Development of the land surveying system in the Moscow state of the XVI-XVII centuries

T V Ilyushina
Moscow State University of Geodesy and Cartography, 4, Gorokhovsky lane, Moscow, 105064, Russia
E-mail: ilushina@feut.ru

Abstract. The article examines the state system of scribal surveys of the 16th - 17th centuries. The procedures of state land surveying were based on the development of cadastral descriptions and the successful work of the «Pomestny Prikaz» – regulating land affairs in the state. Land surveying was carried out to end land disputes for state needs, requests of owners, monasteries, etc. The procedures and rules for land surveying were determined by legislation. During this period, borders were established for counties, cities, principalities, etc. Scribes and land surveyors had to determine the quality and productivity of land, analyze landowner rights, settle disputes and all actions should be set out competently in a variety of documents. They were people well prepared for their work, skilled, with knowledge of agricultural conditions and understanding the tasks of land surveying and land descriptions. Scribes left behind tens of thousands of arranged local dachas and, moreover, well-composed local documents. One of the main characteristics of this period is the gross surveying of 1680-86, which was of great importance in the history of Russian land ownership. It helped to create many boundary documents, secured the rights of owners on the borders, composition and ownership of estates, resolved many land disputes and troubles, brought public land to the notice and gave the government the basis for the further establishment of land holdings and proper taxation.

1. Introduction
The procedures of state land surveying were based on the development of cadastral descriptions and the successful work of the «Pomestny Prikaz» – regulating land affairs in the state. Land surveying was carried out to end land disputes for state needs, requests of owners, monasteries, etc. During this period, borders were established for counties, cities, principalities, etc. The boundary laws of the Moscow state provided for penalties for violations of inter and court orders. The Belozersky charter contains the following decree: «And who will overrun or plow over his boundary, and our governors and their deputies will take eight coins from the guilty». In the Judicial Code of Ivan III and Ivan (1497 and 1550), in addition to a fine, a criminal punishment was imposed for violating the princely, boyar and monastery lands: «And who can cut the border or the verge of deletion from the Grand Duke of the land, or the boyar, or monastery, or the nobleman, and who destroyed the boundary - beat him with a whip, and the plaintiff taking the ruble on it» [1, 2].

In 1525 a Decree was published, where Vasily III ordered using land surveying to determine the amount of land of estates, and to divide the surplus among the poor. In 1556 a Decree was issued with the appendix «Land surveys» - a manual for scribes, containing principles of calculations of measured areas. «A book called geometry of land surveying ... deeply wise, giving an easy way to measure the..."
most inaccessible places, planes, wilds», came out. An order, drawn up according to the rules of simple geometry, led to the appearance of boundary drawings, which are mentioned in the inventory of the Tsar’s Archive in 1575-1584 (the archives of Ivan IV contained several boxes of drawings and a list of 248 cards). The Moscow state, taking care of the safety of its borders, created fortifications along them, the description of which already in the 16th century contained attached drawings of the border strip of the area. The latter were compiled by draftsmen, who were prepared mainly from the icon painters. The best of them were enlisted in the army, taking part in military campaigns [3, 4]. When measuring land, the distance was measured by «measuring rope», the turn of the borders was indicated «to the right» or «left», and the areas of agricultural land and forests in tithing and square versts were determined. Until the 16th century prefabricated drawings of certain areas of the Moscow state were compiled according to the results of inventories, inspections of the area and simple measurements [5].

Already in Sudebnik in 1497 there were several articles (61-63) on the procedures for surveying possessions and regulating issues of feudal land relations:

- Article 61 «On Fences» reflected the struggle of the feudal lords with remnants of communal servitudes. It speaks of the need to establish hedges between neighboring lands in order to avoid damage by livestock. The costs of establishing hedges were laid out equally between adjacent owners [6].

- Article 62 «On Boundaries» described liability for damage or destruction of boundary marks and plowing of non-owned land. Reproducing mainly the articles of the 18th Belozerskaya and the articles of the 4th Dvina statutory letters on punishment for violation of boundary marks, article 62 strengthens the protection of the land property of feudal lords. Not only princely lands, but also boyars and monasteries were subject to protection. If earlier the actions of violators were subject to a fine, then under this article the person guilty of damage to the boundary marks or «soha» of the land would be «beat with a whip, but the ruble was taken from him». The same crime, committed between the peasants, entailed a monetary fine and compensation for losses to the victim, the amount of which was established on the principle of «looking at the person and the wound and reasoning». From the XV century natural rent in some places was replaced by money payments. Scribe books of the first half of the XVI century presented in the form of lists and extracts survived only in a few copies to the Novgorod lands (1500) and one copy to the Tver lands (1540). From the second half of the 16th century there are already many copies of scribe books.

In 1557 work began on land descriptions in accordance with a special Instruction: «Send scribes to all my land, write both ... mine, of the Tsar and the Grand Duke, and of the princes of the Church, and the monastery and church lands, no matter whoever owns it, but measure arable land and not arable land, and meadows, and woods, and all sorts of lands for fishing - rivers, and lakes, and ponds, and on-line fishing, and bridges, and transportation, and backyards, and kitchen gardens, and then put everything in place in the books ...» [7]. The resulting materials served as the basis for drawing up the Big Drawing. Books from the time of Mikhail Fedorovich have been preserved, but the totality of books of the 16th-17th centuries is an insignificant part of the enormous work done by scribes [1].

According to the Decree of service people with the application of «Land Inscriptions» (1556), measurements and calculations of areas were made in versts, royal fathoms (197.4 cm) and quarters. When surveying, the angles were not measured and were not considered, when calculating the area. There were ways to «supplement» the land (equating «middle» and «thin» land with «good» land by increasing the amount of «middle» and «thin» land for «soha» land). Such a recount reduced the total number of landfills in a given property, easing the tax burden. Over time, the level of disorder in units of measurement increased; linear measures were based on the sizes of parts of the human body. In linear measurements, ropes and cords were used. Distances and heights were measured with stakes and linear measure (wooden poles, wands); surveying was conducted «overlook» [look through the stakes], which does not require great accuracy of the results.

By the Council Code of 1649, a system of land surveying was systematized: boundary laws, that determined the procedure for land surveying, were established, penalties for damage to boundary signs were envisaged. [7]. The boundary laws of the Council Code of 1649 established the rules of the controversial and indisputable land surveying. The Code determined the punishment for damage to
boundary marks, for illegal seizure of land, land allocation procedure. During this period, the formation of the Land Survey takes place, decisions on the rights of common and private lands, roads, are issued. When surveying, the main evidence of ownership rights was determined by written documents (granted and legal letters, «indisputable fortresses», «extracts» from scribe books, «tales» of the owners) [3].

Natural resources included in the holdings would have to be accounted when distributing estates, taxation, and preserving the interests of landowners (precise establishment of inter-division of shared ownership, resolution of disputes and strengthening of tenure rights) [1]. Land laws of the Code determined: the controversial and indisputable land surveying of lands not yet surveyed by scribes; and the controversial and indisputable renewal of boundary marks [12, 13]. In cases of requests from the owners to survey their estates and estates, not yet scanned by scribes, the Code prescribed land surveying with old-timers, establishing borders, and eliminating land disputes. If the land surveyor couldn’t resolve the dispute with his power, then in disputed lands a «figurative walking» with an icon was instituted, as evidence of the correctness of the arguing owners [14]. The swirling walk consisted of taking the Holy Icon in their hands and taking the land away. It happened that during this action on the lines people died [15]. Penalties for damage between, for forcible possession of land, and for improper actions of land surveyors were also determined in the Code. The same punishment was also applied to peasants who ruined their borders, but without collecting a fine from the guilty [9, 1]. In the chapter «on estates», the Code gave many rules defining the land rights of landowners, the size of estates and the distribution of land [1].

A significant event in the history of the Russian land surveying was the gross surveying of 1680-1686. The legal strengthening of the rights and boundaries of possessions for a certain period with the corresponding costs and determination of the profitability of land was started from the Moscow district. In 1685 scribes were sent for gross land surveying in «foreign» lands. The value of the gross land surveying was very large - there were many land documents, which established the quantity and quality of land and many land disputes were eliminated. Gross land surveying gave the government a basis for further determining ownership of property and proper taxation. The surveyors practiced certain ways of «approving» land, which later gave rise to a complex system of «strip farming» in the state and the economic and legal grounds for «spreading» strip land (determining shares, etc.). Practical geometry was based on determining distances and areas (areas were measured with a rod and measuring ropes in tithes of 80 in length and 30 fathoms in width according to the Order of 1684).

2. Methods and tools for measuring land
In the XVI-XVII centuries there were two types of land surveying - government and private. The first happened according to the needs of state administration in establishing state and administrative inter and delineation of lands of importance to the government. Private land surveys concerned private transactions to identify lost, controversial and new inter. Land surveys were taken as proof of tenure rights. Measurement of land and forest areas was carried out on quarters of sown bread, on mop of mowed hay and a mile and a half in length and cross. At the end of the XV century tithes were used as a measure of hayfields, and at the end of the 16th century as a measure of arable land. The square tithing in the seedlings at different times and in different places was not the same: it could have 50 soot each. length and width, then 60, then 80 and 40, then 80 and 30. Tithing equated to 80 fathoms in length and 30 in width. The fields of one farm were «swept» by eye or according to the tales of local residents. Yards in cities and villages were also measured along the lengths and widths, and sometimes only along one width along the street. Forests were measured by miles by eye, and sometimes in a quarter, in tithes or fathoms along and across the forest [1]. In 1684 Scribe's order was issued for the production of mandatory, continuous land surveying: «to write, measure and survey local, patrimonial, empty and all kinds of other lands were ordered to the detachment, and not through the lands, so that there would be no passes» [16].

In the documents of land surveys of the XV-XVI centuries the surnames and patronyms of scribes and land surveyors of that time are repeated: these are the well-known Moscow surnames - fathers, sons, grandchildren and great-grandchildren of the family of Viliamino, Beklemishev, Zagryazhsky, princes
Scribes and land surveyors had to determine the quality and productivity of land, analyze landowner rights, settle disputes. Judging by handwritten works, surveyors were able to determine the area of land by dividing the fields into simple geometric shapes - quadrangles, trapezoids and triangles, but this did not harm the surveying. They were the organizers of land-legal, land-tax and agricultural relations, and they understood this matter perfectly.

3. The development of cartography

The beginning of Russian cartography dates back to the 17th century and compilation of the «Big Drawing», the basis for which were descriptions, surveys of territories, the first scribal books of the XIV-XV centuries, and the first description of the map «Book to the Big Drawing» (1627). Maps of this period were compiled on the basis of the river network. The book gave a description of land and waterways and tracts. To move east, the Russians looked for convenient ways and knew and described in detail the shores of the White Sea and the Arctic Ocean. In the XVII century drawings of individual areas were made. After many years of collecting information on natural resources, the first attempt was made to collect drawings in the Atlas (Drawing book of Siberia S. Remezov 1701, Russian popular print map of the whole world of the XVII century), «Scribe map of Russia» by D. Gerasimov (1525). In 1597 one of the first plans of Moscow was compiled - «Petrov-drafting». A number of maps of foreign authors appear: maps of B. Agnese (1525); J. Gastaldi (1548); S. Herberstein (1546); A. Jenkinson (1562); G. Mercator (1594), I. Massa (1633), J. Stryuis (1668); N. Vitzena (1687) and others. At the end of the XVII - beginning of the XVIII centuries. considerable work on the mapping of Siberia was done by P. Godunov (1667) and S. Remezov (1696) – «The Chorographic Book» (collection of maps of various rivers and their tributaries 1697-1711), «Office drawing book» (1702-30), «A drawing of all Siberian cities and lands» (1698) [17, 18, 19]. When describing territories, rivers with tributaries were taken into account; drafts (land lowland, swampy small parts of the waterway); lakes; the woods; mineral resources; the number of arable land, waterless and impassable rocky steppes, etc. This was a preparatory stage for a more detailed mapping of the state. Analysis of cartographic works of this period allows using old maps as a source for studying the level of geographical knowledge, the natural environment (as the main component), types of management, and land categories (agricultural land, land of water and forest funds, land of built-up territories, etc.) [20, 21].

The origin of economic maps in Russia dates to the end of the 17th century. But even before special economic maps appeared, various economic and geographical information was applied, among other loads, to maps of a more general content. Such data were still fragmentary, far from complete, and sometimes random, but still placing them on a map indicates a desire to enrich its contents with information of an economic-geographical order. This desire was associated with the development of trade, with streamlining tax collection, with the development of crafts and later mining business, with the organization of resettlement to the outskirts of the country. On many ancient handwritten maps there are indications of the most important occupations of the local population, mineral deposits and their use, agricultural land, etc. [22]. The inscriptions on the drawings (for example, from the Book of the Big Drawing show about 2000 toponyms and more than 1500 distance values) indicated a sufficient number of gradations of settlements, roads, borders and natural resources.

4. Conclusion

The government took various measures to determine the boundaries of land and forest ownership, because, in addition to the lack of strong evidence, this was hampered by a lack of knowledge and measurement techniques. But there was an urgent need to reform land relations due to the following main problems:

- need to establish the rights, size of allotments and fixing the boundaries of land granted to industrialists, urban residents, foreigners, etc.;
- absence, confusion and inaccuracy of documents of land ownership, inaccuracy of description of lands, borders, disputes about lands;
Land laws of the state were still poor in content, measuring work caused difficulties. But scribes and land surveyors had to classify lands by quality, determine their productivity, levy taxes, settle disputes and draw up a variety of documents. This suggests that these people were well prepared for their business, knew agricultural conditions, the physical properties of land, the functions of water, forest and mineral resources, the methods of measuring and dividing, the layout of taxes and duties, land rights, and understood the tasks and purposes of the description possessions. Geodetic knowledge was simple, but it did not harm land surveying, because surveyors were, first of all, the organizers of land-tax and agricultural relations.

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