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# The Landrace

Newsletter from Landsorten  
No. 14, 2024

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## News from Landsorten

Landsorten's annual general assembly was held on 27<sup>th</sup> February at Jernbjerggård in Slagelse, where Chairman Morten Øster Kristensen from Samsø Mel resigned after having served as Chairman since the association was established in 2021. A new board was elected, which has since constituted itself as follows:

Emilie Hansted Berning, Vild Hvede, Chairperson  
<ehberning@gmail.com>

Karsten Kjærgaard, Livø Avlsgaard, Treasurer

Bjarne Hansen, Aurion and Landsorten

Lars Sørensen, Ørbæk Økologi

Jonas Astrup, Meyers,

Anders Borgen, Agrologica

Gitte Breum, ecology consultant



*Figure 1 Emilie Hansted Berning is the new head of Landsorten. Together with Ingeborg Pauls, Emilie runs the award-winning farm mill [Vild Hvede](#) on Funen.*

## Landsorten's strategy and development

At the general assembly, there was a thorough discussion about the association's strategy and finances, which may be of interest to anyone working with the Landsorten varieties.

Landsorten is trying to build a seed system where we make it possible to offer a wide range of special varieties that could not be produced in the formal seed system. We organize the production of the seed and help create a market for the products. Johan and Bjarne are employed to keep track of seeds and growers. We help with seed cleaning, grain analysis and, as far as possible, ensure that growers can get what they need. Henriette does the same for the buyers. "If a bakery wants purple wheat, someone has to make sure that there are growers who produce it, and that requires that seed is available. It's a big task, because we don't work with products that are just sitting in a warehouse ready for sale. Without Landsorten, it would take many years for a bakery to test a new variety of grain, because seed and bread grain would have to be produced before it could be done. Landsorten ensures that there is always a little bit of everything, so that every link in the value chain has a real choice of many varieties.

As long as the total production is small, all of Landsorten's expenses have to be spread over a few producers and this is expensive per unit produced. Currently, there are only about 500ha of Landsorten varieties grown, so Landsorten has to charge a relatively high quota per hectare and per ton of flour. The area increases every year, and when we reach 1000ha and 2000ha, the cost per hectare will decrease. A knock on the bag is that production increases by 30% per year, but it is up to the association's current and future members to decide how fast the development goes.

Until now, the bottleneck has been explaining to the mills that Landsorten has relevant products and making sure that seed was available. Today, almost all Danish organic mills are members of Landsorten, and there is now enough seed of Mariagertoba, which is the most widely grown variety. In the future, we therefore expect the bottleneck to be convincing consumers and foodservice

buyers of the qualities of Danish organic wheat. In addition, there is potential in feed grain, malting barley and other crops.

Landsorten is a membership organization, and the strategy is that together we make production larger so that it can be made cheaper for everyone. The current membership fee and production fee is so high that it can inhibit sales, but it should be seen as an investment in establishing a system that can be made cheaper in a few years. We hope that as many stakeholders as possible in the industry will support Landsorten and the strategy, and not just wait until the price drops - because then we won't get the increased production that is a prerequisite for lowering the price.

## Landsorten's open field day June 25<sup>th</sup>, 2024

Once again this year, Landsorten is organizing a field walk at Agrologica's experimental field near Mariager, Denmark. There will probably be no bouncy castle or rodeo bull, but it will be an orgy of inspiration about bread and flour and grain. There are literally thousands of different experimental plots, each telling a story about a grain with a specific purpose. The details of the event are not yet finalized, but star chef Emilie Quist Kjærgaard will serve a lunch specially composed with the grains of Landsorten, and Anders Borgen will talk about the grain in the field.

Events take place Hyrdehøjvej 17, 9550 Mariager 11.00-15.00.

Registration for the lunch is required and costs DKK 200 (half price for members of Landsorten).



*Figure 2: Emilie Quist will demonstrate that grain is much more than bread in the plant-based food of the future.*



## Other events

### Eco-field day 12<sup>th</sup> June in Kolding

Innovation Center for Organic Agriculture, ØkologiRådgivning Danmark, and others are organizing Eco-field Day on 12 June in Kolding. Several of Landsorten's varieties are grown in the demo field and we also participate in the debate tent.

### **Double field walk at Ulvedal and Dennis' Innovation field near Skørping on July 6<sup>th</sup>**

Christian Hjorth has run Ulvedal since 1989 and converted 180 hectares into an organic crop farm in 2016. Ulvedal is now one of Landsorten's largest producers of Mariagertoba and Borris Perlerug for both seed and bread grain, which is primarily sold to Aurion. Landsorten has set up experimental plots on Ulvedal's well-managed fields, where 10 wheat varieties are grown in yield trials.

Dennis Christensen does microbreeding on a small property a few kilometers from Ulvedal, where he collaborates with Anders Borgen on research into common bunt resistance and breeding of resistant and old varieties.

July 6<sup>th</sup> we start at 13.00 at Ulvedal [Blenstrupvej 26, 9520 Skørping](#), and then drive to Dennis Christensen and Mariann Jensen, Gerdingvej 9, 9520 Skørping, where we end at 16.00

### **Danish Food Forum presents the food innovation award "The Sharp Knife"**

Agrologica is among the nominated candidates, and the award ceremony will take place on June 6 in connection with the annual meeting of the Danish Food Forum.

## **+12% protein without fertiliser. How do you achieve it?**

A lot of organic grain is discarded as baking wheat due to low protein content. It's a pity, a shame and a waste. So what should the organic farmer do to ensure the protein content of grain for baking?

We know from Basic Agricultural Education that wheat should be sown as early as possible and at 12.5cm row spacing for the best yield. This is in general still true, but the problem is that sometimes you can't get both high yields and high protein content. In conventional farming, the only difference between growing bread grain and feed grain is that bread grain can be given a little extra N fertiliser, but this is not the case in organic farming. fertiliser levels are lower in organic farming and to apply 240kg N is rarely an option. Yet too many organic farmers grow bread grain as if it were feed wheat, which usually ends up with too low protein content, especially in winter wheat. We therefore need to do something different to what the consultant says.

There are several factors that affect protein content:

Firstly, there is the fertiliser and nitrogen effect of good crop rotation, which seems to be the only magic bullet that can simultaneously increase yields and protein content. There are many reasons to work with low fertiliser levels, or to apply the fertiliser in a way that doesn't provide the nitrogen boost that has the greatest immediate effect on protein content. Just be aware that if, for one reason or another, you choose not to apply all the nitrogen fertiliser allowed by law to winter wheat, you will have to use some or perhaps all of the other tools available.

The problem with crop rotation is often that nitrogen is leached from the field in the winter, leaving wheat starving for nitrogen in the spring when it starts to grow. Compared to true catch crops such as mustard and oil radish, wheat grows slowly in the fall and doesn't absorb all the nutrients released from the previous crop. I've considered planting an early sown winter wheat together with a catch crop such as Persian clover or oil radish. This would better retain the nitrogen and then release it back to the wheat in the spring, where one is frozen away during the winter. I have no experience with this idea, but I'm passing it on.

Grain variety is important for protein content. Unfortunately, the varieties with the highest yields have the lowest protein content. There are very few and small exceptions. If your protein content is too low for the growing conditions you have available, you may need to look at another variety to solve the problem. Our main winter wheat variety is 'Popkorn', which has a higher protein content than the common bread wheat varieties on the market, and we are currently also breeding the winter wheat Pop Fitisse, which has an even higher protein content than Popkorn.

Early sowing gives a longer growing season and therefore higher yields. This applies to both fall and spring sowing. Winter wheat therefore usually gives higher yields and lower protein content than spring wheat. One of the tools in the toolbox is therefore to delay sowing. It allows for false seedbeds and less weeds, so it makes sense if the protein content needs to be raised. It has never been a problem to achieve 16% protein in a late sown spring wheat, but in the last 10 years the problem with the yellow gout flies has become so severe that this option has been taken away. It is no longer recommended to sow spring wheat late, simply because the risk of severe yield loss is too high.

The number of plants per area unit has a big impact on the protein content. The fewer plants that share the water and nutrients in the soil, the more there will be for each. The optimal plant number of 350 plants per meter<sup>2</sup> is determined by the yield and price of the seed and harvested grain, but if the price of the harvested grain depends on the protein content, the optimal plant number will be lower. To avoid weed problems at low plant numbers, it makes sense to sow at high row spacing and row clean the grain. How high the row spacing should be depends on how much the protein content needs to be raised, but it's important to understand that you need to go so high that it can be felt in the yield. Otherwise, as with the other measures, it has no effect. Simply keeping the seed rate and increasing the row spacing to 17cm will usually not affect yield or protein content, while 25% seed rate and 50cm row spacing will often provide enough protein even in high-yielding varieties, even on an unfertilized sandy soil. You have to experiment depending on how big a protein boost you need and how good you are at weed management. It never pays to allow large amounts of weeds, because even though protein often costs yield, you don't get any protein from losing yield to weeds.

Mixing cereals with pulses may be an option if you are able to separate cereals and peas after harvest. Wheat is more efficient at pulling nitrogen out of the soil than legumes, so the effect is similar to reduced seed rate, but without the yield loss. At the same time, legumes will fix more nitrogen when the grain drains the soil of nitrogen, so in the overall crop rotation you get a better nitrogen economy by mixing grain and legumes than by growing the crops separately in monocultures. On the other hand, there is a cost to separating the crops, unless the crop is to be used as feed unseparated.



Biological products are emerging on the market that claim to affect both yield and protein content in grain. BlueN® from Syngenta is a product where bacteria are said to have a nitrogen effect by fixing nitrogen from the air, and several other products are said to have a beneficial effect on soil biological turnover. I would certainly not deny that these or other future products may have a beneficial effect, but I have no experience with them myself, but can only hope that someone will make some credible experiences and share them.

## Germination of grain

The germination of grain is of course the first and most important prerequisite for successful cultivation. If the grain is harvested in good conditions and stored dry, +95% of the kernels will germinate immediately when given water. But the shelf life is not infinite. How long the grain can maintain germination depends on storage conditions, including grain moisture, time and temperature. Of these, moisture is definitely the most important. If the grain is just dry enough, it can last a very long time even if the temperature is high.

When grain loses germination over time or as a result of seed treatment and other physical measures, the first symptom is that the grain germinates more slowly. The germination speed drops much faster than the germination percentage. So you may well experience grain with +90% germination, but where germination vigour is still significantly reduced. This can often only be seen in the germination speed, but not in the germination percentage. The germination speed only goes down when the germination damage is more severe. Even if the germination percentage is high, a reduced germination speed can still have a significant impact on yield and weed competition and cannot be detected by a simply counting number of germinated kernels. Seeds that meet the official minimum germination rate of 90% may well result in a yield loss of 10-15% if the germination speed is reduced.

It is possible to have a germination sample with a high germination percentage, but a low germination in the field. This is because the grain has enough energy to germinate on a piece of damp paper in the living room or laboratory, but not enough energy to grow up through the soil in the field. An incipient decrease in germination vitality can be measured by measuring germination speed, which is a more sensitive test compared to a simple count of germinated kernels. Other methods are to damage the grain in one way or another, for example by heat treatment. Grains with high germination vitality will be able to withstand more heat treatment than samples with low germination vitality. Another method is to put the kernels in water and measure the electrical conductivity of the water. This is a quick and safe way to see sprout damage, because sprout-damaged kernels will not be as good at retaining nutrients inside the cells of the kernel, so they will be released to the water, and you can measure this with the electrical conductivity of water. It's really smart.

## Measuring germination percentage

If you only have a single sample that you want to see if it can germinate, simply place it on a piece of damp toilet paper in a saucer for two days and see if the seeds germinate. Cover it with plastic or something else to prevent evaporation. If you have two or more samples and you're interested in seeing the difference between the samples, it immediately becomes much



more complicated because it's difficult to ensure uniform temperature and humidity in a primitive setup. And small differences can make a huge difference in germination speed. If two similar samples are placed on two different shelves in the fridge, they will show different germination rates because there can be differences in temperature at the top and bottom of a fridge, as well as light and shade on the windowsill.

When I test germination, I put a piece of heavy newspaper at the bottom and toilet paper on top. The toilet paper ensures that the moisture is distributed evenly and the newspaper ensures that the roots grow downwards and not through the paper. In this way, the paper can be rolled up and unrolled again when you need to check the sprouting. This saves space when you have many samples to test, but above all it ensures uniform germination conditions for all samples. Simply place the rolled up germination sample in 2mm of water and the water will distribute nicely in the germination roller.

If you're interested in comparing germination speed, it's best to do it at a low temperature, as this slows things down and makes it easier to see the differences. Grain sprouts fine at 2°C, but it's really slow, so for germination testing, 10°C is appropriate. Here you will be able to clearly see differences in germination speed and you won't have to wait too long for the result.

The sprouting roller technique can also be used if you want to pre-sprout grain for planting. In this case, it's just inconvenient that the grain clumps together and the roots grow into each other. By laying the grain in a row on top of the paper, the entire roll can be planted out in the same way you sometimes see vegetable seed bands in the supermarket.



## Dormancy

Although germination capacity is highest right after harvest, the germination may not be high and uniform at this time. This is because the grain is in dormancy. This is a mechanism that the grain has to delay germination and prevent the grain from starting to germinate while the kernels are still in the ear in the field. Germination dormancy is caused by chemical substances that prevent germination. They will eventually break down and the grain can germinate again. Common to most germination inhibitors in grain is that they only work at high temperatures. The substances are there to ensure that the grain does not germinate until after harvest, when the grain is placed in cold soil with rain. Therefore, you may find grain samples that have a low germination percentage in a germination test at room temperature, but germinate perfectly well in the field where the soil temperature is low. If you have a fresh grain sample with low germination, you should take a new germination test at a temperature below 10°C, for example in the fridge. Of course, this takes longer and is annoying at a time of year when you often want a quick answer, but it's the way to do it.

## Priming

The germination capacity, i.e. the maximum germination percentage, is highest right after harvest. It cannot be improved. It can only deteriorate. However, there is an opportunity to cheat a little, because there is actually a way to speed up emergence, even in grains with optimal germination vitality. When germination begins, it starts with a series of chemical processes inside the kernel and it always takes some time before the leaf and root sprouts start growing out of the kernel. While this is happening inside the core, the weeds are already starting to sprout around it. You can take advantage of this. You can simply start germination before sowing. This is called priming and is used in many vegetable crops and also in maize to ensure rapid germination. In practice, this can be done with grain in a malting plant by subjecting the seed to a very short malting, which is stopped before the root sprout breaks through the surface of the kernel. In this phase, the grain can tolerate re-drying, and you can save a few days in the field on the initial germination phases. In the field, the soil temperature is usually low at the time of sowing, and at low temperatures, priming can speed up germination by several days. This has a major impact on weed competition and also extends the growing season by a few days, increasing yields.

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