

1. THE POTASH INDUSTRY IN BOHEMIA AND MORAVIA IN THE 18TH AND 19TH CENTURIES

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INTRODUCTION

Traditional production of potash and related chemicals had been documented on the territory of Bohemia and Moravia since the Middle Ages but it reached its maximum upswing only in the eighteenth century and especially in its second half.¹ In those days this had become one of the crucial branches of production. It played an important role in bleaching and dyeing materials, curing skins, and production of soap, paints, paper, etc. In Bohemia potash was used mainly in the highly advanced glassmaking industry, and glassworks consumed about 90% of the domestic production.² However, past historical investigation didn't pay any attention at all to potash production and in contrast to the study of many other branches of production we lack even the basic information about it.

Potash production belongs, together with some other branches of production (charcoal burning, tar making, pitch extraction), among the so called pre-industrial forest trades, characterized by a strong dependence on natural resources, special technological procedures based mainly on the influencing of natural chemical reactions and by specific social-economic status of producers.³ In the case of potash making in our period there comes out also a unique ethnical constriction of this profession – the overwhelming majority of potash producers in Bohemia and Moravia were Jews.

1. POSITION OF THE RESEARCH

Results of the existing studies of potash production and potash trade in the Central Europe in the eighteenth to nineteenth century are rather patchy and inadequate. On a general level we can draw on older as well as more recent literature dedicated more generally to the

¹ For much more detailed overview of the topic cf. J. Woitsch, *Zapomenutá potaš. Drasláři a draslářství v 18. a 19. století*, Praha 2003.

² Cf. the very rare quantification of Potash consumption in Bohemia in Österreichische Staatsarchiv (hereafter ÖStA) Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 820, 5560, Fasc. 65, 1752–1766, fol. 147–150.

³ E. Weinberger, *Pecheln und Pottaschesieden-gewerbliche Waldnebennutzungen in Altbayern im 18. Jahrhundert*, Forum forstgeschichte - Forstliche Forschungsberichte München 180, 2000, p. 113–138; E. Weinberger, *Waldnutzung und Waldgewerbe in Altbayern im 18. und beginnenden 19. Jahrhundert*, Stuttgart 2001.

history of this period, and also on works from the field of economic and social history⁴ and due to the topic of study also on ethnographic and ethno-cartographic studies and articles on regional and local history and geography. Last but not least, one has to rely on special chemical and chemical-technological reference manuals and various specialized encyclopaedias and dictionaries. So far the most extensive descriptions of potash production on the territory of Bohemia are included partly in the works dealing with the history of forests and forestry,⁵ partly in the works dedicated to the history of glassmaking. In both cases, however, we lack a modern overall analysis of the problem.

Of course, potash production was not a specifically Czech or Central European, not even European, phenomenon. Especially in Germany, Poland and Scandinavia there already exists a noteworthy quantity of partial studies as well as of synthesizing surveys. The present work also takes into consideration results of investigation realized in the countries that had direct or indirect influence on the situation of this branch of production in Bohemia and Moravia (especially through the innovations of technology, and possibly also through direct trade contacts).

Due to the lack of existence or poor reliability of secondary literature the research had to be based on archival and printed sources. Of greatest importance were the sources that originated as a result of activity of state administration and local government in the Czech lands, materials of central authorities with the seat in Vienna and also a wide spectrum of sources of patrimonial provenance. The most important material for the history of economic development of Bohemia in the eighteenth century, including potash production, is being preserved in the deposit Czech Gubernium – Commerciale of the National Archives (formerly State Central Archives) in Prague. The core of the deposit constitutes the correspondence of commercial authorities with their boards in Vienna, with the offices of state administration and local government in Bohemia, reports of manufacture commissions and commissioners, dossiers that document hearings of inquiries, petitions and complaints of landlords, craft corporations and entrepreneurs, monarchical decisions and recommendations in questions of industrial development and also statistics of the advancement of production and trade. Numerous sources of potash production and the functioning of potash monopolies we can find also in other deposits of the National Archives; of value are especially the letters patent and the so called circular letters and ordinances that were gathered centrally in this archive.⁶

⁴ K. Přibram, *Geschichte der österreichischen Gewerbepolitik von 1740–1860*, Leipzig 1907; A. Klíma, *Manufakturní období v Čechách*, Praha 1955; A. Klíma, *Mercantilism in the Habsburg Monarchy - with special reference to the Bohemian Lands*, *Historica* 11, 1965, p. 95–119; P. Bělina, *České země a habsburský absolutismus ve druhé polovině 18. a na počátku 19. století*, Praha 1993; P. Bělina–J. Kaše–J. P. Kučera, *Velké dějiny zemí koruny české X., 1740–1792*, Praha 2001.

⁵ J. Kazimour, *Státní péče o lesy v Čechách v letech 1754–1852*, část 1, *Do válek napoleonských*, Praha 1933, p. 131–134 and passim; J. Nožička, *Přehled vývoje našich lesů*, Praha 1957; B. Štiess, *Potaš*, *Život Plzeňska* 4, 1953, p. 102–105; F. Mareš, *České sklo. Příspěvky k dějinám jeho až do konce 18. století*, Praha 1893.

⁶ J. Kropatschek, *Sammlung aller k. k. Verordnungen und Gesetze von 1740 bis 1780, die unter der Regierung des Kaisers Joseph II. theils noch ganz bestehen, theils zum Theile abgeändert sind*, Bd. 1–8, Wien 1789²; J. Kropatschek, *Sammlung der Gesetze, welche unter der glorreichen Regierung des Kaisers Leopold II. in den*

Many of the crucial dealings and decisions in commercial affairs in the eighteenth century didn't take place in Bohemia and Moravia only, but also on the grounds of the central administration of the Habsburg monarchy in Vienna. Their enormous collections are being preserved in several departments of the Austrian State Archives (Österreichische Staatsarchiv Wien). Dossiers that originated, among others, from the agenda of the court commercial council (Kommerz-Hofkommision), commercial directorium (Kommerz-Hofdirektorium) and other competent institutions, are now administered by the department Finance and Aulic Chamber Archive (Finanz- und Hofkammerarchiv). Results of the investigation in the relevant part of the deposit *Commerz Böhmen*⁷ enabled the author of the study to enlarge fundamentally and sometimes even to rectify the testimony of sources accessible in Bohemia.

From the sources of patrimonial provenance it is necessary to mention architectural plans of potasheries, the oldest of which come from the end of the eighteenth century, and also inventories of potasheries, leases on these potasheries and the relevant dossiers. Important information on the volume and balance of production were acquired from the paperwork of individual manors and the potasheries existing on them. Due to the fact that the study focuses on the whole of Bohemia and Moravia and also due to the methodology applied (macro study) the author had used the manorial sources to verify partial hypotheses. The majority of the material analysed comes from the State Regional Archives in western and southern Bohemia. These are especially the collections of estates, central manorial administrations and family archives of aristocratic families.

Tables and graphs are based on a number of sources of proto-statistical character. Of great importance for an understanding of potash production are materials that originated from the activities of specialized commercial authorities or were compiled for the use of these authorities (in the first place, production tables from the years 1752–1753 as well as land manufacture tables from the years 1756, 1761, 1766, 1769 and 1775–1798)⁸ and statistics that originated from private activities of individuals.⁹

sämtlichen k. k. Erbländen erschienen sind, Bd. 1–5, Wien 1792; J. Kropatschek, *Sammlung der Gesetze, welche unter der Regierung des Kaisers Franz II. erschienen sind*, Bd. 1–25, Wien 1792–1808; W. G. Kopetz, *Allgemeine österreichische Gewerbgesetzkunde, oder systematische Darstellung der gesetzlichen Verfassung der Manufactur- und Handelsgewerbe in den deutschen, böhmischen galizischen, italienischen und ungarischen Provinzen des österr. Kaiserstaates*, Bd. 1–2, Wien 1829–1830.

⁷ ÖStA Wien, Finanz- und Hofkammerarchiv, *Commerz Böhmen*. Nr. 820–825 (5560–5565). *Pottaschenerzeugung und Ausfuhr, Pachtung und Aufschlag (1752–1812)*.

⁸ Z. Martínek, *Řemeslná, domácí a manufakturní výroba a obchod v Čechách v letech 1752–1756*, *Etnografický atlas Čech, Moravy a Slezska sv. III.*, Praha 2000; M. Lišková, *Počátky zemských manufakturních tabel v Čechách (1756–1775)*, *Hospodářské dějiny* 11, 1983, p. 119–133; M. Lišková, *Zemské manufakturní tabely 1775–1798*, *Sborník archivních prací* 32, 1982, p. 550–575; G. Otruba, *Die älteste Manufactur- und Gewerbestatistik Böhmens*, *Bohemia* 5, 1964, p. 161–241.

⁹ J. Schreyer, *Kommerz, Fabriken und Manufakturen des Königreichs Böhmen. Theils, wie sie schon sind, theils wie sie es werden könnten*, Bd. 2, Prag–Leipzig 1790; J. Schreyer, *Waarenkabinet oder niederlage der in Böhmen erzeugten Warenartikel und Naturprodukte dann der damit betriebende Handel*, Prag–Leipzig 1799; J. A. Riegger, *Archiv der Geschichte und Statistik insbesondere von Böhmen*, II., Dresden 1793; J. A. Riegger, *Materialien zur alten und neuen Statistik von Böhmen*, Heft V., Prag–Leipzig 1787–1794.

2. GENERAL PROBLEMS OF THE STUDY OF POTASH PRODUCTION IN THE MODERN ERA

The traditional term potash denotes a mixture of chemicals that for centuries constituted a crucial material for many branches of production. In the first place it was glassmaking, where potash had been added to the so-called glass base in order to ease the melting of the siliceous sands and secondarily it also markedly influenced the characteristics of the glass. Potash also came in very useful in production of dyes, saltpetre, gunpowder and soap; the solution of potassium carbonate had been used for linen bleaching and for curing skins.

The chemical constituent of utility value in potash is potassium carbonate (K_2CO_3). Depending on the materials used and the technology applied the proportion of the substances in potash could vary considerably. In the eighteenth and nineteenth century potash with approximately 30–90% of K_2CO_3 had been produced, the rest was K_2SO_4 (second most important in potash produced by traditional technology, its percentage being 10–30%), Na_2CO_3 , KCl , Fe_2O_3 , K_3PO_4 , K_2SiO_3 and also numerous insoluble impurities and residual water.

From the point of view of terminology used in Bohemia and Moravia in the eighteenth century, which was mostly German, we can state that the very word potash bears on itself marks of the traditional technology. The German term *Pottasche* originated as a compound word from the denomination of iron pot (*Pott*), in which lixiviated wooden ashes (*Asche*) had been evaporated and sometimes also primitively calcinated. Etymology for the English language is identical (*pot + ash*), from here *potash*. The word potash is being used in many other European languages; from the most common national modifications should be mentioned the terms *potaż* (Polish), *potash* (Russian), *potasse* (French), *potassa* (Italian).

In the seventeenth, eighteenth and nineteenth century a very consistent distinguishing (including the terminological) existed for different types of potash.¹⁰ The terms were derived from the materials and technologies, from the places of production and so on. The specific term often enables us to identify the country of origin of the potash and also its quality. From about the turn of the eighteenth and nineteenth century also the first attempts for scientific chemical nomenclature had occurred. Thanks to the development of chemical sciences the only correct term was established – potassium carbonate, of course in the respective linguistic mutations. Due to the powerful influence of tradition, however, up to the present time the scientific denomination is almost not used at all.

¹⁰ Also in Bohemia and Moravia. See ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 820, 5560, Fasc. 65, 1752–1766, fol. 786–795.

3. POTASH PRODUCTION AND POTASH TRADE IN BOHEMIA AND IN EUROPE UP TO THE MID-EIGHTEENTH CENTURY

Well up to the Modern Age the production of chemical substances had been based on the unknowing use and influencing of natural chemical transformations, only gradually uncovered and scientifically substantiated. The technology of lixiviating wooden ashes had been known already in Antiquity, and the resulting product had been used for glassmaking. Thanks to Arabic science the knowledge of alkali production later penetrated through Muslim Spain to Central Europe, even though the autochthonous development of technology without any ties to Ancient traditions is possible as well. The Arabian and Persian scientists were also the first to realize the chemical difference between substances lixiviated from various types of vegetable ashes (later called sodium and potash).¹¹

Medieval and Early Modern chemistry and alchemy didn't bring much new to the theoretical knowledge of potash production. The best technologist of the time, Georgius Agricola, drew on older traditions and on practical experience. In his *Twelve Books on Mining and Metallurgy* he described making of sodium and uncalcinated potash. He calls the resulting product consistently as salt and mentions its use exclusively in glassmaking.¹²

On a practical level fundamental changes occurred in the Early Modern Era. At the beginning, the demand of the main purchaser branches had been satisfied by small workshops documented since the tenth to the thirteenth century. However, the advancement of textile production in Western Europe and glassmaking in Central Europe modified sweepingly the production conditions. While Central Europe (i.e. including Bohemia and Moravia) and Western Europe, including the Mediterranean, had been until the establishment of scientifically grounded production techniques reliant on more and more thickened net of small potasheries, the period from the sixteenth to the eighteenth century had been a golden age of potash production in the Baltic region and the territories of contemporary Russia and Poland. In the times of the greatest boom of potash trade in the Baltic (approximately from 1530 to 1680) millions of tons of potash were sent every year to Flanders, France and England. The main centres of North European trade were Gdańsk (Danzig), Königsberg,

¹¹ J. Beckmann, *Beyträge zur Geschichte der Erfindungen*, Bd.4 , Leipzig 1799, p. 10–14; P. Vágner, *Antická chemie jako předpoklad počátků studia chemických vlastností látek*, *Práce z dějin přírodních věd* 24, 1989, p. 175–201; G. Fester, *Die Entwicklung der chemischen Technik bis zu den Anfängen der Grossindustrie*, Berlin 1923, p. 27–28, p. 40; W. Strube, *Der historische Weg der Weg der Chemie*, Bd. 1 *Von der Urzeit bis zur industriellen Revolution*, Leipzig 1981.

¹² G. Agricola, *Dvanáct knih o hornictví a hutnictví*, Praha 1976², p. 27–29, p. 465–497.

Riga and Archangelsk.¹³ From the seventeenth century on Russian potash could also be found in Bohemia.

The specific natural setting (extensive forests) and social-economic situation (enslaved labour force) of North-eastern Europe, and especially Russia, introduced an advance of volume and forms of potash production not seen anywhere else. At least in the seventeenth century Russia became the world's leading potash producer. When due to the ordinance of Peter I the Russian potash trade became a monopoly of the tsar, however, already coming through were the first signs of the crisis of East European potash production, based on specific technology. While the Eastern (Russian) procedure produced a great quantity of alkalis, these were of extraordinary poor quality in comparison with potash produced in other countries. Besides, in Poland and Eastern Prussia a shortage of high-quality wood came to be felt at that time, due to the reduction of local forests to ashes. Around the year 1770 the Russian potasheries began to change over to more advanced West European technologies. Even in later times Russia kept the position of world's leading potash producer, now comparable in quality with production of other countries, but Poland and the Baltic region lost its outlets especially due to the entry of other suppliers to potash market (Scandinavian and North American potash).¹⁴

In Bohemia the accentuated demand for ashes and for potash of recognizably higher quality had been evident since the sixteenth century, when probably also the first wave of founding of potasheries came about. However, the maximum boom of Czech potash production (as a peculiar branch of production that produced more valuable calcinated potash instead of the raw potash – called *Fluss* – of the earlier period) occurred only in the next two centuries. The initial powerhouse of the domestic potash production of higher quality had been the discovery and improvement of fabrication of the famous Czech glass – the clear potash-calcic crystal – in the last third of the seventeenth century,¹⁵ while the heightened

¹³ Cf. R. Gelius, *Der Europäische Seehandel mit Waidasche und Pottasche von 1500 bis 1650*, Jahrbuch für Wirtschaftsgeschichte 3, 1985, p. 59–72; R. Gelius, *Rola nadbaltyckiego handlu waidazem i potazem w Europejskim przemyśle chemicznym w XVI. i XVII. wieku*, Rocznik Gdański 1, 1984, p. 29–53; M. Bogucka, *Der Pottaschehandel in Danzig in der ersten Hälfte des 17. Jahrhunderts*, Hansische Studien Bd. 6, Abhandlungen zur Handels- und Sozialgeschichte 23, Weimar 1984, p. 147–152; S. E. Åström, *From tar to timber. Studies in Northeast European Forest Exploitation and Foreign Trade 1660–1860*, Commentationes Humanarum Litterarum 85, Helsinki 1988; J. Radkau–I. Schäfer, *Holz. Ein Naturstoff in der Technikgeschichte*, Reinbeck 1987, p. 120.

¹⁴ See at least L. Östlund, *Exploitation and structural changes in the north Swedish boreal forest 1800–1992*, Umeå 1993; L. Östlund–O. Zackrisson–H. Strotz, *Potash Production in Northern Sweden. History and Ecological Effects of a Pre-industrial Forest Exploitation*, Environment and History 4, 1998, p. 345–358; H. Strotz–J. E. Haggason, *Pottasketillverkning i Sverige under historisk tid*, Sveriges Lantbruksuniversitet - Institutionen för skoglig vegetationsekologi, Rapporter och uppsatser 6, 1994, p. 1–48; S. Åhman, *Pottaskebränning i Sverige och Danmark under 1600 - talet. Om en bortglömd skogsprodukt och internationell handelsvara*, Acta Wexionensia, Serie 1. History and Geography, Växjö 1983. T. J. Kreps, *Vicissitudes of the American Potash Industry*, Journal of Economic and Business History 3, 1931, p. 630–666 a W. I. I. Roberts, *American Potash Manufacture before the American Revolution*, Proceedings of the American Philosophical Society 116, 1972, p. 383–395.

¹⁵ Cf. J. Lněničková, *Šumavské sklárství*, Sušice 1996, p. 20; J. Lněničková, *Nordböhmisches Glasrezeptbuch aus der zeit des Barocks*, Glasrevue 45, 1990, p. 14–18.

demand for potash at the same time emerged in many other purchaser branches that gradually changed over from ash and raw potash to calcinated potash.

The technology of potash production in Bohemia hadn't changed much since the times of Agricola. However, in the course of the seventeenth century there had been substantial changes in the field of theoretical knowledge of chemical substances. After the year 1679 the potash producers could take advantage of the book of Johann Kunckel *Ars Vittraria experimentalis oder vollkommene Glasmacher – Kunst*. From the point of view of our topic it is very important that in the closing part Kunckel's work offers the most detailed analysis until then published of the technology of potash production including an exhaustive description of refining the raw potash through calcination.¹⁶

Even though scientific and technological discoveries that were accomplished in the eighteenth century for the most part didn't have a direct impact on the branch of production under study, they represented a base for its further development. In the year 1736 J. L. Duhamel du Monceau postulated his thesis about special chemical character of soda, at that time considered to be an indivisible element. With him followed up A. S. Marggraf who experimentally proved the fact, known for centuries on the level of practical knowledge, but only suspected on the level of the causation, of the difference between soda (alkali extracted from the ashes of sea plants) and potash (boiled from the ashes of terrestrial herbs and wood). And finally in the years 1807–1808 the English chemist H. Thompson proved the possibility of electrolytic decomposition of soda and potash to partial components and through this he sparked a new chapter of scientific cognition of the salts of alkali soils as well as the first efforts to produce artificial (laboratory) alkalis. New methods of preparation of soda (Leblanc 1791–4) and potash that abandoned the traditional material base altogether were still too expensive for practical use, even though they were to prevail over the others in the future.

4. RAW MATERIALS AND ECOLOGICAL CONSEQUENCES OF THE PRE-INDUSTRIAL POTASH PRODUCTION

The basic material for traditional potash making constituted the ashes of terrestrial herbs and wood.¹⁷ The large-scale ash production based on burning of organic materials had in the eighteenth century already become for the most part a task of specialized craftsmen – the so called ashmen who performed it directly in the woods. Ash making belonged to the forest trades, equally as the potash making. It became an independent trade much earlier than potash making and probably the first potash makers came just from the ash burners. Both trades had always existed in close symbiosis.

¹⁶ J. Kunckel, *Ars vittraria experimentalis, oder vollkommene Glasmacher - Kunst*, Frankfurt am Main 1679, p. 324–325.

¹⁷ For the details on ash-making cf. H. W. Kurrer, *Die Kunst vegetabilische, vegetabilisch–animalische und rein animalische Stoffe zu bleichen*, Nürnberg 1831, p. 356–364; S. Pick, *Die Alkalien*, Wien–Pest–Leipzig 1877; A. Hohenstein, *Die Pottaschen-Fabrikation für Waldbesitzer und Forstmänner*, Wien 1856, p. 16–52.

According to outlines available concerning the wider Central European context and actual written sources in Bohemia, it can be stated that ash or rather potash was produced from practically all common local species of deciduous and evergreen trees. There exist dozens of comparative surveys and tables of the period that give volume or else weight and utilization percentage of ashes and potash made of various plants; and these surveys differ substantially at times.¹⁸ In circular letter of the year 1772¹⁹ for potash making is being recommended spruce, fir, beech and willow, while oaks and birches are considered unsuitable due to their chemical characteristics. Comparison with available chemical analysis²⁰ leads us to slightly different conclusions. Of wood (or its ashes) the most rich in K_2CO_3 are elms, ash trees, beeches and oaks. However, much higher percentages of potash (up to ten times higher) is contained only in herbs – of the common ones, in ferns, thistles, cotton grass, wormwood, celandine, bittersweet nightshade and surprisingly also in many cultural plants – barley and wheat straw, vetch, beans, vine or potatoe and sunflower haulm.

Of fundamental importance for the resulting content of potassium compounds in the ashes are also age and condition of wood (diseases) and especially soil and climatic conditions in which the trees had grown. In Bohemia, for example, a delicate problem represented the extraction and sale of the so called tinder ashes (i.e. ashes with high content of potassium sulfate), made by burning of tinder wood.

Theoretical as well as practical knowledge of the utilization percentage of ashes and potash of various types of plants, however, could only be used in a limited way. By a long way the most profitable was the burning of wood of any kind, because even though wooden ashes contain in general less K_2CO_3 than ashes of plants, for the same volume of product much less of the original material was needed. Lower quality was easily recompensed by a higher utilization percentage of wooden ashes, but in the period when lack of suitable wood was felt more and more acutely, possibilities of agricultural production of ash plants were also being taken into serious consideration.²¹ The only plant constantly (probably since the Middle Ages) and plenteously used for potash making in Bohemia had been fern. For potash makers, considering the selection of wood was possible only until the publication of the undermentioned forest regulations. In the case of house ashes, of course, this was impossible to calculate with. In the period of general lack of material, utilitarianism clearly triumphed

¹⁸ Compare, at least, A. Hohenstein, *Die Pottaschen-Fabrikation für Waldbesitzer und Forstmänner*, Wien 1856, p. 18–25, that compiled a comparative table surveying utilization percentage of potash made of 105 types of plants.

¹⁹ NA Prague, CV, inventory no. 277–1772.

²⁰ K. H. Wedepohl, *Glas in Antike und Mittelalter*, Stuttgart 2003; B. Olanders – B. M. Steenari, *Characterization of ashes from wood and straw*, Biomass and Bioenergy 8, 1995, pp. 105–115; M. K. Misra – K. W. Raglane – A. J. Baker, *Wood ash composition as a function of furnace temperature*, Biomass and Bioenergy, 1993, Vol. 4, No. 2, pp. 103–116; W. B. Stern - Y. Gerber, *Potassium-Calcium Glass: New Data and Experiments*, Archaeometry 46, 2004, pp. 137-156

²¹ As the most suitable appeared in this context the wormwood, of which (wildly growing) potash had already been made in the steppe areas of southern Russia.

over experience and commencing development of scientific investigation. In a word, potash makers burned what they had at hand at the moment.

The wood used was meant to be fresh. It was best when the trees were growing at their fastest. Reports from that period rarely agree in relation to data concerning yields and technological efficiency: for the production of 1 kg of calcined potash it was necessary to burn an average 1000 kg of wood. Given the standard density of wood growing in Bohemia, which is in the range from 0,47 g/cm³ for dry spruce to 1,01 g/cm³ for beech, for every kilo of potash 1–2 m³ of wood was burnt. Modern Polish experiments partially confirmed this figure,²² whereas during experimental production in Sweden²³ and in the Czech Republic,²⁴ using a slightly different method, substantially lower yields were achieved (approximately 0,25 kg of calcined potash from 1000 kg of wood).

Reports of the catastrophic state of the forests in Bohemia and insufficient knowledge about the conditions in potash production of that time led to sweeping condemnation of the industry as one of the greatest factors leading to the destruction of the forests in the second half of the 18th century. If we presume that all the potash produced in Bohemia was made from high quality wood as was mentioned above then (detaching the fact that potash production itself was highly energy consuming and required a constant supply of firewood) this would have meant a threat to the forests without any doubt. Indeed, at the end of the 18th century about 1,000 tons of potash were produced in Bohemia every year, which accounts for the consumption of 550,000 – 600,000 m³ of wood, i.e. about 15% of the overall amount of wood production.²⁵ However, the actual situation - and this must be emphasised - was very different.

From the middle of the 18th century, there was a law that along with others limited not only the further development of potash production in Bohemia, but also its influence on the forests. After centuries of voluntarism in exploitation of natural resources, on April 5, 1754, an imperial letters patent was issued concerning "*The forests and wood in the Bohemian Kingdom*". This is also known as the "Terežian forest regulations" as it was issued under Maria Theresa (Marie Tereza), Queen of Hungary and Bohemia. Most of the points in the new law affected the production of potash, but the key was the eighth point dealing with the "*burning of coal and ash, as well as pitch and axle grease*". It stated that healthy trees were

²² R. Gelius, *Der Europäische Seehandel mit Waidasche und Pottasche von 1500 bis 1650*, Jahrbuch für Wirtschaftsgeschichte 3, 1985, p. 59–72; R. Gelius, *Rola nadbaltyckiego handlu waidażem i potażem w Europejskim przemyśle chemicznym w XVI. i XVII. wieku*, Rocznik Gdański 1, 1984, p. 29–53.

²³ L. Östlund–O. Zackrisson–H. Strotz, *Potash Production in Northern Sweden. History and Ecological Effects of a Pre-industrial Forest Exploitation*, Environment and History 4, 1998, p. 345–358.

²⁴ Z. Cílová–J. Woitsch, *Experimentální výroba potaše tradiční technologií*, Sklář a keramik 55, 2005, p. 125–135; J. Woitsch, *Tradiční technologie výroby potaše*, Sklář a keramik 52, 2002, p. 11–19.

²⁵ J. Nožička, *Přehled vývoje našich lesů*, Praha 1957, p. 392; J. Kazimour, *Státní péče o lesy v Čechách v letech 1754–1852*, část 1, Do válek napoleonských, Praha 1933, p. 88; J. A. Riegger, *Materialien zur alten und neuen Statistik von Böhmen I.–XII*, Prag–Leipzig 1787–1794.

not to be used for burning ash, only "waste wood" such as tree stumps, twigs and branches, fallen trees and rotting wood.²⁶

Detailed study of the records revealed that the regulations were really respected and any breaches of them punished. Large-scale burning of high-quality wood continued only in some outlying areas (e.g. Šumava mountains) and the negative impact of potash production on the state of Bohemian forests was limited at after the middle of the 18th century. Wood ash from glassworks, enterprises run by nobles and households became the new raw material base. The last mentioned source was mostly in the form of compulsory supplies of domestic ash provided by subjects.

Tenants of manorial potasheries secured a monopoly on the purchase of ashes within the borders of the respective manor by means of contracts with landlords. Only exceptionally was this monopoly right rented out independently. The delivery of ashes represented an important constituent of the duties assigned to bondmen. Those who did not contribute the given amount of ashes (yearly several buckets [strych - aprox. 93 litres] – one bucket amounts about 2,5 bushels, but for example, owners of taprooms were obliged to supply higher quantities) could be fined or some other penalty was imposed on them. The fine depended on the actual price of the ashes. Manorial officials monitored and regulated carefully the delivery of ashes and it was difficult to acquire them outside the borders of the manor; in areas characterized by high demand for the material this was only possible through illegal purchase and smuggling over the border of the manor. Where ashes were not valued so high and thus authorities did not regulate trading in them, the material was being bought by itinerant merchants. It is characteristic of the whole industry that in the majority of cases, itinerant buyers of ashes in the eighteenth century as well as in later periods were Jews (so called *Aschenjuden*).

We find many of these traders (sometimes called *Aschensammler* or *Aschenhandler* etc.) also in registers of the Jewish population in Bohemia of the 1730s to 1790s. It should be emphasized that these persons also traded in animal skins, textiles, tobacco or liquors. Also common was also the connection of potash making with other peculiarly Jewish professions (tenancy of distilleries, tanneries or butcheries) as well as commercial and credit enterprises. This connection could manifest itself in activities of a single person or in wider kinship or non-kinship networks that could cover the whole territory of Bohemian lands. The Jews not only dedicated themselves to these trades, but also centralized in their hands commercial and financial flows connected to potash making, and often interwoven with other economic activities.

Especially sought-after territories for buying of ashes represented cities and towns,²⁷

²⁶ Národní archiv (hereafter NA) Praha, PT, nr. 1498–5. 4. 1754.

²⁷ Precisely when the ashes started to be collected and bought in towns is a problem that has to be resolved by further study. By analogy it could be assumed that this was already in the Middle Ages. See the information given by C. C. Giurescu, *A History of Romanian Forest*, Bucharest 1980, p. 138 on ash collector in Brasov in the year 1437.

where households and workshops „manufactured“ great quantities of this material. However, in this potash makers often clashed with local craftsmen – especially soap makers – who claimed the exclusive right for buying the ashes from city inhabitants. These conflicts were being resolved by town councils, for example by determining periods or days when only certain guilds or persons could buy ashes (documented, for instance, in Brno, Znojmo, Příbram and Prague). It is also worth mentioning that all documented conflicts took place in royal towns, that is, in towns where the strict system of manorial economy and, within its frame, explicit instructions concerning the use of household ashes did not apply.²⁸

The power of authorities to force the serfs to deliver the ashes was restrained only at the end of the eighteenth century, when the establishment of potasheries owned by the serfs was first authorized²⁹ and, according to G. Kopetz, subsequently an order was given that the exclusive supplying of seigneurial potasheries by the serfs could only be realized on the basis of preliminary mutual agreement.³⁰ After these changes occurred, the potash makers were buying the material for ready money or the authorities possibly offered some small compensation (for example exemption from other levies). However, even for the later period there are documents for conflicts over illegal purchases of ashes outside the borders of territories defined in contracts and forced deliveries of ashes within the frame of corvée labour.³¹

The price of ashes differed substantially according to time and place. More expensive was purchase of ashes in regions without forests, cheapest were the ashes in spring when supplies accumulated during winter season were being sold out and, of course, the price of the ashes rose steadily in the course of the eighteenth century in association with the increase of price of wood. Up to now accessible, haphazardly collected data on prices of ashes in the period under consideration, however, are not sufficient for producing an accurate image of the development of prices of this material. Depending upon the situation on particular manors, the price oscillated between 3 to 15 kreuzers per bucket, common price was 8-10 kreuzers per bucket.

The production of potash thus evidently became the first "recycling" branch of Bohemian industry. The extension of production in the second half of the 18th century arose mainly from intensification and improvement of the technology used. The process of extensive development - increasing the amount of ash processed - was blocked. At best, more ash could be obtained from subjects, but not by burning down forests.

In Central Europe during the eighteenth and nineteenth century no more large forest areas had been colonized. As a consequence, the Bohemian lands lacked the possibility of

²⁸ Conflicts over the buying of ashes are documented also in wider Central European context. See E. Weinberger, *Pecheln*, p. 118.

²⁹ NA Prague, CV, inventory no. 1121 – 22. 1. 1789.

³⁰ See W. G. Kopetz, *Allgemeine österreichische Gewerbesetzkunde, oder systematische Darstellung der gesetzlichen Verfassung der Manufactur- und Handelsgewerbe in den deutschen, böhmischen galizischen, italienischen und ungarischen Provinzen des österr. Kaiserstaates*, Vol. 1, Wien 1829, p. 256.

obtaining ashes in the process of converting virgin nature into agricultural lands. This represented a sharp contrast, for example, to certain regions of North America where potash making developed as a side activity of agricultural colonization.³²

However, the present-day state of research renders it impossible to state a precise proportion of the volume of ashes made by burning of wood in forests and of household ashes bought from or supplied by the serfs. On the most general level it could be claimed that at the beginning of the eighteenth century potash-making depended on forest ashes, while in the last third of the same century there existed a clear prevalence of household ashes, maybe with the exception of the most remote forest areas or winter calamities, when windfallen trees were being massively burnt and the ashes used for potash making.

From the middle of the 18th century potash production cannot be associated with the devastation of forest ecosystems as was the case in Poland,³³ and according to current research not even with essential change in the makeup of the forests as in Sweden. A concrete example is given by the Křivoklát region, where extensive beech forests with difficult access were used for a long period for burning ash without any serious impact on their makeup.³⁴ The environmental effects of traditional potash production were decidedly less than has been assumed up till now, mainly because burning wood for the needs of potash producers was limited radically after the year 1754, and from then on the whole potash industry developed at a far slower rate than we would have expected in view of the great demand for potash. In this connection more attention should be paid to the overall state of the forests, forestry and timber supplies, as the older catastrophic judgements obviously require some amendment.³⁵

5. TECHNOLOGY OF POTASH PRODUCTION IN THE CENTRAL EUROPE

In most cases, the production of potash took place in specialized buildings – potasheries.³⁶ The technology was based on lixiviating the ashes, evaporating the filtrated solution and finally the calcination (annealing) of raw potash in kilns.³⁷ Sieved and moistened

³¹ See J. Rokycana, *Zaniklé řemeslo*, Bozeňsko 1, 1938, pp. 24–25.

³² See H. Miller, *Potash from Wood Ashes: Frontier Technology in Canada and the United States*, *Technology and Culture* 21, 1980, pp. 187–208; D. McCalla, *Forest Products and Upper Canadian Development, 1815–1846*, *Canadian Historical Review* 58, 1987, pp. 159–198.

³³ J. Broda, *Historia Leśnictwa w Polsce*, Poznań 2000.

³⁴ P. Svoboda, *Křivoklátské lesy, dějiny jejich dřevin a porostů*, *Studia Botanica Čechica* 6, Praha 1943.

³⁵ J. Radkau, *Zur angeblichen Energiekrise des 18. Jahrhunderts: Revisionistische Betrachtungen über die „Holznot“*, *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte* 73, 1986, p. 1–37.

³⁶ Cf. several preserved plans (some of them published). Státní oblastní archiv (SOA) Plzeň - Klatovy, V s Tachov, nr. 665; L. Štěpán, *Lidové stavitelství ve stavebních plánech a mapách východočeských archivů*, Díl I., Pardubice–Ústí nad Labem 1990, p. 46–47, p. 112; L. Štěpán–J. Vařeka, *Klíč od domova. Lidové stavby východních Čech*, Hradec Králové 1991, p. 224–225; J. Čáka, *K zániku voltušské flusárny*, *Vlastivědný sborník Podbrdská* 3, 1969, p. 204–207.

³⁷ Description of the potash making technology is based on following printed sources: J. Beckmann, *Anleitung zur Technologie oder zur Kenntniss der Handwerke, Fabriken und Manufacturen*, Göttingen 1777, Göttingen 1809⁶; Ch. R. Rösling, *Pottaschen und Salpeter Siederey (Neue Fabriken Schule)*, Erlangen 1806; S. Kees, *Darstellung des Fabriks- und Gewerbes im österreichischen Kaiserstaate. Vorzüglich in technischer Beziehung I, II/1, II/2*, Wien 1823; J. H. M. Poppe–J. S. Presl, *Obširné prostonárodní naučení o řemeslech a umělostech, čili Technologia všeobecná a obzvláštní*, sv. 1–3, Praha 1836–1837; A. Hohenstein, *Die Pottaschen-*

ashes were first carefully crammed to special vats that had an escape cock (tap) in the bottom part and were furnished with a filtering mechanism (double bottom supplemented by a ply of straw or sawdust) – this was the base of the whole process of separation of salt solution from the ashes. To the soaking tubes water was poured slowly, preferably over a straw or wooden fagot that prevented the uneven soaking of the crammed ashes. The resulting leachate oozed from the escape cock and then ran to the collecting tube. The most suitable for subsequent processing was the most saturated, dark brown or black solution that oozed in the first moments of filtration. Weaker solution was used for repeated flushing of the tubes.

To thicken and evaporate the ash filtrate, iron evaporation cauldrons were used in Bohemia and Moravia that were at least since the mid-1750s a common part of the inventory of all potasheries. Ordinarily, the sufficiently satiated tincture was poured into these cauldrons and then put on to boil so that after reaching the thickness when first salts started to precipitate the filtrate, the tincture was boiled for a prolonged time, only mildly. A thick brown foam on the surface was a signal for a slow raising of temperature that culminated in the phase of commencing crystallization of K_2CO_3 .

Brown, swarthy or black stuff (or grey or greyish green, depending on the material used) of heterogeneous structure containing many mechanical and chemical impurities was usually called by a German name *Fluss* or „raw potash“ (*rohe Pottasche*). It was utilized only for making the glass of poorest quality, for viscous soap and for primitive bleaching of linen. Because of this, in the second half of the eighteenth century it was not produced on purpose in Bohemia.

In the last phase of production – calcination (annealing) – the raw potash was deperated of water and flammable impurities. Through high temperatures influencing the raw potash for prolonged periods the residual water was evaporated, the unwanted organic compounds were burnt and also other impurities went through further chemical transformations favourable for the quality of the final product. The simplest method of calcination was to further heat raw potash in evaporation cauldrons; however, this method did not markedly improve the quality of the product. Since the second half of the eighteenth century it had been common to apply the more advanced method of annealing – calcination in kilns that represented the most complicated and most expensive pieces of equipment of potasheries.

The most developed type of calcination equipment and in a sense also the absolute high point of the traditional technology of potash production represented the massive three-chamber kilns with two furnaces on sides of the annealing platform that started to be used in

Fabrikation für Waldbesitzer und Forstmänner, Wien 1856; C. F. Wyllert, *Gründliche Anweisung zur Fabrikation der rohen und calcinirten Potasche nach den besten und neuesten Bereithungsmethoden bearbeitet*, Nordhausen 1837. An unique instruction for potash makers entitled „*Belehr und Anweisung, Wie sich die Fluss-sieder im Königreiche Böhmeim bey Verfertigung der Potasche zu verhalten haben, damit ein reines und in Absicht auf den Gebrauch dieser Potasche taugliches Guth erzeiget werde.*“ was published by Prague Guberniums in 1772. See NA Praha, Cirkuláře a vyhlášky (CV), nr. 277–1772. Cf. also J. Woitsch, *Tradiční*

Bohemia from the last third of the eighteenth century, when they replaced both the oldest type of baking ovens and the relatively newly introduced two-chamber kilns. The calcinated material could be exposed to intense and long-lasting indirect heat (the calcination process takes place at heats that for prolonged periods exceed 800°C) and if the potash maker considered it proper and put more wood on the fire, the material could also be exposed to direct blazing of flames.

When the test pieces of heated potash that were taken out of the kiln retained white colour (however, the calcinated potash could also be of different colour, in accordance with the impurities not eliminated by calcination – bluish (pearly), reddish, greenish or grey) and seemed clean, the calcination process could be terminated. The candent potash was raked out of the kiln and allowed to cool down. The whole procedure of calcination of one batch took one or two days.

Finished and cooled potash was stored in closed barrels, in the eighteenth century the common type of container and in the case of potash also the only suitable, due to the extreme hygroscopic character of the product. The size of barrels was not standardized.

6. POTASH PRODUCTION AND POTASH TRADE IN THE SECOND HALF OF THE EIGHTEENTH CENTURY

From the accessible sources we can obtain data on three crucial parameters of potash production in Bohemia.³⁸ They are briefly presented in the following table (Figure 1) and resumed in the attached graphs. (Figures 5 to 9).

technologie výroby potaše, Sklář a keramik 52, 2002, p. 11–19.

³⁸ Following text is based on: M. Lišková, *Počátky zemských manufakturních tabel v Čechách (1756–1775)*, *Hospodářské dějiny* 11, 1983, p. 119–133; M. Lišková, *Zemské manufakturní tabely 1775–1798*, *Sborník archivních prací* 32, 1982, p. 550–575; Z. Martínek, *Řemeslná, domácí a manufakturní výroba a obchod v Čechách v letech 1752–1756*, *Etnografický atlas Čech, Moravy a Slezska sv. III.*, Praha 2000; G. Otruba, *Die älteste Manufactur- und Gewerbestatistik Böhmens*, *Bohemia* 5, 1964, p. 161–241; J. A. Riegger, *Archiv der Geschichte und Statistik insbesondere von Böhmen*, 1–3, Dresden 1792–1795; J. A. Riegger, *Materialien zur alten und neuen Statistik von Böhmen*, 1–12, Prag–Leipzig 1787–1794; J. Schreyer, *Kommerz, Fabriken und Manufakturen des Königreichs Böhmen. Theils, wie sie schon sind, theils wie sie es werden könnten*, 1–2, Prag–Leipzig 1790; J. Schreyer, *Waarenkabinet oder niederlage der in Böhmen erzeugten Warenartikel und Naturprodukte dann der damit betriebende Handel*, Prag–Leipzig 1799; NA Praha, ČG Com. 1751 / A6; NA Praha, ČG Com. 1754 / J64; NA Praha, ČG Com. 1773–1783 A1 / 33; NA Praha, ČG Com. 1773–1783 A1; NA Praha, ČG Com. 1784–1785 B2; NA Praha, ČG Com. 1786–1795 sign. 21, kart. 483; M. Lišková, *Manufakturní tabely*, Praha s.d. (unpublished manuscript); ÖStA Wien, Finanz- und Hofkammerarchiv, *Commerz Böhmen*, Nr. 820, Fasc. 65, fol. 3–6, 271, 273, 324; *Commerz Böhmen*, Nr. 821, Fasc. 65, fol. 311, 499–501, 536, 556–559.45,46, 48, 53 and 54.

Figure 1: Basic data about Bohemian potash production in the years 1750 – 1808.

YEAR	PRODUCERS	FOREMEN	PERSONS	POTASHERIES	PRODUCTION (hwt.)	CONSUMPTION (hwt.)
1750	x	x	x	231	7446,75	x
1751	x	x	x	x	x	x
1752	x	x	x	x	9552,5	x
1753	x	x	x	187	x	x
1754	x	x	x	x	x	x
1755	x	x	x	x	x	x
1756	x	x	x	154	x	x
1757	x	x	x	x	x	x
1758	x	x	x	x	x	x
1759	x	x	x	x	x	x
1762	x	x	x	x	x	x
1764	x	x	x	149	5472,2	16411,52
1763	x	x	x	x	x	x
1764	x	x	x	x	x	22626
1765	x	x	x	x	x	26788
1766	x	x	294	213	9555	28325
1767	x	x	x	x	x	32206
1768	x	x	x	x	x	34922
1769	x	x	x	x	x	x
1770	x	x	x	x	x	x
1771	x	x	x	x	x	x
1772	x	x	x	x	x	x
1773	x	x	x	x	x	x
1774	x	x	x	x	x	x
1775	175	x	331	x	x	x
1776	292	x	426	x	x	x
1777	222	x	361	225	x	34000
1778	216	x	377	211	x	x
1779	163	x	295	216	x	x
1780	162	x	273	216	x	x
1781	x	158	234	x	x	x
1782	x	200	321	x	x	x
1783	x	232	367	x	x	x
1784	x	294	448	x	x	x
1785	x	355	569	x	x	x
1786	x	294	515	303	x	x
1787	x	249	404	x	x	x
1788	x	283	543	x	x	x
1789	x	334	476	x	x	x
1790	x	301	463	x	x	50549,325
1791	x	333	586	377	x	x
1792	x	360	583	x	12722	x
1793	x	401	663	x	x	x
1794	x	417	605	x	x	x
1795	x	430	772	x	x	x
1796	x	458	844	x	15399	x
1797	x	456	856	x	18050	x
1798	x	493	842	x	18213	x
1800	x	x	x	x	22337,41	70484,88
1801	x	x	x	x	21714,41	72016,83
1802	x	x	x	x	26385,67	70507,2
1803	x	x	x	x	20487,98	72200,75
1804	x	x	x	x	16678,95	69810,12
1805	x	x	x	x	16971,6	64285,53
1806	x	x	x	x	15898,21	55540,515
1807	x	x	x	x	17438,65	61147,69
1808	x	x	x	x	19551,81	54604,72

The most complete documentation exists for the personal side of the production (numbers of master workers, journeymen and unskilled labourers); less numerous are data on numbers of potasheries and the least information exists on the overall volume of production. Unfortunately we lack comparable data for the Moravian potash industry from this period (Cf. Figure 2) and also the records from all the Czech lands are missing after the year 1808.

Figure 2: Affordable basic data about Moravian potash production in the 18th and in the beginning of the 19th century

YEAR	PERSONS	POTASHERIES	PRODUCTION (hwt.)
1750	x	42	x
1764	x	x	3 691
1768	x	111	8 300
1792	x	98	9 534
1804	125	113	11 000

In the year 1775 there were, according to the data of manufacture tables, in non-agrarian production (spinning excluded) 54 818 persons involved. At the end of the century (1798) the number was 149 194 (again the spinners were excluded). In potash production the number of workers involved was 331 and 842, respectively. This means that potash

production belonged to small branches of production; however, in comparison with other types of chemical production (production of washing-blue, alum, vitriol, oleum) it was the most substantial branch of all.

In the more sparsely documented period of 1750–1775, potash production in Bohemia was at a standstill as for number of potasheries and volume of production. Nonetheless, not even during the great crisis of glassmaking in the 1760s and 1770s there was no substantial limitation of production. It even seems plausible to state that in the period under consideration there existed no positive connection between crises and upturns of glass-making and potash production in Central Europe. Potash production in Bohemia and Moravia had always been insufficient for local needs and it was easy to find a ready market (even abroad) in spite of the momentuous situation in the glass industry. Unfortunately we lack more precise data on glass production in Bohemian lands. The only reliable data state numbers of glassworks in Bohemia. There were 44 glassworks in 1775, 59 in 1777, 66 in 1779, 61 in 1780, 65 in 1782, 65 in 65. In the year 1790 there were 66 glassworks on the whole territory of Bohemia, in 1792 there were 70, at the turn of the century 78. During a period of deep crisis of glass production in the first quarter of the nineteenth century the number of glassworks decreased (in 1818 there were 63, in 1825 there were 58 glassworks).³⁹

A slight conjuncture in potash production between the years 1776–1780 was probably related to the deregulation of the potash trade after the last potash monopoly came to an end in the spring of 1776. On the other hand, we can only guess the causes of the fall in production at the beginning of the 1780s.

Since 1782 all parameters studied had increased and slight fluctuations of the development curve were caused rather by imperfections and incompleteness of the statistics than by factors of the production itself. On the basis of the number of master potash makers in Bohemia in the 1790s it can be asserted that at this time there were in Bohemia certainly more than 400 potasheries, and even though the volume of production also increase twofold in comparison to the situation 50 years before, the characteristics of the size of works didn't change. According to the data provided by the manufacture tables from the 1750s on 163 potasheries, 37,4% of them produced less than 20 hundredweights a year, 19% of them 20–29 hundredweights, 26,4% of them 30–59 hundredweights and only 17,2% of potash enterprises produced more than 60 hundredweights a year. Really large potasheries with the yearly capacity of 100 and more hundredweights were sparse and existed only in areas with rich forest resources. The largest potasheries were able to produce 150–200 hundredweights a year. Gubernial statistics from the year 1751 give us a similar view and the identical situation had endured until the end of the eighteenth century. Dependence on gigantic volumes of raw materials, given their permanent shortage, forestalled the establishment of large potash enterprises of industrial character and secondarily was the reason why this branch of

³⁹ See J. Brožová, *České sklářství v polovině 18. století*, *Sklář a keramik* 29, 1979, pp. 45–49; B. Štiess, *Soupis západočeských a šumavských skláren v minulosti*, *Sklář a keramik* 22, 1972, pp. 281–285; J. Lněničková, *Šumavské sklářství*, Sušice 1996, pp. 21–22; F. Mareš, *České sklo*, passim. See also J. Slokar, *Geschichte der österreichischen Industrie*, Wien 1914, pp. 522–525; G. Otruba, *Anfänge und Verbreitung der böhmischen Manufakturen bis zum Beginn des 19. Jahrhunderts (1820)*, *Bohemia* 6, 1965, pp. 295–303. NA Prague, ČG Com. 1773–1783 A1/1/92.

development lagged from the point of view of technology. Also the increase of numbers of persons involved in potash making corresponds to the trends described.

The marked regional differentiation in potash production in the second half of the eighteenth century was conditioned by two factors. The first of them was the fundamental dependence of this branch of production on its main raw materials – firewood and wooden ashes. Centres of production or rather production areas were thus situated in those parts of land that had rich forest resources. In a micro-regional context potasheries were situated on the country, close to manorial estates and enterprises, to the so called mill settlements, difficultly accessible forests etc. A second determinant of the regional character of potash production was the spatial distribution of purchaser branches (especially glassmaking and chemical enterprises); of certain importance was also the methods and priorities of forest exploitation of the time (preference over potash production was given to floating timber to cities or deliveries to mines and ironworks).

In the second half of the eighteenth century potasheries were present in all regions of Bohemia; however, the production was concentrated especially in centre, southwest and southeast.⁴⁰ The constantly most important position from the point of view of the volume of production as well as number of potasheries kept the regions of Prácheňsko (average share of all persons involved in potash production 13,9%), Čáslavsko (10,5%), Klatovsko (9,9%), Plzeňsko (9,6%) and Tábořsko (8%) that constituted the material base of local glassworks. The regions of Kouřimsko (12%) and especially Berounsko (13,2%) with many small potasheries benefited from their position in the market hinterland of Prague. Of more local importance were potash works that supplied potash to textile and chemical enterprises in the regions of Rakovnicko (5,7%), Budějovicko (5%), Boleslavsko (4,1%) and Loketsko (3,4%). In other regions potash production was absolutely marginal.

The overwhelming majority of potasheries belonged to nobles who rented them out to potash producers or employed them. The nobles seldom ran potash enterprises themselves. Sporadically we find evidence of potasheries operated by communities or by townsmen and in isolated cases Jewish producers owned these enterprises. Dominical potasheries were inseparable from the systems of manorial economy and this fact ensured at least partial assurance of material supply – especially firewood from manorial forests and ashes supplied forcedly by subjects.

Renting out of potasheries to Jewish tenants constituted one of the basic characteristics of this branch of production. When we consider the fact that the Jews and Jewish trade companies dominated also the trade in potash, it is of no surprise that the folk oral tradition called potash making „the Jewish trade“. For many reasons the renting out of potasheries and other enterprises to Jewish entrepreneurs was effective. Among these, it was especially the ability of the Jews to pay the rent on time and in cash, their extensive contacts that ensured the sales, their prudent way of managing the enterprises (in comparison with Christian tenants) and in the case of potash production also their knowledge of technology that stemmed from experience of many generations.⁴¹

⁴⁰ J. A. Riegger, *Skizze einer statistischen Landeskunde Böhmens*, 1–3, Leipzig–Prag 1795.

⁴¹ See R. Kestenberg–Gladstein, *Wirtschaftsgeschichte der böhmischen Landjuden des 18. Jahrhunderts*, Judaica

The rent for potasheries was being paid partly for a year, partly by the potash produced. The leases ensured the potash producers regular supplies of materials and by analogy to Moravia we can also presume the fact of forced work of subjects – for example in transporting firewood and ashes to potasheries.

For the whole second half of the eighteenth century potash had constituted an important commodity on the domestic market and also had been an object of long-distance trade, within the frame of the Habsburg monarchy as well as trade between Bohemia and neighbouring and more distant countries. Besides the fact that potasheries operated in symbiosis with glassworks, bleacheries, paper-mills etc., they produced commodity destined for trade.

Directions and routes of potash trade are easier to trace in the 1750s–1780s, but for the next period the suitable sources are lacking.⁴² However, due to the identical structure of purchasers it is probable that no striking changes had occurred. When asked by the gubernium, part of the potash makers gave local glassworks as their purchasers, but the majority of them stated simply that they sell to the Jews. Main centres of potash trade were Prague and Plzeň (Pilsen). In Prague and in Plzeň – the metropolis of western Bohemia – there were also storehouses of the biggest domestic wholesalers of potash – the companies Popper & Co. and Israel Joel & Co. The majority of the output of potasheries from the regions of Kouřimsko and Berounsko was being sold to Prague and from there the local merchants were selling it especially to northern Bohemia. But there were also lively trade contacts between Prague and potasheries in the regions of Čáslavsko, Tábořsko, Budějovicko and Prácheňsko. Glassworks in the regions of Šumava and Český les were supplied through the Pilsner potash market that drew on deliveries from nearer as well as from more distant regions. Potash was sold in Plzeň especially at annual fairs.

Markets for Czech potash abroad were found especially in the neighbouring German countries.⁴³ Most of the potash was exported to Saxony – especially to Saxon textile enterprises, and also to Bavaria (glassworks)⁴⁴ and to (Prussian) Silesia. However, the state administration tried to prevent the sale of potash to this last country after it had been finally lost. Besides, Czech potash was sold to Moravia⁴⁵ and to Austria. In compliance with the economic policy of the monarchy not even in the periods of the strictest regimentation had

Bohemiae 3, 1967, p. 101–133; J. Schreyer, *Waarenkabinet oder niederlage der in Böhmen erzeugten Warenartikel und Naturprodukte dann der damit betriebende Handel*, Prag–Leipzig 1799, p. 771; T. Pěkný, *Historie židů v českých a na Moravě*, Praha 2001, p. 278–321 and passim.

⁴² NA Praha, ČG Com 1751 / A6; NA Praha, ČG Com 1773–1783 / A1; NA Praha, ČG Com 1773–1783 / B4; NA Praha, ČG Com 1784–85 / B2; NA Praha, ČG Com 1786–1795 / sign.21; J. A. Riegger, *Archiv der Geschichte und Statistik insbesondere von Böhmen*, II., Dresden 1793, p. 105, p. 283–284.

⁴³ Cf. NA Praha 1751 / A6; NA Praha, ČG Com. 1754 / J64; NA Praha, ČG Com. 1773–1783 / A1 / 33; NA Praha, ČG Com. 1784–1785 / B2; ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 820, Fasc. 65, f. 3–6; Nr. 821, Fasc. 65, f. 324; B. Goehlert, *Historisch - statistische Notizen über Böhmen*, Mitteilungen des Vereins für die Geschichte der Deutschen in Böhmen 11, 1873, p. 292–294.

⁴⁴ T. Winkelbauer, *Von Hüttenmeistern und Glasmachern, Aschenbrennern und Flusssiedern. Zur Geschichte der Glaserzeugung im böhmisch-österreichischen Grenzgebiet vom späten 16. bis ins frühe 19. Jahrhundert*, Das Waldviertel 41, 1992, p. 225–252.

⁴⁵ J. Chylík, *Moravský průmysl chemický do poloviny 19. století*, Časopis Matice moravské 70, 1951, p. 166–185; J. Chylík, *Přehled dějin moravského průmyslu, díl I, Do polovice 18. století*, Brno 1948; R. Vermouzek, *Moravské potašárny*, Sborník technického muzea v Brně 1, 1975, p. 48–60;

there been a prohibition on exportation of potash overseas through Adriatic ports. On the contrary, the trade that led through Trieste and Rijeka (Fiume) had been supported every which way.⁴⁶ The export of domestic potash is surprising; especially when we consider the fact that the output of Czech potasheries had never been able to satisfy the demand and due to this potash had been imported to Bohemia over the course of the whole second half of the eighteenth century. The majority of potash produced in Moravia had been sold to Bohemia,⁴⁷ also a great volume of potash from Hungary⁴⁸ and even from Russia.

The opaque system of potash trade and its export abroad that had been supplemented by the steady rise of price of potash on the domestic market for the whole second half of the eighteenth century was a thorn in side of the purchasers. The authorities in Prague and Vienna incessantly had to deal with complaints and appeals of craftsmen who were dependent on potash supplies. The glassmakers were unambiguously the most active of them.⁴⁹ Due to their complaint the export duty on potash was increased in August 1750 from 30 kreuzers to 1 gulden.⁵⁰ Also in the following decades trade tariffs regulations were one of the most important ways of state management of the potash industry. (See Figure 3).

Figure 3: Trade tariffs for potash in Bohemia in the years 1750 – 1808

YEAR	TRADE TARIFF (for 1 hundredweight)					
	IMPORT		EXPORT		TRANSIT	
	gulden	kreuzers	gulden	kreuzers	gulden	kreuzers
before 1750	x	x	x	30	x	x
1750	x	x	1	x	x	x
1752	4 zl. - 4 zl. 48 kr.		6 kr. - 6,75 kr.		2,25 kr. - 13,5 kr.	
1763	x	x	Exportation prohibited		x	x
1775	1	x	2	x	x	6
1784 (Jan.)	x	x	1	x	x	x
1784 (Sep.)	1	x	1	x	x	6
1796	x	x	2	x	x	x
1799	x	x	4	x	x	x
1808	x	x	6	x	x	x

The first general restriction on potash exportation from Bohemia took place in the year 1755. On the basis of resolution of a ministerial bank deputation (Ministerial-Banco-

⁴⁶ ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 821, 5561, Fasc. 65, 1767–1771, fol. 71–72; NA Praha, CV nr. 236–6. 7. 1770.

⁴⁷ NA Praha, ČG Com. 1771 / B1.

⁴⁸ ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 820, 5560, Fasc. 65, 1752–1766, fol. 522–532.

⁴⁹ NA Praha, ČG Com. 1751 / A6; „Die dort orthen brennende Bodaschen so starck ausser Lands Verführet wird, dass wir in Sorgen stehen unsere Hütten des balden aus mangel dieses Materialis stehen zu lassen und zu sehen müssen das frembde auswärtige Glashütten zu wachsen die böhmische aber zu grund gehen werden...“ NA Praha, ČG Com. 1752 / A10.

⁵⁰ NA Praha, ČG Com. 1752 / A10.

Hofdeputation) of April 11, 1755, approved by the Empress, from June 1, 1755 onward potash could be exported from the Czech Kingdom only on special permission – so called pass that was issued by commercial directorium.⁵¹

The selling price of potash differed on depending on conditions in individual dominions and was subject to seasonal fluctuations. In the 1750s one hundredweight of calcinated potash cost 7–8 gulden, raw potash was sold for 5–6 gulden, but was also possible to fetch a price of 10 gulden per hundredweight. The consequences of forest regulations of the year 1754 and of the Seven-Year-War drove up the price of potash to unprecedented heights.⁵² Investigation of the gubernium in the year 1763 indicated that in the regions that lacked firewood and where potash production was not developed this commodity was sold for prices exceeding 10 gulden per hundredweight, and it was not exceptional to find a price of 18 gulden per hundredweight.

On January 11, 1763, the maximum selling price of potash in Prague was prescribed to 10 gulden per hundredweight, in the country to 9 gulden per hundredweight and quickly the export of potash from Bohemia was prohibited completely „*Sub poena confiscation*“.⁵³ However, in pressing these motions into practice the authorities faced grave problems.⁵⁴ The obvious ineffectiveness of the provision of maximum prices and the prohibition of export was mainly due to the impossibility of effective supervision over the potash trade and soon led to more far-reaching modifications. On the basis of court decrees of the turn of the years 1763 and 1764 that took effect on March 1, 1764, potash storing and potash trade were rented out for six years to a consortium headed by Izaak Popper and Löbl Baruch. This provision was expected to ensure maximum prices of potash (9 gulden to 9 gulden, 30 kreuzers) and a system of storehouses, purchase orders and regular reports of consumption was to prevent smuggling and unauthorized trading in potash. This monopolistic company got for a yearly rent of 25 000 gulden an exclusive right to the entire domestic trade, importation and exportation of potash for six years.⁵⁵

A second lease of the year 1770,⁵⁶ again effective for six years, was contracted with a

⁵¹ NA Praha, ČG Com 1755 / B26.

⁵² H. Fechner, *Die handelspolitische Beziehungen Preusens zu Österreich während der provinziellen Selbständigkeit Schlesiens 1741–1806*, Berlin 1886.

⁵³ Cf. NA Praha, ČG Com. 1763 / A2; ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 820, 5560, Fasc. 65, 1752–1766, fol. 135–144.

⁵⁴ ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 820, 5560, Fasc. 65, 1752–1766, fol. 70–91, fol. 92–93; Nr. 820, 5560, Fasc. 65, 1752–1766, fol. 300–323; NA Praha, ČG Com. 1763 / A2; NA Praha, ČG Com. 1755–1772 / D2, D3, D, D18, D19.

⁵⁵ Extensive sources to the history of the first potash monopoly are to be found in: ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 820, 5560, Fasc. 65, 1752–1766, fol. 59–63; fol. 64–69; fol. 144–183; fol. 278–283; fol. 147–150; fol. 271–273; fol. 290–295; fol. 366–431; fol. 404–424; fol. 385–396; fol. 380–384; fol. 472–483; fol. 543–546; fol. 515–524; fol. 723; fol. 847–855; fol. 989–1002; fol. 1025–1029. ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 821, 5561, Fasc. 65, 1767–1771, fol. 150–181; fol. 279–295; fol. 296–426; fol. 499–505; fol. 593–598. NA Praha, CV, nr. 169–17. 2. 1764; NA Praha, ČG Com. 1764 / D5, NA Praha, ČG Com. 1755–1772 / D27, D29, D33, D38; NA Praha, ČG Com. 1755–1773 / D12, D17, D44, D47; NA Praha, Česká finanční prokuratura (FP), nr. 1208, sign. 14 / 100b; NA Praha, FP, nr. 1208, sign. 14/102, 14/104, 14/106, 14 / 120a, 14 / 144, 14 / 149, 14/161, 14 / 227, 14 / 237a. Cf. also J. Woitsch, *Státní regulace výroby a obchodu s draslem v Čechách–potašové monopoly v letech 1764 až 1776*, Časopis Národního muzea–řada historická 172, 1–2, 2003, p. 1–49.

⁵⁶ Cf. project of the monopoly in ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 821, 5561,

group of Jewish financiers that at that time rented out the Landing Bank in Brno.⁵⁷ The new consortium was headed by Salomon Dobruška, Löbl Hönig and Israel Simon Frankl and to its members belonged, among others, also the possessors of the previous monopoly. The new contract subjected the activities of the company to more consistent control of the commercial authorities; the authorization of free petty trade between producers and purchasers of potash represented a novelty. Nonetheless, the basic principles of monopolisation were maintained (maximal price 8–10 guildens per hundredweight, an exclusive right of the potash company to export and import potash). Instead of lump rent the exclusive company had the obligation to pay the state 30 kreuzers of every hundredweight of potash sold.⁵⁸ But the situation on the potash trade in Czech lands had not changed much in 1770–1776 and this fact, together with other causes (lack of interest of tenants in prolongation of the monopoly, gradual changes in economic policy of the Habsburg monarchy) brought a definite end to the monopolization of potash trade on the territory of Bohemia, Moravia and Silesia.

It is rather difficult to evaluate the effectiveness of potash monopolies. Unlike the relatively successful functioning of the tobacco monopoly that had been carried on since the third quarter of the seventeenth century, either by state or private companies,⁵⁹ the monopoly of the potash trade did not prove useful, or rather its results were inconsistent. The first potash monopoly bore to the state an annual rental of 150 000 guildens, which is an insignificant sum in comparison with the rental from the tobacco monopoly (for example in the years 1765 – 1774 this was 900 000 guildens annually). Therefore, it should be considered erroneous to present the potash monopoly solely as a result of the efforts for maximizing profits.

At the first place, however, it should be stressed that the monopoly did not fulfil the main objective of its establishment – that is, to secure the supply of potash for home production, especially glass making. There were many causes of the fact that during the 12 years of existence of the monopoly it had not been effective in stabilizing the Bohemian potash market and securing adequate supplies of high-quality potash. Regardless of the fact that this goal had not been accomplished during the whole second half of the eighteenth century, without reference to the means applied, this development rebutted the pivotal argument of monopoly advocates - mainly commercial officials and influential aristocratic entrepreneurs (not by chance many of them owned glassworks) who attended at the birth of the potash monopolies. Against the preservation of the monopoly also stood the gradual change in the thinking of officials responsible for commercial matters of the monarchy, in a direction towards liberal economical principles, hostile to any kind of privileges.

Fasc. 65, 1767–1771, fol. 582–585, fol. 599–786.

⁵⁷ J. Janák, *Hospodářský rozmach Moravy 1740–1918*, Vlastivěda moravská–Nová řada sv. 7, Dějiny Moravy díl 3 / 1, Brno 1999, p. 275; J. Chylík, *První obchodní banka u nás*, Časopis Matice moravské 69, 1950, p. 261–282.

⁵⁸ For details to the second potash monopoly in Bohemia see ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 821, 5561, Fasc. 65, 1767–1771, fol. 644, fol. 902–1008, fol. 903–904, fol. 951–955, fol. 966–968, fol. 1012–1055, fol. 1092–1093, fol. 1124–1131, fol. 1238–1239, fol. 1254–1260. ÖSt A Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 822, 5562, Fasc. 65, 1772–1775, fol. 145–156, fol. 163–200, fol. 325–330, fol. 1137–1143, fol. 1314–1318, fol. 1356–1361, fol. 1366–1370, fol. 1375–1385. NA Praha, CV, nr. 236–6. 7. 1770; NA Praha, CV nr. 246–4. 3. 1771; NA Praha, ČG Com. 1770 / D8; NA Praha ČG Com. 1772 / D4, D8.

⁵⁹ A. Čapek, *Tabák v Čechách*, Praha 1947, pp. 209–384.

Analysis of long-term trends reveals that the era of potash monopolies did not represent any kind of turning point, because the production as well as importation of potash rose approximately at the same rate as in earlier and later periods. Even though it seems that glassworks, bleacheries and chemical factories were being supplied better than before, especially in the years 1770 – 1776, the main and evidently unwanted outcome of all these provisions was the concentration of main bulk of potash trade to the hands of limited number of chiefly Jewish wholesalers who knew how to benefit from their position.

In the last quarter of the eighteenth century the state interventions to this branch of production limited themselves to the battle against counterfeiting of potash and to changes of customs regulations.⁶⁰ Also of importance were restrictions or prohibitions of exportation of the main and only raw material for potash production – the wooden ashes.

Lack of potash and its rising price provoked responses both on part of potash producers and on part of purchasers – especially glassmakers. The first tried to reduce the cost of production by using new raw materials that would enable them to break free from the dependence on wood ashes; the others were on the look out for newly discovered chemical compounds that substituted for potash, expensive and unreliable in quality (the introduction of sodium and the so called Glauber salt into glassmaking). One of the oldest substitutes for wooden ashes were waste matters produced by soap making and textile industry. Evaporation and calcination of soap lye through traditional technology produced the so-called oily potash (in German *Seifensiederpotasche*, *Öhlerer Potasche*) with approximate content of 20%–30% of K_2CO_3 . The oily potash was heavily contaminated by remnants of oils and other undesirable impurities that came from soap making or scouring of wool. But at first glance it was difficult to distinguish it from normal potash.⁶¹

Due to its characteristics the oily potash was absolutely unsuitable for glassmaking⁶² or saltpetre production, and was being used successfully only for dyeing and bleaching textiles and for soap production. Because after the middle of the eighteenth century more and more frequently there occurred cases of substitutions and mixing of both types of potash,⁶³ the authorities soon intervened. The court decree of March 15, 1765, demanded that barrels containing oily potash were to be for one thing visibly marked by the inscription „*Potaschen aus Seifenlauge*“ (or abbreviation S. L.), and for another supplemented by the data on place of production and name of the maker. Mixing of normal and oily potash was prohibited. Cheaters who didn't comply with this directive were to face fines and confiscation of the

⁶⁰ NA Praha, ČG Com. 1773–1783 / B2; NA Praha, ČG Com. 1773–1783 / B3; NA Praha, ČG Com. 1784–1785 / B2.

⁶¹ H. F. W. Süpke, *Beiträge zu einfach - praktischen Prüfungen verschiedener Handelswaaren*, Braunschweig 1842, p. 6–10; C. F. Wyllert, *Gründliche Anweisung zur Fabrikation der rohen und calcinirten Potasche nach den besten und neuesten Bereithungsmethoden bearbeitet*, Nordhausen 1837, p. 97–100; S. Kees, *Darstellung des Fabriks- und Gewerbesens im österreichischen Kaiserstaate. Vorzüglich in technischer Beziehung I*, Wien 1823, p. 627.

⁶² „Ist zu verhütten, damit nicht Seifensiederäsche unter die auszulaugende rohe Asche mitvermenget werde: denn, da die Seifensieder eines an deren salzigen Niederschlags sich bedienen; so kann kein ächtes Kaufmannsguth daraus erzeugt werden.“ NA Praha, CV, nr. 277–1772.

⁶³ ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 820, 5560, Fasc. 65, 1752–1766, fol. 838, fol. 707–711, fol. 771–785. NA Praha, ČG Com. 1772 / D4; NA Praha, ČG Com. 1772 / D8; NA Praha, CV nr. 1838–10. 12. 1798.

product.⁶⁴

In fact existing exportation of potash (some affordable data are given in the Figure 4) was after more than thirty years officially approved without any restriction on May 7, 1796.⁶⁵ However, also at the end of the eighteenth century there existed a shortage of potash in Bohemia. The main outcome of permitting exports thus was an increase of prices on the domestic market. After the abrupt increase in the 1770s, the price of potash stabilized. Depending on quality and the state of demand, one hundredweight cost 13–18 guildens.⁶⁶ Then the price of potash went far beyond 20 guildens and Czech purchasers again protested energetically against the fact that material of highest quality was being exported abroad. In consequence of these protests in subsequent years the export duties were raised repeatedly. A complete return to the regimentation of the 1760s was the absolute prohibition of potash exportation from Bohemia in April 1809⁶⁷ that remained in force until the 1820s.

Figure 4: Bohemian foreign trade with potash in the second half of the 18th century.

YEAR	IMPORT			EXPORT			TRANSIT		BILANCE		
	hwt.	lb.	price g.	hwt.	lb.	price g./kr.	hwt.	lb.	hwt.	lb.	price g.
1748	620	x	x	2419	93	x	5375	30	1799	93	x
1749	339	x	x	4292	70	x	5884	60	3953	70	x
1750	570	53	x	659	60	x	7644	96	89	7	x
1752	x	x	x	2862	65	12 881/26,25	x	x	x	x	x
1768	x	x	39 894	x	x	20 958	x	x	x	x	18 936
1771	x	x	x	x	x	13 630/12	x	x	x	x	x
1796	x	x	x	x	x	x	x	x	4650	x	x
1797	x	x	x	x	x	x	x	x	2924	x	x

7. POTASH PRODUCTION IN BOHEMIA, MORAVIA AND IN THE HABSBURG MONARCHY IN THE NINETEENTH CENTURY

Since the beginning of the nineteenth century there existed two tendencies, contrary to each other, that influenced Czech potash production. Decrease in demand for potash that were consequence of the introduction of new chemical compounds to purchaser branches (glassmaking, soap making, bleaching, dyeing) had been balanced by rapid growth of precisely those branches of production and by the fact that the new chemicals did not suffice.

⁶⁴ ÖStA Wien, Finanz- und Hofkammerarchiv, Commerz Böhmen, Nr. 820, 5560, Fasc. 65, 1752–1766, fol. 806–807. NA Praha, CV, nr. 236–6. 7. 1770.

⁶⁵ J. Schreyer, *Waarenkabinet oder niederlage der in Böhmen erzeugten Warenartikel und Naturprodukte dann der damit betriebende Handel*, Prag–Leipzig 1799, p. 469–470.

⁶⁶ J. A. Riegger, *Archiv der Geschichte und Statistik insbesondere von Böhmen*, II., Dresden 1793, p. 283–284; J. A. Riegger, *Materialien zur alten und neuen Statistik von Böhmen*, Heft V., Prag–Leipzig 1787–1794, p. 20; J. Schreyer, *Waarenkabinet oder niederlage der in Böhmen erzeugten Warenartikel und Naturprodukte dann der damit betriebende Handel*, Prag–Leipzig 1799, p. 470; NA Praha, ČG Com 1784–1785 / B2.

This phase – a kind of transitional period on the way from traditional production bound to rural environment to modern chemical industry – lasted more or less until the 1850s, when after the introduction of potash production based on molasses stillage and after the dramatic reduction of prices of potash this material again replaced some of the substitutes. Until this time potash had been produced in Bohemia and Moravia by traditional technology, i.e. by lixiviating wooden ashes in small potasheries dispersed in the whole territory.

A century-long search for an effective substitute for exclusive potash-making material – the wooden ashes – was completed successfully in the second quarter of the nineteenth century. This new material was the waste that came from distillation of alcohol from sugar molasses – the so-called molasses stillage or stillage coal. Perfecting potash production from molasses has been ascribed to the French chemist and industrialist A. Dubrunfaut who in 1838 for the first time applied in his factories the new technologies of utilization of molasses stillage.

K. Rademacher introduced into Bohemia potash production based on molasses stillage. The factory that he founded in association with E. Procházka in the year 1857 in the Prague district Karlín (Chemische Fabrik Carl Rademacher & Co.) was a first enterprise of this type in the whole Habsburg monarchy. In subsequent years there came into being in Bohemia, Moravia and Silesia many chemical factories which specialized in industrial processing of molasses (for example in Mladá Boleslav, Most, Smiřice, Kolín, Kralupy nad Vltavou, Brno, Uherské Hradiště, Lipník nad Bečvou, Opava).⁶⁸ Potash making in Central Europe used exclusively the molasses that resulted from making sugar of sugar beet. As a result, this branch of trade was also connected with the rapid development of sugar beet production, especially from the 1830s, when important changes in agriculture occurred. In the years 1835-36 there existed in Bohemia 17 beet mills and in following years new ones were being founded. In 1848 these Bohemian beet mills produced in total 65 000 Viennese hundredweights of sugar, which equaled two thirds of the total production within the Austrian monarchy. In the following decades sugar production increased markedly.

The revolutionary character of potash production based on molasses stillage consisted in the fact that it relieved this branch of production completely of its dependence on wood ashes and the huge quantities of cheap molasses produced by Czech sugar refineries enabled potash makers to produce potash at really low cost and on a large-scale. At the same time, the industrial technology ensured stable and high quality potash – the potash made from molasses contained as much as 95% K_2CO_3 . In the Czech lands the application of these technologies represented a fundamental turning point. It was precisely the potash production based on molasses that was instrumental in the extinction of the traditional trade. In the European context, however, of greater importance was the replacement of wood ashes not by molasses, but by mineral salts.

⁶⁷ NA Praha, CV nr. 2372–21. 4. 1809.

⁶⁸ Cf. A. Wraný, *Geschichte der Chemie und auf Chemischer Grundlage beruhenden Betriebe in Böhmen bis zur Mitte des 19. Jahrhunderts*, Prag 1902, p. 281; F. Faktor, *Z dějin chemického průmyslu v Čechách, na Moravě a ve Slezsku*, Praha 1903, p. 2; W. Gintl, *Die chemische Grossindustrie Österreichs*, Prag 1899, p. 4, p. 17–18; F. Jílek et al., *Studie o technice v Českých zemích 1800–1918*, II., Praha 1983, p. 284–285.

Huge deposits of potassium and magnesium salts in the surroundings of Stassfurt (Saxen-Anhalt) were discovered already in the eighteenth century, but the Stassfurt alkalis began to be exploited on an industrial basis only in the middle of the nineteenth century. Mining of these deposits then developed precipitously so that in the 1870s the output reached up to 350,000 tons of kainite and carnallite mined every year. And precisely in this period, in addition to dominant potassium chloride and potassium sulphate, also potassium carbonate started to be produced on a large scale. In this manner also salt deposits of Eastern Europe and North America started to be exploited to produce potash. However, the factories of Stassfurt soon gained an almost monopolistic position of potash producer and supplier in Germany. Before World War I the German deposits saturated about 95% of world consumption of potassium salts. Mineral potash rapidly and definitely ended the period of traditional boiling of potash of wood ashes and endangered dramatically the potash production based on molasses that came into being only several decades before.⁶⁹

The process of substituting potash made of wood ashes for potash made of molasses and mineral potash, outlined above, could be integrated into general processes of substituting traditional materials and technologies (many times medieval or even older) for modern materials and technologies. Neither potash making could escape this radical change inherent to the industrial revolution.

In spite of this, in the second half of the nineteenth century in Bohemia and Moravia potash had continued to be produced in the traditional way, even though in a limited measure. But small potasheries could not compete any more with great industrial enterprises. In existing potasheries that depended on petty craftsmen of the villages, the technology started to decline. The purchasers didn't need calcinated potash and often they didn't even know it existed, thus the last surviving potasheries lacked kilns used for calcinations and producers didn't use ashes of higher quality or used water from a brook for leaching. On the other hand the tradition of village Jews dominating the potasheries went on, as well as the tradition of the use of ashes produced by households as the primary material. In economically less developed regions the related trade of ash making had persisted for a relatively long time. The last potasheries in Bohemia perished – functionally, not as buildings – around the turn of the nineteenth and twentieth century and together with them perished also the notion of traditional technologies that persisted in settled form for several centuries.

CONCLUSION

Potash production achieved an extraordinary boom in Bohemia and Moravia in the eighteenth century. This boom manifested itself especially in a continual increase in the number of small potasheries. At the same time, potash production had been limited basically in its expansion towards the manufacture and industrial production. This limitation had various causes. The most important of them stemmed from the specific features of the traditional technology of potash boiling – especially its absolute dependence on its crucial

⁶⁹ F. S. Mohme, *The Potash Industry of Europe*, Economic Geography 5, 1929, p. 141–148; R. Wagner, *Handbuch der chemischen Technologie mit besonderer Berücksichtigung der Gewerbestatistik*, Leipzig 1873⁹, p. 133.

material, wood ashes. The search for substitute materials and new technological procedures had not been successful in this period. Besides, the limits of traditional technologies intensified in the second half of the eighteenth century due to a novel attitude of the state to forest management (forest regulations issued in 1754).

The unfavourable state of this branch of production that manifested itself for one thing in its incapacity to supply glassworks, bleach plants, soap-works and chemical enterprises with adequate amounts of potash, for another in the increase of prices, led in the 1760s and 1770s to not very successful intervention of the authorities to the context of Bohemian and Moravian potash production. This intervention brought about in the first place repeated monopolisation of potash trade in the hands of exclusive companies and also the establishment of maximal selling prices and prohibitions of exportation of this commodity from the Czech lands. In the period of accentuated supervision of the authorities over this important branch of domestic production that fit in the contemporaneous efforts of the absolutistic monarchy to uplift crafts and industry, especially due to the loss of economically developed Silesia, a unique instruction for correct potash production came into being.

From the research realized so far it is clear that even the intense effort of commercial authorities could not revive noticeably the Czech potash production, not even on part of technology. The general utilization of calcinations kilns of more developed types represented the greatest achievement of Czech, but also of the world potash production. In the days when many other branches of production – including the chemical ones – entered the period of speedy development, potash production stagnated to a certain degree, even though it sustained its position as the most important chemical production of traditional type at all. The doubling of the volume of production in the period under study was a maximum that could be attained through traditional technology. However, the potash production in Bohemia could not satisfy the demands of domestic industry and crafts. From this fact stemmed the continual increase of prices and the need to import potash from abroad. Even the constant demand for potash did not bring about the establishment of big potash-making enterprises; it manifested itself especially in the regional character of this branch of production and its predominance in the areas with adequate supplies of firewood. The overwhelming majority of the purchasers of potash remained dependent on long-distance trade that remained, as well as the majority of potasheries, in the hands of Jewish entrepreneurs. The potasheries themselves were usually dominical enterprises that were rented in the long term to Jewish tenants to mutual advantage. The monopolization of the potash trade in the 1760s and 1770s brought about also the concentration of potash trade to the hands of great Jewish companies.

The Czech potash production had to face all the problems mentioned also in the subsequent decades. Radical changes occurred much later, at the period of Industrial Revolution, when the traditional material base of potash production was abandoned in favour of industrial large-scale production on the basis of molasses stillage and later the production of potassium carbonate from alkali salt deposits.

Figure 5: Potash production in Bohemia in the years 1750 - 1808

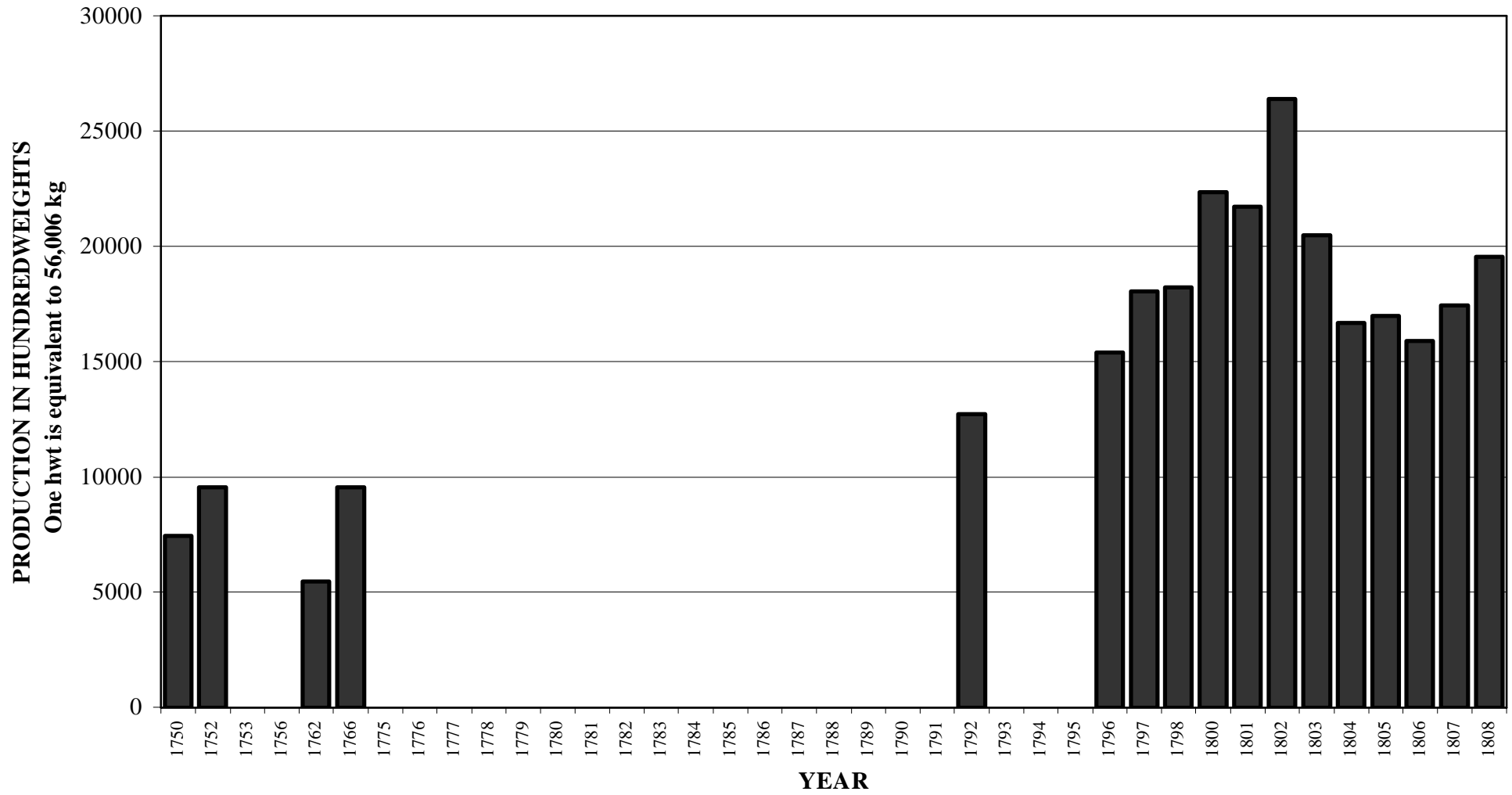


Figure 6: Potash consumption in Bohemia in the years 1762 - 1808

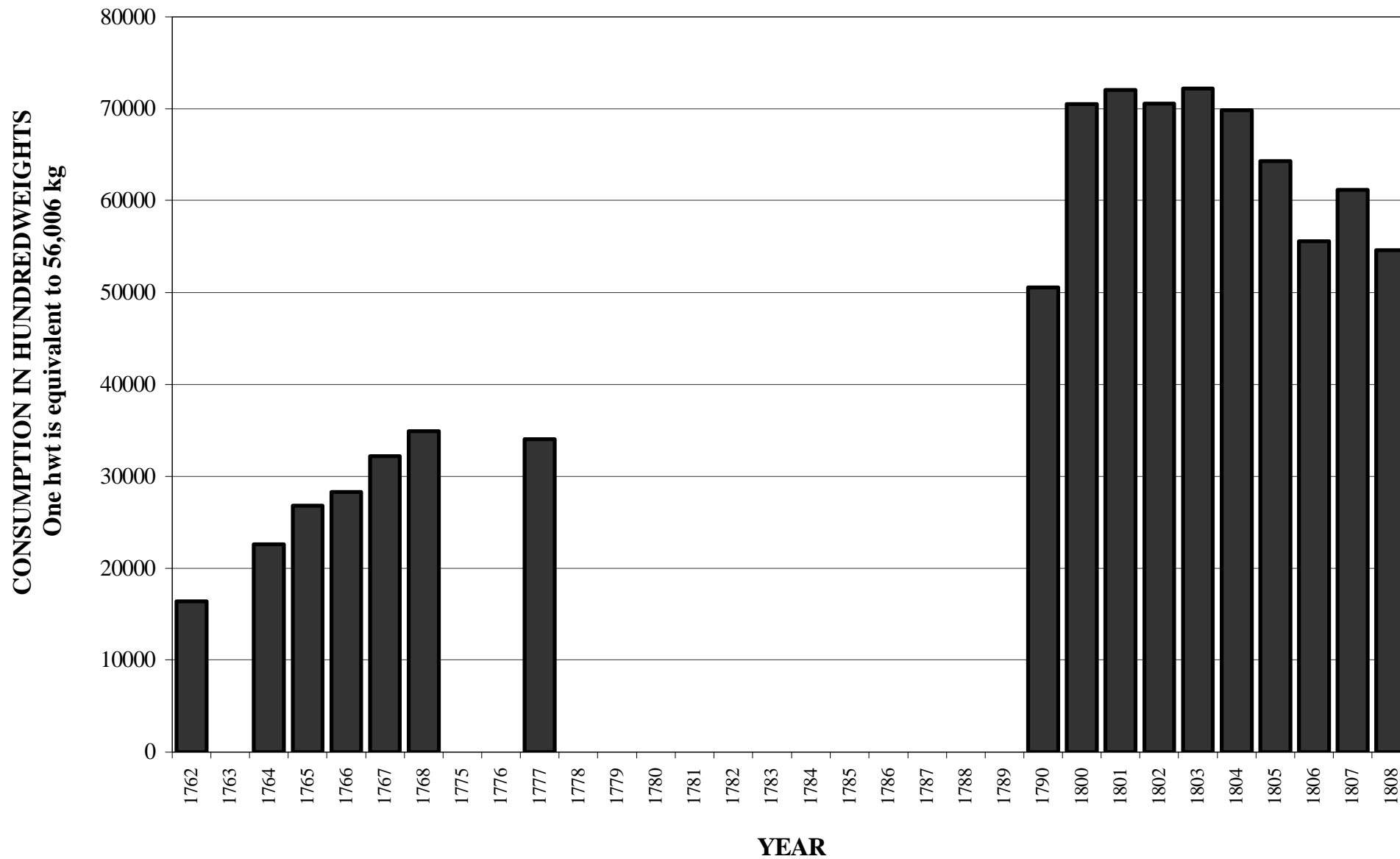


Figure 7: Overall trends in potash production and consumption in Bohemia in the 18th and in the beginning of the 19th Century

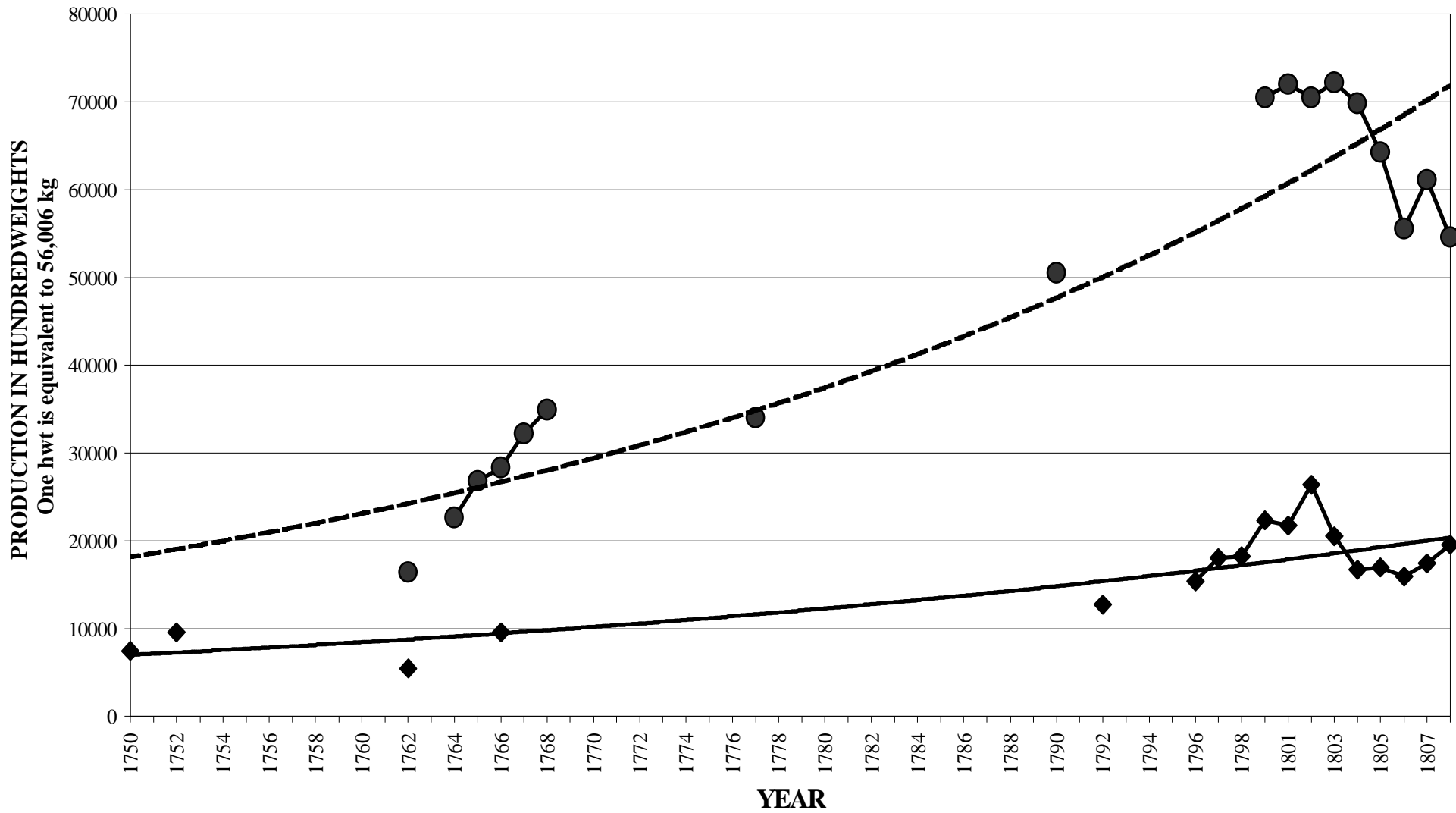


Figure 8: Number of potash producers in Bohemia in the years 1775 - 1798

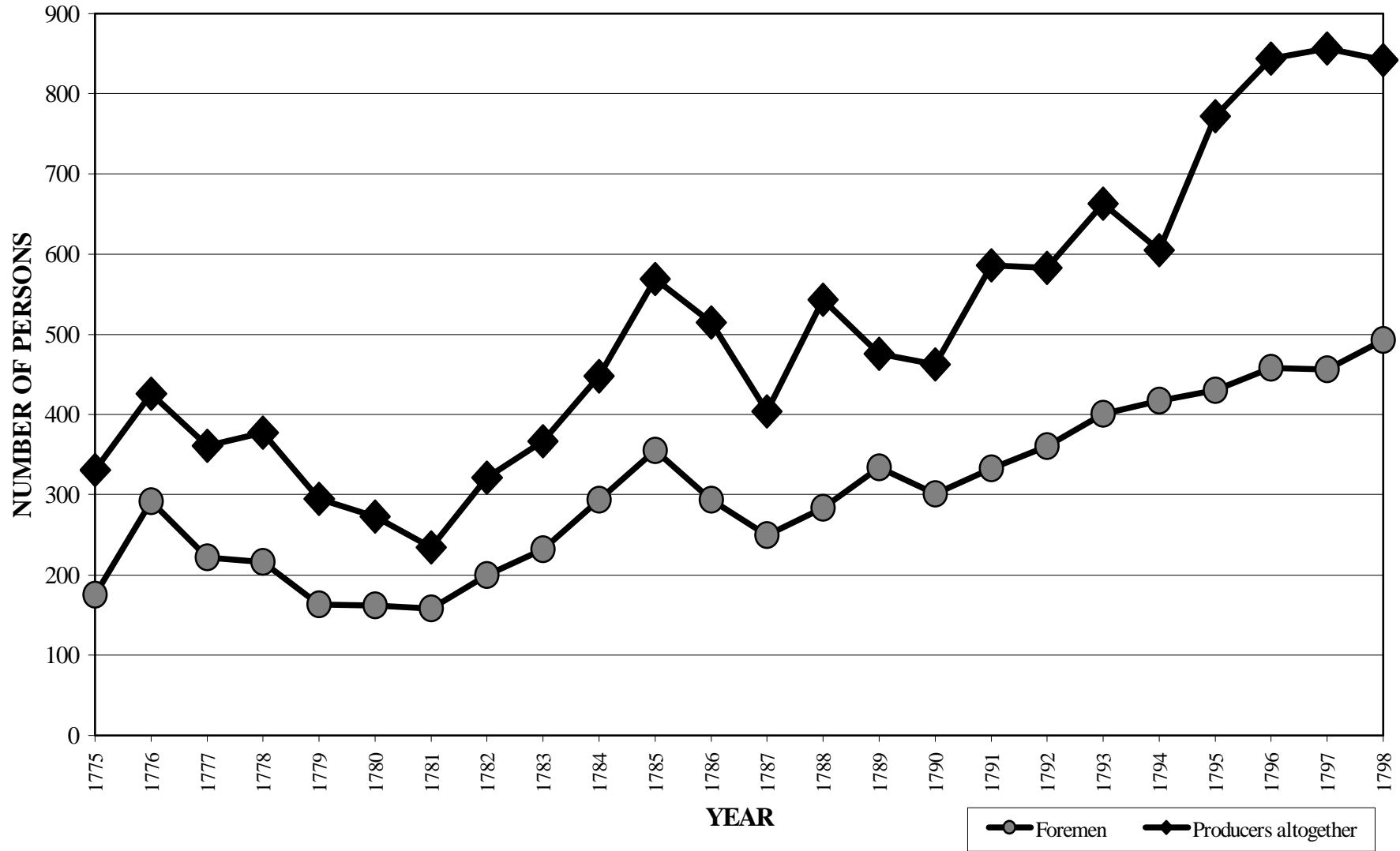


Figure 9: Number of potasheries in Bohemia in the years 1750 - 1791

