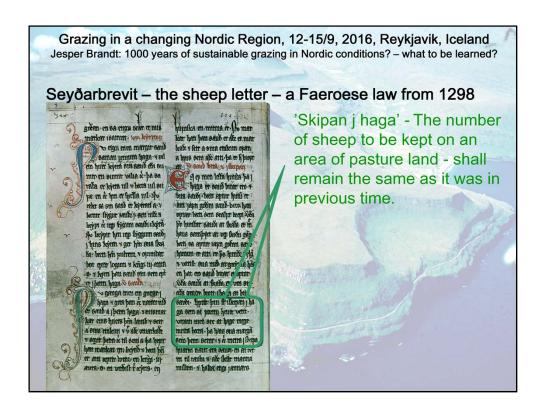
Grazing in a changing Nordic Region, September 12-15, 2016, Reykjavik, Iceland

1000 years of sustainable grazing in Nordic conditions?

– what to be learned?

Jesper Brandt
Dept. of Science and Environment,
Roskilde University
brandt@ruc.dk

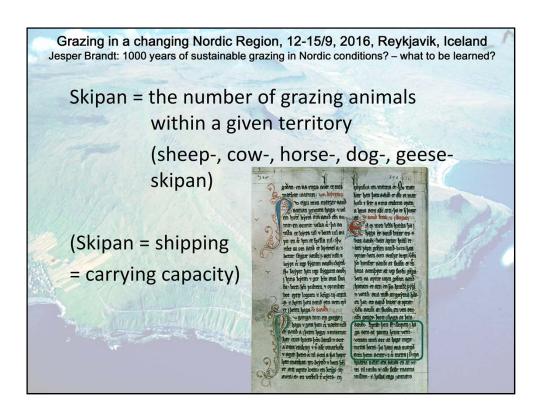
1000 years of sustainable grazing in Nordic conditions? - what to be learned



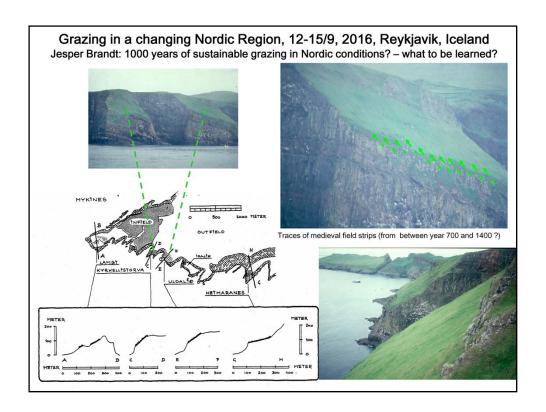
Here in the end of the day, you shall here quite another nordic story of sheep grazing than you have heard mostly here in the wild west of the extensive Iceland. We will move to the tiny Faeroe Islands.

Sustainability or carrying capacity is not a new concept.

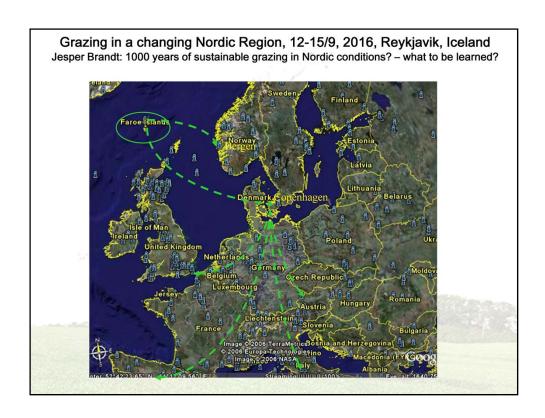
Already in 1298 a special law for the Faeroe Islands, Seyðabrevit (the sheep letter) was passed, which among other points stated that 'the number of sheep to be kept on an area of pasture land shall remain the same as it was in previous times.



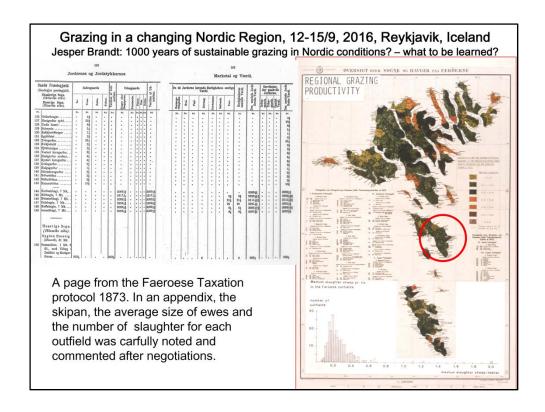
This figure, called skipan – in fact an old form of the English shipping – expressed the carrying capacity of each individual location, and to this day it is used as an expression of the optimum carrying capacity for the various parts of the islands. Additional skipans for cows, horses, dogs and geese were developed as well. It has been argued that the detailed character of the Sheep letter makes it probable that a conscious sustainability practices has lasted over 1000 years.



From historical and archeological studies supported by air photo interpretation it has been proven that arable land and dairy cattle was the most important in early medieval time,

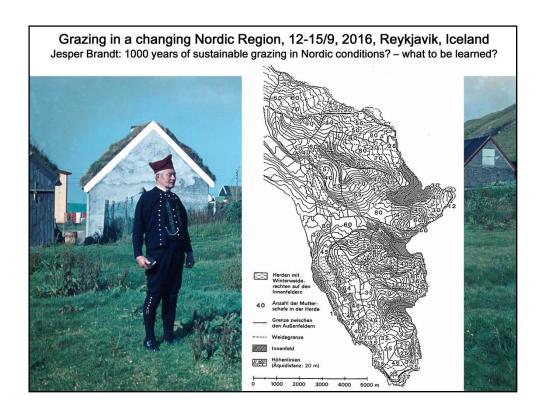


but with the raising prices in Europe on wool and woollen products from the 15<sup>th</sup> century the sheep farming expanded progressively taking up more than 90% of the export. The land use system changed of course correspondingly. So, globalisation is nothing new!

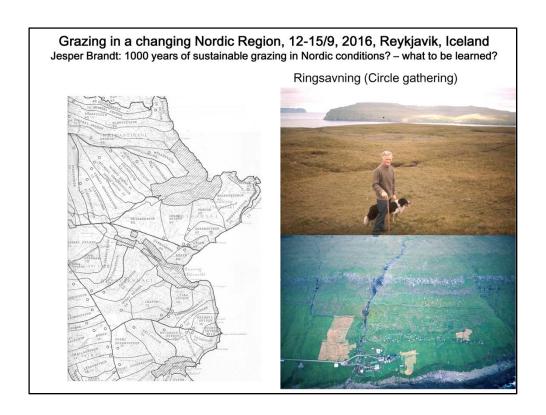


The carrying capacities of the approx. 250 outfields of the Faroe Islands were carefully stated and used for taxation. The most wellknown and detailed was made between 1867 and 1873. Based on this information and a planimetration of all the outfields, small islands and other isolated pasture grounds. I have constructed the map of grazing productivity to the right, given by the average slaughter of average sized sheep and their lambs. Huge variations can be seen, related partly to landscape structure and grazing pressure, but also to the vicinity to bird cliffs, manuring the surrounding outfields.

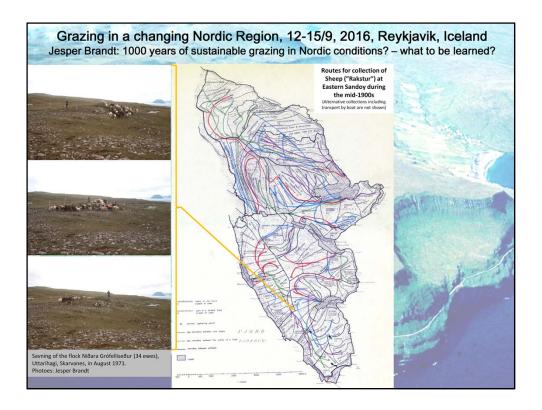
The history of carrying capacity has been studied much more in detail at the eastern part of Sandoy.



Here you can see the layout of 87 single pastures including the fixed number of ewes in the 15 outfields of this area indicating the number of 12 to 90 ewes in each flock or pasture. I arrived at this information in the middle of the 1970ties through interviews with old shepherds, like Óli Danielsen, having been active since the 1<sup>st</sup> World War. Although slightly modified, the pastures have in principle been rather constant at least since late medieval time. Importantly is it that only some flocks had the right to grass the infield during wintertime, whereas other flocks had to settle for a widening of their winter pasture grounds in the lower outfield, e.g. where cows had their summer pasture grounds. So, there was (almost) no winter foddering of sheep, generally related to the high average winter temperature of 4° C. in January.

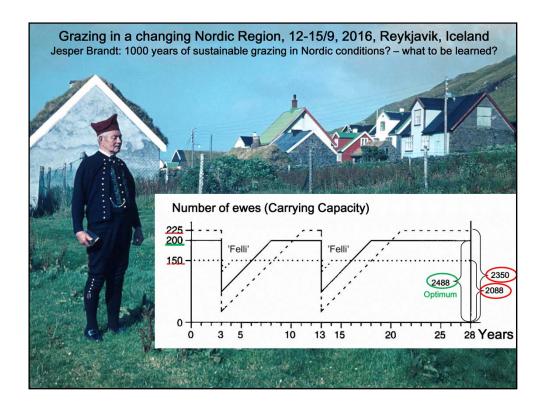


The territorial system of grazing was extremely sophisticated, and well adapted to local conditions. Here at Sandoy it was normal to use a special system of sheepherding called ringsavning – circle gathering around distinct and strategically selected points in the landscape, on this map shown by small circles. Normally the Faroese sheep are shy and escape when you approach them, but around these points they trained to keep collected and calm, which makes it possible to chase them down assembled (se next slide).



This management system was very labour efficient, since it made it possible for the skilled shepherd to herd the sheep into the fold with very little assistance, mostly only with his dogs. Through history, distinct herding routes from the most remote circle gathering points over up to two additional gathering points have been developed for efficiency.

The small circle gathering points could additionally also promote the grazing of areas that might otherwise not be used that efficient.

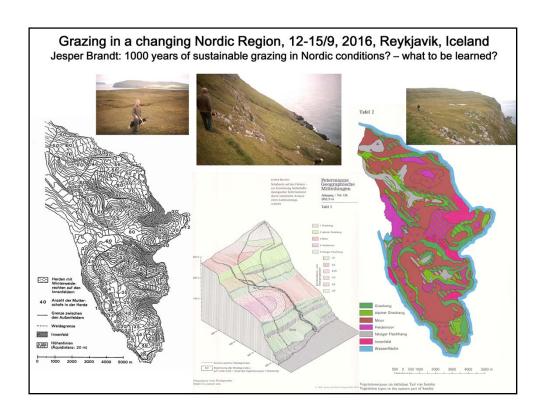


A detailed optimization had to be maintained with a strong and decisive dimension in time also: Some years, a severe winter situation occurs where frost and snow affect the pastures. When it caused the death of more than 1/3 of the sheep population, it was called a 'felli'.

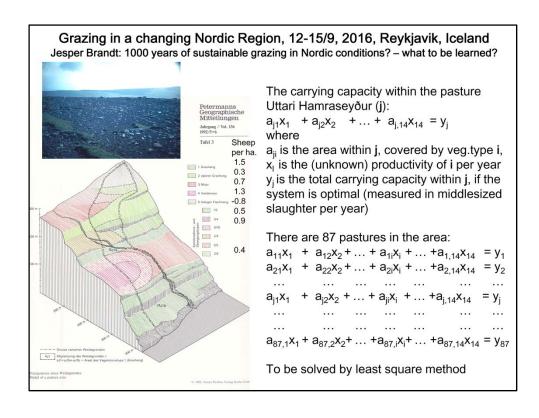
According to a historical source from the 17. hundreds, such a felli was expected to occur in average every 14<sup>th</sup> year.

The occurrence of felli certainly influenced the optimisation process that had to include this risk, since it took years before the size of the stock returned to the normal level. Here on this figure the principle of risk minimization has been outlined, indicating in this case a long-sighted skipan of 200 ewes that represent a historically developed optimum carrying capacity.

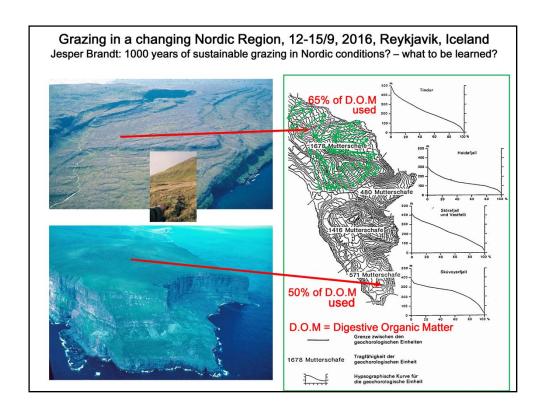
These principles of optimisation of the carrying capacity had to be adapted to the local landscape conditions.



The adaptation process was studied quantitatively through an 'up-side-down' landscape ecological analysis of the relation between vegetation productivity and carrying capacity: Instead of measuring the productivity of the vegetation directly, the known historical data of skipan were used to estimate the productivity.

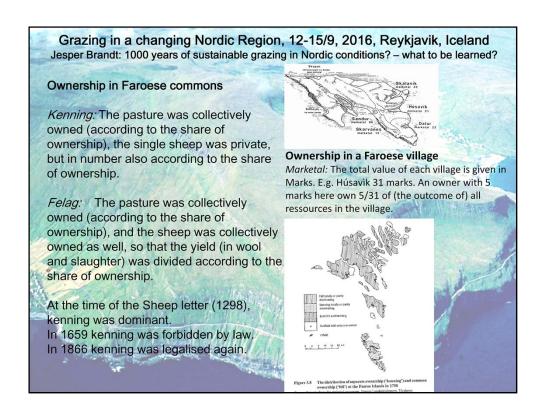


An optimisation modelling of the relation between the productivity of the sheep grazing system and the basic vegetation production of the landscape was developed by using least-square method and linear programming. This permitted not only the estimation of the efficiency of the adaptation to the local landscape conditions, but also to localise and evaluate important bottlenecks in the grazing system.



The basic principle of adaptation to the local landscape is outlined in this figure, showing how four main landscape units of the eastern part of Sandoy can be distinguished, each of them showing a characteristic landscape chorology, decisive for the sheep grazing through its ability to deliver suitable pasture grounds for all seasons and all weather conditions.

Through this modelling it could be estimated that the grazing system in the southern area was able to use only half of the outfields' mean annual grass production (note the high plateau at the lower photo, displaying typical wetlands with vegetation suitable for winter grazing, and the few lowlaying welldrained grass-slopes, typically suitable for summer grazing: It should preferably have been the opposite landscape composition), whereas this percentage was raised to 2/3 in the northern outfield, thus showing a more straightforward adaptation of the grazing system to the landscape composition.



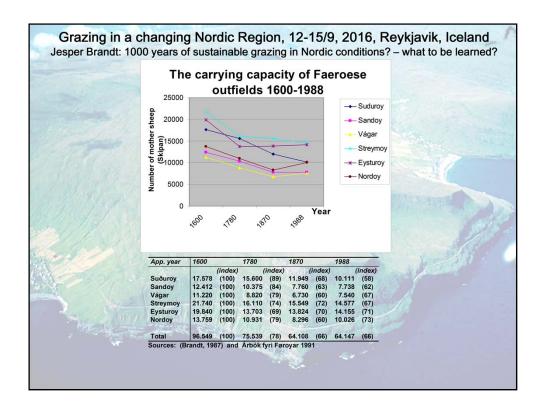
But this adaptation was not just a question of time and landscape adaptation, it was also a question of social or managerial adaptation.

The raising of wool prices at the world market during the middle age combined with a growing fragmentation of land property forced through basic changes in regulation to master the growing conflicts between sheep farming and other types of land use, as well as growing conflicts between different land owners.

At the time of the sheep letter the outfield was a common, owned collectively by all owners in a village. A land owner owned a share of the outfield, given by his share of the total value – Marketal – of the village. But every owner owned his own sheep – in Faeroese called kenning – in number equivalent to the owners share of the total value of the village in Marks.

But this was changed up through the 17<sup>th</sup> to the 19<sup>th</sup> century, where collective ownership, not just of the land, but also of the sheep – so-called *felag* – was forced through in the legislation. Thus each farmer was not allowed to own specific sheep, but a share of the collected output of the sheep roaring, regulated through the election of joint shepherds who had total control over the pasture and the management of the given skipan, carrying capacity. Nobody, not even the owners, was allowed to cross the outfield without the permission of the shepherd.

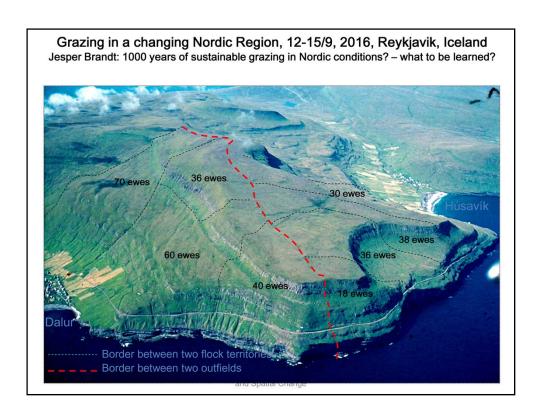
Now, seen in a historical perspective: Was the productivity actually kept? Did the skipan really ensure a sustainable use of the outfields?



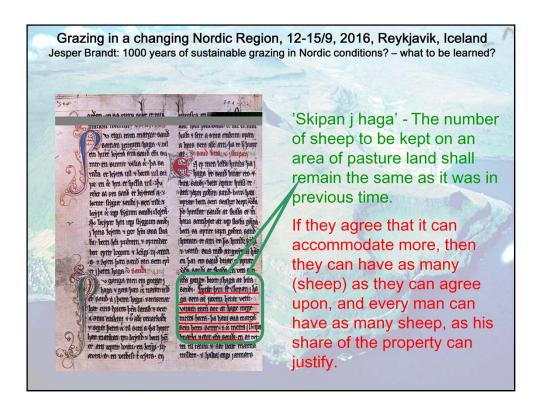
No, it did not. It is a hard fact that in average, skipan was reduced with 1/3 from the beginning of the  $17^{th}$  century to the end of the  $19^{th}$  century, although at different rates on the different islands.

So, what has actually been regulated by the skipan?

Well, apparently the sheep letter only partly regulated an ecological carrying capacity, but was primarily concerned with social conflicts due to uneven grazing pressure at the local level of a single island.



The territorial system of grazing was upheld by the principle of the different flocks being deliberately "shepherded against each other". Since only the infields were fenced, the grazing pressure of each flock within an island had to be kept at the same level, so that there was no reason for a trespassing from one ground to another.

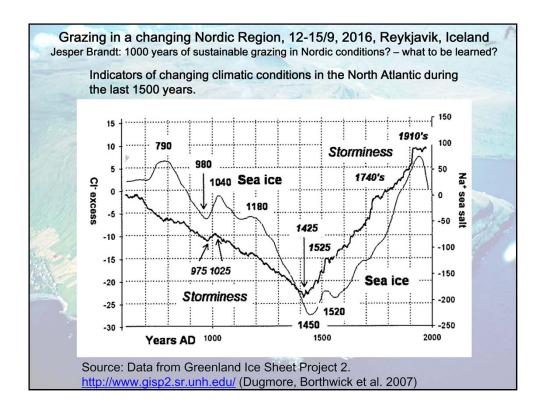


If the owners could agree they were allowed to raise the skipan. The sheep letter continues: 'If they agree that it can accommodate more, then they can have as many (sheep) as they can agree upon, and every man can have as many sheep, as his share of the property can justify'. This has given rise to very different grazing pressure at the different islands.

So we have to conclude with a priority to social conflicts being a main reason for the historical sustainability concept skipan.

However, there is one important problem that still has to be mentioned. Namely the problems of estimating an ecologically based carrying capacity in a situation with climate change.

Understanding of fluctuations in weather conditions have been central for the shepherd's estimation of skipan. They had many refined methods that indeed in most cases could be considered scientific, since they were closely related to empirical experience. But it was all based on the assumption that former weather fluctuations would continue into the future, which has not always been the case.



Here you see the development of some indicators of changing climatic conditions in the North Atlantic during the last 1500 years.

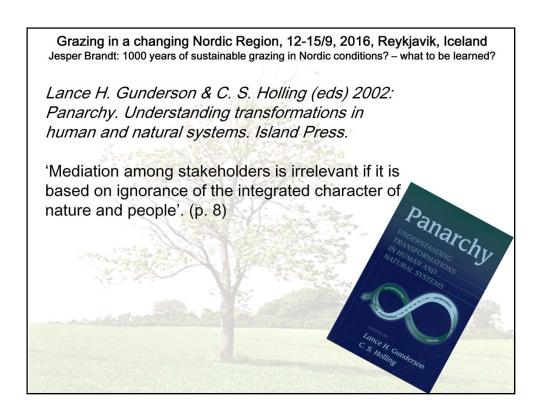
The precise interpretation of the curves is not the interesting point here, rather the fact that not only will a changing climate increase the difficulties for a credible estimation of skipan, it will also weaken the authority of the ecologically oriented management that the united shepherds within each of the islands had developed, in comparison with the more short-sighted market logic of the land owners, including the Danish king, who owned half of the land.

Historically, Faroese shepherds developed several refined empiricially based methods to support the legally developed social strategy aiming at a longsighted sustainable use of the grazing potential expressed in the use of skipan. It was NOT a simple case of "tradegy of the commons", since this economic mechanism between the owners was regulated in detail.

The social strategy was however nevertheless primarily developed to solve social conflicts between land users, not ecological conflicts between nature and people. It is plausible that the growing export interests together with the diminishing ability to master the ecological optimization process due to climatic changes blew the former alliance between the commen management of the economic interests in sheep farming among land owners, and the basic understanding of ecological conditions expressed in the carrying capacity, skipan, primarily managed by the collective practice

of the shepherds within an island.

It thus support the main conclusion of a number of historical studies concerning transformation of human and natural systems.



Probably it has been expressed most sharply by Lance Gunderson and Buzz Holling in a main statement of their comprehensive publication on theory, policy and practice concerning transformation of human and natural system that , "mediation among stakeholders is irrelevant if it is based on ignorance of the integrated character of nature and people".

Grazing in a changing Nordic Region, 12-15/9, 2016, Reykjavik, Iceland
Jesper Brandt: 1000 years of sustainable grazing in Nordic conditions? – what to be learned?

Thank you for your attention!

Jesper Brandt

Dept. of Science and Environment,
Roskilde University