
*Changes in Agricultural Productivity
in the Kingdom of Poland
in the XIXth and Early XXth Centuries*

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Introduction

This paper attempts to estimate changes in agricultural production and in land and labour productivity in the Kingdom of Poland between 1808, and 1913. Data for the years 1808/10 have been calculated for the part of the Duchy of Warsaw which was included in the Kingdom of Poland in 1815. The statistical data on agricultural production, arable land areas, population etc, which are utilized in this paper, have been taken from the various studies cited in the references. The data cover the following branches of production. Crop production includes: cereal crops (wheat, rye, barley, oats, buckwheat and millet), root crops (potato, sugar beet), pod (pulse) crops (pea, broad bean, bean), oil plants (rape, flax and hemp), fibre crops (flax, hemp) and hay. Estimates of crop production are based on average values over periods of a number of years expressed in metric terms.

Animal production includes: meat (beef, veal, pork and mutton), milk and raw wool. It has also been estimated in metric values. Other agricultural products cannot be taken into account

due to the lack of statistical data, so that agricultural production calculated in this manner is therefore underestimated, but the difference seems small since the products omitted did not play an important role, which is why they were not recorded, and their absence is not likely to change the general trend, which is what is essential.

The estimates cover twelve chronological cross sections determined by the availability of data concerning production of basic crop and animal commodities. Data calculated for each section are complete but some estimates have been necessary where there are no figures. For example, the lack of data on flax and hemp production means that it has been estimated on the basis of the volume of the seed produced in proportion to seed fibre production in the years for which both are known.

The lack of hay estimates before 1900 made it necessary to estimate the productivity of meadows and pastures recorded in the first years of the Kingdom of Poland, in the 1860's and at the end of the nineteenth century. Average yields of 10 (quintals/hectare) for meadows and 5 (quintals/hectare) for pastures have been applied throughout the nineteenth century since these were seldom improved on. Additional problems arise from the need to estimate the area of pasture, which was not recorded before 1842. We have assumed that the share of pasture had not changed before and amounted to about 8 percent of the total area.

Meat production in the nineteenth century has been estimated by T. Sobczak,¹ who also provides sources concerning liveweight and meat production per head between 1802 and 1860. Together with meat production, these figures are available for the last years before the First World War,² and using

¹ T. SOB CZAK, *Przełom w Konsumpcji Spożywczej w Królestwie Polskim w XIX w.* [Food Consumption in the Kingdom of Poland in the Nineteenth Century]. (Wrocław, 1968), pp. 87-9.

² S. JANICKI, ed. *Stosunki Rolnicze Królestwa Kongresowego* (Agricultural Relations in the Kingdom of Poland). (Warszawa, 1918), p. 548.

these data it is possible to estimate meat production for earlier periods. Milk production for the years 1808, 1825-7, 1848, 1870 and 1899 has been calculated by T. Sobczak,³ and for 1910 by S. Janicki.⁴ Both give estimates of the milk yield capacity of cows in various periods, which serve as a basis for estimating milk production in the remaining time periods in the present paper. Changes in the milk yields have been interpolated and the number of cows also estimated whenever they have not been distinguished from the total number of cattle. Estimates of wool production were based on an average output of 1.2 kg of raw wool per sheep given in various sources and for various periods, and referred to by W. Pruski.⁵

In order to bring together the various crop and animal products into aggregate agricultural production, individual products have been transformed into conventional (grain) units based on the starch and protein content in relation to 100 kg of grain.⁶

Agricultural Production

In the years 1808-1911/3 total agricultural production was expanding and at the end of the period under consideration it was more than six times higher than at the beginning (Cf. Table 1). However, the rates of growth varied; before 1827 the mean annual rate of increase amounted to 1.5%, the animal production growing faster (2.6%) than crops (1.0%). This relatively high rate of growth was due to the agricultural revival after the Napoleonic wars, and probably took place mainly in the 1820's, when the government of the Kingdom of Poland took various steps to raise the level of the country's economic development

³ T. SOB CZAK, *op. cit.*, p. 151.

⁴ S. JANICKI, *ed. op. cit.*, p. 547.

⁵ W. PRUSKI, *Hodowla Zwierząt Gospodarskich w Królestwie Polskim w Latach 1815-1918* (Animal Breeding in the Kingdom of Poland in the Years 1815-1918). I, pp. 81-2, II, pp. 138-9.

⁶ Cf. G. BLOHM, *Angewandte Landwirtschaftliche Betriebslehre*. 3 Aufl. (Stuttgart, 1957), pp. 85-6.

TABLE 1

CHANGES IN AGRICULTURAL PRODUCTION

Year	Agricultural production					
	vegetable	animal	total	vegetable	animal	total
	in million of conventional (grain) units			in percentage		
1808/10	12.9	5.4	18.3	69.6	30.4	100.0
1827	15.2	7.8	23.0	65.2	34.8	100.0
1839/40	15.7	7.9	23.6	66.0	34.0	100.0
1846	18.9	9.4	28.3	66.1	33.9	100.0
1858	21.6	13.7	35.3	60.7	39.3	100.0
1863	33.7	15.3	49.0	69.2	30.8	100.0
1870	33.8	17.7	51.7	65.4	34.6	100.0
1881	41.6	26.5	68.1	60.7	39.3	100.0
1888	46.6	30.5	77.1	60.1	39.9	100.0
1899	53.8	35.9	89.7	59.7	40.3	100.0
1907	69.1	38.8	107.9	63.9	36.1	100.0
1911/12	83.8	35.2	119.0	70.2	29.8	100.0

by stimulating metallurgy, coal mining, metal-processing and textile industries. The latter (mainly woollen products) were sold both at home and in Russia. The rapid increase in industrial production and credit assistance for large landowners created a favourable climate for reconstruction and agricultural development, especially on the larger estates.

The major features in the increase in agricultural production included: the expanding area under cultivation (increased by 48 percent)⁷ which had been considerably reduced in the last years of the Napoleonic wars, the revival and development of animal husbandry (increase in livestock by 33 percent⁸ and improving

⁷ In the years 1822-7 the share of the area under crops had grown from 46 to 58% of the arable land area. Cf. I. KOSTROWICKA, *Produkcja Roślinna w Królestwie Polskim. Próba Analizy Ekonomicznej* (Crop Production in the Kingdom of Poland. An Attempt of Economic Analysis). (Warszawa, 1961), II, p. 77.

⁸ One large animal unit = 1 head of cattle = 2/3 of a horse = 10 sheep = 4 hogs. Cf. J. LESKIEWICZOWA, ed. *Zarys Historii Gospodarstwa Wiejskiego w Polsce* (Outline History of Rural Economy in Poland). III, (Warszawa, 1970), p. 491.

yields (by 22 percent) due to intensified natural fertilizing and a more careful cultivation.

In the following period (1827-40) agricultural production expanded only slightly (2.6%). To call this stagnation would be too simple however. Until the end of the 1820's the economic life of the Kingdom of Poland was quite animated, and this was reflected in agriculture as well. The November Uprising (1830-1) had brought this development trend to an end. The major hostilities (ten months of military operations), in which more than 150,000 Poles took part, requisitions and plunder by the troops, damage to crops, stock and farm animals, a decrease in the population, the loss of autonomy after the uprising and other Russian reprisals (including confiscation of about 10% of the large landed estates) inevitably affected farming in the 1830's. As a result the area under fallow grew more rapidly than arable land, and attempts to repair the damage due to the uprising were based mainly on a spatial expansion and not on any intensification of production. Although there was a decline in the area under cultivation (by 1.7 percent in the years 1827-40), total agricultural production in 1840 was not lower than that of 1827 mainly due to a changed crop structure, and in particular to the increase in the area under high yielding potato cultivation, whose share in crop production grew from 3.5 to 9.2%.

From 1840 to 1863 there was another boom in agricultural production, the rate of growth being highest at the beginning and in the last years of the period. A rapid growth of production in the early 1840's (average of 3.3% per annum between 1840-6) was due to a considerable extension of the area under cultivation (Cf. Table 2) and the arable land area. This meant an acceleration of the earlier pattern of extensive agricultural development with little change in yields.

In the late 1840's the growth rate of agricultural production fell, to increase again in the late 1850's, and the last years before the Emancipation Act (1858-63) were a period of a record-break-

TABLE 2

CHANGES IN AGRICULTURAL PRODUCTIVITY

Year	Productivity					
	Land			Labour		
	vegetable	animal	total	vegetable	animal	total
	per hectare of agricultural land			per person living from agriculture		
conventional (grain) units						
1808/10	2.21	0.93	3.14	4.57	1.92	6.49
1827	2.53	1.31	3.84	4.80	2.48	7.28
1839/40	2.22	1.11	3.33	4.55	2.27	6.82
1846	2.39	1.20	3.59	5.05	2.53	7.58
1858	2.79	1.77	4.56	5.96	3.78	9.74
1863	4.33	1.96	6.29	9.03	4.09	13.12
1870	4.18	2.18	6.36	7.47	3.91	11.38
1881	5.07	3.24	8.31	7.79	4.98	12.77
1888	5.45	3.58	9.03	7.77	5.10	12.87
1899	5.85	3.90	9.75	7.51	5.01	12.52
1907	7.51	4.21	11.72	8.58	4.82	13.40
1911/13	9.10	3.83	12.93	9.54	4.01	13.55

ing growth rates (average of 7.8% per annum), due both to the extension of the area under crops (potatoes included), to increased yields and to the growth in animal breeding. These years saw the fruition of many of the attempts to intensify farming which had been made since the 1840's, including better utilization of the three-field system, introduction of four-year or longer crop rotations with a decreasing share of fallow, and even regular rotation systems without fallow initiated on some estates. As a result the area of fallows fell by 39% during the years 1846-63. No less important was the trend towards changing villein services into rents and the growth of the internal market due to industrialization intensified in the 1850's⁹ while good prospects

⁹ The industrial revolution intensified in the middle of the nineteenth century. The development of industry was connected with extension of the home market and with exports to Russia after the customs frontier between the Kingdom of Poland and the Russian Empire had been removed in 1850.

for exports to Prussia and western Europe, particularly after the removal of corn duties in England, also stimulated agricultural development. In the years 1854-62 agricultural exports (mainly grain) from the Kingdom of Poland increased more than ten times.

The Emancipation Act of 1864 radically changed the situation in agriculture. The great landowners were deprived of free labour and rents, and were forced to reorganize their estate economies using hired manpower and providing their own stock and farm animals. The process started a gradual transformation of the feudal estates into capitalist enterprises although the intensity of this process varied in time and space in relation to the general level of development of individual regions and to the situation of the agricultural market.

The situation of the peasant farms also changed. Having obtained the proprietary rights of the land they had formerly utilized, the peasants became independent of the manors, although preservation of the large estates and their domination over the countryside maintained several relics of the old system. New kinds of relationships were formed due to the increase in land fragmentation, and the large (especially in the south) number of peasants possessing either very small plots or no land whatsoever and the "land hunger" connected with this. Taxes replaced villein services and rents, and to pay taxes and buy necessary goods and land the peasants had to sell their products or their manpower. This forced participation in the market drew the peasant economies into the market and brought about the stratification of rural communities. Gradually a small group of rich peasant farms emerged with an interest in the growth of agricultural production and the commodity market. On the other hand there was a steady decline in the number of small farms unable to feed the owners and their families, and also in the number of landless peasants selling their labour power both in agriculture and outside.

Emancipation also changed the earlier distribution between the larger estates and peasant lands. Instead of the former expansion of larger estates, the extension of the smaller peasant farms now began, and the share of the peasant farms in the total arable land area grew from 37.5% in 1873 to 48.8% in 1904. This new situation emerged after emancipation and the changes in the agrarian structure considerably influenced the development of agricultural production after 1864. The difficulties, faced by larger landowners in reorganizing their farms and the growing atomization of the peasant farms which were not able to finance modernization, caused a rapid fall of the rate of growth in agricultural production. In the years 1863-70 it was only 5% (average of 0.76% per annum) despite an increase in the area of arable land and cropland of 8%.

The post-Emancipation depression in the Kingdom of Poland had been overcome by the 1870's, and in the years 1870-81 the average annual rate of growth for agricultural production was 2.9%, that of animal production being even higher (4.6% per annum). This was due, above all, to the rising investment in dairy cattle breeding, particularly in the big estates, and to pig breeding, the basic product of the small peasant farms. At the same time fallow was greatly reduced and crop rotation systems without fallow were more and more widely taken up.

In the mid-1880's the rate of growth in agricultural production fell again. There were two reasons for this. Firstly, the European agricultural depression whose delayed influence affected the Kingdom of Poland on account of the German protective tariffs — two German tariff increases in 1885 and 1889 practically ended Polish grain exports to the West. Secondly, large quantities of grain and flour began to arrive from the East (mainly the Ukraine) facilitated by the introduction of differential railway tariffs in Russia (1885). The aim was to soften the effects of the agricultural crisis in the southern provinces of Russia which had lost their German markets and had only limited possibilities for

grain exports to England (in the years 1870-85 Russian exports to England fell from 47 to 29% mainly due to the lack of demand). The expansion of Russian farm products in the Kingdom of Poland brought about a prolonged decline in prices.¹⁰ The price fall affected the grain-orientated large estates and the big peasant farms: the former sought means of raising profitability by intensifying crop cultivation and animal breeding, whereas the latter — apart from some attempts to intensify production — generally looked to extend the area of their farms.

The Polish grain market recovered in the years 1884-99 as a result of increased domestic demand. Industrialization was now well under way, and the economic structure of the country was changing to a mixed agricultural-industrial base. In the years 1870-1900, industrial production grew from 114 to 656 million roubles, while agricultural production rose from 250 to 400 million roubles. The highest rate of industrialization occurred in the last five years of the nineteenth century, when 45% of all the industrial plant of the Kingdom of Poland was constructed.¹¹ Industrial development brought much of the country population to towns, and extended the domestic market for farming products, since the urban proletariat was receiving increased wages and spending more on consumption. Industry also demanded more agricultural raw materials, and so stimulated the intensification and specialization (grain, animal breeding, food-processing) of Polish agriculture.

Agricultural methods were improved mainly on the landed estates, while the large number of smaller peasant farms used traditional methods and spent their limited financial means on buying more land. This intensification was illustrated by increasing yields. In the years 1888-1911/3 potato yields had grown

¹⁰ In the years 1880-95 wheat prices fell by 47% and rye prices by 58%. Cf. Z. KORMANOWA AND I. PIETRZAK-PAWLOWSKA, eds. *Historia Polski* (History of Poland). III, (Warszawa, 1960), p. 399.

¹¹ *Ibid.* p. 405.

by more than 70%, and those of the four cereal crops (wheat, rye, barley and oats) by 50%.

The turn of the nineteenth century therefore saw accelerated growth in agricultural production in the Kingdom of Poland. Total production had grown by 20% over the years 1899-1907 (average 2.5% per annum) and by almost 10% over the years 1907-11/3 (average 2.1% per annum). The increase was mainly due to the expanding crop production.

The expansion of animal production, which up to 1907 grew more slowly (average 1.0% per annum), was checked in the last years of the period under consideration. This was due to a rapid fall in the livestock population by 13% in the years 1907-11/3 (large animal units), which had already begun in the 1890's due to export restriction and strong competition from cheap Russian cattle and pigs. In these circumstances the meat orientation of animal husbandry became profitless, but before 1907 the decrease in livestock was compensated by the improved quality of the animals and the developing dairy industry, so that animal production did not fall but grew more slowly. The change came in the last prewar years and mainly affected peasant animal breeding.

Unlike animal husbandry, crop production grew more and more rapidly (average of 4.3% per annum over the years 1907-11/3). This was mainly due to keen demand on the domestic market and to decreased Russian competition, as Russian grain exports to the West increased. As a result prices rose and in 1895-11/3 reached the level of the pre-depression year 1885. It must be pointed out that while the Kingdom of Poland in the second half of the nineteenth century had a surplus of grain, after 1893 had become an importer of grain. A detailed study of the trade balance of the Kingdom of Poland shows a trend towards an excess of grain and cereal imports over their exports, which started at the end of the nineteenth century. This situation strengthened the grain orientation of agricultural production.

In 1911/3 the share of crop production in total agricultural production was 70% and the share of cereals in crop production was 59% (42% of total agricultural production).

Agricultural Productivity

There are three possible measures of agricultural productivity: land, labour and capital productivity. Since data on capital productivity are not available and as it can to some extent be considered as the inverse of labour productivity, only the changes in land and labour productivity are discussed in the present paper.

Land productivity (that is agricultural production per hectare of agricultural land) in the Kingdom of Poland grew by more than six times over the century under consideration (Cf. Table 2). This rate of growth was differentiated however and in the years 1808/10-27 amounted to an average of 1.3% per annum, animal production growing more rapidly (average of 2.4% per annum) than crops (0.8% per annum). This was due to the livestock revival after the Napoleonic campaigns and a generally favourable market situation in the Kingdom of Poland in the 1820's.

A considerable increase in agricultural production in these years (Cf. Table 1) took place with a very small extension of arable land area (increase by 2%). It was mainly due to extension of the area under crops (up by 48%) at the expense of fallow (down by 29%) whose area had grown in the first two decades of the nineteenth century. Even in 1822 the area under crops accounted for 46% of the arable land, while further development increased this share to 58% in 1827. Though still using the three-field system, the farm economy revived. Animal breeding expanded as well, the number of livestock per 100 ha of agricultural land grew from 29 to almost 38 in large animal units. Extension of crops on to the land that had lain idle for several years and the possibility of increased fertilizing (the expansion in animal

breeding raised fertilizing capacity) brought about an increase of grain yields by 22%, which meant a return to the levels of the end of the eighteenth century.¹²

Agricultural prosperity was radically interrupted in the 1830's and the years 1827-39/40 saw a fall in land productivity by 14%. This was due to the imbalance between the considerable extension of the arable land area and the slower increase of production. Agricultural expansion was not accompanied by any intensification of land cultivation and by increased yields, and proved to be mainly extensive. The extension of arable land area was not accompanied by an increase in the area under crops, and as a result the percentage of land under fallow grew by 27%. The increase in the fallow area (average of 4.4% per annum), was more rapid than that of the arable land area (1.8% per annum) which also meant that the area lying fallow had grown. The percentage of fallow in the total arable land area had fallen considerably in the 1820's, but grew over the next decade from 42% in 1827 to 54% in 1840. This meant not only extensive development of agricultural production but also further extension in the 1830's. This can be explained if the overall situation of agriculture and also the economic life of the Kingdom of Poland in these years are taken into account.

The circumstances of the November Uprising also affected agricultural productivity and served to increase the area under fallow. Agricultural revival and development took place under difficult conditions that were not conducive to the intensification of the agricultural economy. In the late 1830's, when the area under crops had not yet reached the pre-uprising level, agricul-

¹² Average yields of cereal crops in the last thirty years of the eighteenth century are estimated at three to one. Cf. T. KORZON, *Wewnętrzne Dzieje Polski za Stanisława Augusta 1764-1794* (Domestic History of Poland under Stanislaus August 1764-94). (Krakow, 1897), I, p. 334. In 1827 a harvest of 10,4 million korzecs was obtained from 3,5 million korzecs sown, which gives the same ratio of three to one. Cf. F. RODECKI, *Obraz Jeograficzno-Statystyczny Królestwa Polskiego* (A Geographic and Statistic Representation of the Kingdom of Poland). (Warszawa, 1830). Table III.

ture expanded at the expense of forests which were felled probably to obtain the capital needed for agricultural recovery. The land obtained in this manner increased the arable area, but fallow rotation systems were mainly used on these "nowiny" lands (new lands). As a result the area of arable land grew considerably and so did the proportion of the fallow area, and this necessarily affected land productivity which fell both in crop production (by 11.8%) and in animal breeding (by 12.3%).

After 1840 land productivity began to grow. Until 1846 the rate of growth was similar to that of the years 1808/10-27 (average of 1.3% per annum) and resulted from a further extension of the agricultural land area (average of 1.9% per annum) and especially of arable land (2.7%), the fallow area becoming limited (average drop of 1.6% per annum over the six years) in favour of the area under crops which grew at a record-breaking rate (average of 6.1% per annum). The improved ratio between the area under crops and fallow or rather its reversal (46:54 in 1840, 54:46 in 1846) in favour of the former, brought about a more rapid rate of growth in production than in that of the cultivated area. As a result, land productivity grew while yields remained almost unchanged.

The rate of fallow elimination to the benefit of the area under crops increased after 1846 and particularly in the years 1858-63 (average 3.3% per annum). As the arable land area had not expanded over the years 1846-63 (statistics even suggest it fell by 4.5%), the share of fallow decreased considerably from 46 to 29% of the arable land area. This means that rotation systems without fallow were then gradually being introduced. One can estimate that by 1864 crop rotation systems without fallows accounted for about 18% of the arable land.¹³

Apart from better utilization of arable land, increasing land productivity was also influenced by the development of animal

¹³ Cf. I. KOSTROWICKA, *op. cit.*, II, p. 53.

breeding (the number of livestock per 100 ha. of agricultural land had grown from 31 to 42 large animal units in the years 1846-63) and by changes in crop structure, due to the diffusion of more intensive crops (potatoes, sugar beets, industrial plants). Of particular importance were the potato crops, the area of which had increased by 15% over the years 1858-63.

Until 1858 land productivity increased more rapidly for animal breeding (average of 4% per annum) than in crop production (1.4%). The years 1858-63 brought a considerable acceleration in the expansion of crop production (average of 11.2% per annum) due to the beginnings of agricultural intensification: rotation of crops without fallows, improved tools, and the increasing cultivation of intensive crops.

The difficulties which Polish agriculture had to face after Emancipation checked the increase in land in the years 1863-70. The growth in agricultural production was slow (average of 0.76% per annum) and so was the increase in the arable land area (1.13%). As a result the productivity of land under crops fell (average of 0.5% per annum) although this was slightly improved by expanding animal production. All in all, land productivity increased slowly (at an average rate of 0.16% per annum).

It is noteworthy that in these years the increased arable land was cultivated traditionally as is shown by the fact that the increasing area under crops (average of 1.1% per annum) was accompanied by a slightly higher rate of increase in fallow land (1.2%). A certain extension of crop production was also due to a fall of the proportion of the area under intensive crops in the total area under crops (from 14.8% in 1863 to 11.2% in 1870).

In the 1870's the rate of the increase in land productivity grew (to an average of 2.8% per annum in the years 1870-81), that for animal breeding being higher (average of 4.4% per annum) than for crop production (1.9%). Land productivity increased to the development of animal breeding (the number of livestock per 100 ha. of agricultural land had grown from 44 to 50

large animal units) and although to a lesser degree to a further extension of the area under crops (average of 1.1% per annum) at the cost of fallow (a fall of 2.2% per annum). Favourable changes were also recorded in the crop structure, and the share of the area under intensive crops grew (from 11.2% in 1870 to 15.1% in 1881).

The agricultural depression of 1885-94 slowed down the rate of the growth in land productivity. It also brought a gradual fall in the livestock population which lasted until the First World War. The number of farm animals per 100 ha. of agricultural land fell from 56.1 in 1888 to 36.3 in 1911/3 (in large animal units).

The rate of growth in crop production, unlike that animal breeding, began to increase in the late 1890's. As a result the rate of increase in land productivity which had slowed down in the years 1881-8 and 1888-99 (average of 1.2% and 0.7% per annum respectively), grew again in the years 1899-1907 (average of 2.5% per annum) and was quite high even in the years when animal production declined (average of 2.1% per annum over the years 1907-11/3).

The increase in land productivity after 1881 was due to many factors, but mainly to the progress of agricultural intensification. As a result, yields grew considerably: the yields of four cereal crops, which had been relatively stable for a long time (6.6 q/ha. in 1827, 7.5 q/ha. in 1881), increased from 7.5 q/ha. to 11-12 q/ha. during the last thirty years under consideration, while potato yields grew even more rapidly (from 42 to 95 q/ha.).

The fallow area, which in 1881 accounted for 22% of arable land, had decreased almost four times and in 1911/3 did not exceed 6% of arable land. Therefore, at the end of the period under consideration, traditional systems had almost vanished and were being replaced by crop rotations without fallow which were more intensive, which meant that the area under crops could be extended. The increase was also influenced by inclusion

of uncultivated lands, pastures and meadows thanks to a more rational cultivation, fertilizing (beginnings of mineral fertilizing) and drainage. Although well established, this progress could not raise the standard of agricultural economy to any great extent. Yields in the Kingdom of Poland were still much lower than in western Europe or even in the Polish territories under Prussian rule, where grain yields were 70% higher and potato yields three times higher.¹⁴

The lack of statistics on the active population in nineteenth century agriculture means that labour productivity has been estimated as the relationship between agricultural production and the total numbers of the rural population, which at that time was mostly employed in agriculture. While this of course seriously lowers the value of the indices obtained, it will not affect the development trend and enables us to study changes in labour productivity over the century under consideration.

The indices of labour productivity depend both on production and on the numbers of the rural population and as the former has already been discussed, we shall now turn to the changes in the rural population. Its size changed according to the general trend of the total population to increase and to growing urbanization.

In the years 1810-1913 the rural population of the Kingdom of Poland had grown from 2.8 million to 8.7 million. The most rapid increase however came in the second half of the century. Before 1863 the rural population grew by 32% and in the next fifty years by 135%, its share in the total population having fallen from almost 83% in 1810 to 68.5% in 1913. There were years of particularly rapid increase and years when the rural population diminished. Before Emancipation the latter were

¹⁴ In the region of Poznań (under Prussian rule) the yields of four cereal crops amounted in 1911/3 to 19-20 q/ha and those of potatoes to more than 280 q/ha. Cf. S. JANICKI, ed. *op. cit.*, p. 307.

more frequent, and the rural population was seriously decreased as a result of the Napoleonic wars, the November Uprising, the years of hunger in the 1840's and 1850's and the January Uprising of 1863-4.

While the rural population grew more than three times, agricultural production increased almost 6.5 times, meaning that in the period under consideration labour productivity had been raised more than twofold. The amplitude of the oscillations of this index was wider than in the case of land productivity.

Agricultural recovery and development in the 1820's brought a rise in labour productivity of more than 12% (0.7% per annum). This increase was higher for animal breeding (average of 1.7% per annum) than for crop production (0.3%). In spite of serious losses of population at the beginnings of the 1830's, the increase in the rural population in this decade was higher than the growth in agricultural production. Thus labour productivity fell (average of 0.5% per annum).

After 1840 labour productivity grew increasingly fast until 1863. In the years 1840-6 the increase in the rural population reached its highest rate before Emancipation (average of 1.3% per annum) but the increase in agricultural production was much higher (3.3% per annum). Therefore, labour productivity rose (average rate of 1.8% per annum). A higher rate of increase in the years 1846-58 (average of 2.4% per annum) was due to the decrease in the rural population as a result of the famine years. A record-breaking rate of growth in labour productivity has been however noted (average of 6.9% per annum) in the years 1858-63, when production rose rapidly (7.8% per annum) while the rural population expanded rather slowly (0.6% per annum). The increase in labour productivity in the last twenty years before Emancipation was the result of improved tools and the earliest machines.¹⁵ The draught animal stock in agriculture had also

¹⁵ In the early 1850's about 33% of landed estates possessed threshers. In the last

increased: the number of draught animals per 100 ha of agricultural land had grown from 10.4 to 13.5 in the years 1846-63, while that related to every 100 of the rural population from 22 to 28. Draught power was still based on oxen, but the proportion of more efficient horses was constantly growing.¹⁶

During the post-Emancipation depression labour productivity fell by 13% (average of 1.9% per annum in the years 1863-70). Agricultural production in these years grew by less than 5% while the rural population increased considerably (by 21%): in relation to 100 ha. of agricultural land it grew from 48 to 56 people.

The increase in labour productivity in the 1870's was not sufficient (average of 1.1% per annum) to regain the level of 1863 but soon another agricultural depression brought it down again. The rate of growth in agricultural production diminished while the increase in the rural population was still quite rapid (1.8% per annum in the years 1881-1913) despite urbanization and emigration in search for jobs. Rural population per 100 ha of agricultural land had grown to 95 in 1913. The surplus of manpower in the countryside was growing, and this halted the modernization of agriculture and increases in labour productivity. The progress of mechanization was slow,¹⁷ and only the growth

years before the Emancipation of peasants there were about 2,500 sowing machines in the Kingdom of Poland. In 1861 horse-drawn rakes were found "in thousands", during the 1862 harvests "several dozen mowing-machines" were used along with "several hundreds of harvesters". Cf. J. BARDYŚ, *Początki Mechanizacji Rolnictwa Polskiego* (Beginnings of Mechanization in the Polish Agriculture). (Wrocław, 1966), pp. 174, 261, 375.

¹⁶ In 1827 there were 635.2 thousand draught animals including 271.7 thousand horses (Cf. F. RODECKI, *op. cit.*). In 1846 the number of draught animals was 825.5 thousand heads, including 338.4 thousand horses (Cf. *Przegląd Rolniczy, Handlowy i Przemysłowy* — Review of Agriculture, Commerce and Industry. No 22/1851), p. 2. In 1863 there were 1,053.8 thousand draught animals and 484.8 thousand horses (Cf. *Kalendarz Obserwatorium Astronomicznego w Warszawie* — Calendar of the Warsaw Astronomic Observatory. (1860, p. 187).

¹⁷ According to the official 1910 records there were: 1 sowing-machine per 926 ha. of arable land in landed estates and per 2,914 ha of arable land in peasant farms; 1 harvester per 688 ha. and 1,691 ha. respectively; 1 horse-drawn rake per 724 ha. and

in horse draught power could raise the effects of human labour.¹⁸ In general however rural overpopulation and a low rate of mechanization could not offer any stimulus to increase labour productivity. In the years 1881-8 annual growth rate amounted on an average to a mere 0.1% ,while in crop production it even fell. In the years 1888-99 labour productivity fell in both forms of agricultural production (average of 0.25% per annum). Only at the turn of the twentieth century did labour productivity grow (by 0.9%) per annum in the years 1899-1907 and by 0.2% in the years 1907-11/3. The increase referred only to crop production, whereas labour productivity in animal breeding was falling more and more rapidly. It is curious to note that the 1863 levels of labour productivity were restored only at the beginning of the twentieth century.

Conclusion

The trends of agricultural productivity in the Kingdom of Poland in the years 1808/10-1911/13 show that the increase in agricultural production (about 6.5 times) was due mainly to growing land productivity (increase of more than 4 times), above all due to the increased inputs of labour and only to a lesser degree to capital inputs (a mere twofold increase in labour productivity). Agricultural progress was realized through better utilization of land resources and improved cultivation methods, but technologies remained labour intensive.

This was due to the considerable manpower resources in the

1,359 ha. of agricultural land respectively; 1 mowing-machine per 181 ha. and 356 ha. of meadows respectively; 1 thresher per 92 ha. of arable land. Cf. J. BARYŚ, *op. cit.* pp. 176, 263-5, 378.

¹⁸ In 1907 the share of horses in the agricultural draught power resources amounted to 90 percent. Cf. T. SOB CZAR, *Zwierzeta Gospodarskie w Ksiestwie Warszawskim i Królestwie Polskim w XIX w.* (Farm Animals in the Duchy of Warsaw and in the Kingdom of Poland in the Nineteenth Century). (Wrocław, 1964, p. 59).

countryside. Surplus manpower increased in the country in the second half of the century under consideration and could not be absorbed by industry and the cities. This was the effect of a general level of economic development and of the elimination of feudal relations which left much land still in large estates. A great mass of poor or landless peasant were available for agriculture, making manpower very cheap. Under these circumstances capital-intensive investments in agriculture could hardly be profitable.

The situation in Polish agriculture under Austrian rule was similar. In Galicia, non-agricultural branches of the national economy were less developed, and overpopulation surplus manpower and the atomization of peasant land holdings were higher than in the Kingdom of Poland. Increased agricultural production both on the larger estates and on peasant farms was here mainly due to labour-intensive technologies. On the peasant farms even the smallest plot of a low quality soil was thoroughly cultivated. The productivity of Galician agriculture before the First World War (1910) was similar to that of the Kingdom of Poland. Land productivity was slightly higher (13.2 conventional units per 1 ha. of agricultural land), while labour productivity was lower (11.4 conventional units per 1 person living on agriculture).

Polish agriculture under Prussian rule developed much more rapidly. The wide markets of rapidly industrializing Germany and the lack of surplus manpower (or even seasonal shortages of labour) stimulated the modernization of agriculture and increases in production by means of labour-saving technologies. In 1912 the land productivity coefficient (24.2) was almost twice as high as in other Polish territories and the labour productivity coefficient (33.2) was almost three times higher than in Galicia and 2.5 times higher than that recorded in the Kingdom of Poland.

TABLE 3

PERCENTAGE AVERAGE CHANGE PER ANNUM

	Time periods										
	1808/10-27	1827-39/40	1839/40-46	1846-58	1858-63	1863-70	1870-81	1881-8	1888-99	1899-1907	1907-11/3
Gross production	1.5	0.2	3.3	2.1	7.8	0.7	2.9	1.9	1.5	2.5	2.1
vegetable	1.0	0.3	3.3	1.2	11.2	0.0	2.1	1.7	1.4	3.5	4.3
animal	2.6	0.05	3.3	3.7	2.3	2.2	4.6	2.1	1.6	1.0	- 1.8
Land productivity	1.3	- 1.0	1.3	2.3	7.6	0.16	2.8	1.2	0.7	2.5	2.1
vegetable	0.8	- 0.9	1.3	1.4	11.2	- 0.5	1.9	1.1	0.7	3.5	4.2
animal	2.4	- 1.2	1.4	4.0	2.1	1.6	4.4	1.5	0.8	1.0	- 1.8
Labour productivity	0.7	- 0.5	1.8	2.4	6.9	- 1.9	1.4	0.1	- 0.25	0.9	0.2
vegetable	0.3	- 0.4	1.8	1.5	10.3	- 2.5	0.4	- 0.4	- 0.3	1.8	2.2
animal	1.7	- 0.7	1.9	4.1	1.6	- 0.6	2.5	0.3	- 0.2	- 0.5	- 3.4
Agricultural land	0.16	1.4	1.9	- 0.7	0.14	0.6	0.11	0.6	0.7	0.01	0.01
Arable land	0.13	1.8	2.7	- 0.33	- 0.04	1.13	0.14	0.1	0.5	0.09	0.08
Cropland	2.8	- 0.13	6.1	1.7	1.7	0.1	1.1	0.6	1.1	0.7	0.6
Fallow land	- 1.7	4.4	- 0.3	- 2.3	- 3.3	1.2	- 2.2	- 2.0	- 2.3	- 4.2	- 6.0
Yields of the principal crops (wheat, rye, barley, oats)	1.3	0.0	0.2	0.13	0.6	0.0	0.6	1.0	1.1	2.1	2.9
Yields of potatoes	0.2	0.5	0.5	0.2	1.7	0.4	0.7	4.4	3.8	2.7	0.0
Land under intensive crops	7.8	3.8	4.8	2.6	0.6	- 1.4	3.3	2.0	1.5	2.8	1.4
Livestock in conventional (large)											
animal units per 100 ha of agricultural land	1.7	- 0.9	- 1.0	2.1	1.6	0.8	1.2	1.6	- 0.8	- 3.6	- 2.5
Rural population	0.7	0.75	1.3	- 0.24	0.6	3.0	1.6	1.8	1.8	1.75	1.8
Rural population per 100 ha of agricultural land	0.6	- 0.6	- 1.0	0.0	0.4	2.4	1.5	1.1	1.0	1.4	1.8

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Appendix: Conversion Units

Proportions of seed and fibre production:

- A. 1. Flax: seed = 100% Fibre = 85.90% (in relation to seed
2. Hemp: seed = 100% Fibre = 113-118% production)
- B. *Grain Units* (100 kg of a given crop equivalent 100 kg of cereal grain) Cf.
G. Blohm, *Angewandte Landwirtschaftliche Betriebslehre* 3, Aufl., (Stuttgart,
1957).

(1) *Crops*

100 kg of wheat, rye, barley, oats, millet, buckwheat	= 1.00
100 kg of pulses	= 1.20
100 kg of potatoes and sugar beets	= 0.25
100 kg of rape seed	= 2.00
100 kg of flax seed	= 2.50
100 kg of hemp seed	= 1.40
100 kg of flax fibre	= 0.70
100 kg of hemp fibre	= 0.50
100 kg of hay (meadow)	= 0.30
100 kg of hay (pastures)	= 0.10

(2) *Livestock Products*

Meat (live weight 100 kg)	
Cattle, sheep, lambs	= 6.00
Pigs	= 5.00
100 l of milk (3.5%)	= 0.74
100 kg of wool (raw)	= 40.00

C. *Large Animal Unit Equivalents*

Horses	= 1.5
Cattle	= 1.0
Sheep	= 0.1
Pigs	= 0.25

