71.2	72.1	70.8	76.8	76.8	76.9
Gardens	1.6	—	—	—	1.9	1.9	1.9
Meadows	13.2	15.6	15.2	15.7	13.2	13.2	13.2
Pastures	12.9	12.5	12.4	13.1	7.9	7.9	7.8
Vineyards	0.7	0.7	0.3	0.4	0.2	0.2	0.2

The proportion of cereals fell from 66% in 1848 to 57% in 1937; the main decline took place in rye, oats and partly also in barley, whereas the wheat-growing area increased by 50%.

The intensity of cultivation can be seen best from the growing yields per hectare, which in the period 1800–1937 more than trebled.

An idea of the changes in cultivation areas that occurred in the farming landscape during the eighteenth and nineteenth centuries can be gained from the figures in Table 9.3. A more detailed survey of the exploitation of arable land is given on Table 9.4, which shows crop structures in Bohemia in the period 1848–1914.

Of course, changes in the crop structure affected the look of the open-farming landscape, but had a far less negative impact on it than the later eras at the end of the nineteenth century, and particularly in the first half of the

Table 9.4 Crop structure in Bohemia (percentages)

	1848	1871– 75	1876– 80	1881– 85	1885– 90	1891– 95	1896– 1900	1901– 05	1906– 10	1911– 14
Cereals	66.0	61.2	61.2	61.5	61.7	61.0	61.2	61.3	59.8	59.9
Root crops	4.3	18.7	19.1	19.3	18.8	20.3	20.4	20.1	18.5	18.6
Feed-grain	3.7	11.2	11.5	11.6	12.0	12.2	12.4	12.8	15.7	15.9
Other	4.4	4.0	4.2	4.5	4.9	4.8	4.7	4.6	4.9	4.7
Fallow	21.6	4.9	4.0	3.1	2.6	1.7	1.3	1.2	1.1	0.9

Table 9.5 Crop yields in Bohemia (tonnes per hectare)

	1848	1870	1871– 80	1881– 90	1891– 1900	1901– 10	1911– 14
Wheat	1.08		1.20	1.36	1.40	1.65	1.85
Rye	0.95		1.06	1.14	1.15	1.45	1.67
Barley	0.96		1.07	1.37	1.39	1.64	2.00
Oats	0.81		0.90	1.08	1.05	1.28	1.71
Cereals (total)	0.95		1.06	1.22	1.24	1.51	1.81
Potatoes	6.0–7.0		7.00	7.30	7.80	9.90	9.50
Sugar-beet	12.00	16.00	17.00	20.80	22.40	27.00	26.20
Peas		0.68	0.81	0.72	0.76	1.04	1.20
Lentils		0.61			0.76	0.79	0.85
Rape		0.83	1.07	1.02	1.08	1.24	1.34
Poppy		0.35			0.59	0.76	0.83

twentieth century, when unilateral agricultural exploitation made itself fully felt.

All measures carried out in farming had a single goal—to raise yields—which is evident from Table 9.5, showing the trend of yields per hectare in Bohemia in the period 1848–1914. The largest increase was for sugar-beet. As sugar-beet had proved the economically most viable crop, the greatest attention was devoted to it and it was cultivated on the best land. Also, the cultivation area increased substantially.

After the freeing of the peasants in 1848, land holdings were carved up, farms were parcelled, individual fields sold to other holders or shared out among inheritors. For instance, when farm land was being shared among several brothers and sisters, so as not to put anybody at a disadvantage concerning soil fertility, locality or distance, the original lots were sub-divided longitudinally. Long and narrow strips resulted, which were economically most unsuitable (South Moravia). Other factors, such as the building of railways, river regulation, industrial construction, the growth of towns and villages, contributed to the splitting up of land-holdings.

The outcome of these changes, taking place over a number of years, was many split and scattered lots, with a large number of small parcels of land in different, often widely scattered, locations belonging to one farm. Further, it resulted in odd-shaped fields.

Considerable changes in land-holding occurred in Czechoslovakia in the period of 1918–38, on the basis of the Land Reform Act of April 1919. In accordance with that Act, the land of the gentry and large estate-owners was confiscated, i.e. all arable land exceeding holdings of 150 ha and other land over and above 250 ha, totalling 4 081 000 ha.

Under the Allocation Act of 1920, only about 1 800 000 ha were shared

out, as follows: 400 000 ha were taken by the state which set up state-farms; 600 000 ha went to the provinces and communities in the form of provincial estates; and 790 000 ha were allocated to small-holders and middling peasants.

The scattered land-holding determined the character of the farming landscape. Millions of parcels and strips of various shapes, which persisted until 1948, formed a colourful mosaic. This image of the typical Czech landscape, however, could not continue: it had to be transformed to comply with the new, collective type of farming.

### 9.3 COLLECTIVIZATION OF AGRICULTURE FROM 1945

After the Second World War, Czechoslovak agriculture underwent marked changes. These changes occurred during a historically short period—not only with regard to the introduction of new production methods, but primarily with regard to the introduction of a new organization of production relations. The socialization of agriculture and rural life was completed within a very few years, unequalled in other countries. The transformation of the Czechoslovak village into cooperative-based farming communities cannot be compared with any similar schemes in the world.

The National Assembly passed an Act concerning the setting-up of Unified Agricultural Cooperatives (JZD). The government concentrated all its attention on the socialist transformation of agriculture, on the transition from individual small-holding farming to cooperative farming on a large scale. That historic document was preceded by efforts made since the end of the Second World War to implement the Košice Government Program and new land reform, designed to eliminate all large estates and to allocate their land to farm-workers and small-holders.

The land allocation was carried out in cooperation with the peasants themselves, according to the proposals of the Farmers' Committees set up under the auspices of the local People's Committees. The 'Hradec Program'—calling for the carving up of estates of more than 50 ha—was directed against the village bourgeoisie and could be implemented fully only after 1948.

Through the land reform, small and middle size peasant farms acquired more than 1 600 000 ha of farm land and, concurrently, a state socialist sector emerged, which in 1948 farmed roughly 6% of all the land. The class composition in the villages changed: the number of farms with more than 20 ha fell to 26.3%, whereas in 1930 it had amounted to 35.1%. The originally founded Farming Cooperatives (JZD) were comparatively small units with areas of 200–300 ha of farm land, as is evident from Table 9.6.

The state farms, which immediately after the Second World War farmed only a small proportion of farm land, quickly expanded after the year 1948

Table 9.6 Development of farming cooperatives

Year	Number of JZD	Average area (ha)	Proportion of total farm land (%)
1949	28		4.3
1951	3 138	355	14.6
1952	5 848	353	29.7
1954	6 502	276	26.5
1956	8 061	263	30.8
1958	10 816	420	66.5
1962	7 912	550	59.6
1964	7 135	592	58.6
1966	6 328	616	55.6
1968	6 328	625	55.5
1970	6 270	638	56.0
1972	5 318	766	57.6
1974	3 099	1 343	59.0
1976	1 959	2 183	61.1
1978	1 813	2 340	60.8
1980	1 747	2 474	62.4

(Table 9.7). The state took over breed improvement and plant improvement farms, church estates, large farms and vacant farm land in the border regions. During the period of collectivization, they served as exemplars for the organization of large-scale agricultural production.

Farm land in less productive regions, primarily in the border hills, was given

Table 9.7 Development of state farms

Year	Number of SF	Average area (ha)	Proportion of total farm land (%)
1952	192	3.201	8.3
1954	188	3.857	10.0
1956	182	4.949	12.1
1958	164	6.090	13.5
1960	465	3.105	15.5
1962	359	3.096	16.4
1964	314	4.426	19.3
1966	346	4.265	20.6
1968	343	4.273	20.5
1970	336	4.264	20.0
1972	305	4.720	20.4
1974	290	4.952	20.3
1976	214	6.514	19.9
1978	191	6.864	20.1
1980	203	6.864	20.1

\*Table 9.8 Workers permanently occupied in agriculture

Year	Number of people	Index 1936 (%)
1939	3 277 000	100
1946	2 565 000	78
1950	1 922 000	59
1955	1 839 000	56
1960	1 386 000	42
1965	1 195 000	37
1970	1 183 000	36
1975	990 000	30
1980	894 000	27

Table 9.9 Hectares per worker in agriculture

Year	1936	1948	1950	1955	1960	1965	1970	1975	1980
Hectares	2.35	3.34	3.89	3.97	5.35	5.96	6.00	7.11	10.65

to the state farms. The great labour shortage in those regions resulted in their large-scale production being of a rather low-intensity character. The substantial and constant dwindling of labour in farming is shown in Table 9.8 (its causes are outside the framework of this study). Agriculture today employs only one-third of its pre-war manpower. Thus, the land area per worker has greatly increased, as shown on Table 9.9.

From the above brief survey it is obvious that increasing demands are placed on the farmland of Czechoslovakia. With a declining number of farm workers and an increasing population and rising nutritional standards, it is required to produce an ever-growing volume of staple foods.

## 9.4 TRANSITION TO LARGE-SCALE PRODUCTION IN CROP CULTIVATION

### 9.4.1 Dynamics of Land Exploitation (Table 9.10)

At 1 January 1980, the total land area of Czechoslovakia, which amounts to 12 788 094 ha, was divided up as follows:

Farm land	6 923 549 ha, (54.14%)
Woodland	4 534 617 ha, (35.46%)
Other	1 329 928 ha, (10.40%)

The present condition of, and the future outlook for, the use of land is not too encouraging. Since 1945, agriculture has lost approximately 500 000 ha of farm land, 490 000 ha of which was arable. The problem of resettling the

Table 9.10 General dynamics of land exploitation (hectares)

	Farm land	Woodland	Other
1950	7 505 846	4 350 525	930 723
1955	7 417 000	4 371 094	1 002 640
1960	7 362 031	4 371 799	1 054 264
1965	7 187 866	4 445 160	1 228 429
1970	7 103 080	4 445 563	1 239 451
1975	7 042 142	4 477 505	1 268 447
1980	6 923 549	4 534 617	1 329 928

border regions after 1945 caused difficulties with ensuring the farming of land in those parts. On long, uncultivated land in the border regions, mostly at higher altitudes, meadows, pastures and even arable land turned, by natural succession, into woodland, which until recently caused considerable losses of farm land in those parts.

Table 9.11 Annual absolute losses of farm land and arable land (hectares)

Year	Farm land	Loss	Arable land	Loss
1948	7 748 215	—	5 218 000	—
1950	7 505 846	—	5 096 000	—
1953	7 215 403	—	5 007 000	—
1955	7 417 000	—	5 156 000	—
1959	7 388 577	26 546	5 153 231	9 959
1960	7 362 031	35 237	5 143 272	11 813
1961	7 326 794	30 881	5 131 459	11 021
1962	7 295 913	58 541	5 120 438	11 337
1963	7 237 462	24 764	5 109 101	2 441
1964	7 212 698	24 832	5 106 606	17 362
1965	7 187 866	27 676	5 089 298	17 671
1966	7 160 190	15 812	5 071 627	18 127
1967	7 144 378	12 384	5 053 500	14 745
1968	7 131 994	15 235	5 038 755	13 362
1969	7 116 759	13 679	5 025 393	14 838
1970	7 103 080	10 193	5 010 555	12 177
1971	7 092 887	16 289	4 998 378	8 946
1972	7 070 598	6 081	4 989 432	9 094
1973	7 070 517	10 186	4 980 338	13 815
1974	7 060 345	18 203	4 966 528	23 260
1975	7 042 142	38 169	4 943 268	35 272
1976	7 003 973	14 260	4 907 996	1 445
1977	6 989 712	13 681	4 906 552	8
1978	6 976 031	24 446	4 906 554	15 321
1979	6 950 585	27 986	4 891 223	33 923
1980	6 923 549			

Particularly ominous is the substantial loss of farm land since 1937, which by 1979 represented a total of 1.32 million hectares of farm land and 1 million hectares of arable land. A survey of farm and arable land losses in absolute figures per year is given on Table 9.11. From this table and Figure 9.1 it can be seen that, despite legislation to protect the agricultural land, its losses are still too high. Although an amended law on the protection of agricultural land came into force in 1976, in recent years losses have risen sharply, mainly by the conversion of fields into woodland and land serving other purposes, accounting for 74% of the losses. However, these losses of farm land reflect also the introduction of order into the exploitation of farm land, implemented by a process of physical stock-taking of farm land areas by all socialist farming organizations.

The transfer of agricultural and arable land to other purposes since 1948 is shown on Table 9.12. In the majority of cases, high-quality, flat, arable land is taken from agriculture, because building on it requires relatively small investment.

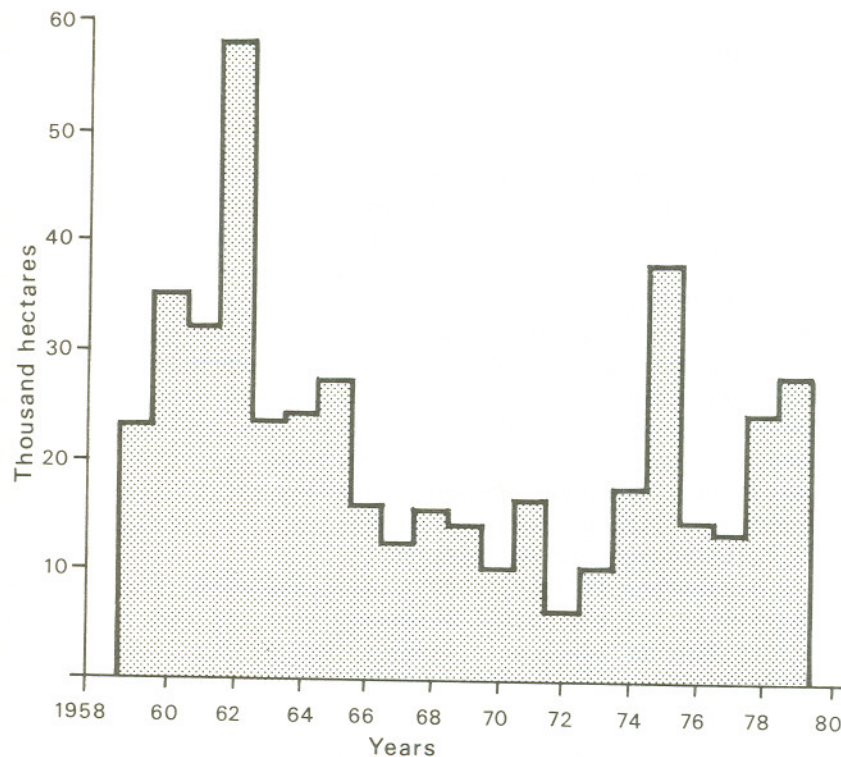


Figure 9.1 Trends in absolute losses of farm land in Czechoslovakia

Table 9.12 Transfer of farm land and arable land to non-farm use (hectares)

Year	Construction		Mining		Other purposes	
	Farm land	Arable	Farm land	Arable	Farm land	Arable
1963	8 137	4 664	1 764	1 082	28 611	5 973
64	10 248	6 570	1 894	1 407	30 879	7 283
65	9 299	5 390	1 357	692	24 590	7 075
66	9 191	5 458	1 175	899	16 394	3 267
67	8 557	4 870	1 049	555	13 773	2 815
68	7 045	3 902	617	311	13 525	2 454
69	8 816	4 681	456	332	11 797	2 582
70	6 549	3 713	383	280	9 443	2 118
71	6 596	3 783	451	315	14 574	1 721
72	8 099	4 676	376	258	6 504	1 148
73	5 729	3 624	295	137	8 511	2 038
74	7 399	4 722	91	56	16 546	2 330
75	9 382	5 390	305	179	36 754	4 247
76	7 051	4 045	177	70	15 737	2 650
77	5 957	3 769	532	311	15 183	2 938
78	8 925	5 173	722	498	23 865	4 344
79	6 292	3 524	787	505	27 900	4 350

It should not be forgotten that a large part of permanent land losses is caused by the farmers themselves. The effective use of machinery in crop cultivation requires fields of 50–80 ha. Their formation, however, is affected by the network of ways and roads and the structure of the ground. Hence on small fields which cannot be combined with others to provide larger areas, cultivation is uneconomical and these areas are often left unused or only partly used. Another factor contributing to losses of farm land is the lack of care that farming enterprises pay to the maintenance of cartways and paths; if they are badly passable, vehicles drive directly over the fields, causing tremendous and unregistered losses of arable land, amounting to several thousands hectares nationwide. Moreover, the land deteriorates under the heavy machinery. Untended roads also result in many fields not being limed, as heavy lorries cannot reach the fields.

Two further categories of land should be mentioned which, though belonging to agriculture, are not farmed at present: these are sites temporarily exempt from farming, which on 1 January 1980 totalled 16 432 ha, and temporarily uncultivated land, which totalled 85 822 ha, representing 1.24% of the total farm land.

Sites temporarily exempt from farming are used as handling areas for building projects—in particular the construction of roads, telecommunication

Table 9.13 Farm and arable land areas per inhabitant (acres)

Year	Farm land	Arable land
1936	56.20	40.80
1950	64.80	46.70
1955	56.65	39.40
1960	53.60	37.50
1965	50.40	35.70
1970	48.93	34.47
1975	47.76	33.53
1980	45.10	31.79

lines, barrage construction, housing estates, industrial and produce-processing plant building. Temporarily uncultivated land includes land held by socialist farming organizations which, for various reasons, cannot be farmed at the moment (waterlogged, overgrown with shrubs, steeply sloped, thin topsoil, etc.), but which can be reclaimed and again serve agriculture. In some parts of Czechoslovakia, the area of temporarily unfarmed land is increasing. As a rule, it is made up of small enclaves of land in hilly, wood-covered regions, meadows scattered among the forests, and lots on steep slopes. With the contemporary heavy machinery, they cannot be cultivated or even reached, or are too far away from the farms to make their cultivation viable.

However, farm land and arable land registers not only losses, but in some years also increments. Non-farm land, by deforestation or reclamation, becomes farm land.

What, then, is the outlook for future farm-land trends? It may be assumed that, after 1981, annual losses will amount to roughly 5500 ha of farm land. However, this will be possible only provided all land-protection measures are adhered to and no more land of high fertility, often in vegetable-growing areas, is seized for the construction of housing, power stations, factories, warehouses, railway stations, etc.

Permanent losses of farm land result in a diminished farmed area per inhabitant, as shown on Table 9.13.

#### 9.4.2 Reallotments (Tables 9.14–9.16)

Reallotment changes not only the property or usage rights, but above all the economic use of land. Land reallotment in general is to provide conditions more favourable for cultivation.

Table 9.14 Trends in farm land structure (hectares)

	1937	1948	1960	1972	1980	Difference 1937-80
Arable land	5 894 722	5 870 125	5 134 114	4 989 432	4 857 300	-1 037 422
Hop fields	— <sup>a</sup>	— <sup>a</sup>	8 880	9 591	12 219	+ 12 219
Vineyards	17 015	18 639	24 466	35 720	45 343	+ 28 328
Gardens	185 356	209 172	213 908	215 718	221 706	+ 36 350
Orchards	— <sup>a</sup>	— <sup>a</sup>	48 888	78 403	77 376	+ 77 376
Meadows	1 135 310	1 153 455	1 082 098	961 202	864 974	- 270 336
Pastures	875 406	848 629	820 780	786 532	844 681	- 30 725
Total farm land	8 107 809	8 100 020	7 333 134	7 706 598	6 923 599	-1 184 210

<sup>a</sup>Hop and orchard areas for 1937 and 1948 are included under other categories.

Table 9.15 Percentage representation of main categories of farm exploitation, taking farm land = 100

	Arable land	Meadows	Pastures
1937	72.0	14.0	10.8
1948	72.5	14.2	10.5
1980	70.2	12.5	12.2

Until 1948, farm land, mostly privately owned, was split into small strips of fields in scattered locations, often quite distant from the farm buildings, sometimes even belonging to the cadastre of another village. Typical, too, were the impractical shapes of fields, particularly strips, wedges, etc., and the bad accessibility for lack of roads.

The farm land was divided into 33 million lots averaging 7 ares in Bohemia and Moravia and 4 ares in Slovakia. There were 1 507 000 individual farms.

These land-holdings badly hampered farming. In particular, they either impeded or prevented the mechanization of work in the fields, the use of sophisticated cultivation techniques, and the effective application of pesticides. In addition, they caused losses of farm land (2–3% on the average on field boundaries) which represented 240 000 ha and made melioration difficult.

Therefore, attempts had been made in the past to overcome these disadvantages by rearranging private land-holdings by various means. Thus, for example, the so-called 'rounding-off' consisted in a voluntary exchange of lots between neighbours in order to form larger and continual holdings. 'Consolidation' aimed mostly at improving the shape and accessibility of fields, 'separation' merged lots of individual farms into larger wholes.

The rationalization of land-holdings met the needs of private smallholders well, but became unusable after 1948, when, under the socialist system, farmers began to merge their fields to form collectively farmed larger areas. This transition to socialist large-scale farming called for a new kind of reallocation, which would facilitate, primarily, the joint organization and operation of agricultural production on the basis of cooperation among small and middling farmers, as well as the introduction of progressive, large-scale farming methods, providing room for the application of research findings and modern technology to ensure high productivity.

In Czechoslovakia, reallocation can be divided roughly into the following stages: 1948–52, 1952–60, 1960–71, and 1971 up to the present day.

The first stage after the passing of the Land Unification Act in 1948 mainly consisted in the ploughing-under of boundaries dividing individual fields, as one of the first steps of collectivization. Though this first unification of the

Table 9.16 Structure of cultivated areas (thousands of hectares)

Year	Cereals	Wheat	Barley	Corn	Husks	Sugar-beet	Potatoes	Bulk feed-grain	Energy-providing feed-grain	Oil crops	Fibre crops
1936	3 363	893	633	102	133	154	714	807	104	19	22
48	3 020	869	858	142	81	182	551	711	355	53	31
49	2 842	797	572	129	75	194	569	946	215	55	34
50	2 755	755	614	129	90	221	660	826	225	60	33
51	2 638	740	634	139	97	244	666	826	214	68	60
52	2 639	766	624	139	109	233	669	862	178	74	65
53	2 634	748	649	149	119	232	636	734	309	81	67
54	2 526	712	629	147	119	215	630	769	289	82	56
55	2 568	720	642	160	108	216	621	841	313	64	63
56	2 633	722	668	183	101	222	630	876	305	60	63
57	2 640	742	670	169	96	227	629	809	353	57	62
58	2 596	738	669	180	93	234	607	871	373	59	64
59	2 567	720	672	187	92	242	585	857	447	70	65
60	2 494	652	707	195	104	242	569	831	567	76	62
61	2 472	643	696	201	104	252	515	952	527	82	54
62	2 497	673	694	237	121	260	508	806	619	72	54
63	2 466	720	692	213	137	259	503	959	483	72	58
64	2 506	831	686	186	153	259	491	959	457	72	59
65	2 448	826	667	161	142	230	444	950	489	69	48
66	2 521	892	690	151	138	232	437	1 041	443	64	43
67	2 550	929	712	150	111	206	408	975	515	67	43
68	2 602	999	712	138	93	197	372	967	525	68	45
69	2 641	1 054	780	127	70	183	325	1 064	492	50	39
70	2 613	1 081	803	128	58	183	338	1 083	494	48	33
71	2 676	1 103	851	142	48	189	332	1 055	478	64	28
72	2 756	1 197	854	148	37	192	321	883	587	65	29
73	2 782	1 235	873	169	34	199	305	918	528	72	33
74	2 756	1 276	867	167	—	205	280		1 450	45	31
75	—	1 183	980	158	—	218	251		1 410	45	30
76	2 724	1 278	857	204	—	221	240		1 394	63	30
77	2 733	1 287	856	203	—	218	237		1 386	72	33

land was of fundamental economic and political importance to collective farming, some indicators even then signalled the negative effects this would have on the environment. The ploughing-under of boundaries and obsolete grassy paths and the elimination of other territorial and vegetational obstacles often entailed the pollution of surface waters and streams by topsoil.

The second stage represented a gradual transition to a higher form of reallocation, described as 'technical economic reallocation'. This facilitated the new organization of the farm land by unifying the fields of each farm to form large areas and shapes suitable for mechanized cultivation, but keeping within the framework of existing field paths, roads and water systems, such as streams, drains, ditches, etc. Obstacles in the way of field unification—such as obsolete paths, hollow ways, high boundaries with no erosion-preventing function, shrubs, isolated trees—were eliminated on the basis of simple earth-work projects.

The only road to economic and successful farming was seen in the complete clearing of the land of all biological obstacles. The reallocated territories were not considered from the water-management angle at all, and earlier reclamation was disregarded. For instance, reallocation damaged existing drainage systems, disrupting the water management of extensive areas, which led to waterlogging or water oozing to the surface. Damage was done by abolishing high-banked field paths, which sometimes stood in the way of the smooth cultivation of unified fields, but at the same time served the natural draining of surface water and flood waters, or into which opened forgotten drain outlets, for which no substitutes were built. By deep ploughing and, above all, by the new method of deepening the topsoil, old drains were either crushed or interrupted, which resulted in extensive waterlogging because the drainage systems worked in reverse and collected water into spots from where there was no way for it to escape. The waterlogged fields could either not be farmed at all and had to be left fallow, or they were farmed after long waiting periods.

Very often, land reallocation disregarded the erosion-preventing function of high boundaries reinforced by turf and shrubs. Soil, deprived of turf cover, was washed away into ditches, streams and rivers.

Gradually but inexorably, reallocation eliminated the scattered vegetation from the landscape. In particular, in the rich farm regions, which were poor in woodland, this had an extremely negative effect on micro-climatic, hydrological and soil conditions, and, above all, on the living, recreational and aesthetic value of the landscape.

Major changes occurred in the structure of cultivation in the post-war years, owing to the increasing proportion of technical crops (mainly sugar-beet) and feed-grains and the falling proportion of cereals (particularly rye and oats) and potatoes. The shift from cereals to technical crops and feed-grains on arable land resulted—despite increased yields per hectare—in a lower cereals production than in pre-war years.

### **9.4.3 Some Positive and Negative Phenomena Caused by Large-scale Farming**

All measures carried out in post-war years (and which are still being carried out in the sphere of cultivation) had one aim—to increase crops. Despite the substantial loss of farm land, crops increased, mostly owing to the changed structure, and to cultivating crops with higher yields per hectare, largely through higher doses of fertilizer. In recent years there has been a gradual transition to the use of combined fertilizers, which are more effective under unfavourable climatic conditions. Until recently, all measures taken to increase yields (fertilizing, new, higher-yield varieties, pesticides, new cultivating methods, better machines) were considered from one angle only—that of increasing yields. However, all the above measures brought secondary consequences, which were frequently under-estimated. Yields were forced up at any cost, regardless of the risks involved. It therefore is important to reassess the resulting situation and to reconsider the numerous risks incurred by constantly increasing the demands on agricultural production. (Large-scale farming is often regarded as the chief polluter of the environment, a view with which one cannot agree.)

Table 9.17 shows the trend of yields per hectare of the major field crops. The per-hectare yields of cereals were particularly favourably affected by the new varieties cultivated, among which an increasing proportion is made up of highly productive Soviet-bred varieties, especially wheat.

At present, crop cultivation is oriented towards greater concentration and specialization. In crop cultivation, concentration concerns mainly cereals, because they have the highest unit-yield from the area under cultivation, the products are easily stored and cultivation and harvesting is highly mechanized. Many farming enterprises therefore cultivate cereals three or four times in succession, although the fertility of the soil is not up to it. Figure 9.2 shows how cereals cultivation has varied over the years: in recent years the area has been about 55% of the total. This should mean that cereals may be planted twice in succession at the most. However, the small quantity of interim crops causes cereals to be grown more often.

Farmers mostly concentrate on growing wheat, because this is economically the most attractive. However, wheat is also the most demanding as to preparatory crops and individual varieties, and individual cultivation methods. Therefore, wheat is sometimes grown in entirely unsuitable climatic regions. Harvesting then is often delayed and crops lose their full value.

Thus, with increasing integration and specialization, the principles of correct crop rotation are not always respected, with a negative impact not only on crops, but also on the environment. This includes mainly the following:

- (1) On raising the quotient of cereals on arable land, the proportion of crops improving soil fertility declines, gradually impairing soil quality.

Table 9.17 Crop yields per hectare (tonnes per hectare)

Year	Cereals	Wheat	Barley	Corn	Husks	Sugar-beet	Potatoes	Bulk feed-grain	Energy-providing feed-grain	Oil crops
1936	1.58	1.63	1.61	2.31	1.49	30.86	14.35	—	—	1.09
48	1.58	1.64	1.54	2.09	1.44	23.58	11.01	—	—	0.70
49	1.83	1.95	1.79	1.87	1.45	22.04	10.15	—	—	0.87
50	1.71	1.89	1.68	1.70	1.23	28.47	12.35	—	—	0.77
51	1.99	1.80	2.18	1.39	21.39	21.35	11.05	—	—	1.04
52	1.81	2.05	1.82	1.53	0.98	20.55	11.84	—	—	0.76
53	1.92	2.08	1.92	2.88	1.30	24.11	15.26	—	—	0.76
54	1.70	1.56	1.77	2.59	1.26	26.11	13.19	—	—	0.73
55	1.99	2.04	2.01	2.44	1.45	28.51	12.73	—	—	1.05
56	2.07	2.13	2.11	2.18	1.48	20.67	15.29	5.11	18.06	1.13
57	1.97	2.06	2.04	2.65	1.16	29.83	13.94	4.46	18.36	0.97
58	1.87	1.83	1.79	2.73	1.22	29.91	10.91	4.95	—	1.07
59	2.16	2.29	2.19	2.80	1.23	20.56	10.87	4.60	—	1.28
60	2.32	2.33	2.48	3.05	1.43	34.63	9.02	4.50	21.40	1.10
61	2.31	2.60	2.28	2.47	1.39	28.03	10.40	4.84	14.83	1.28
62	2.32	2.45	2.53	2.35	1.42	22.84	9.89	3.91	14.66	1.02
63	2.31	2.46	2.35	2.93	1.41	31.42	12.96	4.64	18.80	0.90
64	2.12	2.22	2.10	2.65	1.29	29.31	15.60	4.37	18.70	0.83
65	2.18	2.42	2.14	2.79	1.45	26.10	8.46	5.55	17.34	1.26
66	2.34	2.53	2.34	3.27	1.28	34.10	13.40	5.65	21.31	1.38
67	2.58	2.71	2.73	3.03	1.70	37.61	14.83	5.32	18.30	1.46
68	2.84	3.16	2.98	3.38	1.47	41.78	17.56	5.26	21.52	1.25
69	3.00	3.10	3.23	3.99	1.79	32.16	15.90	5.28	21.18	1.20
70	2.77	2.95	2.84	4.09	1.68	36.96	14.21	5.79	24.00	1.54
71	3.30	3.53	3.36	3.98	1.89	31.27	13.94	5.53	20.15	1.76
72	3.17	3.37	3.12	4.44	1.70	36.11	15.81	5.23	27.95	1.81
73	3.51	3.78	3.40	4.03	1.69	31.09	16.75	5.92	23.58	1.84
74	3.83	3.99	3.92	4.01	1.30	39.73	16.32	5.68	—	2.08
75	3.43	3.57	3.20	5.49	1.37	35.62	14.24	6.03	—	2.06
76	3.49	3.77	3.40	3.60	1.25	24.61	17.55	5.70	21.00	1.80
77	3.85	4.07	3.77	4.70	1.68	38.40	16.04	7.88	29.25	

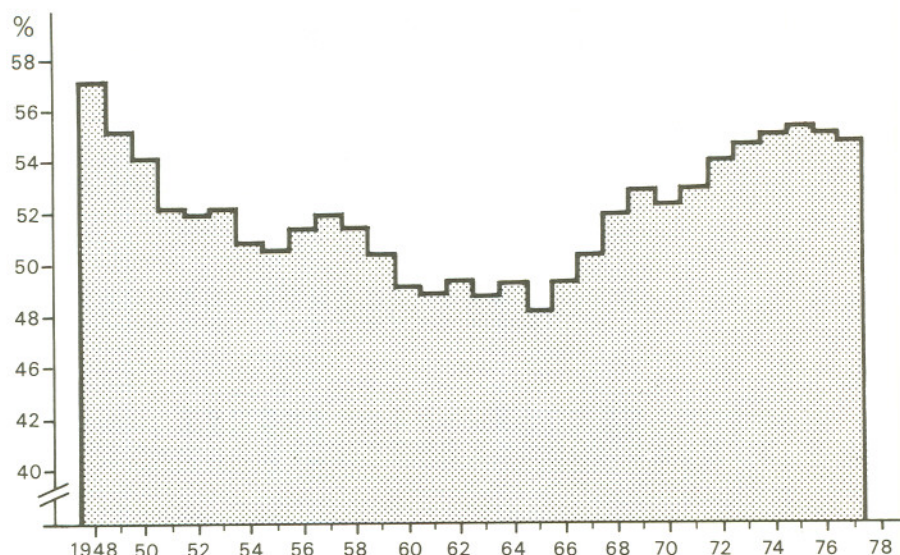


Figure 9.2 Cereals cultivation (by area) as a percentage of total cultivation

- (2) On growing cereals in too long a succession, there is a risk of so-called soil fatigue, multiplication of damaging factors (e.g. pests and plant disease), and increasing seasonal weeds following winter crops.
- (3) By repeatedly growing crops with similar biology and cultivation, vegetation factors in the soil are exploited unevenly and unilaterally, which reduces yields.
- (4) Repeated cultivation of similar spring crops leaves the soil unprotected by vegetation for a longer period, resulting in undesirable moisture evaporation, in a risk of water and wind erosion of the soil, and the runoff of unused nitrates and residual pesticides.
- (5) In connection with a repetition of similar or identical crops, the effect of unsuitable machinery on soil fertility makes itself felt, in particular the excessive use of heavy transport, cultivating and harvesting machinery.

#### 9.4.3.1 Chemicals in Cultivation

The application of synthetic fertilizers has increased very quickly throughout the entire period since the Second World War. Among the socialist countries, Czechoslovakia ranks high on the list of users of synthetic fertilizers. The trend is shown in Table 9.18 and Figure 9.3.

However, the constantly rising doses are not matched by the per-hectare yields, which are only increasing slowly, as demonstrated in Figure 9.4. For

Table 9.18 Application of synthetic fertilizers (kg/ha)

Year	Total	Nitrates	Phosphates	Potassium
1936	13.1	3.1	6.6	3.4
48	18.4	4.9	7.9	5.6
49	21.3	5.6	7.3	8.4
50	28.2	7.7	9.2	11.3
51	27.4	7.2	8.6	11.6
52	30.5	6.7	8.9	14.9
53	36.8	8.1	10.7	18.0
54	44.6	10.7	12.2	21.1
55	46.7	13.4	13.2	20.1
56	53.5	12.7	15.6	25.2
57	57.2	12.6	15.3	29.3
58	70.2	17.6	18.0	34.6
59	67.0	18.3	20.2	29.5
60	68.3	20.1	21.9	26.3
61	76.6	19.7	24.8	32.1
62	80.1	22.1	26.1	31.9
63	93.4	24.5	30.8	38.1
64	115.2	32.0	35.6	47.6
65	126.1	34.7	35.8	55.6
66	130.9	39.2	36.1	55.6
67	133.4	40.4	35.1	57.9
68	158.5	50.3	41.9	66.3
69	168.6	56.8	44.3	67.5
70	182.4	59.5	49.7	73.2
71	195.5	62.0	52.1	81.4
72	202.4	66.9	51.9	83.6
73	200.9	66.5	54.0	80.4
74	222.0	72.6	59.4	90.0
75	242.8	76.7	65.8	100.3
76	230.6	84.7	61.2	84.7
77	245.6	90.2	68.2	87.2
78	253.7	88.7	69.7	95.3

the season 1980/81, farms were to be supplied with fertilizers corresponding to 255 kg of pure nutrients per hectare, which, apart from the GDR, is the highest rate in the CMEA countries.

Compared with pre-war farming, the quantities of fertilizers used have increased 25 times, but yields have only risen by roughly 2.5 times. Although still higher doses of synthetic fertilizer are being considered for future application, salination is appearing on as much as 30 000 ha. Because in recent years the function of organic fertilizer has been under-estimated, the soils are unable to absorb the large quantities of nutrients supplied. Even the vegetation cover is unable to utilize all the available nutrients, and thus a

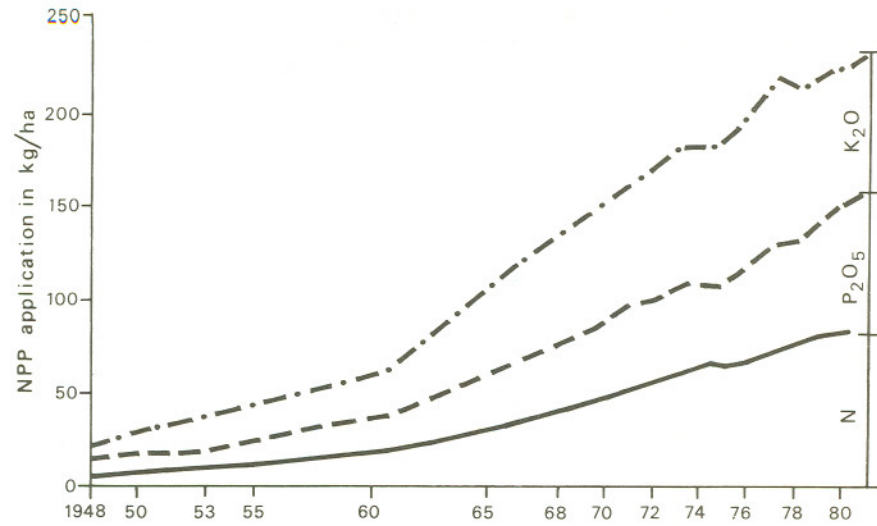


Figure 9.3 Trends in the application of artificial fertilizers in Czechoslovakia

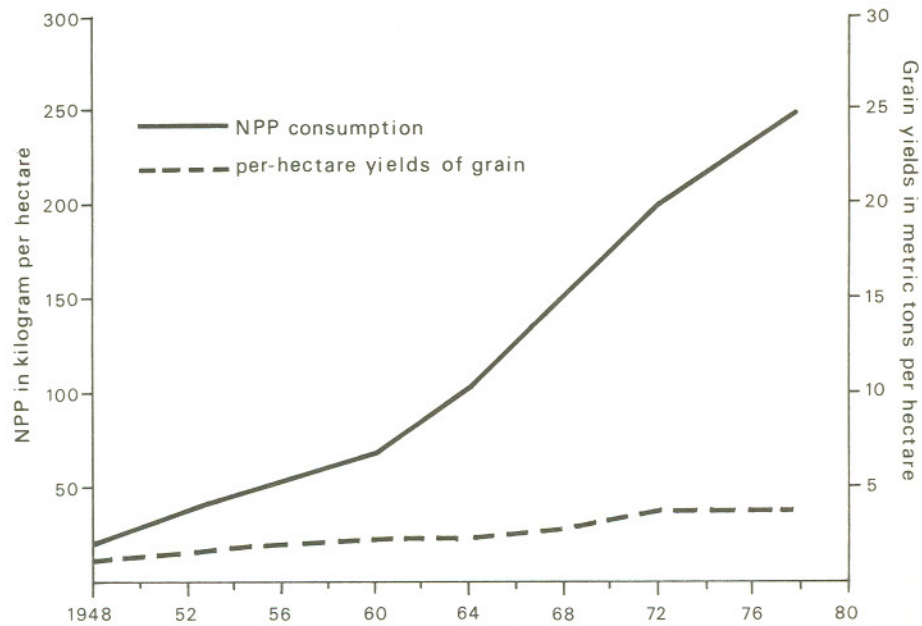


Figure 9.4 Trends in the application of synthetic fertilizers, and grain yields

— NPP consumption  
 - - - Grain yields

Table 9.19 Application of chemical pesticides

	1969-71	1975	1976	1977
Total consumption of pesticides (t)	6 078	13 302	14 239	14 487
Application of pesticides (kg/ha)	0.856	1.889	2.033	2.073

substantial part of these substances reaches surface waters and groundwater. This threatens the quality of water in all reservoirs and rivers with eutrophy caused by phosphates and unabsorbed fertilizer; the quality of drinking water is often spoiled by nitrates, which reach surface water, and groundwater by runoff from fields.

The use of plant-protecting chemicals is also increasing, as shown in Table 9.19.

These tremendous quantities of chemicals applied over large areas of land lead to the pollution of water and the environment as a whole.

#### 9.4.3.2 Adding to the Size of Fields

The steadily increasing areas of individual fields also raise the risk of damaging the environment. Within a relatively short space of time, the mosaic of tiny strips, squares and wedges changed into fields stretching beyond the horizon, often exceeding 200 ha.

The heavy machinery used on large fields has a negative effect on soil fertility and general crop yields, owing to the soil compaction. It also facilitates erosion and unproductive water evaporation.

As a consequence of the removal of boundaries, paths, ditches, copses and other obstacles impeding the surface water from running off, the risk of erosion on large fields is growing. Today, more than 720 000 ha of soil are threatened by water-caused erosion. Large, uninterrupted areas also encourage wind erosion and dust.

On too-large fields, irregularities in soil conditions are difficult to even out, in particular on slopes and uneven ground (e.g. saturation with nutrients, destruction of foci of persistent and resistant weeds, pests and diseases, differentiated soil treatment, etc.). This leads to uneven conditions of growth and development in crops, irregular vegetation and yields, and a general irregularity of soil fertility, an irregular influence on evaporation, soil erosion and weed infestation. Shortcomings in cultivation have a far more marked and negative effect on large areas than on smaller fields, distributed over the land in a mosaic.

From large crop-covered areas, footpaths through the fields, grass-covered banks, shrubbery and trees have disappeared, so small, highly valuable living areas in the environment have become inaccessible. Together with isolated trees or clumps of trees, local names of individual localities disappear and the landscape becomes anonymous.

The biological protection of vegetation on extensive fields is greatly limited, as they no longer provide any refuge for small wildlife—birds, insects and rodents—which ensure a certain biological control of the environment. Small game slowly disappears from the land farmed with wholesale methods.

Huge fields, chemicals and highly efficient machinery, with its noise and width of implements, play their parts in the contemporary decline of game (hares, for example). Unending mono-cultures offer a single-plant diet, which ends abruptly when the entire field is harvested, and the animals cannot adapt quickly enough to other available food resources.

It is obvious that the mere increase in the size of individual fields has a strong impact on the ecology of a landscape.

#### 9.4.4 Measures Needed to Combat Undesired Interference with the Environment

*Guidelines for the Preparation and Endorsement of Projects of Reallotment with Regard to its Effect on the Environment* was drafted in 1975. These guidelines, approved by the Ministry for Construction and Technology, the Ministry of Agriculture and Nutrition, the Ministry of Forestry and Water Management, the Ministry of Culture, the Home Office, the Ministry of Health and the Czech Geological Office, serve the staff on People's Committees at all levels, the staff concerned with nature conservation and the protection of the environment, as well as planners. They are guidelines for the preparation and planning, assessment and endorsement, implementation and supervision of all land reallotments, not only in order to protect the human environment, but also to ensure its purposeful formation and to increase desirable favourable effects.

The guidelines have to be applied wherever reallotments are undertaken, i.e. wherever there is a change in the exploitation of land of any type and for whatever reason. They unify and supplement the principles controlling environmental protection. They will be amended and extended in accordance with new findings of science, research and practical experience, and to cover further types of activities affecting the exploitation of territories and the environment.

In future, therefore, reallotment will be planned in accordance with the methodology issued by the Ministry of Agriculture and Nutrition and with the *Guidelines*. These determine procedures to be followed with regard to the

following problems:

- (1) wind erosion;
- (2) water erosion;
- (3) the watershed;
- (4) the biology of the environment concerned;
- (5) the social function of the environment.

Complying with the guidelines should help to avoid wholesale negative effects on the landscape such as those which occurred in the past. Thus, the open-farming landscape should fulfil not only its productive function, but also a function for the whole of society, for present as well as future generations.

### **9.5 TRANSITION TO WHOLESALE LIVESTOCK FARMING**

Livestock farming, like crop cultivation, underwent a gradual change of its internal structure during the long-term process of collectivization. The basis of livestock farming was provided by domestic animals coming from private breeders and sheds to the large cooperative or state farms.

The trend of livestock production during the past 30 years can be divided into three stages. In the years 1945–49, small-scale husbandry still prevailed, whilst the basis was being laid for socialization of that branch of the economy. During the years 1949–60, socialist production methods recorded their first successes in livestock farming. Since 1960, a modern wholesale production has developed.

In the post-war period, a substantial increase was recorded, mainly in the breeding of pigs and poultry. In the period from 1948 to 1975, animal production increased two and a half times. The ratio in the number of animals bred changed considerably. Since the end of the 1950s, qualitatively new wholesale methods began to develop, accompanied by large investments and the development of socialist agriculture.

#### **9.5.1 Trends in Farm Animal Density**

The population density of farm animals is an indication of intensity of livestock farming. In the post-war period 1949–63, the number of farm animals rose quickly. Figures for livestock per 100 hectares had exceeded the pre-war level as early as 1953 in Bohemia and Moravia in 1950, in Slovakia in 1952. Since 1954, the number of farm animals per 100 hectares of farm land remained on roughly the same level until 1965, and has been showing a mild upward trend ever since (see Table 9.20).

This trend is connected with an accelerated turnover of herds, but also with substantial changes in the structure of livestock herds. These consisted mainly in a rising number of pigs and poultry and a decline in the number of horses.

Table 9.20 Number of livestock per 100 ha of farm

Year	Livestock per 100 ha	Year	Livestock per 100 ha
1920	85	1953	105
25	93	54	97
		55	98
30	91	56	101
31	91	57	102
32	91	58	101
33	95	59	100
34	93		
36	99	60	103
37	105	61	104
		62	105
47	78	63	105
48	74	64	104
49	83	65	105
		66	101
50	96	67	102
51	95	68	103
52	98	69	103

#### 9.5.1.1 Horses

The marked decline in the number of horses bred (see Table 9.21) in connection with the spreading use of tractors in the past 30 years, also affected—apart from all the undeniable advantages which this brought about—the exploitation of the land.

The use of increasingly heavy machinery on the land leads to soil deterioration, as previously described. When horses were used as tractive force, these problems did not arise to any marked degree. Also, it is worth mentioning that even today there remain small areas of land that are not used for agriculture, as the contemporary machines cannot work small and irregularly shaped lots, nor too steeply inclined or overly wet ones, where formerly all work had been done by horse-drawn implements. Frequently, there is a missing link between contemporary strong machinery and human strength.

The curtailment of horse-breeding was not properly utilized to extend cattle-raising, though more feed had become available. In Czechoslovakia, horses are not bred for meat.

#### 9.5.1.2 Pigs

The main characteristic of animal breeding in the post-war years was the fast increase in the number of pigs and poultry (Tables 9.22 and 9.23) and the slow

Table 9.21 Numbers of horses kept

Year	Horses (thousands)	Year	Horses (thousands)
1920	567	1957	542
25	702	58	517
		59	456
30	666		
31	646	60	389
32	666	61	330
33	659	62	292
34	659	63	254
35	654	64	227
36	663	65	204
37	645	66	188
38	645	67	177
		68	166
47	653	69	
48	630		
49	628	70	144
		71	
50	629	72	
51	605	73	100
52	572	74	84
53	559	75	
54	544	76	62
55	543	77	57
56	543	78	53

increase in cattle. The great demand for meat caused the fast development of slaughter pigs. Slaughtering weight was relatively high, and only in recent years, responding to consumers' wishes, has the slaughtering weight been reduced. Between 1952 and 1970, the number of piglets raised from one sow has risen from 9.1 to 17.5. New wholesale breeding techniques have evolved and through their adoption the number of pigs has almost doubled. Pig breeding is done in large concentrations, relatively independent of the land. Compared with pre-war days, the number of pigs per 100 hectares of arable land has doubled, in Slovakia even trebled.

Currently, pigs are concentrated in large-capacity breeding and finishing houses, comprising from 5000 to 20 000 head. Of course, this increased number of pigs and their strong concentration has its effect on farm and arable land. Apart from the sties taking up much land (which, owing to their noxious smell, have to be well apart from human habitations), the main problem is the disposal of manure. Particularly during the vegetative period, liquid manure, though kept in huge storage tanks, is difficult to dispose of and

Table 9.22 Numbers of pigs kept

Year	Pigs (thousands)	Year	Pigs (thousands)
1920	2 926	1957	5 369
25	2 470	58	5 435
		59	5 283
30	2 696		
31	2 509	60	5 687
32	2 570	61	5 962
33	3 381	62	5 895
34	2 962	63	5 897
35	2 678	64	5 845
36	3 160	65	6 139
37	3 538	66	5 544
38	3 712	67	5 305
		68	5 601
47	2 944	69	
48	2 566		
49	3 242	70	5 036
		71	5 935
50	4 218	72	6 093
51	3 802	73	6 086
52	4 234	74	6 256
53	4 918	75	6 630
54	4 174	76	6 686
55	4 771	77	6 820
56	5 285	78	7 510

is often carted away in tank-trucks to distances of over 50–60 km. In addition, the land in the vicinity of the pig-breeding stations is often over-manured and there is a risk of soil contamination by parasites and germs, causing infectious diseases.

It is important, therefore, to arrange cultivation around pig stations in a manner facilitating the optimum application of liquid manure over the largest possible area.

Table 9.23 Percentages of pigs and poultry against total livestock

Year	1936	1953	1955	1960	1966	1968	1974
Pigs and poultry	25.8	26.5	28.0	32.1	34.9	33.7	38.6

Table 9.24 Numbers of poultry kept

Year	Birds (thousands)	Year	Birds (thousands)
1920	22 772	1957	23 876
25	29 009	58	24 250
		59	25 364
30	29 900		
31	31 124	60	27 569
32	32 124	61	28 157
33	34 124	62	28 805
34	36 124	63	28 032
35	37 730	64	30 093
36	38 902	65	28 840
37	41 748	66	27 752
38	42 254	67	29 446
		68	31 208
47	12 321	69	
48	13 478		
49	16 393	70	34 870
		71	38 238
50	17 794	72	39 170
51	18 206	73	39 157
52	18 690	74	41 232
53	20 787	75	
54	21 094	76	43 065
55	22 540	77	44 142
56	23 367	78	44 774

### 9.5.1.3 Poultry

During the last 30 years, the number of poultry kept has doubled (Table 9.24). Particularly in recent years, the production of broilers and eggs increased substantially. Wholesale methods for breeding broiler chickens were introduced. These, in contrast to pig-raising, did not in any essential way affect farm land exploitation. So far, there does not appear any need for special cultivation methods for disposing of manure.

Also, there has been a marked increase in the breeding of ducks. Wholesale geese-breeding has not proved as successful, owing to certain problems encountered.

### 9.5.1.4 Cattle

Throughout all post-war stages, the number of cattle increased slowest of all (Tables 9.25 and 9.26), though owing to the falling number of horses some

Table 9.25 Head of cattle per 100 ha of farm land

Year	Head
1934-38	55.4
1949-53	57.1
1954-58	56.8
1959-63	60.3
1964-68	62.5
1969-73	61.4
1974-78	66.1

Table 9.26 Trends in head of cattle (absolute numbers)

Year	Cattle total	Year	Cattle total
1910	4 377 149	1956	4 106 755
		57	4 133 866
20	4 139 010	58	4 090 845
		59	4 183 467
25	4 487 222		
		60	4 302 513
30	4 256 225	61	4 387 350
31	4 247 686	62	4 518 291
33	4 141 744	63	4 507 175
34	4 213 380	64	4 479 806
35	4 104 272	65	4 436 166
36	4 079 039	66	4 388 984
37	4 376 045	67	4 462 073
38	4 705 809	68	4 436 691
		69	4 249 376
47	3 974 851		
48	3 274 967	70	4 222 576
49	3 663 009	72	4 348 785
		72	4 466 340
50	4 212 756	73	4 466 557
51	4 303 262	74	4 555 889
52	4 376 382	75	4 654 236
53	4 445 371	76	4 553 377
54	4 082 428	77	4 653 956
55	4 040 645	78	4 758 301

feeding resources had become available. The pre-war level in the number of cattle was reached again only in 1971, when the pre-war dairy production was also surpassed. Greater meat production was attained by increasing the number of cattle, as well as by raising the slaughtering weight.

The contemporary trend in cattle-farming is oriented towards the largest possible productivity by setting up high-capacity cattle stations. The aim is to achieve a labour productivity of 60–80 dairy cows, or 350 calves, 350–400 heifers or 400–800 steers per worker. However, the concentration of farm animals over and above a certain limit produces a series of new problems and ecological phenomena. In connection with the housing of farm animals, ecological problems are at present acquiring ever-greater significance, as entirely new trends in construction strongly affect the biotope of stable and sty.

High livestock concentrations in one locality (e.g. Žehušice, 1741 dairy cows; Polerady, 5000 steers; Milotice, 3430 calves; etc.) call for gigantic supplies of bulk feed. Such quantities, despite the introduction of special cultivation methods, cannot be grown in the vicinity, and have to be transported over considerable distances, sometimes over tens of kilometres. This is all the more important wherever large cattle stations are located in the foothills of mountain regions, as transport costs over uneven ground sharply increase. Also, such stations are often located in regions where formerly cattle freely grazed on ranges (e.g. in the border mountains), whereas today it is necessary to concentrate fodder in one spot, sometimes in quite distant places.

The composition of livestock feed in super-large cattle stations has been changed, feed mixes replacing bulk feed, which is more difficult to handle. Very often, as much as 75% of the grain produced is fed to livestock and poultry, which leads to an incessant increase in the grain cultivation area, with all accompanying phenomena described in the preceding section.

#### **9.5.1.5 Sheep**

The least favourable post-war trend appears in the number of sheep farmed (Table 9.27). Although the pre-war density per 100 ha had been reached as early as 1952 (10.9 head) and the increase continued until 1954 (14.4 head), after 1955 their numbers began to fall. In recent years the number of sheep is rising again, owing to increased consumer interest in mutton and lamb, sheep cheese and other dairy produce.

Over the territory of Czechoslovakia, sheep farming is distributed irregularly. It is concentrated mainly in the hills and mountains of Slovakia. Sheep are used, too, to graze off the grass on airfields, in water-protection zones, etc. In recent years, the number of small sheep-farmers has been increasing again, and they are using a number of small areas, gardens and fallow fields as pasture for their animals.

Table 9.27 Numbers of sheep kept

Year	Sheep (thousands)	Head per 100 ha	Year	Sheep (thousands)	Head per 100 ha
1920	878	10.8	57	956	13.2
25	744	9.2	58	889	12.3
			59	817	11.1
30	506	6.5			
31	438	5.7	60	727	10.0
33	381	4.9	61	646	8.9
34	395	5.1	62	603	8.3
35	424	5.5	63	527	7.3
36	453	5.8	64	527	7.4
37	486	6.3	65	568	8.0
38	534	6.9	66	614	8.6
			67	670	9.5
47	491	6.6	68	770	10.9
48	386	5.2	69	906	12.8
49	459	6.2			
			70	977	13.9
50	531	7.2	71	—	—
51	596	8.1	72	—	—
52	800	10.9	73	—	—
53	982	13.4	74	842	11.6
54	1 017	14.4	75	805	11.4
55	1 017	14.2	76	797	11.4
56	1 000	13.7	77	841	12.0

#### 9.5.1.6 Goats

Until the Second World War the keeping of goats was fairly common, but with the progressing specialization of farming it lost its importance. The number of goats fell sharply and no attempt was made to farm them on a larger scale. Today, about 82 000 goats are kept in the whole of Czechoslovakia.

#### 9.5.1.7 Domestic Animals

The falling number of 'domestic' animals kept by individual rural inhabitants (cattle, sheep, geese, goats) led to the common pastures, owned by almost every village, falling into disuse. These pastures, the 'village commons', usually covered less fertile grazing ground near the village. After the transition to wholesale cattle farming, these village commons lost their function, natural dissemination covered them with brush or otherwise changed their plant-life, and frequently they became a source of weed infestation. Often,

these unused pastures are ploughed up and used as arable land, though their quality is low.

### **9.5.2 The Trend Towards Concentration in Livestock Production**

At the very beginning of the collectivization of Czech agriculture, it became obvious that it was absolutely essential, for economic and operational reasons, to transfer the livestock from their small, inferior sheds scattered throughout the whole village into communal sheds and stables, which would have at least some mechanization.

In that first stage of collectivization, larger farms and estate stables for 20–30 head of cattle were used for the purpose. Where there were no such facilities available, barns were converted to house the animals in the villages and, if there was enough space, larger cowsheds for 50–70 animals were added to them. The newly built or converted stables in the villages, with too many animals crowded in and insufficient technology, though serving their economic purpose, did not bring any marked improvement in working conditions. Moreover, they had a negative effect on the village environment.

During the next stage of development, the institute 'Agroprojekt' in Prague and its branch offices drafted, in 1954, so-called 'development plans' for all Unified Agricultural Cooperatives (i.e. for every village). These had an agricultural part, which included a calculation of the numbers of cattle and other livestock that could be supported by the available land. The technical part contained the selection of a site and planned the necessary sheds for the envisaged number of animals.

The adapted sheds in the villages were abandoned, including the adjacent grounds which had served as paddocks. Those buildings, yards and gardens, left to their fate, soon became derelict and an eyesore in the villages. The new cattlesheds, made to house 96–105 head of cattle, mostly without any storage rooms, were built on farm land, in order to comply with the extremely strict hygienic, veterinary and fire-prevention regulations.

The plan contained the distribution of the various kinds of animals into production centres. At the time, larger concentrations were already proposed:

500–600 dairy cows	or
400–600 calves	or
600–700 steers	or
200–400 sows	or
1500–3000 pigs	or
10 000 hens.	

As an alternative, the concentration of pig-finishing into three locations with 12 500 head each and two poultry breeding stations with 100 000 birds each was proposed in some districts.

Based on the results of these studies, principles and methods for all districts were to be derived. Compiled by design offices, university departments and research institutes, these studies were of key importance for territorial projections of agricultural production and its relationship to comprehensive district planning.

Though these territorial district studies undoubtedly brought some positive results, they could not be considered a final solution, in view of changing concepts and unclarified long-term problems related to economics. For this reason, work on them was stopped. However, the studies did show that it was just as unrealistic to approach problems of human settlement only from the angle of agricultural production, as to under-estimate or disregard farming when planning settlements.

In 1963—the next evolutionary stage—the Farm Production Authorities compiled so-called General Regional and District Plans as long-term outlines of agricultural production up to the year 1970. However, these were not comprehensive and did not approach farming investments and rural construction from the district-territorial angle. They were only a sectional back-up document.

The period of agricultural construction after 1960 was already characterized by attempts to introduce specialization and concentration of crop cultivation and cattle-farming, permitting wholesale production methods. Objects built in those days were already equipped with more up-to-date machinery, animals were mostly standing on grids without beds of straw. This raised labour productivity, e.g. one attendant tended 30 dairy cows. The sheds were at a distance from the villages and, to make construction cheap, were built on flat sites, often on the best arable land. This procedure in turn led to the construction of housing for the farm workers nearby, as well as of further farm buildings and installations, resulting in many cases in a shift of the village to the new site, outside the original settlement, which became deserted and neglected.

This state of affairs showed the need for approaching the development of villages by country planning methods. In 1958, the State Committee for Construction of that time (SVV) issued Regulation 22 on building documentation, including JZD buildings, which stipulated that all construction work had to be preceded by so-called technical-economic analysis (TER). This was a simplified method of country planning to be employed in individual villages.

Similarly, construction work at state farms had to be based on so-called technical-economic projects (TEP). These methods of planning and designing buildings could be applied only from 1960, when, concurrently with the territorial reorganization of Czechoslovakia's administration, the first mergers of Farming Cooperatives (JZD) to form larger economic units were taking place. As a result, the TER method, which was applicable only to one JZD within one village, no longer fully corresponded to the problems at hand, not meeting the need of merged Unified Farming Cooperatives.

Therefore, in this period of transition it became necessary to approach problems from the aspect of broader production relations. To this were added further, unclarified views on eliminating the difference between industry and farming and between town and rural areas.

On 22 November 1960, the Central Committee of the Communist Party of Czechoslovakia decided that all these matters should be treated in a pilot project covering ten selected districts, in the form of Territorial District Plans, part of which should be a territorial pilot plan for the economic territory covered by a single farming organization—i.e. the merged JZD. The Territorial District Plans included:

- (1) a project for the territorial organization of the district and its settlement structure;
- (2) a project for the territorial organization of farming production and construction.

Farming enterprises was proposed in a way that would facilitate maximum application of wholesale farming methods and technology.

The livestock farms, however, turned out to be mere shadows of the original concepts and had numerous operational, technical, architectural and constructional faults and shortcomings—such as un-reinforced access roads, connecting ways and handling areas, neglected (often devastated) immediate surroundings of the farms without any greenery, uninspired building designs, which were often left unfinished. Drains and lighting were bad, dung-heaps and dungwater-pits too small, hygienic facilities for the workers insufficient and frequently not functioning.

These shortcomings had several causes, the most important of which were (i) a noncomprehensive approach to design and construction, (ii) non-compliance with designs and plans, and (iii) limited funds which resulted in economizing measures. Architectural design was underestimated or suppressed for fear of increasing costs.

### **9.5.3 Brief Operational–Economic Evaluation of Large Cattle sheds**

To date, no strict limits have been set as to how big a concentration of domestic animals is supportable for individual regions. There is no doubt that—despite the difficulties encountered—wholesale cattle farming will increase. A brief economic assessment is given below.

#### **9.5.3.1 Calf-raising Stations (over 500 animals)**

In 1977, in the Czech Socialist Republic alone, there were 69 calf stations with a capacity exceeding 500 animals. The daily weight increment during the milk-feeding stage was 616 grams, during the plant-feeding stage 706 grams. Production costs per kilogram amounted to 16.26 crowns. A serious problem

was the high number of animals lost by forced slaughter and perishing, which averaged 9.07%.

#### **9.5.3.2 Raising Heifers (capacity over 300 animals)**

In 1977, there were 61 heifer stations with capacities exceeding 300 animals. The average capacity was 620 animals. The daily weight increment was 558 grams and production costs per kilogram averaged 19.48 crowns. Forced slaughter accounted for 1.89%, perishing 0.47%.

#### **9.5.3.3 Large-capacity Dairy Farms (exceeding 300 animals)**

In 1978, large-capacity dairy farms contained a total of 113 358 animals, corresponding to 8.6% of the total in the country. In one-quarter of them, annual milk yields were very low (less than 2600 litres per cow), while another 25% attained good milk yields (more than 3400 litres per cow). 30–40% of the dairy cows were bracked out annually, so that they did not even reach their maximum lactation age.

#### **9.5.3.4 Cattle-fattening Stations (over 500 animals)**

In 1977, there were 78 large cattle-fattening stations, averaging 754 animals. The daily increment in weight amounted to 767 grams and the costs of producing 1 kg of meat averaged 16.98 crowns. Out of the average number of steers, 9.84% had to be slaughtered prematurely and 1.21% perished. The highest losses were among animals stabled on grids, the lowest among those stabled on deep straw.

### **9.5.4 Guidelines for Assessing Wholesale Farming Buildings**

In 1972, the *Guidelines for Assessing Buildings Serving Wholesale Farming Production with Regard to Environmental Protection*, which were compiled jointly by four ministries, were issued. After testing, these guidelines were to be transformed into generally binding legal regulations.

Plans for farming construction have to be considered very carefully. Decisions on location and erection of new large-scale farming operations must be preceded by a comprehensive analysis of all their possible effects on and consequences for the environment. The main responsibility for this activity will rest with the People's Committees at all levels. It will be primarily in their hands to minimize the negative impacts on the environment.

## 9.5 CONCLUSIONS

The goal of the socialist system, which is interested in permanently high production and not short-term profit, must be to strive for the optimum, not the maximum, in managing its natural resources. Therefore, the urgent need to eliminate possible conflicts between economic and biological reproduction is moving into the foreground.

Efforts must increase to optimize economic development while keeping in view the ecological aspects of the natural environment and the healthy progress of human society. This involves a constant battle to suppress one-sided and biased approaches inclined to give priority to group or local interests.

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