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Nordic Innovation Centre

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## Nordic Malt House

- A democratic business model for small scale malting of grains
- A blue ocean approach to revitalization of the Nordic beer industry



Main authors: Jens Olsson, Anne Rahbek Christensen, Kenneth Bellaire Frausing



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Nordic Innovation Centre

## Nordic Innovation Centre

The Nordic Innovation Centre initiates and finances activities that enhance innovation collaboration and develop and maintain a smoothly functioning market in the Nordic region.

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# Technical Report: Nordic Malt House



Composed by Meyer Consulting

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# List of contents

<b>1 PARTICIPANTS</b>	<b>4</b>
1.1 PROJECT FACILITATOR	4
1.2 PROJECT MANAGER	4
1.3 PROJECT PARTICIPANTS	4
1.4 ORGANIZATIONS INVOLVED IN THE PROJECT	6
<b>2 FACT SHEET</b>	<b>7</b>
<b>3 EXECUTIVE SUMMARY</b>	<b>8</b>
3.1 MAIN OBJECTIVES	8
3.2 METHOD AND IMPLEMENTATION	8
3.3 RESULTS AND CONCLUSIONS	9
3.4 RECOMMENDATIONS	9
<b>4 BACKGROUND</b>	<b>11</b>
<b>5 NORDIC MALT</b>	<b>11</b>
5.1 TOWARDS A SPECIALTY MALT DEFINITION	11
5.2 CREATING A GENUINELY DIFFERENTIATED PRODUCT	12
<b>6 THE NORDIC MALT HOUSE</b>	<b>13</b>
6.1 AIM OF THE NORDIC MALT HOUSE	13
6.2 IDEAL DESIGN OF THE NORDIC MALT HOUSE	13
6.3 ORGANIZATION AND OWNERSHIP	14
6.4 PRINCIPLE SKETCH OF THE MALT HOUSE	14
6.5 INVESTMENT AND FINANCING	15
<b>7 CREATING A MALT CULTURE THROUGH KNOWLEDGE SHARING</b>	<b>15</b>
<b>8 MALT OF EXCELLENCE</b>	<b>16</b>
<b>9 FUTURE PERSPECTIVES ON THE CREATION OF NORDIC MALT HOUSES</b>	<b>17</b>
<b>10 FINAL REMARKS</b>	<b>17</b>

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## 2 Fact sheet

<b>Title:</b> Nordic Malt House	
<b>Nordic Innovation Centre project number:</b> 06395	
<b>Author(s):</b> Jens Olsson, Anne Rahbek Christensen	
<b>Institution(s):</b> Meyers ApS	
<p><b>Abstract:</b> Malt is the most important raw ingredient in beer production, providing both flavor, aroma, colour and the sugars that make the fermentation possible. Malt is produced from the germination and subsequent kilning of grains, hereby creating an enzymatic process that transforms starch into fermentable sugars. The most commonly used grain type for malt production is barley, but other grain types, e.g. rye, wheat and oat, are used as well.</p> <p>Looking at the brewing industry, it is evident that malt has turned into a global bulk commodity. Only a handful of malt houses serve the needs of the beer industry and small scale brewing is almost solely carried out with malt imported from either Germany or UK.</p> <p>The main objective of the project is to establish a network consisting of Nordic brewers with the purpose of identifying strengths and potentials in the development of a Nordic malt category. The aim is to develop a democratic business model for malting smaller batches of grain with special characteristics.</p> <p>Focusing on our Nordic climate and heritage will allow us to develop new differentiation parameters for Nordic brewing, hereby creating a more diversified beer market and a stronger position on the export market. However, the micro breweries will not be able to lift this task individually. The development of a Nordic malt category calls for a democratic model of cooperation: Locally or regionally based malting facilities where breweries can source Nordic malt types in relevant quantities.</p> <p>The background for the project dates back to 2006 where Meyers assisted Carlsberg in hosting the ‘Nordic Brewer Symposium’. On the symposium the lack of unique raw ingredients was identified as a barrier in the breweries efforts to create a unique profile. Two main challenges were defined: one concerning hops and one concerning malt.</p> <p>Creating awareness about taste characteristics is a major challenge that needs to be addressed before larger quantities of regionally or locally produced malt can be marketed. The challenge is that little if any knowledge exists on malt’s impact on flavour and aroma besides an industrial definition focusing on identifying off-flavours. Hence the whole language about taste has to be addressed and developed as a prerequisite to identifying the characteristics of a Nordic malt type.</p> <p>The project is designed to address the challenge of creating:</p> <ol style="list-style-type: none"> <li>1. Activities that will stimulate the development of a vocabulary that can describe the sensory characteristics in relation to malt</li> <li>2. An increased demand for Nordic malts</li> <li>3. A business model that can be expanded both in number (more small cost efficient malt houses) and in size (economies of scale).</li> </ol>	
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## **3 Executive Summary**

### **3.1 Main objectives**

Malt is the most important raw ingredient in beer production, providing both flavor, aroma, colour and the sugars that make the fermentation possible. Malt is produced from the germination and subsequent kilning of grains, hereby creating an enzymatic process that transforms starch into fermentable sugars. The most commonly used grain type for malt production is barley, but other grain types, e.g. rye, wheat and oat, are used as well.

Looking at the brewing industry, it is evident that malt has turned into a global bulk commodity. Only a handful of malt houses serve the needs of the beer industry and small scale brewing is almost solely carried out with malt imported from either Germany or UK.

The main objective of the project was to establish a network consisting of Nordic brewers with the purpose of identifying strengths and potentials in the development of a Nordic malt category. The aim was to develop a democratic business model for malting smaller batches of grain with special characteristics.

Focusing on our Nordic climate and heritage will allow us to develop new differentiation parameters for Nordic brewing, hereby creating a more diversified beer market and a stronger position on the export market. However, the micro breweries will not be able to lift this task individually. The development of a Nordic malt category calls for a democratic model of cooperation: Locally or regionally based malting facilities where breweries can source Nordic malt types in relevant quantities.

The main objectives of the project have been achieved and are described in this report and in appendix A (Danish report with English summary). A model for malting as well as for cooperation has been identified and is currently under implementation in at least two malt houses in the Nordic countries. The project has helped to establish a fundamental understanding of the need for cooperation between brewers and maltsters. Likewise the model for cooperation has been expanded to include farmers as well, as it is evident that the local or regional malt house is the ‘missing link’ in the value chain from grain to beer.

### **3.2 Method and implementation**

Contacts have been established to existing projects and malting companies. This included meetings with Børglum Kloster (Denmark), Danish Malting Group and Viking Malt (Sweden). In addition to this, the project has included desk research focused on market development, international price comparisons on malt and analysis on the international malt portfolio. All of this in order to address the market potential of Nordic Malts.

The project hosted 3 meetings and participated in the European Beer Festival held in Valby in September 2009. During the project period there were additional minor workshops and meetings, including guest brews in Tromsø (Norway) and Nørrebro Bryghus (Denmark) as well as a field trip

to Mørdrupgaard (Denmark), where the owner Per Grube has a project (in cooperation with Nordic Gene Bank) focused on up-scaling the production of old cultivars.

The last meeting was stretched to include the three-day European Beer Festival in Copenhagen, attended by 20.000 people. Jens Eiken, Per Kølster, Pekka Kääriainen and Jens Olsson contributed with on-stage presentations concerning malt relevant topics. Furthermore Per Kølster presented a microscale ‘drawer malting’ set-up, which can be implemented in a regular one bedroom apartment.

### **3.3 Results and conclusions**

Only 34 different types of malt exist globally, no matter if you are a home brewer or the world’s largest brewery group. It would be impossible to imagine a world where all winemakers would have to rely on 34 standard grape concentrates from a transnational supplier. The winemaker has to interact with his terroir, that is the unique qualities of a particular geographic area that can be related to the interaction between the plant, the climate and the soil, and translate this uniqueness into wines of different character. This intimate relation between the raw ingredient and the end product has been lost in the beer category, since the malting process is carried out by a few large companies that cover the entire market for malt. We call this the ‘black box’ of malting.

The main conclusions from the meetings and workshops are:

1. There is a need and a will to analyse and understand this ‘black box’ of malting, as this can lead to a closer connection between the brewer and his main raw ingredient.
2. The project has identified a low cost investment model and a rough blue print for a micro-malting plant that can accommodate the need for producing small batches of malt.

Likewise, the project has identified two different complexity levels in which small scale malting can be carried out:

1. A no-nonsense setup, where anyone with a little skill can malt grains. This is mainly on a trial and error basis, but is important as it adds to the understanding of malt and its possibilities. This model has been presented on the internet and at the European Beer Festival.
2. The actual development of Nordic malts, the analysis of the ‘black box’ and development of a Nordic malt profile has to be addressed on a different level. The elements from the business model are the same, but there is a stronger need to analyse and document the processes during the malting. This work is a large task and cannot be carried out by one individual. Hence, we have urged the brewers to work together and to invite researchers and students from the relevant faculties of natural science to participate in the process.

All information and generated knowledge is channeled through existing networks of farmers, maltsters and brewers.

### **3.4 Recommendations**

We have proposed that the brewers, farmers and maltsters create a Nordic Malt Forum based on the well established network between brewers today. The main objective for the Nordic Malt Forum is to establish a formalized network for knowledge sharing, which is absolutely crucial, since the project recommends a decentralized structure of several locally or regionally based malt houses.

The project also recommends that further analysis is carried out to identify flavour and aroma qualities, various grain types (old as well as new cultivars), the technique of malting and roasting as well as a thorough analysis of the value chain from grower to consumer. As the specialty market for malt is currently immature, any new results might influence further research.

The recommendations fall into three categories:

*Brewers and beer enthusiasts*

- Establish Nordic Malt Forum as the basis for knowledge sharing
- Establish contacts with farmers who are interested in establishing a dialogue regarding inner qualities of their produce
- Create one or more malt houses in each of the Nordic countries
- Introduce an annual “Malt of Excellence” competition as a way of creating awareness of the inner qualities of the malt.

*Research and education*

- Put more focus on the education in malting. The current education basically consists of a two week course followed by practical instructions for those brewers who more or less accidentally become maltsters.
- Establish research programmes in sensory evaluation of malt and the malt process’ influence on flavor and aroma.
- Combine existing projects on old cultivars with analysis on their malt potential

*Public sector*

- Support initiatives that have the potential of creating a more diverse portfolio of malt
- Support relevant partnerships between researchers and brewers/farmers/maltsters
- Support bottom-up initiatives and capital-extensive malting plants

## 4 Background

Today, only a handful of malt houses serve the needs of the beer industry. Small scale brewing is almost solely carried out with malt imported from either Germany or UK. Likewise, the beers produced on the Nordic as well as global market are all reproductions of well established beer styles mainly from Germany, Belgium, England and USA.

In order to develop beer types that are truly Nordic in their origin, the brewers need to have malt which is malted from grain grown in our region and malted according to the wishes and traditions among Nordic brewers. The Nordic Malt House project has sought to develop a business model for establishing small scale malting facilities that can produce malt specialized to the microbrewer market.

## 5 Nordic Malt

### 5.1 Towards a Specialty Malt Definition

Generally, the definition of specialty malt is a question of the obtainable price. However, a more qualitative definition should include the following differentiation parameters:

- Cultivar
- Soil condition
- Temperature
- Water conditions
- Chemical content
- Growing method
- Treatment & style
- Small scale production & artisanal approach

The opinion shared amongst the participants was that the use of especially old cultivars should be further explored and that the identification of relevant cultivars should be based on their historic reputation with regards to growing, handling, malting and taste characteristics. However, it was also noted that the further identification and selection will have to be conducted on a trial and error basis, since many factors regarding the malting properties of old cultivars are yet to be analyzed and documented.

Therefore, terminology is an important aspect of creating Nordic malt and a Nordic malting culture. We need a vocabulary to understand and discuss the properties of specialty malt and to stimulate a qualitative demand based on sensory differentiation parameters rather than technical specifications.

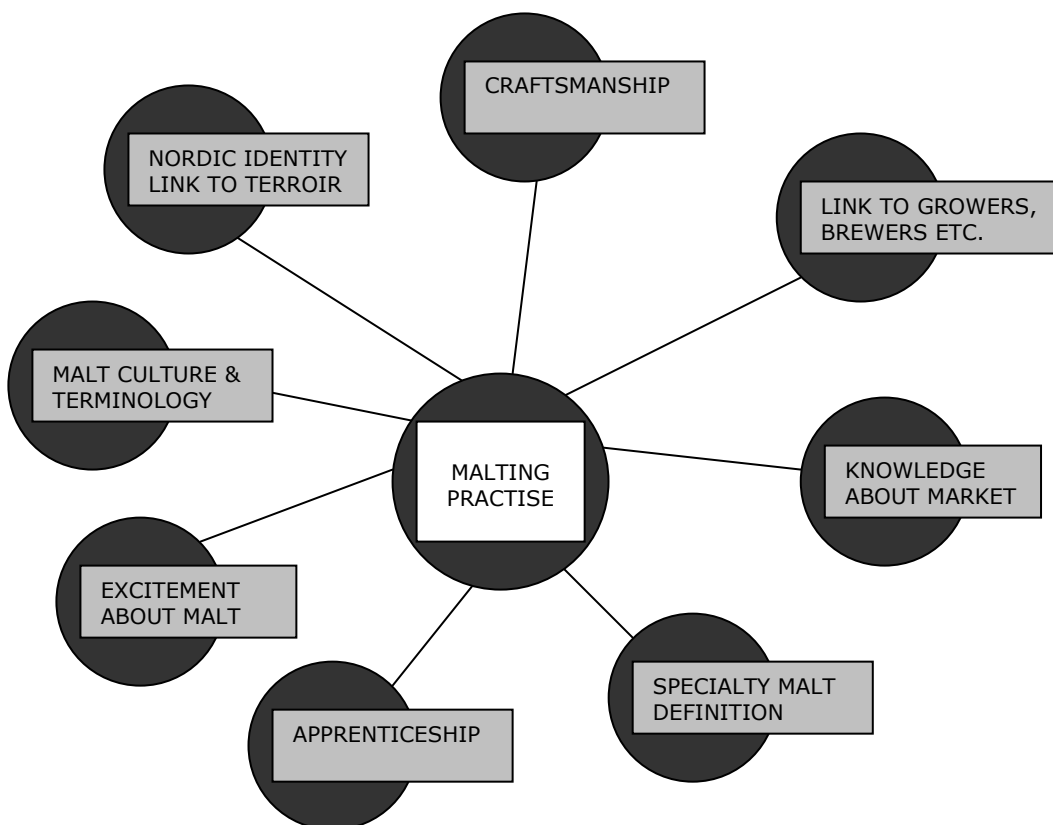
Furthermore, availability is an important factor, since many cultivars only exist in very small quantities. Hence, close cooperation with Nordic Gene Bank and crop growers is of vital importance in order to ensure substantial amounts of specialty malt varieties for evaluation in the brewing process.

## 5.2 Creating a genuinely differentiated product

The notion of authentic Nordic malt only makes sense if it represents a genuine differentiation from the malts currently produced. In order to succeed, the project participants reached the conclusion that:

- 1) The technical characteristics of regionally or locally produced malt must be assessed in order to create a certain level of quality standard and reasonable degree of reproducibility
- 2) The development of Nordic malt types requires a change of perspective away from seeing malt as a bulk commodity. This requires the development of a vocabulary that enables us to describe and discuss the sensory characteristics of different malt types.
- 3) The craftsmanship of small-scale and low-tech malting should be embraced as a unique selling proposition of Nordic malt similar to the craftsmanship and artistic dimension associated with small-scale coffee roasting.
- 4) Since malt is not the end-product, but a raw ingredient mainly used for beer production, it is imperative that the brewer takes on the task of transforming the raw-ingredient into beer types with a genuine Nordic profile.

Excitement is crucial to both supply and demand of Nordic malt. The malting practice will only be successful when knowledge, passion and a well established culture surrounds the Nordic malt. Therefore, the following focus areas for creating a Nordic malt universe have been identified:



To a certain extent, these dimensions are interdependent as they co-create and nurture each other. However, a fundamental step for moving on from here is creating the physical platform of the actual malting facility in order to harvest experience and skillfully keep developing Nordic malt through that experience.

There is a need for an evaluation of grains similar to e.g. sensory evaluation of coffee. Making beer is a long production chain with many links, and much happens in the production process from the raw grain to the final beer. Many variables here affect the quality. Just looking at the malt itself, several parameters decide the quality of the raw grain: Soil condition, temperature, growing method, chemical contents etc. Anders Kissmeyer had the experience of extracting a more intense flavour from floor malted products when producing India Pale Ale, which could point in the direction of using more primitive technologies.

## **6 The Nordic Malt House**

### **6.1 Aim of the Nordic Malt House**

The Nordic Malt house should serve the obvious task of producing malt. However, in order to achieve the above stated goals, the overall aims of the malt house have to be defined in broader terms. Therefore the malt house should serve several aims:

- 1) Produce high quality malt from locally or regionally produced crops.
- 2) Function as a teaching environment where brewers, farmers, students etc. can get hands-on experience with malting.
- 3) Function as a democratic and open knowledge base between brewers, maltsters and grain growers, where
  - a. the malt house works as a common 'learning space'
  - b. all relevant experience benefits both growers, maltsters and brewers
  - c. knowledge is put into practice both in the malt house and brewery

### **6.2 Ideal design of the Nordic Malt House**

Apart from the portfolio of legal structures (e.g. cooperative, individually owned, shareholder etc.), there are some further considerations to take into account. Most important is the complexity and size of a malting facility. Whereas the small scale (less than 1 million DKK) malt facility can easily be managed and operated by 1-2 people, the large scale plants (e.g. Børglum Kloster) needs a range of investors to share the investment and the risks. Most micro brewers have already placed their investment in brewing facilities, which is why external financing must be identified. Since the investment in a malt facility will require risk willing capital regardless of size, this speaks further in favour of the low cost / low tech model, where the amount of risk willing capital needed is held at an absolute minimum.

Furthermore, we believe that before establishing larger scaled malt facilities there is a need to demonstrate that significant results can be achieved through a limited investment. Therefore, the ideal model for a micro malt house should be based on the following criteria:

- Small scale
- Low tech
- Low investment (and hereby low risk)
- Modular

- Simple to handle and clean
- “Open source”, based on knowledge sharing
- Able to produce to a certain specification within a reasonable margin
- Able to produce batch sizes of approx. 500 kilos
- Able to run different maltings at the same time
- Working in close cooperation with one or several farmers and breweries
- Organized within the framework of Nordic brewing guilds
- Approved for organic production
- Suitable for training and education
- Based on both public and private financing

### **6.3 Organization and ownership**

The two most likely ownership models for a malt house are:

- 1) A cooperative of brewers, maltsters and possibly grain growers, where each of the stakeholders contributes.
- 2) An individual with the necessary skills and determination, possibly with some degree of support from public funding (e.g. support from Danish Innovation Law or Rural Development Programme)

The manager of a malt house must have a very diverse knowledge of grains and agriculture as well as malt and brewing. As it could prove difficult to find one person with all the mentioned skills, a sensible alternative would be to hire an operational manager and a practical manager, not necessarily full-time.

Over the course of time, many small malt houses around the region should be established. From a terroir and environmental perspective it makes sense to embrace the shortest possible supply chain from grower to brewer. Crop growing, malting and brewing should take place within the same region in order to minimize transportation. Since a large part of the malting processes concern the handling of grain, the malt house would benefit from being established on or very close to a farm.

### **6.4 Principle Sketch of the malt house**

The following chapter presents a model for the construction of a simple, low cost, small scale malting plant, which can be operated in a controlled and reproducible way and where generated knowledge can be shared in a way that inspires as many people as possible to participate.

Different models for a Nordic malt house have been discussed, but the working group has agreed on recommending a malting plant with the capacity of producing batches of ½-1 tonne. This can be carried out using either floor malting or malting in a box. Due to the less labour intensive technique, we have emphasized the box approach and designed a modified Saladin box. The box is used both for steeping, germination, drying and the final curing. Humidity as well as the temperature may be fully controlled during the malting process by using air, irrigation and a mixer constructed of vertically turning mechanical screws (called ‘snails’). The revolving mechanical screw can be designed to be easily moved from box to box, and to operate in each box every day. Filling and

emptying is carried out with a mechanical drainer. The final heat treatment takes place in the same box, although curing at a higher temperature than 150<sup>0</sup>C has to be carried out in a coffee roaster. A seed cleaner is used to clean seeds before malting and to remove the rootlets and acrospires before storing and packaging the malt. The number of boxes defines the total capacity of the malting plant. A total time of approx. 7 days per malting enables to start a new malting each day if there are 7 boxes in the system. To ensure the facility performance and quality, there must be capacity to receive more grain lots in 'hold' and perform a fine-grade cleansing. Likewise, there must be capacity to purify, store, pack and dispatch malt. With 40 working weeks per year the annual capacity is up to 280 tonnes or even more.

A more detailed description of the actual design and construction of the facility can be found in Appendix A (Danish report with English summary).

## **6.5 Investment and financing**

The complete economic model for the Nordic Malt House can be found in Appendix A (Danish report with English summary). This economic model does not include public funding. Depreciation is 5 years, with a negative result year 1. Summing up, the total investment will be less than 3 million DKK, divided by:

Buildings: Approx. 2 million DKK

Malting equipment: Approx. 1 million DKK

The investment in the necessary equipment is approx. 1 million DKK or approx. 150.000 euro. This includes facilities to store and clean seeds/malt, seed/malt transport, the malting itself, roasting and packaging. The malting plant could be housed in a 400 m<sup>2</sup> building with the necessary facilities (water, electricity, air, accessibility etc.). Yearly costs for housing are estimated to approx. 180.000 DKK or 24.000 euro. A very rough estimate of the production costs show the price for malt is between 7 and 8 DKK and app. 1 euro per kilo. Including the investment and housing the production prize will be app. 9,5-11 DKK or app 1,5 euro per kilo, assuming that the total annual production is 100 tonnes. If the production is 300 tonnes the comparable production price decreases to 8,3-9,6 DKK.

Several factors are critical to the economy. However, assuming that brewers are willing to pay for malt with complete transparency and hopefully interesting brewing and taste qualities, the technical solution and the malting house design should be able to become a healthy small business. If the malt is sold to an average price of 15 DKK/kg (ex. VAT) the potential profit margin is about 4 DKK/kg. Yet, as the idea is to meet specific demands from individual brewers, the costs of each batch may easily become higher than the most rational approach. Hence, a major challenge is to create close cooperation with the brewers in order to meet their demands and get their acceptance of the relevant price. This speaks in favour of a malting plant organized as a cooperative business.

## **7 Creating a malt culture through knowledge sharing**



The creation of craftsmanship, a malt culture and sharing of knowledge are three interdependent factors for the success of the Nordic Malt House. Only through these factors can we

- 1) make high quality Nordic malt
- 2) stimulate excitement and interest in malt
- 3) acquire the necessary skills and terminology to communicate and share knowledge with other producers and links in the value chain.

Neither the craftsmanship or the culture, nor the sharing of knowledge, is about fixed definitions or equations. Instead it is about passing on the accumulated tacit knowledge, identifying basic processes and guidelines and identifying malting styles.

One of the big challenges here is to make sure that the malt culture grows while still keeping it artisanal. In order to manage the challenges described above, it is crucial to build personal links backwards and forwards in the value chain. As with other artisanal products, the personification is central.

Additionally, cooperation with the Nordic Gene Bank should be considered. For example, the Nordic Gene Bank has information on chemical contents of various types of Nordic grain which could be used to identify the qualities of different grains in the malting process.

In general, we need to demonstrate a democratic openness towards all stakeholders in the beer category in order to make our idea easy to understand and our model easy to replicate. This is part of our aim, since the overall goal is to diversify the market and create a rich Nordic malt identity. Therefore the project promotes the idea of offering people to take part and malt their grains themselves within the malt house.

## **8 Malt of Excellence**

The education level of maltsters has been discussed and found to be very basic. Brewers are taught malting for just two weeks. In order to create a culture in the industry for malting with passion, we suggest the creation of a competition among maltsters with the working title “Malt of Excellence” similar to the coffee industry’s “Cup of Excellence”. For consumers, this would nurture excitement and the development of a malt terminology, and for the producers, it would help them differentiate their beer and reward the good effort.

The “Malt of Excellence” would be an ideal forum for developing a language to discuss malt and the quality dimensions of malt and hereby strengthen the connection between farmers, maltsters and brewers. To our knowledge, there has never been such a gathering with the focus on discussing the sensory qualities of malt.

As malt is seen as a commodity, it can seem difficult to brand. Therefore, the task is to produce malt which is more than a commodity and is offered to the market through networks of farmers, maltsters and brewers. To succeed with this strategy it must be made obvious to the market that the Nordic malt is a different product than traditional malts, providing the brewer with a far better choice of aroma, taste and body. The “Malt of Excellence” could be an effective way to launch a qualitative debate about the locally or regionally produced malt and facilitate a view on malting as a craftsmanship with an artistic dimension worth engaging in and exploring.

## 9 Future perspectives on the creation of Nordic Malt Houses

Creating a microbrewery 15 years ago was not economically efficient. Creating a micromalting house today will not be economically efficient either. In the long run, however, it will somehow follow the development microbreweries underwent. In other words, we cannot expect to earn money immediately since this is a pilot project. What we need is a 3 year research period where the following strategy can be applied:

- Bottom-up strategy to build the Nordic malt house and explore the potential of the Nordic malt culture in general.
- Build a physical structure, harvest experience and identify ‘best practice’
- Create a small, flexible solution with few stakeholders in order to be able to experiment with the concept before moving to the next step
- Stimulate demand for Nordic malt through openness and co-creation with micro breweries, homebrewers and beer enthusiasts.

The big joker is the actual costs which makes the small scale prototype important. An initial low cost investment will help limit the risks.

The prototype-approach will make it easier to understand the difference that Nordic malt makes and the opportunities within. In time, this should be reproduced in cooperation with an increased group of stakeholders under the supervision of the first edition malting facility. In 3-5 years, a model like Børglum Kloster can be considered.

All of the participating Nordic countries are encouraged to follow the recommendations above, so we have a ‘representative’ in each country. Eventually we will be able to share knowledge and raise finances within the framework of the “Nordic Malt Forum”. More malting houses will create diversity and a basis for comparison between the different practices. We must be able to demonstrate a strong Nordic cooperation in order to give rise to the identity of Nordic malt.

## 10 Final remarks

Following the Nordic Malt House project, we already see effects on the future of Nordic malt and the realization of Nordic malting facilities. The entrepreneurial spirit has grown as a result of the realized potential of a Nordic malt category and the identification of a sustainable small scale business model. In Norway and Denmark, the establishment of three malting facilities is being planned as of today.

Per Kølster has received public support to expand his existing malting facility on Fuglebjerggaard. Meanwhile he has begun the malting of 50 different cultivars from a project on old Nordic cultivars from Nordic Gene Bank, which is a partner in this project. The malting started in January 2009. Additionally, Per Kølster is considering the options to cooperate with Jørn Ussing (Aurion) and the House of Cereals in order to combine malt with baking.

Likewise, the belief in the future of Nordic malt has taken shape since the initiation of the Nordic Malt House project. The bigger scaled Børglum Kloster project in North Jutland, which has faced problems raising capital, has now decided to continue its activities. The project was closed down due to lack of investment funds. However using some of the findings in the Nordic Malt house project the investment is now back on track and has gained funding of 11 mio. DKK from a private fund. We regard this as a clear signal that the Nordic Malt House project has been a key argument in the revitalization of the ambitions at Børglum Kloster. The project has inspired hope in the malting business and provided Nordic maltsters with enthusiasm not only to continue but proactively take part in the development of the Nordic malt and malting culture.