**Accounting in self-regulated cooperation: how tally-sticks made cooperation between farmers possible in northern Dalecarlia, Sweden, 16th and 17th century.**

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**Abstract**

In this article successful cooperation is explained from the perspective of accounting history. As such it complements theories by Ostrom (1990/2011, 2007, 1995) about what makes self-regulative cooperation functional over longer periods of times.

The study is based on examples of successful cooperation between farmers, especially from the area of northern part of Dalecarlia, Sweden. The empirical material consists of around 1300 notched sticks that were in use during 17th and 18th century and are included in the Nordic museum’s collection of village organizing artefacts.

Cooperation between the farmers was successful because notched sticks functioned as accounting technologies that defined who were the members in a team and made the work of each member visible. As such the sticks upheld the institutional principles by functioning as accounting technologies that: extended the ability to remember, made possible value measurement and balancing at annual meetings.

This study illustrates the role of accounting in farming villages in Sweden during 16th and 17th century. Such farming villages are noteworthy because they are examples on cooperation that have been successful over longer period of times. Moreover, these examples shows that accounting is important for cooperation, and that the accounting that was used in these farming villages functioned in a different way compared to accounting developed in hierarchical organisations and commercial organisations. This argument is backed up by examples on how self-organised farming villages used notched sticks as accounting technologies for making cooperation functional. There are theories about how cooperation is made possible, especially Ostrom (1990/2011, 2007, 1995), but the role of accounting have been neglected.

In her theories Eleanor Ostrom (1990/2011, 2007, 1995) explains what it is that makes self-regulative cooperation functional over longer periods of times. Her theories has been important when it comes to designing democratic solutions to problems that deals with limited resources and interplay between the state and local cooperation.

Before Ostrom the assumption in dominating theories of economic sciences was that self-organised cooperation inside and between groups will not work because individuals tend to maximise their self-utility and do not act from the perspective of what would be the best for the collective. Such argument is based on experiments and game theories where no communication between participants is assumed to take place and all individuals act from their individual interest; no one consider consequences of their actions and the cost is high for changing the situation. Assumptions like these has led to the conclusions about that there are needs of strong external actors like the state that control and govern from distance or market based solutions that is considered to work just because individuals tend to maximise their own utility.

Ostrom on the other hand pointed out that there are many examples on cooperation that have been efficient and successful for longer times. Based on these examples she explains under what conditions self-organised collective actions work. Conditions for cooperation exists in situations where individuals communicate with each other, where they have the possibility to learn when and who they can trust, when they consider what causes their actions have for each other and for the common resources. It is when individuals take part in such situations that norms and social capital develop and this makes it possible to solve dilemmas about self-utility and collective-utility. Thus, cooperation depends on institutional conditions (Ostrom & Ahns, 2003). There are eight institutional principles of design that are said to explain successful cooperation (Ostrom, 1990/2011):

1. Clearly defined boarders of what is common and who are taking part in the cooperation.

(ii) Fit between rules and local context.

(iii) Participants in the cooperation have the possibility to influence the rules.

(iv) The one that is responsible for the overview is answerable to the cooperative members.

(v) It is the participants in the cooperation that decide how sanctions should be adopted.

(vi) There are mechanisms for conflict solutions.

(vii) The right to organise is not questioned by external authorities.

(viii) Regulations on different levels are nested/connected.

Even if Ostrom discussed many different institutional mechanisms that are needed for successful cooperation she did not mention accounting. This article therefore seeks to complement Ostrom’s theory about institutional conditions for cooperation and give explanations of why accounting is necessary for cooperation. Ostrom has based her argument on examples of successful cooperation; especially cooperative farmers and she have underlined the importance of more research of this kind and especially more examples of successful cooperation. This study departs from the same idea: through investigating successful cooperation will cooperation be explained. But, the focus is putted on the role of accounting and how accounting technologies can be connected to the principles of design that according to Ostrom explains cooperation.

This study concentrates on an area in Sweden, the northern part of Dalecarlia, in which farmers retained and developed their traditional self-governmental organisations into later times compared to other areas in Sweden. In northern Delecarlia there are many examples of different cooperation that the farmers had. Accounting technologies were involved in almost all relations that had to do with the commons. These relations between farmers were formalised and stabilised through accounting that functioned as contracts but was also a way to keep records and calculate the farmers’ rights and obligations of the commons.

The reasons for concentrating on northern part of Dalecarlia are that there is more material about farming villages’ cooperation present in museums and archives from this area compared to others. But, this region is also of importance because the traditional village organisation survived for longer times in this area compared to other regions (Erixon, 1961). One explanation of why the northern part of Dalecarlia differs is that reforms with the aim of concentrating landownership did occur later compared to other parts in Sweden (Hellspong & Löfgren, 1994). Also, the heritage (the fields etc.) was divided in smaller parts (*hemmansklyvning*) between all children. And not like other parts of Sweden where one child took over the farm (Norlind, 1912). Something else that characterized this area is that the concentration of capital and power were lower compared to other regions in Sweden. Usually work was performed in teams rather than through the system of one big landlord with paid labour.

The accounting technologies that were used in Dalecarlia were mainly different forms of notched sticks or pieces of wood with inscriptions. In the literature of anthropology, ethnology and accounting history such sticks occasionally have been discussed under the concept ‘tally sticks’. In this article notched sticks will be used as synonymous with tally-sticks. There are many different kinds of tally sticks; some could be divided into two parts and thus function as two recipes and used as a technology for control. But the most common ones were just one stick with notches based on the principle of calculating through tallying instead of using numbers. Most often the sticks seems to have been used as a technology for remembering and making basic calculations.

Beside the function of control, memory and calculation these sticks did also functioned as contracts. If for example ten members did cooperate the stick had ten different marks, each mark symbolising one farm. Thus it was the farms, not persons, which had obligations and rights. The marks often looked like symbols from the *futhark* or some kind of cross. Next to these marks notches were made in order to keep record of for example how many days each farm had worked on the common field; how much material each farm had given to the common village house; how big parts each farm had in the common mill or saw and how much of their rights they had used. Often different sticks were used for different kind of cooperation.

Thus, these notched sticks defined who were the members in a team and each of the members’ work was made visible. But also, definitions of the commons appeared through the sticks. As such they could be used for keeping records on the members obligations and rights. Most of the sticks that are preserved from the 17th and 18th century concern rights and duties in the village where the members were the actual village inhabitants. But there were also other sticks for cooperation with only some farms in the village or between different farms from different villages. Examples of such sticks are sticks for the church boat, mill, saw and mountain farms. There are also sticks that concerned the obligations and rights that had to do with the membership in the parish and the farms belonging to a certain geographical area that had responsibility for one soldier. In Swedish this geographical area was named *rote*.

The usage of the notched sticks was connected to annual meetings. At such meetings debts and fines were calculated for the members that had not contributed enough or made any faults. Often the fines were defined in number of days that the indebted members needed to work extra, or were paid in booze directly at the meetings.

**Performativity of accounting: state, market and self-regulated cooperation**

Accounting research that has been directed at understanding accounting as inscriptions that make possible controlling and governing from a distance (Robson, 1992) or accounting as a part of the architecture of financial markets (Forsberg, 2010; Forsberg & Stockenstrand, 2014) can be seen as being connected to what Ostrom (1990/2011, 2007) describe as state control or market based solutions. But this article is positioned as research about the role of accounting for cooperation, what Ostrom describe as self-governing organising (Ostrom, 1990/2011, 2007). Examples of such research can be found in accounting history where inscriptions are considered to play an important role for exchange, cooperation and the developing of civilisations. Through history inscriptions have been used in different cultures over different period of times for keeping order, and in this way facilitating organising (Ezzamel, 2012). Among other things do this research show that the development of different accounting technologies are connected to the development of size of groups that makes different exchanges with each other and that accounting makes complex exchanges possible (Ezzamel & Hoskin, 2002; Basu et al., 2009). The departure for this research has been that accounting affects organizations and society. As such accounting do have performativity and as such often plays a constitutive role in society/for cooperation (Ezzamel, 2012). It is to this field that this study about notched sticks that make self-governing organisations possible are directed.

When it comes to notched sticks not very much has been written in scientific accounting journals. Exceptions are Baxter (1989) and Jones (2010) but they do not go very deep into the tally sticks in the context of village organising but concentrates more on how sticks were used in commercial activities and for keeping records on taxes and debts. When it comes to Sweden and Finland has Grandell made a collection of different kinds of tally sticks. Focus in his overview is how the tally sticks looked like and the technique of bookkeeping (Grandell, 1982; 1989). There are also other examples of overviews of different kinds of tally sticks as Zidov (2010) that presents sticks especially from Slovenia and its surroundings, including Switzerland and then of course Menninger (1958/2014) that concentrates on the history of symbols and numbers.

In Forsberg (2015) notched sticks are described as historical examples of what in our present time are discusses under the label heterodox theories of monies, especially community currencies. It shows that the notched sticks used for village organizing made possible non-coinage money that functioned as local money and had effects on social relations. The present study builds on the same material as Forsberg (2015): the notched sticks collected by the Nordic Museum together with literature according which these sticks appear in many different variations around the world.

This extended study of the use of notched sticks in their local, time-specific context explains how these sticks, by impacting the behaviour of individuals in local communities, co-operation was made possible. Therefore, the nature, roles and impacts of these sticks contribute to an international readership on different ways of organisational control in different historical contexts.

**Studying notched sticks as objects**

The study is directed against the role of notched sticks, in other words the focus is putted on the objects. It is about how the notched sticks do something, how the sticks with inscriptions create associations between different units (different farms, acres, workdays, horses, collectives). As such it can be said to be inspired by Latour (2005) since it contain an analysis of units in a network and how these units are stabilised by measures, techniques and how they are connected with each other (Justesen & Mouritsen, 2011; Barter & Bebbington, 2013; Tresch, 2013). According to this perspective cooperation cannot by explained by neither individuals nor institutional mechanism alone, but as something relational. More precisely, as an affect that arisen when different parts in the network are combined. And it is the notched sticks that make associations between different units possible. It is when relations are created and transformed into inscriptions that the “commons” and the collective appear.

Moreover, the notched sticks can be seen as “boundary objects” that relate different actors with different goals and interests and makes possible cooperation without consensus and external centrals (Briers & Chua, 2001; Star & Griesemer, 1989; Bowker & Star, 2001; Star, 2010; Håkansson & Lind, 2004). Other analytical concepts of importance deals with the ability of accounting to create boarders of who is included in the cooperation and how values arise trough inscriptions and objects, accounting as contracts but also how trust can appear through accounting technologies (Mouritsen & Thrane, 2006).

But the way that actor network theory is used in this study does not stand in conflict with Ostrom’s institutional design principles that explain under what condition cooperation is functional. One of the claims of the article is that accounting objects and inscriptions is sufficient for the institutional principles of design that are said to make cooperation possible.

**How the empirical material was collected**

The Nordic museum, Stockholm, has a collection of around 1300 notched sticks. A major part of this collection concern sticks that were used for village organisation or other kind of cooperation. A major part of these has been included in a special register consisting sticks used for village organising. This register has the following classification.

*Tools used for summoning members:* Message sticks etc.

*Signs of honour:* Old man’s stick etc.

*Sticks for measuring:* The fence stick etc.

*Village list:* Sticks with the different farms marks/list of members etc.

*Turn taking sticks:* snowploughing, post delivery etc.

*Accounting sticks:* sticks for keeping records of fines, working days, materials etc.

*Other sticks:* sticks for church boats, weddings etc.

(The whole list is enclosed in appendix)

The collection of notched sticks at the Nordic museum comes from different villages and parishes in Sweden, but especially from the area of northern part of Dalecarlia. However, there are not any full collection of all different kind sticks from one and same village. From some villages there are a couple and from others only one. Then there are many villages that nothing has been collected from. Moreover, the level of descriptions about what the sticks have been used for and what the notches symbolises differs from stick to stick. In other words it is a rich material but it is geographical spread out and it contains variations.

Therefore the method that has been used is ”reference pluralism” combined with the indicia method (Myrdal, 2007; 2012). In other words, many different sources and different clues have been used for making sense of how the sticks were used and their function for cooperation. This method makes it possible to understand objects in relation to their context. The material has been used in a critical way where different sources have been weighted against each other. To use material from different sources makes possible interpretation that includes more aspects and avoid interpretations based on few sources (Myrdal, 2007; 2012).

*Sources that have been used*

The collection of notched sticks kept by the Nordic museum is relatively rich compared to other museums, considering the number of sticks but also when it comes to the descriptions of the sticks. The descriptions and explanations of how the sticks were used are collected as enclosures and letters that the museums ”collectors” did attach to the objects when sending it to the museum. As mentioned above the focus is directed to the geographical area called upper Dalarna. But in cases where the material from other areas in Sweden can cast lights on how the sticks functioned, such materials have been included in the study since it can enriched the interpretation.

Beside the actual objects and their attached information other evidences of the functions that the sticks had in villages organizing have been used. Examples are: ”village” and ”parish” instructions” (*byordningar and sockenordningar*), regional laws (*landskapslagar*), protocol from law courts (*häradsrätter* and *tingslag*), protocol from parish, farmers daily journals. Especially valuable information about the sticks has been collected from the Nordic museum’s list of questions, especially the one about village organising (around 1910-1940)\_, but also the list about church boats. This list gives information about even more sticks than have been included in the Nordic museum’s collection. Valuable has also been personal archives of former ethnological researchers connected to the museum. And, of course the topographic archive and village investigations of certain villages. Furthermore, previous research and reports in history and ethnology have been consulted.

**Notched sticks as credit networks from a broader perspective**

Making inscriptions on sticks is a technique that has been used all around the world for different purposes. According to a myth it was one of the yellow emperor’s ministers that invented the notch stick around 2700 BC. (Graeber, 2012) And, the Chinese sign for contract consists of a notched stick and a knife (Flegg, 2002) (and a dog that watches over fairness?). Another evidence of the usage of notched sticks in China is that the oldest split tally-stick that has been preserved actually comes from China. This stick is believed to have been in use around 500 BC (Goetzmann and Rouwenhorst, 2005). These findings may open up speculations about that notched sticks as credit technologies were spread through the Silk Road. However, there are several African findings of notched bones and stones far older (Sy & Tinker, 2006; Annisette, 2005).

Splitting notched sticks was a technique that became common in commercial activities. It worked thanks to the annual rings on the wood that made it possible to identify that the parts of a stick that had been divided actually belonged to each other. Dividing a stick was also a way to prevent that the seller or the buyer carved new notches on the stick without the other part knowing, since it would become obvious when they putted the parts together. For example, if Clint buys eight beaver hats on credit from John they make eight notches on a stick, split it and keep one part each. Since the notches can be seen on each part the stick function as a receipt and memory, and since they later on can compare the sticks it also functioned as a control instrument. It has also happened that the parts of the sticks circulated as coinage money. (Menninger, 1958/2014)

Notched sticks have also been used around Europe. The latest 70 years many sticks have been found in Norway, Greenland, Ireland, England, North of France, Sweden, Poland, Latvia and Russia. In Russia there are especially in 14 villages that notched sticks have been found, of these Novgorod stand out in importance. Thus, there are signs that notched sticks were used along the trading routes that were among others used by the Vikings. But the oldest notched sticks that have been found in North Europe have been found in Elisenhof, Schleswig-Holstein, it seems to been in use around 700-800 ad. (Kovalev, 2002)

In early Rome and among early Germanic tribes something existed that was called *festuca*. It is unclear what this was. But it seems to have been a technology similar to notched sticks that functioned as receipt and contract. According to Menninger (1958) is this *festuca* mentioned in the *Common law* *of the Franks*, *Alemannic* and *Salic law*. The *festuca* is also mentioned by Mauss (1954).

Except from functioning as a credit instrument in the commercial industry was notched sticks used as receipt for delivered money or other things that was stored in medieval monasteries. One of the oldest sticks that were used for keeping record on debts is from ”Mining Order of Jesenice”, 1381 AD. (Zidov, 2010; Menninger, 1958). And, notched sticks are mentioned as valid juridical documents in *Basel statute book* from 1719 and Napoleons *Code civile* from 1804. (Menninger, 1958)

In the same way as for other technologies of debts there have been annual institutionalised events when the debts noted on the sticks were cleared. To these events trading men brought their sticks and cleared their mutual claims and debts in certain ”clearing houses”, it was most often during fairs. Examples on medieval places where this happened is St. Giles, Winchester; Champagne, Brie in France. In Greece the name for fair was *panegyris* and in Rome *nundinae* (Innes, 1913; 1914).

It is of highly interest to consider how and if there was any yearly clearing of debts or if the debts run over many years. Yearly clearance but also amnesty for debts is a way to avoid unmoral interests and avoiding debt traps. This is especially the case when the debts are increasing with interests. (Graeber, 2012)

However, notched sticks have not only been used for keeping records on debts in commerce but also in hierarchical organisations. With the help of notches on sticks the English taxmen kept records of who had paid and who had not, but also of governmental expenditures. Moreover, in England notched sticks where split and used as store of value that could be cleared in the Royal Treasure (Davies, 2002; Menninger, 1958). Another example is how the tax clerk in Sweden used notched sticks for keeping records of how what different farms should pay in tax and how much they already had paid. The clerks had one stick for each village with each farm’s mark on it. Next to each mark notches were made when the farm paid. Grandell (1982) argues that the practice of using sticks in village organising comes from these sticks that the tax clerks used - the sticks used by the clerks and the sticks used in the village for keeping records of daily works looks the same.

However, it is quite hard to tell what kind of notched stick that was the first one in use. They have been used for a very long time and with many different aims. In Europe, for example, sticks have been used for recording taxes. And, we know that sticks were used in a similar way in Scandinavia, Hungary, France, England, Netherland, Bulgaria, Russia, Croatia, Bosnia, Dalmatian and Serbia (Zidov, 2010). But sticks have also been used for keeping records of working times, debts, sheep and cattle farming, mining, calculating votes, turn-takings and fines (Zidov, 2010).

Notched sticks around in the world have similarities when it comes to basic functions as contracts and memory. But often did local symbols developed that only could be understood by a smaller circle of people. Notched symbols were often personal and the knowledge was transferred over generations (Zidov, 2010; Menninger, 1958). But there are some symbols that are common at least in Europe, as simple notches, points, circles and stars, even if their meanings differ (Zidov, 2010). Symbols like I, V and X are often used for 1, 5 and 10. But not as roman sequential numbers but as groupings, in other words tallying (Menninger, 1958).

When it comes to village organising there are some preserved notched sticks (most of them from Walis, Switzerland (Menninger, 1958; Zidov, 2010; see also Kataloge des Österreichischen Museums for Volkskunde, 2004). These were used for cow and sheep farming, mills, voting calculations, turn-takings (night watch, carrying the flag, work in forest, ringing the bell). They were also used for calculating rights to use the bull or baking house, and how much the different members actually used their rights, for organising snow ploughing and different transports, usage of the common water channel for watering private farms, how much milk private farms had taken from the common herd compared to what they had right to take, cooperative local wine stores. Both simple and sticks that were split were used in such cooperatives (Zidov, 2010). Beside splitting sticks another method to make sure that no one made unfair changes on the sticks were to colour them red. (Menninger, 1958)

**Cooperative forms inside and outside the village and their basic principles.**

Before going into the different notched sticks used for village organising a brief description of the local written regulations will be given. Local regulations existed for both the villages and parishes. These regulations are considered to have their origins in oral traditions that later on were written down. In some places in Sweden the village organisation was more formally regulated than others. It was the village counsel consisting of the owners of land (farmers) that decided about the regulation. However, in northern Dalecarlia are these village regulations very rare. But in other parts of Sweden they become common. Similar regulations existed also for the parish and the regional entity that was responsible for the soldier (*rote*). The oldest written village regulations that have been preserved in Sweden are from late 17th century. The king tried to standardise the village regulation year 1742 through a model example that villages were supposed to follow. (Erixon, 1953/1954)

This model example of village regulation mainly consists of a list of obligations that the farmers had to the collective village and fines specified in money units that the farmer should pay to the collective. Fines were specified for faults as when the individual farmer had not done enough daily works; for example crossing another farmer’s acre or not having their pigs in place etc. A basic idea with the model example was also to try to make the villages use the paid fines for good things/investments, like supporting the poor, or fire preventions. At the time when the model example came was a common way to pay the fines in booze (a common tradition was to let the beer go around at the meeting as a symbolic act were the one that had not fulfilled their obligation was reunited into the collective). (Erixon, 1931)

In these local written village regulations obligation and rights were calculated based on number of men, size of the private acres or number of cows.

In many cases the villages had a book beside the notched sticks where the village members debts and credits were kept together with the villages collective costs and incomes. This bookkeeping made it possible to balance debts and credits to following years. But there is also example on that on each Valborg party (once a year in may) the left over coinage money should be divided equally between the village members (Putsered, Halland: E.U. 7773). In many cases was the fines paid the same day as the annual meeting when the clearance took place. Often it was paid in money or in booze. There are examples on that interests were used in cases when the fines were not delivered at the day of the clearance. It was the village counsel that decided about an increase of the fine as a punishment. (E.U. 8821, Berga församling Småland)

**Notched sticks used for organising the collective**

The different farms in the village were integrated in a common economy that included activities as farming, cattle, fishing and other social activities. There are some basic principle for distribution and cooperation that are more prevalent than others, and they are more or less present in all different kinds of village organising.

The farms can cooperate through the principle of *turn taking*. Another principle is the principle of *fines* (the member that does not fulfil their obligations has to pay a fine). Then there is the principle of *exchange* (one give up something in order to get something else). Another principle is fair distribution by lottery (five fishermen make five piles of their catch and let the lot divide the piles). These different ways of distribution are mirrored in the designs of the notched sticks. Thus there are different sticks used for turn taking, fines, exchange and lottery. Beside these ways of organising there are informal but institutional ways where people in a village helped each other when needed. In such events, like helping each other with building a roof, the one that received help were supposed to hold a food feast afterwards. In these cases food and drinks have the function of social money (Graeber, 2012) and in these cases there were no sticks involved.

Bellow I will give several examples of sticks that were used in different cooperative activities. But before that I will make a short introduction of the most common sticks that were used in traditional village organization.

At a traditional village meeting there were several sticks involved (Erixon, 1929a). They stabilised and uphold relations in the village. The major village counsel met once a year, often in May, before the farmers moved to different mountain huts were they stayed during summer. It was the farms that were member in the village. In most cases it was the oldest man in a farm that represented it. During this annual meeting the members checked each other’s fences and compared and calculated their communal working days. There were several sticks used for this.

The summoning stick (*budkavlen*). When collecting the members for the meetings the “oldest in the village” did send a certain stick that travelled between the different farms. In some villages it went in a circle and in other cases it followed the order that the farms’ marks were inscribed into the stick.

The neighbour stick (*grannstaven*) had all the members’ marks on it together with the year when they entered the village. It was also a stock of honour signifying who was the oldman.

The stick of duty/fines (*pliktstaven*). This stick had all members’ marks on it, and beside the marks notches for keeping records of different fines were made. When a member that had debts to the village paid them the notches that symbolised the fines were carved away.

The stick for measuring the fences (*gärdesgårdskavlen*). This stick was used for measuring the fence, to make sure that it had no holes that animals could slip through.

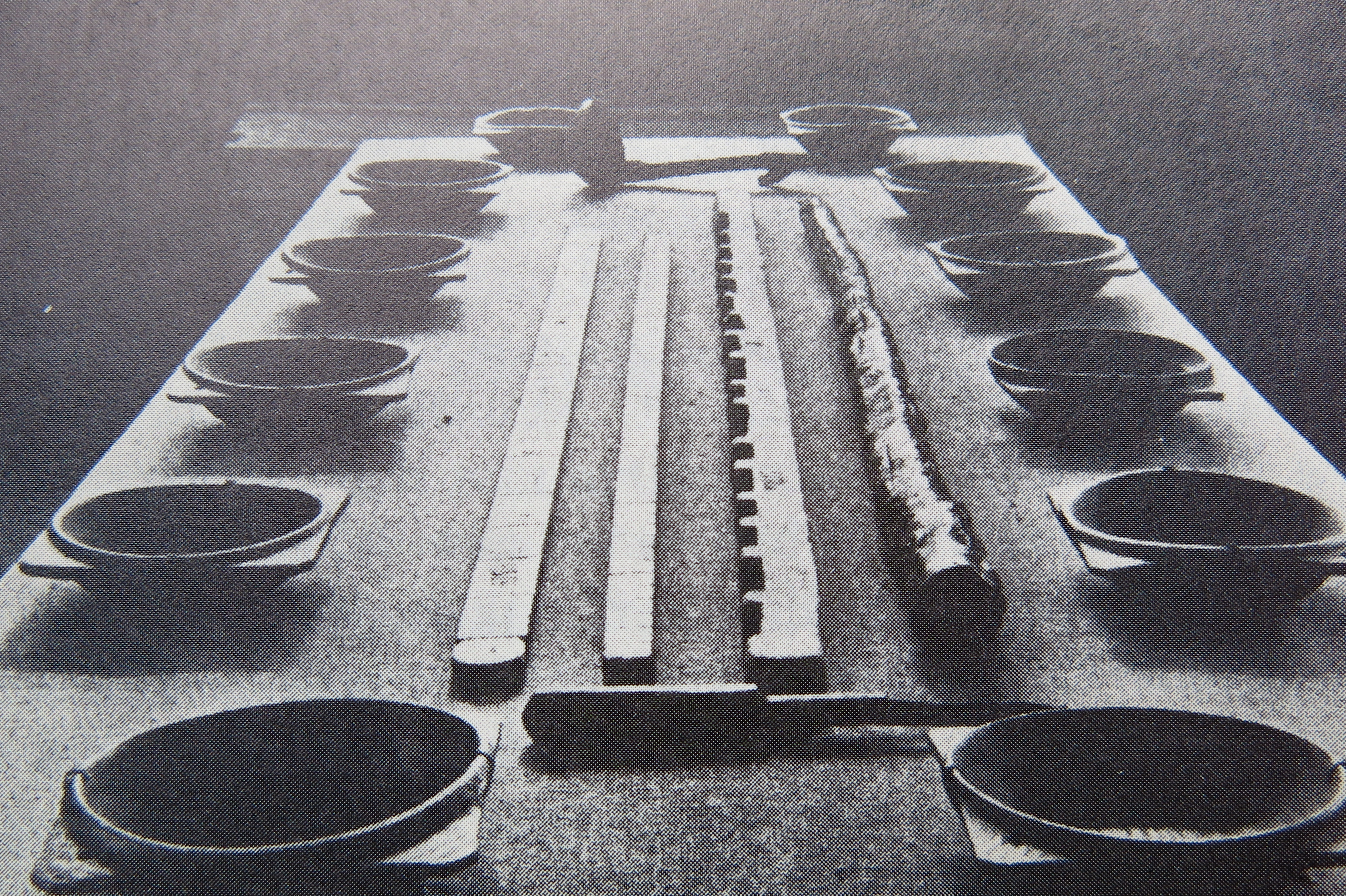


Figure X. Insignias and instruments at the village meeting (From Erixon, 1929a)

The village meeting ended with the neighbour beer. The ladle (deppa) where suppose to swim around in the heated brew when it was ready and approved. The brew was then poured in the bowls (*snipa*) (in some villages a goblet was handed around among the members). The duty to be the “oldest man in the village” went around in turns. The one that had a farm with more men than others served as the oldest more often than others. The fines were often paid in booze or mead. In for example Utby in southwest of Sweden the fines was calculated as one *halvstop* (almost a pint) booze for each fault. The members drank the booze at the following party. (E.U. 38591, Utby)

**Sticks based on the principle of fines**

On the sticks of fines the farms’ marks were inscribed on one side of the stick, and next to these marks other notches were made to signify faults that later on was transformed to some kind of value. At some sticks these notches for faults often symbolised a value in money units or days of work.

A typical example of villages with cooperation based on the principle of fines is fishing villages with a harbour that is run by a cooperative (Eskeröd, 1906). Such harbour cooperatives often had entrance fees. The member in the harbour was not the farmer that owned land but the ones that used the harbour. In older times the fee was paid in beer or booze but later on it was given in coinage money, or at least valued in coinage money (Forsberg, 2015). Each member in the cooperative had both rights and obligations. Each member had a stick with unique features that could be distinguish from the other members’ sticks. On these sticks the members’ marks were inscribed together with the year when they entered the cooperation. (Eskeröd, 1906) The sticks were kept by the harbour oldman that stored them on a thread. The oldman appointment was a duty that went around in turns. (Eskeröd, 1906)

If a member in the harbour team did not show up at the communal works in the harbour they received a notch on their stick. When summoning the members at the annual meeting the oldman blew in a horn (it was also common to use a drum or notched sticks). During the meeting the total fines were calculated and cleared. The notches symbolising faults were carved away when they were paid (Eskeröd, 1906).

**The turn-taking system**

Turn-taking sticks were a common solution when different obligations were distributed between neighbours. These sticks helped different farmers to remember when it was their turn. And, since the stick travelled in a special order the different farms had a technology that told them who were supposed to have done a special duty. In that way these turn-taking sticks also had a control function. There are many different kinds of turn-taking sticks that were used in different activities in villages as: taking care of the sick and being orderman. Similar sticks were used in the duties of the parish: taking care of the poor, giving ride to the kings men and priests etc., ploughing snow, arranging the weekly Sunday school, ringing in the church bell, digging graves, fire inspections etc. (Grandell, 1982)

The turn-taking sticks went around in its simplest form like a gavel that can be seen as a variant of the gavel that is common at today’s at board meetings. But it also happen that it had inscriptions with different meanings. It could have the farms marks on it and in that way the turn-taking order was inscribed. Also, notches could be made next to the farm marks in order to make it possible to compare and make sure that everyone had not done too much or too little. It was of course also possible to put the notches on a general stick for fines. Sometimes the actual duties were specified, with letters and words, on the turn-taking stick. An example is the stick for the duty to be a fireguard. On this stick it was specified what times the fireguard should walk around and what was going to be checked. (E.U xxxx, Färnäs, Dalarna)

Turn-taking sticks could be linked to sticks of fines. A farm that was included in the village team had turn-taking duties and when these were not fulfilled fines were inscribed with notches on the actual turn-taking stick or the village’s general stick of fines. Sometimes a notch for a missed day of work meant that the farm had to work extra days the upcoming year. But it also happened that this shortage of workdays was transformed into money units. Thus, the members in the cooperation had a debt to society/village that was quantified into money. In this way the debt could be paid in other ways, and especially if the farm that had a debt to the village did not do the extra day of work the village counsel could instead take things from the farm up to a certain value. Thus, in this way the sticks make possible reciprocity through value (Ezzamel, 2012) by transforming duties to value units.

**Sticks for daily works**

The principle for the sticks of daily work was that all farms, based on their number of men (or sometimes area of owned land) had to do a certain days of work. Notches were made frequently for keeping record of this. Usually one day of work for a man was signified by a cross or dash and meant either days of work of one man, horse or woman (In Finland crosses were used for horses, dashes for men and points for women (Grandell, 1982:73)). When Lithberg (1921) discusses the sticks used for keeping order on rights and obligations in Sweden, he explains that one long dash was made for a man’s day of work, a shorter dash for women and points or crosses for horses.

According to Grandell (1982) there only seems to exist 15 notched sticks of daily work preserved and they are either from Dalarna or Vörå parish in Finland. But, as mentioned above there are a couple of more in other parts for Europe (Zidov, 2010).

The sticks of working days are examples on how daywork function as abstract unit of measuring value that function as “calculative money” that made it possible to compare different farms contributions to the common.

**Notched sticks that were used in saw and mill cooperatives**

Beside the actual village organizing the farmers also cooperated when building and taking care of saws and mills. As well as other cooperative initiative in and around the village these organisations did build on egalitarian principle of distribution. In this section sticks that were used in saws and mills will be presented. The sticks used for organizing saws or mills are important when it comes to the role of accounting because these teams were more complex and depended on more abstract value measures.

The members in a saw or mill team did not only contributed with workdays, but also timber, planks, and sometimes with workdays with horses and wagons. Even more, they also had to buy the actual saw from outside the village and therefore at least some members needed to contribute with coinage money (and different coins were circulating). Something that made the organising even more complex was that some members owned bigger parts in the saw, and therefore were supposed to contribute with more material and work, and they had the right to use the saw for longer times. How big part each farm had varied, sometime the rights were divided based on how much land the farms owned and sometimes how many men that lived at the farm, or how much resources the farm had putted down in the construction of the building. (Grandell, 1982; Nikander, 1932; Grandlund, 1938a)

And, to make it even more complex, when it comes to using the saw or mill you wanted to use it the days when the river stream was as strongest. If you as a member did not take part in maintenance you could lose your part and consequently the right to use it. (Grandell, 1982; Nikander, 1932; Grandlund, 1938a)

As the cooperation becomes more complex there seems to bee a need for accounting technology that could translate the different materials, works and different coins to a single unit of value that was linked to fair distribution of rights to use the saw or mill.

In Gruddbo, Dalecarlia, Sweden, were organization of the mills were based on that each team had 144 parts. Each part was named “hour” because during a week it was possible to use the mill for 144 hours (six days multiplied with 24 hours). In other words one part gave the member the right to mill for one hour. Often one farm had six parts. The parts could be bought and sold or be inherited. (Granlund, 1938a)

What times the members could use the mill was decided in a lottery. If no one were supposed to use the mill someone else could pay for using it instead. Each mill had an oldman that kept record on who stood in turn to use the mill. The oldman also stored the key and made sure that the members contributed with maintenance in a fair way. Once a year did the oldman summon the members and all different notched sticks that had been used during the year was putted together. All activities and materials used for maintenance were transformed into a money unit. And if any member had not contributed as much as others they had a debt to the mill team. But actual coinage money were never paid, instead the oldman made sure that the ones in debt had to do extra work until the debt was paid. (Granlund, 1938)

When building a mill, or a saw, the calculation and valuation were based on measures of value expressed in money units. The right to use the mill were calculated based on number of men at the farm. (In Finland there are verdicts that say that even if someone has contributed more to the construction and maintenance it is the number of man on the farm that decide the rights of use. The reason for this was that material for building the mill was considered to be taken from the common forest and therefore the mill belonged to the common). It was the number of parts that decided how much maintenance a farm needed to do (Nikander, 1932).

When it comes to both sawing and milling extra days could be bought. In such cases the price was defined in money but paid with extra workdays. As coinage money (physical money) seldom was not used in the village but almost only calculatingmoney. (Granlund, 1938)

There are quite many notched sticks that once were used in saws and mills that have been preserved. They are shaped in many different ways. The stick can be everything from simple sticks with the farms’ marks with some notches next to them, to sticks with many sides that functioned as columns that made it possible to see how much different material and workdays the different farms contributed with and the turn for using the saw and how many hours. Moreover, through the sticks and its money of accounts debts are calculated and it is made sure that the debts are paid.

**The wedding stick**

Cooperation based on the principle of exchange appears in the case of the wedding stick, as described by Erixon (1929b). Also, it is an example that shows how integrated the technology of accounting sticks were in the daily life of farmers. The wedding stick was made in order to keep record of how much the guests had given as wedding gifts. The background was that instead of using the turn taking principle, which for example was dominating in Gotland, Sweden, it was the principle of exchange that dominated in Dalecarlia. Thus, sticks were used not only when it came to organising teams for public activities but also in the everyday life.

On the wedding stick the guests’ marks were inscribed, as on many other kinds of sticks. But the wedding stick also represented the dinner table and the marks pointed out where the different farms were supposed to sit. Inscriptions were also made for keeping record of how much malt the guest had given to the bridal couple. During the evening the guests were given different much to drink depending on how much malt they had been given. In other words, the guests actually exchanged malt for drinks, but the “gifts” also affected where on the table they should sit.

Besides the farms’ marks, the stick had notches that signified how much malt each farm had given. The ones that had most notches were given the most honourable seats, and bigger parts of the table. Then during the evening when drinks were served other kind of notches were inscribed and compared with how much rights to drink each one had. (When it comes to food, the usual custom was that everyone brought his or her own food). (Erixon, 1929b)

The wedding stick is an example of how money of accounts made possible exchange of one thing against another based on value. There is also credit involved and the notches have the ability to store value during a certain period of time and could only be exchanged during the party night.

When it comes to wedding another kind of stick was used for the building of the wedding house. All farms in the village were supposed to contribute with timber, plank and workdays. This stick made sure that everyone contributed with the same amount. (Erixon, 1929b)

**The stick of the church boat**

As mentioned above, beside the actually village cooperation that consisted of farms in a certain geographical area there were at the same time teams created that consisted of some members from one village and some from another village.

One example of such teams is the church boat team in Dalecarlia. In the bigger villages it was common with several boat teams. One team could consist of up to 29 members. The largest boats could take up to around 80 persons. (Erixon, 1929c)

The church boat teams organized the building, maintenance and journey. It was the collective team that owned the boat but each farm owned the oar and oarlock by themselves. Both the oar and the oarlock had the farms’ marks on them. The marks where also inscribed on the seats that belonged to each member. (Erixon, 1929c)

The number of seats that belonged to the members depended on how many parts the farm had bought. The farm had to pay for one part for each person/seat on the boat. On the stick of the church boat the number of parts that each farm had bought were represented by notches. (Erixon, 1929c, E.U.: 6716; 6922)

The boat team stand out as a separate entity. It was the boat team as an entity that covered all the costs involved in the building and maintenance of the boat. And, the farms that were owners of parts (stock owners) were obligated to support with workdays and material as tar, timber, iron and coinage money. The obligations of the farms depended on how many parts they had in the boat team. There are protocols preserved from a building of a boathouse in *Nusnäs* that include accounts on paper over how much and with what the different owners has supported with and how these have been transformed into money of accounts. When the farms different contributions had been transformed into such ‘calculationmoney’ the farms contribution could be compared and assessed based on how big part they had in the team. In other words the members had debts and claims to the boat team. (Erixon, 1929, E.U.: 6716, 6922)

The boat cooperative also owned and maintained a house for the boat. The same principle as for the boat was in place for this house. Each farm should support with work and material (and sometimes coinage money) that mirrored how many parts in the team that the farm owned. Each farm had also responsibility for the part of the roof of the house that was located above the seats in the boat, when parked in the house. In that way the whole boat functioned as a notched stick that marked rights and obligations. (Erixon, 1929c, E.U.: 6716, 6922)

The symbols inscribed on the stick of the church boats differ from other kinds of sticks. These inscriptions were made in a local form of roman numbers. A leaned dotted line meant 4. A full leaned line was 5. Two lines in cross were 10. (Erixon, 1929c, claims that the organisation of the church boat teams is quite old enough for being a possible way of organising used by the Vikings)

**Sticks concerning tax and support of soldiers**

Beside the sticks that were used for village organising and other cooperatives there were also sticks that were linked to the kings demand of tax and support of soldiers together with church duties. As an example the priest had a stick for controlling that the farmers supported the church and priest with ten per cent. (Hellspong & Löfgren, 1994)

There were sticks in use for the unit *rote*, based on a geographical area that was supposed to support one soldier with food and cloths et cetera. Depending on how much land that was owned by the individual farm it had to contribute with different much. A money-measure was used for expressing each farm’s part in this unit. Boards, often by wood, were used to calculate and express the obligation that each farm had. Different sticks were used for remembering how much each farm contributed with.

It also happened that the rote as a unit was used for other communal services than serving the soldier. And, sometimes when voting the voting rights were express in money.

On these sticks rather large roman numbers were signifying shilling and smaller numbers *runstycken*. (Granlund, 1971:21)

**Notched sticks as accounting that made cooperation possible**

A Swedish village during 16th and 17th century, especially in the region upper Dalarna, can be described as an economy where the individual farms were integrated into a communal economy. And, collective work was in many ways the only solution. It is hard to row a church boat by your self, build bridges and roads. There were common resources and it was easier to build, invest and maintain a saw and mill together with others. Collective work was the common way of organising. As such village economy often had private ownership, the farms were the owners, but most of the work was done collective. As Hansen describes it, people lived in villages because they wanted to cooperate (Hansen, 1952).

In these villages accounting played an important role for sharing and organising the commons. Notched sticks were used frequently. The sticks were a technology that functioned as an infrastructure for many different variances of organizations. They functioned as contracts between farms and were more stabile compared to individual humans that died frequently.

The notched sticks had a constitutive role and can explain how the institutional principles of design, as described by Ostrom, were made possible. Bellow it is explained how Ostrom’s institutional design principles were constituted and were made stabile through the notched sticks.

1. *Clearly defined boarders of what is common and who is participating in the cooperation*.

The stick that has the farms’ marks carved into it had a social meaning. The marks and notches were inscribed relations. As such the sticks did define the commons and who were the participants together with the benefits and duties. Through the farms’ marks it is clear who is included in the cooperation. But the stick also creates a boarder against outsiders. It is farms that are members, not individual persons and membership is connected to ownership of land. Moreover, the farm’s marks did also function as signs on a contract. Different sticks were used for different activities and resources. As such they create boarders in time and space, and different sticks calculated different benefits and duties. The sticks defined the commons and linked different farms to it and stated their benefits and duties. Also, different sticks use different kinds of principles of distribution.

1. *Fit between the rules and the local context.*

The different sticks used in the village context differ from each other. Each stick was developed in its own context. Even when it comes to tax and obligations like giving the priest a ride etc. the sticks were designed by the teams themselves and the sticks were used in order to make sure that everyone contributing with their part. Taxes etc. were in the area of upper Dalarna collective and it was up to the farms in the village to make sure that each farm contributed with what they should. In this way the technology of the sticks can be described as infrastructure for different forms of contracts, money and distribution; as such it makes possible fit between rules and local context.

1. *Participants in the cooperation have the possibility to influence the rules*.

The teams in and around village are all examples on self-governmental organisations where the members together design the principles of cooperation. The notched sticks could everyone understand and since they were flexible enough to constitute different forms of exchange – reciprocity of things as well as reciprocity of value – the farms could influence how the cooperation would be designed. The sticks were formed in meetings were all the members participated. Furthermore, it was no one external to the teams that demanded how the cooperation would look like. (Even if the King’s letter that consisted a model village order can be seen as a try to influence how the village should be organized.)

1. *The one that is responsible for the overview is answerable to the cooperative members*.

The different teams had an oldman, or similar, that summoned the farms for meetings, and stored the notch sticks. Often this duty was going in turns or was elected by the members. There are examples on where the sticks have been stored in a coffin with two locks and the keys given to different members. But there are examples that signify that the participants trusted each other seems also to have been trust involved and there are examples of were the oldman just seem to have the sticks hanging on the wall. The turn-taking principle, or voting system, of the one that was responsible for the overview can be seen as tools for the ones that are controlled to control and demand responsibility from oldman. It also affects the power structure and hinders asymmetrical power structures.

1. *Adoption of sanctions and the sanctions are decided by the cooperative members*.

Fines as well as definition of faults were decided on the annual village or parish meetings. The value of these fines was often defined in calculationmoney, but often paid in daily works or booze. At least in later times the fines were often written down and expressed in calculationmoney. And, definitions of misdeeds and applied sanctions differed between different villages. At the annual meetings debts were cleared or it was specified what someone that had not fulfilled their obligations should do in order to pay their debt to the village or team. In practice the members agreed upon what someone in debts should do in order for the debts to be cleared.

1. *There are mechanisms for conflict solutions*.

The sticks functioned as memory sticks that recorded days of work, material etc. In this way the members could during the meetings prove that they had done a certain amount of workdays etc. Also the meetings followed an institutional form – traditionally such meetings have been described as meeting where everything between the members should be raised, all hidden conflicts should be expressed. It was at these annual meetings where the members accuse each other and the sticks transformed the faults, to debts to the collective and the debts in turn become transformed into value units that could be paid in different ways. The drinking and food sharing connected to a traditional meeting functioned as a ceremony where the punished member became reunited with the collective.

1. *The right to organise is not questioned by external authorities*.

External authorities did not question villages’ and the other teams’ way of organising. However, there are examples where villages trying to build a local church that would make them more in depended. This affected the parish duties. Important to note here is that the church and priest were financed directly from its local members, and the people that paid the priest as a consequence demanded accountability (Rothstein, 2003; Rothstein & Broms, 2013). When it comes to accounting therefore local democratic solutions might have had more influence on accounting than standardisation enforced by external authorities.

1. *Regulations on different levels are nested/connected*.

The different levels of organising are complex. There are the cooperation at the village level, the parish level and rote. Generally, that the tax and external obligations were expressed in collective ways and it was up to the members in the different units to organise the work between them. In the research material about the village organising there are no standard formulas or accounting, enforced by external authorities. Instead different accounting solutions were developed locally in many different variants. This made it possible to link external demands with the village organisation without giving up the principles of self-organising. Also, there are signs that a lot of organising and democratic solutions can be a way of keeping external influences (king, state, church) on a distance. That would be in line with Scott (1985, 1990, 2009) that has emphasised the role of resistance to a larger degree compared to Ostrom.

The notched sticks as an accounting technology uphold the institutional framework needed for successful cooperation. Considering this social affect the examples of notched sticks’ role in village organising do challenging the mainstream view of performativity in accounting research that has putted the focus on the role of accounting for making possible control and action at a distance. The variances of sticks used for village organising shows how accounting creates a network of relations that function as an infrastructure for democratic solutions that made it possible for each participant to involve and agree upon design principles that make sustainable cooperation possible. This kind of performativity is more of the kind of local democratic involvement that has been described in Ezzamel (2012).

Moreover, the notched sticks do create visibility of the participants’ rights and duties in relations to their actions. This visibility may enhance cooperation since the members tend to contribute to the collective if they know that others are going to do the same. And, the sticks give stability through its functions as memory and control. Often it seems it is enough if the members knew that there is a technology that creates visibility and creates predictability and function as a contract.

When it coms to the sticks’ function as a technological infrastructure there are three themes that stand out: creation of memory, value, and balancing. These themes are importance to consider since they explain how the notched sticks as accounting technology are related to the institutional principles of design.

**Memory**

Most of the sticks that were used among cooperating farmers in villages seem to have been developed as technology enhancing the ability to memorize. It is worth noting that in the material there are no sticks with the technology of split tally-sticks with the function of making sure that no one make changes on the stick and has the function of a mutual receipt or using colouring to make sure that no one add notches. However, there are some cases mentioned where a chest had two locks with different keys that were kept by different members.

**Value**

The technology of notches sticks make value reciprocity possible, it makes it possible to have something like a scale where different contributions and resources can be weighted against each other. In this way accounting makes possible more complex exchanges.

Thanks to calculationmoney that made it possible to measure and compare different things did it become possible to calculate individual benefit and put it into relation of duties. This can explain cooperation arisen when individuals are over rules and finally end up with solutions based on mutual benefit (Ostrom, 1995). However, there is the standpoint that you live in a village because you do want to cooperate (Hansen, 1952). According to this perspective, cooperation cannot be seen as having its roots from context free individuals that always calculate costs and benefit. Instead cooperation seem to be about making benefits possible, making sure you have a mill, a cow a field and so on, but not calculating the benefits for individual involvement but egalitarian distribution. Even humans as cultural beings do use calculationmoney (Forsberg, 2015). The role of the notched sticks therefore seem to be more about making possible egalitarian distribution, as traditional village organising is about, were different contributions are weighted against each other.

**Yearly clearance/balancing**

The sticks involved in organizing farmers in different teams were connected to an annual meeting. It was on this meeting where the farmers agreed upon what should be done, how often and how benefits and duties should be distributed. Different sticks were made with different purposes. But the point with the sticks is that they are balanced/cleared at annual meetings. As such the sticks ability to function as a technology for memory and making value reciprocity possible laid the conditions for balancing at the annual meeting. This made it possible for the participants to compare each other’s contributions and rights, and agree upon what the ones that had not fulfilled their obligations were supposed to do.

The notched sticks used in farming villages were important for constitution and maintenance of cooperation. They were involved in creating institutional arrangement necessary for cooperation because accounting as inscriptions constitutes and inscribes relations and define boarders, entities, and participants and make value reciprocity possible. The notched sticks extended memory, made it possible to use a value for calculating and annual balancing. As such the notched sticks can be seen as an infrastructure that made possible adoption of accounting systems to the local context, but still fulfilled the institutional design principles of cooperation.

Self-regulated cooperation has been shown to be important for democratic organizing and sustainable development, as Ostrom has pointed out. But, this article points out that accounting is sufficient for maintaining the institutional condition for cooperation. We need more research in accounting history focusing on accounting in self-regulated organizing, especially when it comes to collecting examples of how accounting are involved in making self-regulated cooperation possible.

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