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## **From Mapping to Mixing: Political Recognition of Expertise from the Allotment System to the Public Promotion of Manufactories**

### **Introduction**

Since the Middle Ages, saltpetre has been an important resource for the manufacture of gunpowder, constituting approximately three quarters of its weight. In Sweden, gunpowder's other constituents--ten to fifteen percent each of sulphur and charcoal--were in abundance in pyrite deposits and in deciduous forests. Saltpetre, on the other hand, was scarce. While the military had used gunpowder more extensively since the 17<sup>th</sup> century, the 18<sup>th</sup> century in addition saw gunpowder blasting slowly replacing the older use of fire setting in mines, the traditional method of cracking the ore. Since saltpetre was primarily processed using manure and wood fuel, also farmers had interest in saltpetre production apart from the military and the miners.

The importance of saltpetre, and the competing interests surrounding it meant that its production in addition entered the discourse of academics and others interested in natural philosophy and economics. Dissertations on the topic were published and defended at universities in Uppsala and Lund as well as at Åbo Academy in Finland, then a part of Sweden. Other publications came out of the Royal Swedish Academy of Science and the Royal Patriotic Society and the War College, all in Stockholm. Thus, Swedish saltpetre production represented a rich topic for 18<sup>th</sup>-century intellectuals. To sum up, saltpetre in 18<sup>th</sup>-century Sweden was a site of contestation for military, agrarian as well as scientific interests.

This book deals with the organization of saltpetre production in Sweden and its transformations during the 18<sup>th</sup> and early 19<sup>th</sup> centuries. More specifically, it addresses how scientific knowledge interacted with political decision-making to propose and create new

production organizations. How did the various parties refer to scientific theories in their debates on optimizing saltpetre production? Who employed which theories and with what agenda? In the end, did arguments based on scientific findings have any impact on the organization of saltpetre production?

In the 16<sup>th</sup> and early 17<sup>th</sup> centuries, saltpetre production had been organized by forcing farmers to deliver raw materials to saltpetre works run by the Crown. In 1612, the growing military importance of gunpowder called for a reorganisation and saltpetre production was placed under the military. Four years later, a decree stated that each homestead (*hemman*) in the vicinity of saltpetre works had to deliver four barrels of soil, one barrel of sheep's dung, half a barrel of ashes, three loads of wood and two sheaves of straw.

In effect, the 26 Swedish saltpetre works operating in 1624 used such locally supplied raw materials to extract saltpetre from a nitrogenous mix of soil, dung, and ashes, through a wood-consuming process of leaching and boiling. The mix of soil, dung, and ashes was soaked with water that was then filtered. The filtered liquid was used once or twice more for leaching the mix and was finally heated in large copper cauldrons holding 800 litres or more (somewhat more than 200 gallons). Saltpetre workers then skimmed off impurities and, through a very complicated and tedious step-by-step process that took weeks of continuous heating, extracted raw saltpetre from the lye. The raw saltpetre was then again resolved in water and impurities were skimmed off in order to obtain pure saltpetre suitable for gunpowder production.

This system of duty deliveries to saltpetre works did not provide enough to meet the national need and saltpetre had to be imported in large quantities. Towards the mid-17<sup>th</sup> century, the deliveries in kind started to be transformed into a monetary tax called the saltpetre aid (*salpeterhjälpen*). The saltpetre aid was introduced as a possibility to avoid tax in kind, but was made mandatory from 1642. Simultaneously, the monetary saltpetre aid was complemented by mobile saltpetre "boiler teams" (*pannelag*).

### **Organization for taxation and military needs**

The big organizational transformation came in 1686, when the saltpetre boilers' allotment system (*salpetersjuderiindelningsverket*) was introduced in order to map and more efficiently exploit saltpetre-rich soils of the Swedish countryside. Through the allotment system, Sweden was divided geographically into seven inspection areas (*inspektionsområden*). With the aid of the county governor (*landshövdingen*), each inspector took inventory of his respective area, approved the saltpetre delivered, paid out remunerations and collected fines. In each inspection area, 20 to 30 "boiler teams" were responsible for extracting saltpetre from soil by leaching and boiling. Within each team, a foreman and two to five boilers were enjoined to produce at least 10 lispounds (85 kilos or somewhat less than 200 pounds) of saltpetre each. Otherwise, they were fined. As compensation, saltpetre boilers were exempt from conscription to the armed forces. The seven inspection areas comprised districts (*sjuderidistrikt*), each corresponding to a boiler team consisting of a number of military parishes (*rotar*), with eight to ten homesteads in each. One boiler team then circulated among the homesteads within a specific military parish for one year so that soil for the boiling of saltpeter would not be taken from the same homestead more than once every six years, or in the southernmost district not more than once every four years. Instead of having the farmers deliver the material to saltpetre works run by the Crown, the saltpetre boiler teams now brought their pots and pans to the farms to extract the saltpetre from the soil on site.

Less is known about the scale of Swedish saltpetre and gunpowder production in the 18<sup>th</sup> century and the information found in secondary sources is seldom conclusive. Nevertheless, according to an unverified statement the production of raw saltpetre reached a peak at 144.5 tons in 1712, during the Great Northern War between 1700 and 1721. But subsequently this fell to about 50 to 60 tons a year. Sixty years later, however, saltpetre production was once again raised to a new all-time high, probably to a large extent a result of rationalizations of the saltpetre boilers' allotment system. In 1773, 353 tons of saltpetre were produced and delivered to the Swedish gunpowder mills, although the annual deliveries quickly sank to around 250 tons, which still satisfied both military and civil demands.

Even if there is some disagreement about the exact production figures of raw saltpetre, a general trend is clear. A peak in production appeared around 1710 followed by a decline. The need for gunpowder during the Great Northern War may explain this peak, while the ensuing stagnation has been viewed as a consequence of the conscription of saltpetre men into new regiments. Another rise in production can be discerned during the second half of the 18<sup>th</sup> century when production largely satisfied the demand. This is reflected by the decision of the King in 1783 to limit the annual saltpetre production rate to 30,000 lisponds (255 tons).

Apparently, the organization of saltpetre production in the saltpetre boilers' allotment system was fairly efficient. This was perhaps no wonder since it mobilized every farmer, cow and sheep in Sweden or at least in the southern and eastern parts where the soil was rich enough in saltpetre to be exploited and the wood abundant enough to keep the lye boiling. Obviously, this required advanced monitoring of both the population and the land. In the 1620s, the Swedes had developed a system of parish registration (*kyrkobokföring*) to monitor citizens. Organized by the Church on the command of the Crown, the registration was launched to levy the Swedish soldiers and sailors of the Thirty Years' War. This bureaucratic innovation involved a thorough control of the Swedish population: their civil status, income, domicile and criminal as well as clerical records were documented. In 1680, the system functioned as an efficient control apparatus that gave the military and tax administration the means to exploit the human and material resources of the country. In fact, this parish registration is among the oldest still running and renders Sweden a genealogists' heaven.

The introduction of the saltpetre boilers' allotment system depended even more on the existing taxation system (*indelningsverket*) with roots in the Middle Ages, when taxes were collected in goods rather than money. By allowing the Crown's officials themselves to collect their subsistence from the copyholders and tenants in a specific area, this system admitted taxation without involving exchange of monies. Moreover, to secure the supply of troops, the War College administered a military allotment system in 1682 (*det ständiga knektehållet*), that augmented the more general system established during the Thirty Years' War. This addition entailed the division of each county into military parishes where the taxpayers were required to recruit a soldier, who then had to be lodged and given a piece of land to farm

during peace-time. From this perspective, the introduction of the saltpetre boilers' allotment system signified a new use of a familiar and reliable institutional framework.

The system for taxation and the military allotment system, together with the administrative control they both relied on, constituted a foundation for the Swedish nation state from the 17<sup>th</sup> century. Here it was possible to supply protection and political stability as well as possibilities for concentration of resources. The Swedish historian Jan Glete has pointed out that the ability to manage this type of complex organization was the innovation that made nation states possible in early modernity. Management skills transformed the relation between state and society giving the state potential both to use military power independently of local power structures and to make taxation more efficient.

In Glete's overarching analysis, the early modern state relied on three organizational pillars: one for taxation as means for to resource allocation, one military for exercising violence and one political for the management of taxation and the military. Both the military and the administrative organization for taxation were parallel and brought together on the highest political level. From the 1720s this was the council of the Swedish King and the four-estate Diet. From this perspective, both taxation and the military were equally important for the management of the nation state.

### **Expansion of the saltpetre boilers' allotment system**

Despite the solid organizational underpinning, the saltpetre boilers' allotment system proved ineffectual until the second half of the 18<sup>th</sup> century, when the War College had made new inventories of the country's saltpetre-rich soils. Especially during the 1740s, the allotment system was expanded and made more efficient due to a number of inventories made by civil servants of the War College systematically mapping different counties. By devising a finer-meshed division of homesteads and individuals, the allotment system became an effective tool for collecting and exploiting materials such as soil, dung, and wood that were needed for producing saltpetre.

These efforts can be put in the context of topographical literature gaining in popularity from the 1740s when the director of the land survey inspection, Jacob Faggot, published a call

for more thorough and systematic descriptions of different parts of the country. A forerunner had been Carolus Linnæus, who had travelled distant parts of the country from the 1730s in order to map resources and published economic descriptions for future exploitation. Dissertations on the same theme were also defended at the universities and economic descriptions influenced the efforts of the War College to expand the saltpetre boilers' allotment system specifically and the general allotment system for taxation in general.

These efforts seem to have raised production in the saltpetre boilers' allotment system. Simultaneously, however, costs for domestic saltpetre production were increasing considerably. The growing expenditures was put in contrast to the declining prizes on the international market from 1760s making the domestic production more and more vulnerable for criticism.

Most of all, this was aired in the four-estate Diet governing Sweden from the death of Charles XII in 1718 and the new constitution of 1719 to the coup d'état of Gustav III in 1772. Here nobility, clergy, burghers and peasantry had possibilities to bring up issues of relevance to their activities. Admittedly, the estate of the peasantry was the weakest of the four estates and representatives of the peasantry were excluded from the most powerful of committees, the secret committee.

Still, by contrast with the peasantry of most other European countries at this time, the constitution gave Swedish peasants formal means to voice their political opinions, for instance by bringing up parliamentary appeals (*riksdagsbesvär*) on behalf of their voters. Parliamentary appeals often addressed local or regional issues, rather than ideological ones, typically issues of taxation and industrial policy. Problems connected to the saltpetre boilers' allotment system also frequently surfaced throughout the 18<sup>th</sup> century. Most commonly, farmers complained about the lack of wood fuel with which they often had to supply the boilers, especially pressing in forestless areas. Others criticized the farmers' duty to deliver saltpetre manufactured in the allotment system to collection sites. Additional themes were complaints regarding boilers inability to restore barn floors they had broken up in order to access the manure. Appeals became more common as the saltpetre boilers' allotment system was expanded and made more efficient.

The peasantry was quite often successful in their appeals, at least when they were in accordance with rules and regulations. Simultaneously, a clear discrepancy can be observed between the appeals brought up by the peasantry and the issues addressed by the War College. While the peasantry reacted to changes and injustices they felt were forced upon them by the saltpetre boilers' allotment system, the War College had possibilities to act to introduce new boiling methods as well as expanding the allotment system. Moreover, activities of the War College seemed to be intensified after peace treaties, when more far-reaching changes often were suggested. The genre of appeals, on the other hand, limited the peasantry and made it impossible to suggest radical changes of saltpetre production.

This is probably the reason comments of world market prices of saltpetre are non-existent in the source material. Not even when the saltpetre prices decreased from the 1760s and large-scale import did it become a feasible alternative. Only in the 1780s were proposals made in this direction and debated publicly. It was first and foremost the War College and to some extent the council of the King that had to possibility to consult and mobilize knowledge resources in the form of investigations and reports to support suggestions for changes in saltpetre production.

### **Saltpetre barns as industrial policy**

Towards the middle of the 18<sup>th</sup> century, a novelty was introduced to further raise the saltpetre productivity of Swedish soils. This novelty, however, did not fit the production organization of the existing allotment system of saltpetre boilers. The building of saltpetre barns nevertheless became a more common method for treating soil before its actual leaching and boiling. These barns were rather simple wooden sheds where soil—mixed with manure, stale urine, composted wastes, or even carcasses—was stored in oblong pyramidal heaps. Their roofs kept the rain from leaching the soil, which was turned every fortnight. The idea behind the saltpetre barns was that saltpetre could be generated or grown more efficiently in certain favourable environments such as well-tended heaps of soil in shelters. In general, the soil from barns could also be used for processing every third or fourth year, at most every second. This should be compared to the rate of production in the allotment system, where the soils

were collected at most every sixth year, except in the southernmost parts where the rate was every fourth year. Since the saltpetre barns were immobile and needed continuous tending for three to four years before their content could be used for the evaporation of saltpetre, this alternative production method did not fit the organization of the mobile saltpetre men.

In Sweden, saltpetre barns had been referred to from the end of the 17<sup>th</sup> century, but there are no indications that they had come into more general use before the 1740s. A central document encouraging the foundation of saltpetre barns was an instruction on how to build them and why published by the War College in 1747. Here, the War College described two different kinds of saltpetre barns. The simpler kind was cheaper, easier to build and “could serve the more simple-minded,” while the more elaborate kind was more expensive but also would “richly reward the trouble.” The reasons for the publication of the report were not only

to avoid the load the Kingdom, in days of yore, must have suffered, to let considerable *Capitals* go out for the procurement of Saltpetre for the defence of the Country and other necessary uses, but one has likewise been conscientious, to provide the Mines with enough gunpowder, especially since it has been clear to each and everyone, that those with a lot of saved Forest and relieve of working load, now almost everywhere have begun to use gunpowder for blasting Ore in the Mines.

The efforts of the War College were not limited to words alone. The Crown also promised to pay a reward for every lispound of saltpetre delivered and produced from soil treated in a saltpetre barn, a reward significantly higher than the remunerations given to the saltpetre men.

From 1744 and during the following decades, the Crown approved of loans to encourage the construction of barns. In 1748, the Crown gave a loan of 3,000 daler copper coins free of interest to the town clerk of Linköping, Carl Fredrich Lund, for expanding his saltpetre works with barns. Soon, more loans followed and, between 1752 and 1754, loans totaling 74,000 daler copper coins were given for the erection of saltpetre barns. In 1756, a letter from the King stated that every barn erected, larger than 60 times 16 ells (around 40 times 10 yards) with soil heaps higher than 3 ells (2 yards), was to be rewarded with a bounty of 300 daler copper coins.



These loans and bounties resembled those supplied to owners of manufacturing operations (mainly for the production of textiles) by the Estates' Office of Manufacture (*Rikens Ständers Manufakturkontor*), which was established in 1739 and operated as a subdivision of the College of Commerce (*Kommerskollegium*) from 1766. The subsidies, as well as the organizations that administered them, were an established institutional framework for supporting production favoured by the government. So the loans and bounties for the building of saltpetre barns was not an institutional innovation, but rather an expansion of the system for supporting the manufacturing of textiles, tobacco, sugar, glass, paper, porcelain, and other desirable goods.

Thus, it is clear that the two forms of production had different institutional frameworks. The saltpetre boilers' allotment system relied on older and more traditional forms of resource allocation copied from the allotment system of taxation and to some extent involving coercion. In contrast, saltpetre barns relied on the more recent institutional framework including loans and bounties implying stimulation. Moreover, the expansion of the more traditional saltpetre boilers' allotment system relied on topographical literature, while the ambitions to make saltpetre barns more efficient leaned on chemical investigations. Thus, not only the institutional framework, but also the area of knowledge mobilized to improve production output differed between the two organizations.

The subsidies seem to have made it financially profitable to produce saltpetre, at least in some cases. According to one contemporary statement, a saltpetre barn would give an annual return of 9 to 12 percent. Others, however, complained that barns did not produce soil with saltpetre content and instead constituted a diversion from agriculture. As a consequence, the bounties were supposed to have been abolished in 1784, when the War College complained that the production of saltpetre prepared in barns did not meet their expectation. Still, some compensation was paid out after that year as well.

According to one source, about one third of the saltpetre produced in Sweden in the 1790s nevertheless originated from soil that had been prepared in barns. At the same time, it is important to point out that most of the saltpetre was still produced within the older

allotment system. In 1815 there were 1,128 saltpetre barns scattered around the country (not including Finland, which had been lost to Russia in 1809).

### **Discussions about saltpetre**

Saltpetre production was important to both the military and farmers. The central issue to both parties was how saltpetre could be produced efficiently. Public discourse attacked this problem from many different angles during the 18<sup>th</sup> century, a time when economic doctrines constituted a critical foundation. The general political debate was marked by a cameralism that went hand in hand with an agriculture-friendly form of reform-mercantilism. The essence of this economic doctrine was the use of domestic resources to compensate for the lack of overseas colonies and for the consequent expenditures of foreign trade. In addition, studies of nature were seen as a powerful tool to unveil the possibilities given by Providence in order for a nation to be self-sufficient.

This mix of economic and scientific arguments mirrors an ideology of utility. This was a thought system connected directly to the Enlightenment and subsequently with ideals associated with David Hume, Adam Smith and the Physiocrats, but is not to be confused with the utilitarian ethics of Jeremy Bentham. With roots in the early 17<sup>th</sup> century, the ideology of utility stressed the application of natural philosophy and economics as a means of raising domestic production for the benefit of the whole nation. These ideas fit like hand in glove with the military demand for domestic saltpetre production based on ideas regarding national security. Together they formed a strong alliance.

Thus, besides economic doctrines, debaters continuously blended proposals with chemical matter theories. In the 17<sup>th</sup> century, the predominant view was that saltpetre was a mineral, which—if the circumstances were right—could be grown or generated. The use of saltpetre barns signified one important conclusion arising from this theory. Throughout the 18<sup>th</sup> century, similar ideas were suggested, although it now became more common to think of saltpetre as a salt. At the same time, though, other views were also proposed, such as the possibility that different substances could be transformed into saltpetre, for example sulphuric acid would be transformed to nitric acid, which in turn would produce saltpetre.

The ideology of utility in Sweden had an institutional foundation in the Royal Swedish Academy of Science. Another centre was Åbo Academy in Western Finland, where the professor of chemistry, Pehr Adrian Gadd, also functioned as inspector of saltpetre works in the county. Under Gadd's supervision, the student Abraham Granit published and defended a thesis on saltpetre in 1771 arguing for the possibility of growing or generating saltpetre in soil under certain circumstances. The use of saltpetre barns was one important conclusion. Even more interesting, though, is how Granit's study was translated into French and published together with the instructions of the Swedish War College from 1747 and other translated texts in the French crash program for saltpetre production 1776-1794.

Simultaneously, however, mayor Carl Fredrich Lund voiced his discontent with his own saltpetre barns claiming that "it was as impossible to bring out of a saltpetre barn, much saltpetre, as it is to suggest the cultivation of 50 acres, where the land holds no more than 10." Lund believed that saltpetre in air could be fixed in soil with the help of minerals and dead plants and suggested that soil and manure should be treated in the open at the farmhouses so that as much saltpetre as possible could be evaporated by the Crown boilers. Lund's proposal triggered off a press debate in Stockholm in the autumns of 1770 and 1771. In general, the opponents to saltpetre barns had as much practical experience as the advocates. What they lacked, however, was academic status.

During the 18<sup>th</sup> century, alchemy remained a source of ideas for chemistry. One of the most important builders of saltpetre barns was the alchemist Jacob Johan Anckarström. After a military career, he planted fruit gardens and built saltpetre barns on his estate north of the capital Stockholm. Inspired by alchemy, Anckarström's matter theory stated that ordinary salt, given the proper environment, could be transformed into saltpetre. Although he did not detail how to prepare the soil for this transmutation, he concluded that the barns should be built so that a maximum quantity of the soil's salt could become saltpetre.

From the early 1780s, economic arguments seemed to have become more important and used to argue for an abolition of the saltpetre boilers' allotment system altogether, balancing its production with the erection of saltpetre barns and import. In the 1790s, the director of saltpetre works, Lars Cronstrand, argued that farmers themselves should be ordered to collect

stale urine and manure and use it to prepare soil in saltpetre barns connected to their cow-houses. Crown boilers with the right knowledge should then evaporate the saltpetre from the soil, compensating the farmer for his work. In this way, Cronstrand calculated, manure would be left over for the farmers to spread in the fields in order to raise crops. Peter Jacob Hjelm, a fellow of the Royal Swedish Academy of Science and director of Laboratorium Chymicum of the Board of Mines (*Bergskollegium*), also confronted the issue of saltpetre production. Contrasting other participants in this debate, Hjelm not only advanced his own views but also translated a treatise by French chemist Antoine Lavoisier on the building of saltpetre barns.

To sum up, it is clear that the individuals debating saltpetre production had very diverse backgrounds. Academic chemists, military men, noble alchemists, mayors, directors of saltpetre works etc. constituted a very heterogeneous group in comparison to those office-holders mapping saltpetre soils for the War College in order to expand the saltpetre boilers' allotment system. In addition, the issues addressed by individuals interested in saltpetre production from economic and chemical perspectives, for instance how to treat soils in saltpetre barns or how to organize the process of leaching and boiling, was in stark contrast to the issues brought up in appeals by the peasantry, more or less exclusively connected, as they were, to the conditions of the saltpetre boilers' allotment system.

Another important observation is that chemistry, having earlier replaced topography as the science predominantly used to increase saltpetre production, in the 1780s had to give way to economics leading to a stronger impact for ideas of abolishing domestic saltpetre production for import. This was further strengthened by the prevailing physiocratism among many economic thinkers at the time. Knowledge of both chemistry and economics proved to be a popular rhetorical strategy.

### **Abolition of the saltpetre boilers' allotment system**

Throughout the 18<sup>th</sup> century, the peasantry politically matured and acquired greater influence on domestic policies. Its rise was only temporarily weakened by the overturn of the government in 1772. When officials from the War College also started to question the high costs of the saltpetre boilers' allotment system in public investigations from the 1780s, its

days were counted. Especially the household committee (*Hushållskommittén*) of the 1790s was important for the abolishment of the saltpetre boilers' allotment system. Here, a number of high representatives of the War College, as well as some anonymous, made their criticism of the system public and suggested import as well as the erection of saltpetre barns as a more efficient alternative.

There were a number of reasons for this turn of events. First of all, prizes on the international market hit a minimum in the early 1790s making domestic production comparably expensive. Secondly, simple saltpetre barns had proved successful in Finland raising saltpetre production there. One of the most important proponents of the simple barn was the Åbo professor Pehr Adrian Gadd, who had vigorously introduced them from the mid-1770s and who had also understood the importance of adding ashes (with potassium content) to the soil in barns. In this way, saltpetre barns became an important component of the production system in the 1790s so that about a third of domestically produced saltpetre had been leached from soil in barns. A constant flow of short and clear instructions on how to build and manage barns throughout the 1790s and the 1800s contributed to the development. In this context, it is important to remember that all these improvements were based on practice rather than an understanding of the processes involved when saltpetre is generated in soil.

When resistance to an abolishment of the saltpetre boilers' allotment system was broken, events developed fast and already by 1800, the Diet decided on a new mode of taxation where every farmer had to deliver half a lispound of saltpetre to the Crown. In return, the saltpetre boilers allotment system would be abolished. Curiously enough, the only estate to vote against this change was the peasantry, probably because they saw an opportunity to get rid of the production altogether and switch to import.

The abolition of this allotment system still signified a major victory for the peasants. Instead of having saltpetre boilers exploiting soils, all farms now had to contribute to the saltpetre production of the country. By stipulating that every homestead had to deliver a specific quantity of saltpetre annually (*salpetergården*) bought at a set price by the Royal Ordinance, the responsibility was transferred to the farmers and made it in their interest to

organize saltpetre production more effectively. The new regulation supplied institutional conditions that ultimately promoted the preparation of soil in saltpetre barns.

During the following decades, Swedish saltpetre production saw many changes. Most importantly, Sweden had lost Finland to Russia in 1809 and with it one of the most productive areas for saltpetre. This loss could only be compensated with a campaign increasing saltpetre production in Sweden from 5,000 lisponds in 1809 to 24,600 in 1828. By then, the production seemed to run efficiently in specific regions such as the north of Sweden and the saltpetre tax in kind seemed more and more dated. The amount of saltpetre that had to be delivered was thus decreased in the 1820s to be abandoned altogether in 1830:

### **Conclusions**

Swedish saltpetre production underwent a series of institutional changes during the 18<sup>th</sup> century. In the early decades, saltpetre was a scarce resource, which posed a constant threat to gunpowder production and therefore to national security. From the 1730s, however, the production slowly rose so that by the 1770s its supply met the Swedish demand. The transformation of saltpetre, from a scarce resource into an abundant asset, occurred despite a decreasing number of saltpetre boilers from the 1760s onwards. This paradox is partly explained by the introduction of saltpetre barns and alternative institutional conditions for saltpetre production. But since it took time to reorganize saltpetre production, introduce appropriate institutional conditions and develop knowledge of how to efficiently construct barns and manage the soil in them, the establishment of saltpetre barns was gradual. Of significance for the rising saltpetre production was also the already established and throughout the 18<sup>th</sup> century more smoothly running, although increasingly complaint ridden, production organization of the saltpetre boilers' allotment system, couched as it was in an older and well-adjusted institutional framework.

When trying to understand why the saltpetre boiler' allotment system was abolished in the beginning of the 19<sup>th</sup> century, it is important to take into account bureaucratic expertise acting anonymously in organizations like the War College. Their changing views influenced public investigations like the household committee and set off the political decision-making

process towards an abolishment of the existing system. It is however, important to keep in mind that they did this without any major transformation of the institutional framework of expertise. New in this context was, instead, the authority with which chemical knowledge was formulated in instructions and other documents influencing policies. Sure enough, this new authoritative voice of chemistry made it seem more reliable and thus attractive to policy-makers. But it was achieved without a more accurate understanding of the processes behind the generation of saltpetre.