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**AGRICULTURE OF GALICIA IN THE SECOND HALF OF THE 19TH -
FIRST THIRD OF THE 20TH CENTURIES:
A PASSAGE FROM PRINCIPLE TO PRACTICE**

- Abstract -

From the second half of the 19th century until the beginning of the First World War there was a significant economic progress in all sectors of economy on the territory of Galicia, which in that historical period was under the authority of the Austro-Hungarian Empire. Along with various aspects of influence on the development of agriculture in the region, the article reveals the impact of popular science education, which was one of the key criteria for the promotion of the economic management newest methods. This allowed the region to progress economically, which was significantly behind other regions of the Austro-Hungarian Empire before the beginning of the study period. There was a breakthrough in methods and approaches to farm management in the studied period; mechanization of processes, new technologies of soil cultivation, and land reclamation were introduced. Agricultural processing industry started to develop intensively. A serious consideration was given to breeding, which had a positive impact on the development of livestock breeding. All these aspects have led to significant improvements in the industry's performance.

Keywords: Galicia; agricultural sector; land reclamation; agriculturally used areas; agricultural production; crop yields.

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Articulation of the issue

In the second half of the 19th century and before the outbreak of the First World War there was a significant onward movement in the agricultural sector in Galicia. One of the reasons for the relatively successful growth of the agrarian sector of the economy of Galicia was the development of sectoral science the findings of which were implemented. Systemic research and scientific experiments have made it possible to carry out both arable farming and animal husbandry advantageously. However, scientific research without further implementation could not significantly affect the industry development in the region. Therefore, it is important to examine and comprehend the practical demonstration of scientific innovations, i.e. the implementation of scientific research results in the agricultural sector of Galicia.

In the series of studies the authors have identified each segment that influenced the evolution of agricultural industry in general and definite structural units of the agricultural sphere in particular: arable farming (grain and other crops), vegetable cultivation (market gardening, horticulture) and animal husbandry (cattle breeding, horse breeding, swine and sheep rearing etc.).

Literature review

The suggested topic is scantily studied in national academic circles. Among other scholars, the subject is partially covered in the works of Mykhailo Klapchuk¹, Hryhorii Kovalchak², and Volodymyr Klapchuk³. The issue was widely examined in Polish scientific information sources both of the period under study⁴, and in the first half of the twentieth century⁵.

¹ Klapchuk M.M., “*Hranytsia mizh zemlerobskym ta skotarskym typom hospodarstva na Deliatynshchyni v XVII–XIX st.*” [“The line between an agricultural and cattle-breeding type of economy in the Deliatyn district in the 17th–19th centuries”], in *Kultura ta pobut naselennia Ukrainykykh Karpat : resp. nauk. konf., prysv. 50–richchiiu utv. SRSR : tezy dop. ta povid.* [Culture and Life of the Population of the Ukrainian Carpathians: Contributions from Scientific Conference on 50th anniversary of the USSR], Uzhhorod, 1972, pp. 18-19.

² Kovalchak H.I., *Ekonomichni rozvytok zakhidnoukrainykykh zemel* [Economic Development of Western Ukrainian Lands], Nauk. Dumka, Kyiv, 1988

³ Klapchuk, V.M., *Silke hospodarstvo Halychyny* [Agriculture of Galicia], Foliant, Ivano-Frankivsk, 2015.

⁴ Rewieński, S., “Bibliografia rolniczo-technologiczna polska od r. 1800 aż do naszych czasów” [“The bibliography of Polish agriculture and technology from 1800 till the present day”], in *Encyklopedia rolnicza* (t. 1) [Encyclopedia of Agriculture (Vol. 1)], Warszawa, 1890, pp. 339–450; Walewski, C. & Gieysztor, J.K., “Bibliografia rolniczo-technologiczna polska od r. 1800 aż do naszych czasów” [“The bibliography of Polish agriculture and technology from 1800 till the present day”], in *Encyklopedia rolnicza* (t. 1) [Encyclopedia of Agriculture (Vol. 1)], Warszawa, 1890, pp. 328-339; Bujak, F., *Galicja, t. 1: Kraj, ludność, społeczeństwo...* [Galicia, vol. 1: Country, population, society...], 1908; Diamand, H., *Polożenie gospodarcze Galicji przed wojną* [Economic situation of Galicia before the

The register of literature on issues relating to agriculture, covering a significant part of the bibliography of the period under inquiry, proved to be valuable for the study⁶.

In addition to scholarly publications, agricultural matters knowledge has been disseminated in the professional periodicals such as “Rozprawy c.k. Galicyjskiego Towarzystwa Gosp.”, “Rolnik”, “Przegląd Weterynarski”, “Ogrodnictwo”, “Bartnik Postępowy”, “Głos Rolniczy”, “Przewodnik Kółek Rolniczych”, etc. It is worth noting that much of the published material in the afore-mentioned titles was a translation of the foreign scientists’ works as well as experts’ opinions. Stefan Pawlik, professor of the Agrarian School in Dubliany⁷ criticized such narratives in his work *Notes on the influence of the German literature on farms in Poland in the 19th century (Uwagi o wpływie literatury niemieckiej w XIX wieku na gospodarstwa w Polsce)*, 1903.

It is clear from the analysis that the issue requires a closely and systematic examination, which will provide an opportunity to reconsider the impact of scientific industry achievements on the economic development of then Galicia. The

war], Lipsk, [6. v.], 1915; Dziewulski, S., “Piśmiennictwo polskie ekonomiczne w ciągu ostatnich lat pięćdziesięciu [Polish economic literature in the last fifty years]”, in *Z dziejów polskiej myśli ekonomicznej [From the history of the Polish economic thought]*, Warszawa, 1918, p. 23 i.n.; Matczuk, A., *U progu nowożytnej polskiej bibliografii dziedzinowej. Julian Aleksander Kamiński i jego Piśmiennictwo polskie rolniczo-technologiczne od roku 1549 do 1835 (1836) [At the dawn of modern Polish subject bibliography. Julian Aleksander Kamiński and his Polish literature on agriculture and technology from 1549 till 1835 (1836)]*, “Folia Bibliologica”, no. 58, 2016, pp. 35–63.

⁵ Grochowski, T., *Zarys bibliografii pszczelniczej polskiej [Outline of the Polish bibliography on beekeeping]*, Lwów, 1925; Pruski, W., *Przyczynek do bibliografii dzieł o koniu w języku polskim [Contribution to the bibliography of works on horse in Polish]*, “Roczniki Nauk Rolniczych i Leśnych” [“Yearbooks of Agricultural and Forestry Sciences”], no. 13, 1925, pp. 125–145; Grochowski, T., *Zarys bibliografii ogrodniczej polskiej [Outline of the Polish bibliography on horticulture]*, Kraków, 1927; Przerembel, Z., *Polska bibliografia cukrownicza 1799–1929 [The Polish bibliography on sugar from 1799 till 1929]*, Warszawa, 1930.

⁶ Estreicher jr., K. (Ed.), *Bibliografia polska XIX stulecia (nowe wydanie) [Polish Bibliography of the 19th Century (new edition)]*, Kraków, 1959; Kosiek, Z., *Bibliografia polskich bibliografii gospodarstwa wiejskiego [Bibliography of Polish rural farm bibliographies]*, Warszawa, 1962; Dybiec, J., “Główne tendencje i kierunki w rozwoju polskiej historiografii rolniczej w XIX i XX w.” [“Main trends and directions in the development of Polish agricultural historiography in the 19th and 20th centuries”], in *Wkład ośrodka krakowskiego w badania nad historią nauk rolniczych w Polsce [Contribution of the Cracow centre to research on the history of agricultural sciences in Poland]*, Kraków, 1998, p.57 in.

⁷ Until 1901, it was a school, eventually becoming an academy afterwards.

experience of an agricultural system development in Galicia during the Austro-Hungarian period should be thoroughly studied.

Research objectives

The overwhelming majority of Galicia's residents, which was then an autonomous part of the Austro-Hungarian Empire, were involved in the agricultural sector, earning a living from field-crop cultivation and/or animal husbandry. In order to shape our research objectives, it is very important to understand how agriculture was interpreted in terms of sectoral scientific achievements in that historical period. Thus, for instance, in the *Encyclopedia of Agriculture*, which was published in Lviv, it was noted that by agriculture or agronomy one means all the science that studies land cultivation in order to get heavy yields with the least labor costs⁸.

"Economic Journal of Cracow", in turn, defined agriculture as the art of tilling, fertilizing and tending to the land to produce grain, fruits and plants required for people⁹. From what has been said, agriculture is physical embodiment of theoretical knowledge and skills gained in the scientific field. So, the main purpose is to study the impact of theoretical scientific advances on human practice in the agricultural field by mainstreamification agricultural knowledge.

Findings. Tillage and crop production

Having comprehensively analyzed the statistical data on agricultural development in Galicia in the period under study, we obtain basic results that give an opportunity to substantiate the focal points of our paper.

The level of agriculture in Galicia at that time was definitely much lower than the level of agricultural sector development of the individual (chiefly agrarian) European countries. At the turn of the 19th-20th centuries, grain crops yields in most European countries were twice as high as in Galicia (Table 1¹⁰).

Table 1

Statistical data on staple crops yields in Galicia and Europe, cwt / ha (compiled by the authors)

States, regions	Wheat	Rye	Barley	Oats	Potato
Belgium	27	24	29	24	175
Germany	23	18	22	19	150

⁸ "Rolnictwo" ["Agriculture"], in *Encyklopedia (wydanie Macierzy Polskiej)* (t. 2), (627). [*Encyclopedia (Polish edition)*] (Vol. 2). (627)]. Lwów, 1907.

⁹ *Rolnictwo [Agriculture]*, "Dziennik Gospodarski Krakowski" ["Economic Journal of Cracow"], no. 4, 1806, p. 1.

¹⁰ Diamand, *op.cit.*

Ireland	23	19	24	23	107
The Netherlands	26	19	28	22	190
Austria	15	15	16	13	100
Sudetenland	17	15	17	18	110
<i>Galicja</i>	<i>13</i>	<i>11.9</i>	<i>12.65</i>	<i>12</i>	<i>126.3</i>

Table 1 exhibits that only potato cultivation in Galicia was relatively competitive on the European agricultural market; grain crops yields were half as low. This was also confirmed by Franciszek Bujak in his study *Economic Development of Galicia (1772–1914)*¹¹. He examined the average yield of agricultural products (cwt / ha) in 1903–1912, defining the scope of examination by the limits of the early twentieth century (Table 2).

Table 2
Average yield of agricultural products (cwt / ha) in 1903–1912¹²

States, regions	Wheat	Rye	Potato	Hay
Galicia	11.5	10.6	113.4	30.9
Czech Republic	17.7	15.8	94.8	32.9
Germany	20.3	17.0	132.4	42.5
Poznań	20.4	16.6	143.2	38.0
Denmark	30.0	19.0	164.0	41.0

However, if we consider the dynamics of yield changes in Galicia between 1872 and 1913, we observe it was positive and constantly growing one (Table 3). The reason for growth can be attributed to agricultural extension, which has been constantly developing in the region. Scientific achievements in the agrarian sphere aroused increasing interest of the parties in charge of agricultural activity.

Table 3
Cumulative yield index in Galicia, in quintal per 1 ha¹³

Years	Wheat	Rye	Oats	Barley	Potato
1872–1876	8.8	6.5	5.9	7.9	72
1880–1884	9.1	7.2	6.4	8.0	85
1884–1888	9.5	7.6	7.2	8.5	92

¹¹ Bujak, F., *Rozwój gospodarczy Galicji 1772–1914 [Economic development of Galicia, 1772–1914]*, Lwów, 1917.

¹² Ibidem.

¹³ Jezierski, A., & Wyczański, A. (Eds.), *Historia Polski w liczbach (Tom II. Gospodarka) [History of Poland in numbers (Vol. 2. Economy)]*, Zakład Wydawnictw Statystycznych, Warszawa, 2006.

1894–1898	9.2	8.0	7.3	8.2	100
1901–1910	11.0	9.9	9.1	9.7	110
1909–1913	11.7	11.3	10.7	11.2	111

Due to this, in the early 20th century the economic situation has significantly improved in Galicia. In 1917, Franciszek Bujak wrote about it thuswise:¹⁴

“In the last few years before the war, we have been on the right track, we have undertaken extensive work on the rational organization of our economic life, and we have started to make up for our backlog and shortcomings. From a passive society, exploited by strangers from afar, we have become an active society, which has taken itself to use the wealth of its country and to satisfy its needs. If we were given an opportunity to continue along this path with all the perseverance and consistency, the space between us and our western neighbors would undoubtedly be rapidly shrinking.”¹⁵

Advance in growing grain varieties in Galicia took place at the turn of the 19th–20th centuries and was largely the result of increase insight in the field of agriculture, research on enhancing grain crop types and land resources efficiency.

The study further analyzed how agriculturally used areas underwent changes in the structure, under which crops the main arable land was used and how this had a positive impact on the dynamics of yield improvement in Galicia of the day.

Table 4
Land resources structure in 1852–1902¹⁶

Agricultural lands	Area, ha		
	1852/1866	1889	1902
Tillage	3590373	3803444	3799575
Meadows and vegetable	922802	986082	984205

¹⁴ *Weszliśmy w ostatnich latach przed wojną na dobrą drogę, podjęliśmy rozległe prace około racjonalnej organizacji naszego życia gospodarczego, zaczęliśmy odrabiać zaległości i zaniedbania nasze. Ze społeczeństwa biernego, eksploatowanego przez obcych z daleka, stawaliśmy się społeczeństwem czynnym, które samo wzięło się do użytkowania bogactw swego kraju i do zaspokajania swoich potrzeb. Gdyby nam było danym iść dalej tą drogą z całą wytrwałością i konsekwencją, to niewątpliwie szybko zmniejszałaby się przestrzeń między nami a naszymi zachodnimi sąsiadami.* Here and subsequently, unless indicated otherwise, translations from Polish are by Ihor Makaruk.

¹⁵ Bujak, *op.cit.*, pp. 57-58.

¹⁶ Pilat, T. (Ed.), *Wiadomości statystyczne o stosunkach krajowych* (Tom XX. - Z. III.) [Statistical information on national relations (Vol. 20., P. 3.)], Druk. Związkowa, Lwów, 1905.

gardens			
Pasturage	768944	743480	716918
Forests	2113766	2023724	2020212

We conclude (*vide* Table 4) that the structure of land resources changed dynamically in favor of tilled land, meadows and vegetable gardens due to reduction of pasturage and forests. This trend should have influenced the increase in agricultural production in the region.

In addition, in 1900, 13.3% of the arable land in Galicia was lying fallow¹⁷. This contributed to improved soil fertility and more efficient exploitation of agriculturally used areas, because the land was resting in a loose and weed-free state, which contributed to the accumulation of sufficient moisture in it.

In 1874–1913 (Table 5) the areas of grain crops decreased gradually, albeit the areas for industrial and forage crops increased¹⁸.

Table 5
Distribution of ploughland in Galicia (in percentage terms)

Years	Grain	Leguminous plants	Potato	Forage	Alios	In all
1874	74.6	3.7	10.0	6.3	5,4	100.0
1881	71.2	4.3	11.3	7.2	6,0	100.0
1897	67.4	4.9	13.5	11,6	2,6	100.0
1913	67.7	2.5	14.8	12,2	2,8	100.0

Decrease in seeding-down the grain crops from 74.6% of all arable lands of Galicia to 67% in 1913, a year before the First World War outbreak, could have a negative impact on meeting the demands of the native population for bread. Table 6

¹⁷ Pilat, T. (Ed.), *Wiadomości statystyczne o stosunkach krajowych* (Tom XVI. - Z. III.) [Statistical information on national relations (Vol. 16., P. 3.)], Druk. Związkowa, Lwów, 1898.

¹⁸ Jezierski, A., & Wyczański, A., *op.cit.*

summarizes the dynamic pattern in the structure of the agriculturally used areas in Galicia from 1900¹⁹ till 1911²⁰.

Table 6
Dynamic pattern in the structure of the agriculturally used areas in Galicia

Agriculturally used areas	Area, ha			
	1900	% of all used areas	1911	% of all used areas
Tillage	3799879	48.41	3806619	48.5
Meadows	875045	11.15	873615	11.1
Pasturage	716848	9.13	738604	9.41
Forests	2021230	25.75	2015528	25.7

At that time, most farmers were employing obsolete cultivation methods coupled with inadequate tools. Thus, in order to alter the situation and improve yields, it was essential to provide instruction among agricultural producers, which consisted in encouraging the use of modern equipment and the application of advanced management methods.

The scholars have observed that as a plough the Galicians normally used a few iron sheets riveted together by a self-taught blacksmith, who did not fully comprehend the value of ploughing and its importance in the future harvest. Therefore, in most cases, such ploughing simply cut the soil into strips and lumps, not hoeing it²¹.

Jan Feliks Sikorski, professor at the Agrarian School in Dubliany, made an in-depth analysis of powerful methods of ploughing in his work *Mechanical Soil Tillage*²².

The introduction of mechanization in all agricultural activities has greatly facilitated labour-intensive processes and has also had a positive impact on the efficiency of labour outcomes.

¹⁹ Pilat, T. (Ed.), *Podręcznik Statystyki Galicji* (Tom VI. - Część 1.) [*Galicia Statistics Manual* (Vol. 1., P. 1.)], Pierwsza Związkowa Drukarnia, Lwów, 1900.

²⁰ Kryukov, N.A., *Slavjanskie zemli* (Tom II. – Chast 1.) Galitsyya: Syelskoe hozyaustvo v Galitsyi i obshcheye razvitiye strany [*Slavonic Lands* (Vol. II., Part 1): Galicia: Agriculture in Galicia and the general development of the country], Typography of V.O. Kirshbaum, Petrograd, 1915.

²¹ Wygoda, B., *Uprawa roli. Studium społeczno-gospodarcze* [*Cultivation. Socio-economic study*], Lwów, 1916.

²² Sikorski, J.F., *Mechaniczna uprawa gleby. Podręcznik dla użytku praktycznych gospodarzy i uczniów szkół rolniczych* [*Mechanical soil cultivation. A handbook for practical use by farmers and students of agricultural schools*], Lwów, 1898.

Table 7
Agricultural machinery and equipment, 1902²³

Size of farms, ha	Machinery, pcs.	Number of farms possessing machinery and equipment									
		Fertilizer sowers	Grain seeders	Fodder harvesting machines	Reaping machines	Potato harvesters	Chaff-cutters	Centrifugal machines	Shot casting plants	Milk houses	Flour mills
<2	35533	1	3	0	10	12	32163	10	2829	139	1544
2-5	114009	2	16	2	24	60	108000	23	3865	582	11069
5-10	82164	0	15	1	24	50	77556	38	2609	1586	16243
10-20	24821	1	15	2	9	35	23158	28	1054	2632	9309
20-100	6594	6	137	74	30	45	6209	28	406	2774	3758
>100	3801	276	2138	1211	606	406	3598	213	859	3300	3069
Total	266922	286	2324	1290	703	608	250684	340	11622	11013	44992

It follows from Table 7 that the maximum number of machinery and equipment was assigned to large farms that had tangible gains from agricultural activities whilst small family-operated farms possessed only the most necessary equipment. There were only three steam ploughs in Galicia at the time, and 12 mechanical seeders²⁴.

Besides, an important element of yield improvement was not only processes mechanization, but also research study of soils, use of fertilizers, introduction of crop rotations, new methods of land tillage, drainage of swampy fields, and use of melioration²⁵. The significance of drainage systems as well as irrigation of agricultural lands was given scientific credence²⁶. This made it possible to use land plots that had previously been considered unfit for grain crops effectively.

²³ Bujak, *op.cit.*.

²⁴ *Ibidem*.

²⁵ *Ibidem*; Biernacki, S., *Potrzeby nawozowe gleb Galicji Wschodniej [Fertilizer demands of Eastern Galicia soils]*, Lwów, 1913.

²⁶ Krzyżanowski, K., *Zasady technicznych amelioracji rolnych, polegających na odwodnieniu i nawodnieniu ziemi [The principles of technical land reclamation, consisting of drainage and irrigation of the soil]*, Tarnów, 1879.

Commencing in 1876, it was with the purpose of intensification of agriculture in the region that active land improvement measures were enacted. Some fertile soil areas were drained and irrigated; the government has bankrolled significantly for this. Thus, in the 1876–1892 timeframe the funds allocated for reclamation works increased by 230 times, amounting to PLN 1607370²⁷.

One more important trend in the development of the sophisticated techniques in agriculture was a selection of grain crops. They worked on it in the above mentioned Agrarian Academy in Dubliany²⁸, where experiments on different grain varieties were conducted in the field environment. The cultivation of wheat, barley, rye and oats has been subject to in-depth analysis and research; what counted was to understand when to sow grains and when to harvest.

In addition to grain, other crops, such as potatoes and sugar beet, were also valued. In 1906, a professor of the Agrarian Academy in Dubliany and the Jagiellonian University, Stefan Jentys published the work *Agricultural Value of Newer Potato Species*²⁹ which revealed the experiments that were carried out by the scientists in 1903–1904.

Potatoes were used as a food product as well as the raw materials for production of alcohol, preparation of starch and other derivatives. Significant areas were allotted to potato cultivation as the yield of this crop was quite high in East Galicia (Table 8). Farmers, who grew potatoes, as well as sugar beet farms, had high hopes for the development of the processing industry, namely alcohol production.

Table 8
Potato yields through 1909 to 1913³⁰

Province	Area, ths ha	Gross yield, ths cwt	Yield, cwt / ha
Lviv (Lemberg)	159.2	19258.8	121
Stanislaviv	108.5	9764.1	90
Ternopil	142.2	17778.7	125
Galicia	409.9	46801.6	112

²⁷ Pilat, T. (Ed.), *Wiadomości statystyczne o stosunkach krajowych* (Tom XVI. - Z. III.) [*Statistical information on national relations* (Vol. 16., P. 3.)], Druk. Związkowa, Lwów, 1898.

²⁸ Mazurkiewicz, Z., *Odmiany owsów w doświadczeniach polowych w r. 1912* [*Oat cultivars in field experiments in 1912*], "Rolnik" ["The Farmer"], no. 84(12), p. 1913, p. 227.

²⁹ Jentys, S., *Wartość rolnicza nowszych odmian ziemniaków* [*Agricultural value of newer potato species*], Kraków, 1906.

³⁰ Khraplyvyi, Ye., *Silke gospodarstvo Halytsko-Volynskykh zemel* [*Agriculture of Galicia-Volhynia lands*], Drukarnia NTSh, Lviv, 1936.

Traditionally, small farms were not engaged in the cultivation of beet, this was done by large and high-capacity farms. The authors on beet growing informed the readers about the results of tests, methods of planting and tencance, winter storage, and seed production³¹.

Table 9
Sugar beet yield growth dynamics in East Galicia, 1884–1906³²

Crop plant	1884–1893	1896–1905	1906	
	Yield, cwt / ha	Yield, cwt / ha	Yield, cwt / ha	Gross yield, ths cwt
Sugar beet	165.1	205.4	212.0	1107

Analyzing the results presented in Table 9, we observe that sugar beet yields have been growing rapidly, although most of the products were processed to produce alcohol rather than sugar³³.

Researchers and scholars who were engaged in leguminous crops studies attached great significance to the cultivation of clover. The academic papers centred on soil tillage, the variety of cultivars, the traits of sowing, tending, harvesting, drying and threshing³⁴.

Judging from Table 10, one is to observe that the clover was sown to produce hay and seeds alike³⁵. Consequently, different methods of sowing, tencance and

³¹ Żeleński, S., *O korzyściach uprawy buraków cukrowych* [On the benefits of sugar beet growing], "Tygodnik Rolniczy" ["Agricultural Weekly Magazine"], no. 36, 1894, pp. 281–284; Turnau, J., *Obróbka buraków* [Processing of beet], "Tygodnik Rolniczy" ["Agricultural Weekly Magazine"], no. 11, 1903, pp. 103–105; Kosiński, I., "Przyczynek do metodyki doświadczeń polowych z odmianami buraków" ["Contribution to the methodology of field experiments with beet species"], in *Roczniki Nauk Rolniczych* (t. 2) [Yearbooks of Agricultural Sciences (Vol. 2)], 1906, pp. 1–56.

³² Bujak, F., *Galicja, t. 1: Kraj, ludność, społeczeństwo...* [Galicia, vol. 1: Country, population, society...], 1908.

³³ Dąbrowski, H., *Hodowla i nasiennictwo buraków cukrowych na przełomie XIX/XX wieku* [Cultivation of sugar beet at the turn of the 19th and 20th centuries], "Gazeta Cukrownicza" ["The Sugar Gazette"], no. 8, 1902, pp. 150–151.

³⁴ Czaykowski, T., *Zasilanie lichych koniczyn nawozami sztucznymi* [Feeding of clovers with artificial fertilizers], "Głos Rolniczy" ["Voice of the Farmers"], no. 17, 1902, pp. 259–260; Antoniewicz, L., *Koniczyna szkarłatna* [Scarlet clover], "Głos Rolniczy" ["Voice of the Farmers"], no. 21, 1905, p. 325; Wiśniewski, S., *Młoda koniczyna* [Young clover], "Tygodnik Rolniczy" ["Agricultural Weekly Magazine"], no. 21, 1916, p. 170; *Wpływ nawozów potasowych na wzrost koniczyny* [Effect of potassium fertilizers on clover growth], "Tygodnik Rolniczy" ["Agricultural Weekly"], no. 5, p. 70.

³⁵ Pilat, T. (Ed.), *Podręcznik Statystyki Galicji* (Tom VI. - Część 1.) [Galicia Statistics Manual (Vol. 1., P. 1.)], Pierwsza Związkowa Drukarnia, Lwów, 1900.

processing were employed. The demand for hay and seeds was obviously different and dependent on the exigencies. That is why the average annual area for clover per hay cultivation was much larger than that for clover per seed³⁶.

Table 10
Clover crops and harvesting (1889–1898)

Clover	Area, ha			Crop, cwt	
	Total	% to agricultural lands	% to ploughed fields	Gross yield	per 1 ha
For hay	258832	7.93	6.81	8741295	33.77
For seeds	15339	5.93	0.4	23853	1.56

Table 11
Areas and crop yield in 1899³⁷

Clover	West Galicia			East Galicia		
	Area, ha	%	Crop yields, cwt / ha	Area, ha	%	Crop yields, cwt / ha
For hay	141256	48.4	43.5	150670	51.6	30.9

The areas used for the cultivation of clover for hay increased from the annual average of 258832 ha in 1889–1898 (see Table 10) to 291926 ha in 1899 (Table 11). There is also a noticeable difference in yield between West Galicia and East Galicia.

The authors who wrote on clover issues emphasized that it is a perfect forage fodder for animals, and its processing enriches the soil with nutrients³⁸.

Quite intimate knowledge of clover was presented in Bronisław Janowski's work, who offered advanced methods of growing clover mixtures and described the growing practices, harvesting and processing of the finished materials extensively³⁹.

³⁶ Klapchuk, *op.cit.* 2015.

³⁷ *Ibidem.*

³⁸ Dżianott, L., *Kilka praktycznych uwag o chowie, pielęgnowaniu i karmieniu bydła [Some practical remarks on cattle rearing, nurturing and feeding]*, "Tygodnik Rolniczy" ["Agricultural Weekly Magazine"], no. 28, 1886, pp. 222–226; Zabłocki, R., *Spasanie młodego koniczu [Grazing a young clover]*, "Głos Rolniczy" ["Voice of the Farmers"], no. 19, 1902, p. 299; *Koniczyna perska [Persian clover]*, "Tygodnik Rolniczy" ["Agricultural Weekly Magazine"], no. 19, 1913, p. 297; *Konicz czerwony [Red clover]*, "Głos Rolniczy" ["Voice of the Farmers"], no. 1, 1910, pp. 10–11; *Siewajcie koniczce [Sowing of clover]*, "Głos Rolniczy" ["Voice of the Farmers"], no. 7, 1907, pp. 101–102.

³⁹ Janowski, B., *Uprawa mieszanek koniczynowych [Cultivation of clover mixtures]*, Lwów, 1908.

The important place among industrial crops was occupied by cultivation of flax for the fibres⁴⁰. Several fundamental works of that period contributed to agricultural extension in this area. It is worth making a careful note of Władysław Noskowski's work, an agronomist and a teacher at the Agrarian School in Dubliany, where he turned the attention of agricultural producers to the number of flax varieties, its sowing features, how to tend to them during growth, how to make fertilizers, how to undertake measures against maladies and pests as well as what the latest methods of harvesting are⁴¹.

It was also published Wojciech Chłopiński's *Cultivation and Processing of Flax*⁴² which was commissioned by the Galicia Economic Society in Lviv, and testifies to profound interest of farm representatives in flax cultivation. It stands to mention that Wojciech Chłopiński studied flax farming systematically and put high emphasis on this branch of farming operations. In addition to the work just listed, the author had other popular publications relating to flax⁴³.

Undoubtedly, science-education works of the study period had a positive impact on the development of flax farming in Galicia; most of them were issued in East Galicia.

Table 12
Flax crops and harvesting over a period of 1889-1898⁴⁴

Crop plant	Area, ha			Crop, cwt	
	Total	% to agricultural lands	% to ploughed fields	Gross yield	per 1 ha
Flax	25280	0.78	0.67	83798	3.31

⁴⁰ Jarosiński, P., *Sprzęt lnu i przygotowanie połączeń [Flax equipment and joint preparation]*, "Tygodnik Rolniczy" ["Agricultural Weekly Magazine"], no. 24–25, 1916, pp. 210–212.

⁴¹ Noskowski, W., *Podręcznik uprawy lnu i wyprawy włókna lnianego według najnowszych metod [A handbook on flax cultivation and flax fibre extraction following the latest methods]*, Lwów, 1872.

⁴² Chłopiński, W., *Uprawa i przerabianie lnu [Cultivation and processing of flax]*, Lwów, 1907.

⁴³ Chłopiński, W., *Wyniki porównawczej uprawy kilku gatunków lnu [Results of comparative cultivation of several flax species]*, "Rolnik" ["The Farmer"], no. 52, 1913, pp. 950–952; Chłopiński, W., *Len jako poplon [Flax as a catch crop]*, "Przewodnik Kółek Rolniczych" ["Guidebook on Machinery Rings"], no. 13, 1917, p. 8.

⁴⁴ Pilat, T. (Ed.), *Podręcznik Statystyki Galicji (Tom VI. - Część 1.) [Galicia Statistics Manual (Vol. 1., P. 1.)]*, Pierwsza Związkowa Drukarnia, Lwów, 1900.

Table 13
Areas and crop yields in 1899⁴⁵

Crop plant	West Galicia			East Galicia		
	Area, ha	%	Crop yields, cwt / ha	Area, ha	%	Crop yields, cwt / ha
Flax	11542	48.8	3.2	12088	51.2	3.7

When compared Table 12 with Table 13, we observe that the areas used for flax cultivation in 1899 decreased as compared with the annual average for 1889–1898. However, more consideration was given to flax cultivation in East Galicia than in West Galicia; the crop yields in East Galicia were higher respectively.

Horticulture was coming into ascendance in the region during the study period, which was encouraged for further development and improvement by researchers, scholars, authors of science-education literature (Table 14). The published works gave detailed instructions on how to plant gardens, to tend to them in order to have sufficient yield, the varieties of seedlings; a large number of such studies have been published just as in West Galicia⁴⁶, so in East Galicia⁴⁷.

⁴⁵ Klapchuk, *op.cit.* 2015.

⁴⁶ Giżycki, K.F., *Ogrodnictwo, zastosowane do potrzeb ziemianina polskiego [Horticulture applied to the needs of a Polish landowner]*, Lwów, 1845; Konkolewski, M., *Jaś Sadowski, mały założyciel sadów, dla użytku młodzieży wiejskiej [Jaś Sadowski, the founder of small orchards for the use of rural youth]*, Rzeszów, 1847; Kozubowski, A., *Sadownictwo [Horticulture]*, Kraków, 1868; Czepiński, M. & Langie, K., *Powszechnie ogrodnictwo* (t. 1–3), [General horticulture (Vols. 1–3)], Kraków, 1868–1869; Mieroszowska, E., *Poradnik ogrodowy ku pożytkowi gospodyń wiejskich ułożony [A garden handbook for the benefit of rural housewives]*, Kraków, 1890; Brzeziński, J., *Dobór wzorowy odmian drzew owocowych do hodowli ogólnej [Sample selection of fruit tree varieties for generic breeding]*, Kraków, 1897.

⁴⁷ Giżycki, *op.cit.* 1845; *Krótki wykład zasad rozmnażania i sadzenia drzewin wszelkiego rodzaju dla ludu wiejskiego, ułożony przez wydział c.k. Galicyjskiego Towarzystwa Gospodarskiego [A short lecture on the principles of propagation and planting of trees of all kinds for the rural population, arranged by the Department of Galician Farm Society]*, Lwów, 1852; Kisielewski, A., *Przechadzki po polu i ogrodzie [Strolls along the field and garden]*, Lwów, 1869; Schmidt, A., *Katechizm hodowania drzew owocowych jako też rozpoznawania owoców według pewnych systemów i wyrabianie jablecznika [Catechism of cultivating fruit trees as well as identifying fruit according to certain systems and making cider]*, Lwów, 1878; Boberski, W., *Najważniejsze sposoby uszlachetniania drzew owocowych [The most important ways of refining fruit trees]*, Tarnopol, 1880; Roehring, A., *Sadownictwo [Orchading]*, Lwów, 1881; Pierożyński, L., *Kilka słów o sadownictwie i ogrodnictwie [A word on horticulture and gardening]*, Lwów, 1882; Ćwikliński, H., *Ogrodnictwo lasowe [Forest gardening]*, Lwów, 1882; Oleskow, J., *Podręcznik hodowli nasion gospodarskich na podstawie teorii i praktyki [A manual on seed growing based on theory and practice]*, Lwów, 1885.

Table 14
Fruit tree species in Galicia⁴⁸

Region	Proportion of fruit tree species, %								
	Apple trees	Pear trees	Plum trees	Cherry trees	Sweet cherry trees	Apricot trees	Peach trees	Mulberry trees	Nut trees
Galicia	58.4	11.1	17.0	7.1	4.3	2.2	0.1	0.1	3.3

In publications related to horticultural development, a point was made to the need to organize a fruit trade, to establish agencies that could purchase and distribute the fruit-growing products⁴⁹. The total area used for orcharding in Galicia was 71.1 thousand hectares. At that time more than 6.1 mil pcs. of fruit trees were landed in Galicia or 129 pcs. / ha (Table 15)⁵⁰.

Table 15
Orchards in Galicia⁵¹

Region	Number of trees	Number of trees per 1 ha	Fruit harvesting	
			cwt	kg per 1 person
Galicia	6122123	129	1300129	26.4

Compared to the publications relating to the cultivation of orchard trees, the number of printings on fruit-bush growing was much lower. The reason was that this type of horticulture was underdeveloped in the region; certain attention in the science-education works was also turned to currants. It was argued and noted that this type of horticulture merits more consideration of local farmers, as its products are tasty and useful ones⁵².

⁴⁸ Klapchuk, *op.cit.* 2015.

⁴⁹ Gniewosz, W., *Znaczenie i potrzeby ogrodnictwa w Galicji [The importance and needs for gardening in Galicia]*, Kraków, 1908.

⁵⁰ Klapchuk, *op.cit.* 2015.

⁵¹ Khraplyvyi, *op.cit.*

⁵² *Polepszyć można rodzaj porzeczek [It is possible to enhance the sort of currants]*, "Tygodnik Rolniczy" ["Agricultural Weekly Magazine"], no. 40, 1887, pp. 330–331; Tabeau, J., *Hodowla porzeczek i agrestu [Currants and gooseberries farming]*, "Głos Rolniczy" ["Voice of the Farmers"], no. 3, 1901, pp. 36–38; Morawski, Z., *Porzeczeki*

Popular journals and scientific editions have also published material on the cultivation and tending to gooseberries⁵³, raspberries⁵⁴, and viniculture⁵⁵ occasionally.

Hayfields and pasturage were an essential source of natural forage for livestock. There were 562 thousand hectares under hayfields in Galicia. Hayfields were divided into lowland (55.2%), field (42.7%) and reclamative (2.1%). Hayfields of Galicia had high crop yields (Table 16)⁵⁶. Low-lying hay meadows yielded 58.5% of all hay which was collected in Galicia, field hay meadows – 36.5% whereas reclamation hay meadows – 5%.

Table 16
Hay harvesting (ths cwt)

Region	Lowland			Field			Reclamative			Total
	1 mowing	2 mowing	Total	1 mowing	2 mowing	Total	1 mowing	2 mowing	Total	
Galicia	4594.6	1373.1	5967.7	3049.2	683.4	3732.6	370.1	134.7	504.8	10206

As for the pasturage, the farms of Galicia employed 211284 hectares of agricultural land for grazing⁵⁷. Mountain valleys were at the forefront of unpopulated mountain pasture grounds⁵⁸.

[*Curant*], “Głos Rolniczy” [“Voice of the Farmers”], no. 6, 1902, pp. 88–89; Morawski, Z., *Smrodynia* [*Black Currant*], “Głos Rolniczy” [“Voice of the Farmers”], no. 7, 1902, p. 106.

⁵³ Namysłowski, B., *O niebezpiecznym mączniaku na agrestie* [*On dangerous gooseberry mildew*], “Ogrodnictwo” [“Horticulture”], no. 6, 1907, pp. 161–163; Trzebiński, J., *Nowy pasożyt na agrestie* [*New gooseberry parasite*], “Ogrodnictwo” [“Horticulture”], no. 7, 1904, pp. 200–201; Namysłowski, B., *Jak zwalczać mączniaka agrestu* [*How to fight gooseberry mildew*], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 44, 1913, p. 689; Chmielewski, Z., *Mącznica amerykańska agrestu w Galicji* [*American gooseberry mildew in Galicia*], “Ogrodnictwo” [“Horticulture”], no. 3, 1912, pp. 79–86.

⁵⁴ Tabeau, W., *Hodowla malin* [*Raspberry farming*], “Głos Rolniczy” [“Voice of the Farmers”], no. 6, 1901, p. 90; *Jak należy postępować z malinami w lecie?* [*How should raspberries be handled in summer?*], “Głos Rolniczy” [“Voice of the Farmers”], no. 10, 1906, p. 153.

⁵⁵ Kośnierski, T., *Nieco o roślinie winogrodowej* [*A bit about the grapevine plant*], “Bartnik Postępowy” [“Progressive Bartnik”], no. 1, 1881, pp. 23–25; Brzeziński, J., *Obrączkowanie winorośli* [*Ring-barking of Grapevines*], “Ogrodnictwo” [“Horticulture”], no. 11, 1904, pp. 321–323; Zajac, M., *Nieco z historii win owocowych* [*Some history of fruit wines*], “Ogrodnictwo” [“Horticulture”], no. 5, 1911, pp. 148–151; Chłapowski, K., *Nowe winogrona* [*New grapes*], “Ogrodnictwo” [“Horticulture”], 1912.

⁵⁶ Klapchuk, *op.cit.* 2015.

⁵⁷ Khraplyvyi, *op.cit.*

The issue of Galicia agricultural industrialization, its economic necessity was a pressing one during the studied period. More and more emphasis was placed on the processing of agricultural products using the then mature technologies: sugar refining, flour manufacture, brewing, and yeast production. Needless to say, evidence-based education could not remain uninvolved in these processes, but tried to influence them positively by generating and publishing new results of agricultural research⁵⁹.

The foregoing processes were reflected in the works of researchers and scholars who, in due course, analyzed the processes that took place on the eve of the First World War in the historical aspect⁶⁰.

⁵⁸ Pawłowski, J., "Karpatski polonyny" ["Carpathian mountain meadows"], in J. Pawlikowski's *Kaliendar Towarystwa «Silskiyi hospodar» za 1929 r.* [*Calendar of the 'Farmer' society for the year 1929*], Lviv, 1928, pp. 42–46.

⁵⁹ Rutowski, T., *Przemysł cukrowniczy, jego wpływ na rolnictwo i znaczenie w gospodarstwie narodowym. Przyczynek do rozwiązania kwestii krajowego przemysłu w Galicji* [*The sugar industry, its impact on agriculture and its significance for the national households. A contribution to solving the issue of domestic industry in Galicia*], Kraków, 1883; Pawlik, S., *W sprawie przemysłu cukrowniczego* [*On the sugar industry*], Kraków, 1902; Bandrowski, F., *O potrzebie powiększenia produkcji drożdży prasowanych w gorzelniach rolniczych galicyjskich* [*On the need to increase production of pressed yeast in Galician agricultural distilleries*], "Tygodnik Rolniczy" ["Agricultural Weekly Magazine"], no. 38, 1902, pp. 343–344; Domański, J., *Znaczenie gorzelnii dla rolnictwa* [*The importance of distilleries for agriculture*], "Gorzelnik" ["The Distiller"], no. 22, 1903, p. 202; Gerasiński, F., *Niedomagania przemysłu gorzelniczego* [*Distillery industry deficiencies*], "Gorzelnik" ["The Distiller"], no. 16, 1904, p. 189; Gargas, Z., *Rolnictwo i jego funkcje w gospodarstwie społecznym* [*Agriculture and its functions in social farming*], Kraków, 1904; Pawłowski, J., *Znaczenie cukrownictwa dla Galicji* [*The importance of the sugar industry to Galicia*], Lwów, 1905.

⁶⁰ Styś, W., *Wpływ uprzemysłowienia na ustrój rolny* [*The impact of industrialisation on the agricultural system*], Lwów, 1936; Wykrętowicz, S., "Fazy rozwoju przemysłu rolno-spożywczego na ziemiach polskich 1815–1939" ["Stages of development of the agri-food industry in Poland through 1815 to 1939"], in *Pamiętnik Powszechnego Zjazdu Historyków Polskich w Lublinie* (t. 1) [*Diary of the General Meeting of Polish Historians in Lublin* (Vol. 1)], Warszawa, 1968; Michalewicz, J., "Przemysł gorzelniany Galicji doby autonomicznej między monopolem dworskim a monopolem państwowym (XIX–XX w.). Próba ujęcia modelowego" ["Galicia's distillery industry in the autonomous period between the manorinal and state monopoly (19th–20th centuries). A modelling approach"], *Rocznik Naukowo-Dydaktyczny WSP w Krakowie* [*Academic Yearbook of the WSP in Cracow*], z. 126, Prace Historyczne XIII, [Historical Works 13], 1993, pp. 103–112; Spyra, A., *Browarnictwo Galicji doby autonomicznej* [*Brewing in Galicia*], Kraków, 1994; Kramarz, H., "Młynarstwo i jego funkcje w Galicji (Z problematyki uprzemysławiania rzemiosła chłopskiego)" ["Millers and grain milling in Galicia (On the issue of industrialization of peasant crafts)"], in K. Ślusarek (Ed.), *Polska i Polacy w XIX–XX wieku. Studia ofiarowane Profesorowi Mariuszowi Kulczykowskiemu w 70. rocznicę Jego urodzin* [*Poland and the Poles in the*

In terms of the current study, a Franciszek Bujak's quotation is appropriate:⁶¹ "Modern farmers set up distilleries and grow potatoes instead of grain, which they sell in the form of spirits and possibly ready-to-use vodkas; they set up sugar mills to grow beets; they set up breweries to bring in better out on barley; they process the wheat into flour and bran in their own mills and make bread in their own bakeries; they keep the gardens from which fruit and vegetables are processed into tinned food and other preserves."⁶²

Animal husbandry

A very important branch of agriculture was animal husbandry. Similarly to plant cultivation, it required new and effective approaches in farm management practices. It was in this direction that the sectoral research headed, reporting to the consumer the results of its researches by means of scholarly and science-education literature.

The published papers of the study period tried to cover all the major spheres of animal husbandry: horse breeding⁶³, cattle breeding⁶⁴, poultry raising⁶⁵, swine

19th–20th centuries. Studies offered to Professor Mariusz Kulczykowski on the 70th anniversary of his birthday], Kraków, 2002, pp. 295–317; Kargol, T., "Ziemiaństwo a uprzemysłowienie Galicji na przełomie XIX i XX w. (do 1918 r.) (t. 7)" ["Landowners and the industrialization of Galicia on the cusp of the 19th and 20th centuries (until 1918)"], In W. Puś & J. Kita (Eds.), *Studia z historii społeczno- -gospodarczej XIX i XX wieku [Studies in the social and economic history of the 19th and 20th centuries]*, Vol. 7, Łódź, 2010, pp. 133–149; Wnęk, J., *Rozwój galicyjskiej ideologii przemysłu cukrowniczego w latach 1860–1918 [Development of the Galician sugar industry ideology in 1860–1918]*, "Gazeta Cukrownicza" ["The Sugar Gazette"], no. 5, 2010, p. 129 132–135; Broński, K., "Rozwój przemysłu młynarskiego w Galicji" ["The Development of Milling Industry in Galicia"], in J. Chumiński & M. Zawadka (Eds.), *Z dziejów przemysłu przed 1945 rokiem [From the history of industry before 1945]*, Wrocław, 2012, pp. 81–98.

⁶¹ *Rolnicy nowocześni zakładają gorzelnie i zamiast zboża uprawiają ziemniaki, a te sprzedają w formie spirytusu, a ewentualnie gotowych do konsumpcji wódek; zakładają cukrownie, aby uprawiać buraki; zakładają browary, aby lepiej spieniężyć jęczmień; pszenicę przerabiają na mąkę i otręby we własnych młynach, a nawet mąkę na chleb we własnych piekarniach; utrzymują ogrody, z których owoce i jarzyny przerabiają na konserwy i inne przetwory.*

⁶² Bujak, *op.cit.* 1917, p. 289.

⁶³ Sanguszko, W., *O chowie koni i polepszeniu rasy w Galicji [On horse rearing and breed enhancement in Galicia]*, Lwów, 1839; Rozwadowski, W., *Uwagi nad środkami ku podniesieniu i rozpowszechnieniu chowu koni w Galicji [Notes on means to increase and propagate horse husbandry in Galicia]*, Lwów, 1866; Kretowicz, P., *Kucie koni [Forging of Horses]*, Lwów, 1884; Szybalski, F., *Instrukcja dla dozoruujących w stajniach [Instructions for stable handlers]*, "Tygodnik Rolniczy" ["Agricultural Weekly"], no. 33, 1887, pp. 270–272; Ryx, J., *Przyczynek do hodowli konia [Contribution to horse breeding]*, "Przegląd

rearing⁶⁶, sheep rearing⁶⁷, apiculture⁶⁸ and veterinary medicine issues⁶⁹. The breeding issues were treated at some length, allowing for a qualitative improvement of the livestock population.

Weterynarski” [“Veterinary Review”], no. 3, 1888, p.209, 237, 260, 291; Zygmontowicz, L., *Jaka karma dla koni lepsza, sucha czy wilgotna?* [Which horse fodder is better, dry or moist?], “Głos Rolniczy” [“Voice of the Farmers”], no. 9, 1901, pp. 135–136; Dąbrowski, F., *Zwilżanie obroku koniom* [Wetting feedstuff for horses], “Głos Rolniczy” [“Voice of the Farmers”], no. 4, 1903, pp. 60–61.

⁶⁴ Puchalski, F., *Poradnik gospodarski zawierający w sobie sposoby i środki dotyczące się chowu i leczenia bydła i koni, kultury lasów i myślistwa* [A farm handbook containing ways and means for cattle and horse breeding and treatment, forest and hunting culture], Rzeszów, 1871; Skrzyński, S., *Rys gospodarstwa krajowego w Galicji* [An outline of a domestic farm in Galicia], Lwów, 1883; A.L., *O owcach i ich wełnie wobec tegoczesnych koniunktur* [On sheep and their wool in relation to the economic situation at the time], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 34, 1884, p. 3; Dzianott, *op.cit.*; Malsburg, K., *Z systematyki bydła krajowego* [Ordination of domestic cattle], “Roczniki Krajowej Wyższej Szkoły Rolniczej w Dublanach” [“Yearbooks of the National Agrarian School in Dubliniany”], 1894, pp. 65–136.

⁶⁵ *Czy chów drobiu może być źródłem dochodu u nas?* [Can poultry farming be a source of income for us?], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 27, 1885, p.3; Bojanowski, S., *Kilka wskazówek i uwag dotyczących chowu kur* [Some tips and observations on the rearing of hens], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 7, 1901, pp. 53–56; Idem, *Kilka wskazówek i uwag dotyczących chowu kur* [Some tips and observations on the rearing of hens], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 8, 1901, pp. 61–64; Idem, *Kilka wskazówek i uwag dotyczących chowu kur* [Some tips and observations on the rearing of hens], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 9, 1901, pp. 69–72; Bętkowska, H., *Hodowanie młodych kaczek* [Raising young ducks], “Głos Rolniczy” [“Voice of the Farmers”], no. 6, 1903, pp. 88–89; Czaykowski, T., *Warunki wzrostu młodych indyków* [Conditions for growth of young turkeys], “Głos Rolniczy” [“Voice of the Farmers”], no. 9, 1903, pp. 133–134; Mańkowski, H., *Chów drobiu w Galicji i sprawa podniesienia tej gałęzi gospodarstwa krajowego* [Poultry farming in Galicia and the issue of elevating this branch of the domestic farm], “Hodowca Drobiu” [“Poultry Farmer”], no. 1, 1905, p. 9; Neumanówna, M., *Pielęgnowanie drobiu w zimie* [Nurturing poultry in winter], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 50, 1913, pp. 782–783.

⁶⁶ A.B., *W jaki sposób należy obecnie prowadzić hodowlę trzody chlewnej, aby zapewnić sobie najwyższe dochody?* [How should swine rearing be carried out now in order to secure the highest income?], “Tygodnik Rolniczy” [“Farmer’s Weekly”], no. 5, 1887, pp. 37–38; Czaykowski, T., *Tuczenie trzody chlewnej* [Fattening of Swine], “Głos Rolniczy” [“Voice of the Farmers”], no. 2, 1901, pp. 26–27; Antoniewicz, L., *Jak pielęgnować maciory prośne?* [How to nurture pregnant sows?], “Głos Rolniczy” [“Voice of the Farmers”], no. 16, 1905, p. 250; Masiór, J., *Szczepienie świń* [Swine vaccination], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 9, 1913, pp. 130–131.

⁶⁷ Pawlikowski, K., *Krótką nauka o chowie owiec poprawnych* [A brief study of sheep rearing], Lwów–Tarnów–Stanisławów, 1840; Wodzicki, K., *O hodowaniu owiec* [On sheep rearing], Lwów, 1853; Stanowski, J., *Usiłowania mające na celu zabezpieczenie*

In the second half of the 19th century, there was a general tendency to increase the number of livestock in Galicia, except for some years or periods when there was blight or murrain⁷⁰.

Table 17
Dynamic pattern of livestock population in Galicia⁷¹

	Horses	Bovine animals	Mules, donkeys	Sheep	Goats	Swine	Beehives
1851	530554	1434826	741	955908	221000	675000	0
1857	612222	2325650	2081	810831	41803	683567	0
1869	695610	2070572	1891	966763	35824	734572	257493
1880	735262	2242861	1011	609253	13225	674302	295686
1890	765570	2448006	1203	630994	21095	784500	261047
Austria, 1890	1548197	8643936	57952	318678 7	1035832	3549700	920640
% Galicia, 1890	49.45	28.32	2.08	19.80	2.04	22.10	28.35

zdrowotności owiec w naszych owczarniach [Efforts to protect the health of sheep in our sheepfolds], "Tygodnik Rolniczy" ["Agricultural Weekly"], no. 44, 1884, pp. 5–7.

⁶⁸ Lubieniecki, J., *Dokładna praktyczna nauka dla pasieczników. Jak mają chodzić koło pszczół, aby rozmnożyć prędko pasieki i wydobyć z nich zysk największy możliwy, tak we zwyczajnych naszych ulach krajowych, jako też w ulach dzierzonowskich [A thorough practical study for apiarists on how to tend to the bees to quickly multiply the apiaries and get the best possible profit from them both in our ordinary domestic hives as well as in the landlords' ones]*, Lwów, 1859; Macieszkiewicz, B., *Czy warto zakładać pasieki? [Is it worth establishing apiaries?]*, "Tygodnik Rolniczy" ["Agricultural Weekly Magazine"], no. 14, 1886, p. 113; Dąbrowski, F., *Pomoc dla pasieczników [Assistance for beekeepers]*, "Tygodnik Rolniczy" ["Agricultural Weekly Magazine"], no. 49, 1912, p. 758.

⁶⁹ Wierzejski, A., *O chorobach ryb [On fish diseases]*, "Okólnik Krajowego Towarzystwa Rybackiego w Krakowie" ["Circular Letter of the National Fisheries Society in Kraków"], no. 1, 1881, p. 29; Szpilman, J., *Zaraza drobiu zwana cholera kur [Poultry plague known as chicken cholera]*, "Przegląd Weterynarski" ["Veterinary Review"], no. 2, 1887, p. 45, 74; Kwieciński, S., *O stosowaniu lewatyw u zwierząt domowych a mianowicie o lejku Hegara [On the use of enemas for pets, namely the Hegar funnel]*, *Przegląd Weterynarski [Veterinary Review]*, no. 2, 1887, p. 239; Seifman, P., *Trudności napotymane w rozpoznawaniu nosaczyny u koni [Difficulties encountered in diagnosing glanders in horses]*, "Przegląd Weterynarski" ["Veterinary Review"], no. 2, 1887, p. 157, 187, 213; Prus, J., *Pomór czyli zaraza trzody chlewnej. Zmiany anatomopatologiczne [Plague or swine blight. Post-mortem signs]*, "Przegląd Weterynarski" ["Veterinary Review"], no. 10, 1895, p. 217; 241.

⁷⁰ Klapchuk, *op.cit.* 2015.

⁷¹ *Podręcznik Statystyki Galicji*, 1958.

In general, during the period under study (Table 17), a sharp fall in the number of sheep, goats, swine, mules and donkeys was observed whereas the number of horses and bovine animals was constantly growing. At that time, Galicia was home to almost half of the horses, a third of horned livestock and hives.

As of 1910, there were more than 5.5 million heads of major livestock species in Galicia⁷².

Table 18
Number of livestock in Galicia through 1900 to 1910

Cattle species	1900	1910	Increase(+), decline (-)
Horses	869138	905272	+4.2%
Bovine animals	2718545	2505079	-8.5%
Swine	1254909	1835464	+46.2%
Sheep	437697	358953	-18.0%
Goats	17952	19164	+6.8%
Mules and donkeys	962	481	-50%

When we examine Table 18, we notice that the number of bovine animals, sheep, mules and donkeys decreased during the study period, which was caused by various maladies and murrain whilst the same period saw an increase in the number of swine, horses and goats.

One of the primary animals that contributed to agricultural activities was a horse. This is evidenced by the relevant statistics in Table 19.

Table 19
Number of horses in Galicia

Years	Number, ths. pcs.	Density, pcs./km ²	Density, pcs./1000 animal units
1830	478	6.2	115
1870	696	8.9	128
1882	735	9.4	123
1900	865	11.0	119
1912	906	11.5	113

The herd dynamics discloses that the number of horses has been steadily increasing for 80 years⁷³. This was facilitated by the scientific influence on the industry.

⁷² Pilat, T. (Ed.), *Wiadomości statystyczne o stosunkach krajowych* (Tom XXIV. - Z. I.) [Statistical information on national relations (Vol. 24., P. 1.)], Druk. "Mieszczanka", Lwów, 1911.

Antoni Barański, who was a co-founder of the Imperial Royal Veterinary School in Lviv (Lemberg), was a great authority in this field of agricultural research. In his studies⁷⁴, he described horse species, how to keep their health in check, how to organize their nutrition, tending, breeding and housing properly. The scholar thought that oats were the best feedstuff for horses.

The state of horse breeding development in Galicia was also promoted by exhibitions of the top breeds of horses organized in different cities of the region. The best stud farms, which were engaged in successful selective breeding, received awards. During the fairs the craft people, who appraised horses, pointed out first the fact whether the animal is suitable for heavy duty in the farm and whether it is able to yield healthy progeny.

Another significant type of animal husbandry was bovine animals. In Galicia, as in other regions of the empire, beeves belonged to the category of animals frequently bred in local farms. Most farmers were convinced that a cattle breeding was far and away more profitable than arable farming, and its added benefit was the large amount of fertilizer produced. Accordingly, at the beginning of 1911 there were 2505012 horned cattle units in Galicia⁷⁵, including cows – 1491548 (63.5%); breeding bulls – 58686 (2.3%); bulls for slaughter – 54324 (2.2%); and young stock of both sexes – 800545 (32.0%).

Table 20 displays the dynamics of changes in bovine animals' number and density in the 1830–1912 timeframe⁷⁶.

Table 20
Bovine animals' population in Galicia

Years	Number, ths. pcs.	Density, pcs./km2	Density, pcs./1000 animal units
1830	1468	19.0	358
1870	2072	26.8	380
1882	2243	29.0	376
1900	2715	35.1	371
1912	2503	32.4	312

This is recognized that the number of horned cattle population decreased by 8.5% in Galicia through the course of 1900–1911.

⁷³ Jezierski & Wyczański, *op.cit.*.

⁷⁴ Barański, A., *Chów koni [Horse breeding]*, Lwów, 1883; Barański, A., *Konie gospodarskie, ich wychów i utrzymanie [Farm horses, their raising and upkeep]*, Lwów, 1890.

⁷⁵ Kryukov, *op.cit.*.

⁷⁶ Jezierski & Wyczański, *op.cit.*.

In the late 19th early 20th centuries, the science-education literature gave a lot of advice on cattle grazing, tending and rational treatment when breeding⁷⁷. Current knowledge of cattle farming has been constantly changing and increasing, with a positive impact on livestock development. Works were published on general, group and individual bovine animals nutrition; on fodder distinctive features and methods of horned cattle feeding⁷⁸; on calf rearing⁷⁹; on bovine animals nutrition with green forage⁸⁰; on fattening different breeds of horned cattle, sheep and swine⁸¹.

As reported by the Institute for Economic Research, the local population of Galicia consumed only 50% of meat in the study period⁸². Meat product surplus were supplied to other regions of the empire or exported abroad.

Another important element of animal husbandry in Galicia during the study period was sheep rearing which required due attention, as the population was constantly decreasing. In 1880, there were 609 000 sheep in Galicia, and before 1910 the number of sheep decreased almost twice – by 359 000. The industry importance is confirmed by the fact that 61 365 rural and urban farms were engaged in sheep breeding in Galicia, which is 12.9% of all farms in Galicia. Thus, there were 3.8 sheep per one Galician farm⁸³.

⁷⁷ Pająk, A., *Krótką nauka chowu zwierząt domowych ułożona w pytaniach i odpowiedziach dla młodzieży uczącej się w szkołach wiejskich* [A short study of pet husbandry arranged in questions and answers for young people studying in rural schools], Kraków, 1870; Popiel, A., *Podręcznik do hodowli bydła rogatego* [Handbook on horned cattle breeding], Lwów, 1882, XI–XIII; por. Śniegocki, A. (1897). *Chów bydła rogatego* [Horned cattle farming], “Wskazówki i rady dla gospodarzy wiejskich” [“Guidelines and tips for farmers”], Lwów, 1897; Adametz, L., *O rasie bydła rogatego z galicyjskich Karpat zachodnich* [On the bovine animals species in Galician Western Carpathians], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 19, 1898; Turnau, J., *Bydło czy konie?* [Cattle or horses?], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 52, 1901, pp. 422–425; Antoniewicz, L., *Jak karmić bydło w zimie?* [How to feed the cattle in winter?], “Głos Rolniczy” [“Voice of the Farmers”], no. 18, 1902, pp. 275–276; Iwski, *Parzenie paszy dla bydła i świń* [Brewing of feedstuff for cattle and swine], “Głos Rolniczy” [“Voice of the Farmers”], no. 1, 1902, p. 2; Górniak, J., *Jak dochować się dobrej krówki?* [So how do you keep a good cow?], “Głos Rolniczy” [“Voice of the Farmers”], no. 18, 1903, pp. 280–281.

⁷⁸ Ludkiewicz, Z., *O paszach i żywieniu bydła* [On fodder and cattle feedingstuff], Lwów, 1910.

⁷⁹ Sandoz, F., *Wychów cieliczek* [Raising of the calves], Kraków, 1913.

⁸⁰ Włodek, J., Recenzja na S. Boguszewski *Karmy zielone dla bydła rogatego*, Kraków 1913 [Review of S. Boguszewski’s *Green fodder for horned cattle*], “Tygodnik Rolniczy” [“Agricultural Weekly”], no. 32, 1913, p. 502.

⁸¹ Klecki, W., *Rasy opasowego bydła, owiec i trzody chlewnej* [Breeds for fattening cattle, sheep and swine], Kraków, 1916.

⁸² Klapchuk, *op.cit.* 2015.

⁸³ *Ibidem*.

The largest number of sheep, about 50% of the total number in Galicia, was in the Stanislaviv province (Table 22).

Table 21
Sheep population in Galicia⁸⁴

Years	Number, ths. pcs.	Density, pcs./km2	Density, pcs./1000 animal units
1830	751	10	181
1843	1367	18	207
1869	967	12	178
1890	631	8	95
1910	378	5	47

This was due to the large areas of high-altitude mountain valleys (over 18 thousand ha), which made it possible to graze sheep with minimal costs for their upkeep.

Table 22
Sheep population in Galicia in 1910⁸⁵

Province	Amount, pcs.
Lviv	70573
Stanislaviv	148662
Ternopil	89903
Galicia	309138

The authors of research papers that have studied sheep rearing called for the breeding of these animals, arguing that this branch of animal husbandry is an essential one. The printed material covered the guidelines that advised how to tend to lambs and mature sheep, how to organize their feeding and housing⁸⁶.

However, the number of these research letters was skimpy in contrast with the studies on horses or bovine animals.

⁸⁴ Jezierski & Wyczański, *op.cit.*.

⁸⁵ Klapchuk, *op.cit.* 2015.

⁸⁶ Pawlikowski, *op.cit.*; Wodzicki, *op.cit.*; Stanowski, *op.cit.*; Łaszczyński, W., *Podręcznik dla owczarza [A Shepherd's Handbook]*, Kraków, 1891.

There were also not enough papers on swine rearing; despite this, it was very dynamic in Galicia. In 1900, there were 1294 thousand units of them, and as of 1910 their number increased to 1835 thousand units within the limits of the region⁸⁷.

Table 23
Dynamic pattern of swine population in Galicia⁸⁸

Years	Number, ths. pcs.	Density, pcs./km ²	Density, pcs./1000 animal units
1870	735	9.4	135
1890	785	10.0	119
1900	1254	16.0	169
1912	1834	23.4	229

Over the course of 1870–1912, the number of swine increased by 2.5 times (Table 23), the number of animal unit per population only by 1.7 times. This is conditioned by the various swine maladies in the study period. Thus, during 1899–1906, 100000 swine were compulsorily slaughtered resulting from epizooty in Galicia.

For the foregoing reasons, scientific publications were of utmost importance, regulating the effective feeding of swine, their rearing, prevention of diseases, their propagation, piglets raising, tending to breeding sows⁸⁹.

Another vital part of animal husbandry was poultry farming. It was in the period under study that a significant growth in the number of poultry took place (Table 24). The number of chickens has almost doubled as well as the number of other poultry species increased by 2.5 times⁹⁰.

Poultry farming in Galicia was mainly developed in small peasant farms. Every year poultry products worth 31.8 million korunas were exported from Galicia⁹¹.

⁸⁷ Krukov, *op.cit.*.

⁸⁸ Jezierski & Wyczański, *op.cit.*.

⁸⁹ Czaykowski, *op.cit.* 1901; Antoniewicz, *op.cit.* 1905; Masior, *op.cit.* 1913.

⁹⁰ Pilat, T. (Ed.), *Wiadomości statystyczne o stosunkach krajowych* (Tom XXIV. - Z. I.) [Statistical information on national relations (Vol. 24., P. 1.)], Druk. "Mieszczanka", Lwów, 1911.

⁹¹ Krukov, *op.cit.*.

Table 24
Number of poultry in Galicia (1900–1910)

Poultry species	Amount, pcs.		Population increase	
	1900	1910	Pcs.	%
Chicken	6878377	10301255	3422878	49.8
Geese	457939	566671	108732	23.7
Ducks	285319	384533	99214	34.8
Other poultry	133252	234271	101019	75.8
In all	7756787	11488640	3731843	48.1

Clearly, in the situation that has developed in Galicia the authors of works on animal husbandry argued the necessity to develop poultry farming. The rise of articles on this topic occurred at the turn of the 19th and 20th centuries⁹².

The publications encouraged the development of poultry farming on small farms. In their works both academicians and practitioners of poultry farming have proved that this type of management is as important as horse breeding and bovine animals rearing⁹³. They also had regard for geese breeding and fattening, and proper handling of their feathers⁹⁴.

While analyzing the influence of scientific and popular thought on the development of agriculture in Galicia, it is impossible to ignore apiculture. Thus, the institutions were created that promoted the development of the industry in the region. In 1870s, the Galician Society of Apiculture and Horticulture and the first Galician Honey Company were established in Lviv (Lemberg). The general assembly of beekeepers facilitated discussions on improving honeycraft practices.

⁹² Bojanowski, *op.cit.*; Stasieniewiczowa, K., *Jak się u nas drób sprzedaje* [How we sell poultry], “Głos Rolniczy” [“Voice of the Farmers”], no. 19, 1902, pp. 297–298; Mańkowski, *op.cit.*; Kukura, A., *O rentowności hodowli drobiu* [On the profitability of poultry farming], “Hodowca Drobiu” [“Poultry Farmer”], no. 10, 1906, p. 100; Misiewicz, T., *Kury rasowe: Minorki, Orpingtony, Plymouth – Rocks i Wyandoty* [Pedigree hens: Menorquina, Orpington, Plymouth – Rocks and Wyandott], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 16, 1912, pp. 247–248.

⁹³ Misiewicz, T., *Przyczyny, dlaczego chów drobiu na wsi tak słabo się rozwija* [The reasons why poultry farming in the countryside is so poorly developed], “Tygodnik Rolniczy” [“Agricultural Weekly Magazine”], no. 35, 1912, pp. 544–545.

⁹⁴ Bętkowska, *op.cit.*.

As testimony to interest in apiculture, there are many different scholarly and science-education studies that have influenced the development of the industry in Galicia⁹⁵.

In 1880, 296 thousand hives were registered in Galicia whilst 211.2 thousand in 1900. In the period through to 1910, there was a sharp increase in interest in beekeeping and it was actively promoted. There were already 326194 hives in Galicia in 1910⁹⁶.

It stands to mention that the volume of bee farming production primarily depended on the conditions of honey flow, i.e. physical and climatic parameters coupled with vegetation period. Around 3.6 million kg of honey and 45–65 thousand kg of wax was produced in Galicia annually⁹⁷.

Table 25
Number of hives in Galicia⁹⁸

Province	Number of hives		
	Frame hives	Not mobile	Total
Lviv (Lemberg)	40993	16772	57765
Stanislaviv	21930	3581	28511
Ternopil	77946	5814	83760
Galicia, pcs.	140869	26167	170036

The number of beehives by region makes it possible to ascertain that apiaries were laid close to agriculturally used areas; in the mountainous terrain, beekeeping has hardly developed.

Findings

Thus, the development of agricultural knowledge in Galicia is evidenced by a large number of publications on agricultural issues. It should be noted that there was fostered an awareness of the need to reform outdated and ineffective methods of agriculture under the influence of popular science thought.

⁹⁵ Macieszkiwicz, *op.cit.*; Czaykowski, T., *Gdzie pasieka może mieć powodzenie? [How can an apiary be successful?]*, “Głos Rolniczy” [“Voice of the Farmers”], no. 5, 1903, pp. 74–75; Dąbrowski, *op. cit.* 1912; M., *Recenzja na S. Röhrenscheff 12 miesięcy w pasiece, Tarnów 1917 [Review of S. Röhrenscheff’s 12 months in an apiary]*, “Pszczelarz” [“Beekeeper”], no. 1, 1918, pp. 13–14.

⁹⁶ Kryukov, *op.cit.*.

⁹⁷ Klapchuk, *op.cit.* 2015.

⁹⁸ *Stosunki Rolnicze R.P. [Agricultural Relations R.P.]*, no. I, 1934, pp. 98–102.

Based on the above analysis, we argue that a significant number of scholars, researchers, and reformers, who were engaged in regional distinctive features of farming, believed that agriculture would be more successfully developed than industry in the Galician territory⁹⁹.

The results of scientific ideas influence on the Galicia agrarian sector development are summarized in Table 17 by the example of the dynamic growth major crop yields in the 1901–1911 timeframe (Table 26).

Table 26
Gross yield of staple crops¹⁰⁰

1901-1910		1911	
Gross yield, cwt	Yield, cwt / ha	Gross yield, cwt.	Yield, cwt / ha
Rye			
6180353	9.8	8312636	11.9
Barley			
3331236	9.65	4295597	12.65
Oats			
6195941	9.5	8428168	12.0
Maize			
910245	11.4	719291	11.5
Potato			
?	111.2	64794276	126.3

This was made possible by propagation and education of knowledge on both the latest technologies in agriculture and new methods of work organization in the industry. The problems which did not allow gaining heavy yields were revealed, the scientific approach to soil constitution studying as well as introduction of effective mechanization, use of fertilizers, conducting land reclamation and other things were developed.

A clear-cut breakthrough in vegetable cultivation was the development of new cultivar species, which enabled a significant enhancement in yield.

An unequivocal achievement in the study period was the development of animal husbandry in Galicia and the reason for this, coupled with other objective factors, was academic outreach.

⁹⁹ Wnęk, J., *Popularyzacja wiedzy rolniczej w Galicji* [*Popularization of agricultural knowledge in Galicia*], “Galicja. Studia i materiały” [“Galicia. Studies and materials”], no. 1, 2015, pp. 61–98.

¹⁰⁰ Krukov, *op.cit.*.

Table 27
Cattle density in the top ten European livestock breeding countries¹⁰¹

Country, land	Cattle density per 1 km ²				Density per 100 inhabitants			
	Horses	Horned cattle	Swine	Sheep	Horses	Horned cattle	Swine	Sheep
Austria	6.0	30.53	21.44	8.27	6.3	32.06	22.51	8.5
England	6.91	37.55	11.36	99.46	5.21	28.28	8.56	74.97
Belgium	8.57	63.04	37.91	8.0	3.81	27.74	16.68	3.52
Galicia	11.53	31.91	23.38	4.57	11.27	31.2	22.86	4.47
Denmark	13.72	57.56	37.63	18.62	20.65	86.67	56.66	28.04
Spain	1.03	4.69	4.8	29.96	2.66	12.15	12.43	77.51
Italy	3.33	21.62	8.75	38.94	2.94	19.09	7.72	34.37
Germany	8.03	38.15	41.0	14.25	6.69	31.79	34.12	11.87
France	6.03	26.65	13.62	32.36	8.24	36.42	18.61	44.22
Sweden	1.3	6.09	2.06	2.28	11.32	53.14	1794	19.89

As is evident from Table 27, which compares the statistical data of the ten leading animal breeding countries in Europe, Galicia was one of the first six countries in Europe during the study period, based on the criteria of livestock density per 1 km² and per 100 inhabitants.

Another important asset of agricultural education was the fact that the authors of scholarly and popular science works gradually instilled in agricultural readers the belief that raising their cultural context level of certain economic processes comprehension would significantly improve their economic situation and increase productivity of farm workers.

The titles also underscored that the work of farmers is a unique and complex activity, which is aimed at obtaining agricultural products that are a source of income for people not only in Galicia but throughout Europe as well.

Having regard to the above, we witness that a substantial advance in the development of agriculture was registered in Galicia of the Austro-Hungarian era. All this would have been impossible without the patient work of agricultural ideologists, who relentlessly and doggedly promoted innovative concepts of working on land.

¹⁰¹ Pilat, T. (Ed.), *Wiadomości statystyczne o stosunkach krajowych* (Tom XXIV. - Z. I.) [Statistical information on national relations (Vol. 24., P. 1.)], Druk. "Mieszczanka", Lwów, 1911.