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Nordic Association of Agricultural Scientists

NJF Seminar 474

Nordic heritage varieties of cereals

- History, cultivation, breeding, milling, baking, brewing, food quality and health

Mariehamn, Åland, Finland, 15-17 July 2014

NJF
Nordic Association of Agricultural Scientists

Programme

15 July

08:30-08:45	Welcome to Åland Miljöminister Carina Aaltonen,
08:45-09:15	The agriculture on Åland, Joachim Regårdh, Hushållningsällskapet Åland,
09:15-09:45	Heritage varieties from the Nordic-Baltic region Igor Loskutov, VIR,Vavilov Institute, Russia
09:45-10:15	Coffee
10:15-10:45	Heritage varieties ex situ and in situ in Finland Maarit Heinonen , MTT, Finland
10:45-11:00	Landraces in Nordgen collections Jette Nydam Hansen, Nordgen Alnarp
11:00-11:15	Heritage varieties in Estonia Annika Michelsson, Estonia
11:15-11:30	Heritage varieties in Sweden Anders Lunneryd, Wästgötarna, Sweden
11:30-11:45	Heritage varieties in Norway Silja Valand , Norsk landbruksrådgivning, Norway
11:45-12:00	Heritage varieties in Denmark Anders Borgen, Agrologica, Denmark
12:00-13:00	Lunch
13:00-13:30	The cultural history of rye in Finland Hannu Ahokas, MTT, Finland
13:30-14:00	British heritage wheats Andrew Forbes, Brockwell Bake Association, England
14:00-14:30	Input to an active Norwegian plant genetic policy Åsmund Åsdal, Norsk Genressurssenter
14:30-15:00	Coffee and bread
15:00-17:00	Added-value processing of cereals
15:00-15:45	Science meet the Market-tension between theory and practice Kristina Creutz, Malmgård,Finland
15:45-16:30	Local organic food from Åland Mikael Björklund, Åland
16:30-17:00	Discussion
17:00-20:00	Posters and stakeholders market, farmers, millers, bakers,associations,genebanks, researchers
20:00-22:00	Dinner

16 July

08:30-12:00	Nordic heritage varieties of cereals.
08:30-09:30	Health aspects of rye Prof Kati Katina, The Nordic rye group, Helsingfors University, Finland
09:30-10:00	Mineral content in cereals Hans Larsson, Swedish University of Agricultural Sciences, Alnarp, Sweden
10:00-10:30	Coffee
10:30-11:40	Aroma profiles of cooked wheat grain compared to whole meal bread prof Åsa Hansen LIFE, University Copenhagen, Denmark
11:40-12:00	Baking with heritage varieties Jörn Ussing Larsen, Bageriet Aurion, Denmark
12:00-13:00	Lunch
13:00-14:30	Organic breeding of cereals
13:00-13:30	Evolutionary breeding and new heritage varieties Hans Larsson, Swedish University of Agricultural Sciences, Alnarp, Sweden
13:30-14:00	Breeding in Denmark Anders Borgen Agrologica, Per Grupe Mördrup gård,
14:00-14:30	Breeding in Norway Johan Svärd Aschim vestre, Anders Naess Oikos,
14:30-15:00	Coffee
15:00-18:00	Demonstration of heritage cereals in the field, Jomala experimental station
19:00-21:00	Tasting experience and dinner in Smakbyn

17 July

09:00-16:30	Excursion
09:00-09:45	Bus from Mariehamn
09:45-11:30	Organic farming, Organic cereals 150 ha including spelt wheat, Marketing and distribution of organic cereals from the farm Mats Häggblom, Germundö gård, Saltvik
11:30-12:30	Milling of organic cereals Överängs kvarn Sören Karlsson, Ödkarby, Saltvik Baker Verner Sundberg
13:00-14:30	Lunch at pub Stallhagen, Finström, Ålands only brewery
15:00-16:00	Small bakery Johannas hembakta, Kvarnbo, Saltvik Presentation of the bakery and coffee
16:25-16:30	Arrival to Mariehamn

Nordic and Baltic Cereals Genetic Resources Heritage in Global Collection of Vavilov Institute of Plant Industry (VIR)

Igor Loskutov

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The N.I.Vavilov All-Russian Research Institute of Plant Industry (VIR) is a genebank that is the oldest in the world and the largest in Europe. Its collections number over 325 thousand accessions of plant genetic resources which include both a widest range of cultivated crops and their wild relatives. Since its initiation in 1894 in the form of the Bureau for Applied Botany, VIR has been closely cooperating with Nordic countries. The first accessions sent from Finland and Sweden, or collected there date back to 1901-1904. The passport database of VIR collections (http://vir.nw.ru/data/dbf.htm) is available online and offers data on the most historically interesting crop accessions. For instance, collecting of genetic resources of winter and spring wheat, winter rye, spring barley and oat was carried in the first half of the 20th century before WW2 in such Nordic and Baltic countries as Iceland, Norway, Denmark, Sweden, Finland, Lithuania, Latvia and Estonia. Passport data on each accession contain information about the entity that collected the accession or handed it over to VIR and the time frame. This material is represented by landraces, primitive varieties and improved cultivars collected or created in the first half of the 20th century. All accessions of the above-mentioned crops display wide botanical and genetic diversity that covers a big number of forms possessing special importance for breeding purposes both in Russia and abroad. Besides, the collections include breeding material from the mentioned countries (most of all from company Svalof, Weibull, Hankkija, Jokioninen, etc.) that was collected or otherwise included in the collections in the 1960's–80's. These accessions are represented by improved cultivars and breeding lines that feature a wide diversity of economically important traits. All accessions from the VIR collections have been studied under conditions of the Russian Federation and some of them have been used as commercial cereal cultivars since 1920's.

Heritage varieties ex situ and in situ in Finland

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In Finland agriculture and horticulture are today mainly based on the use of bred cultivars. However landraces and local strains are cultivated to some extent, especially landraces of cereals, forages, fruits, berries and some vegetables. There are no comprehensive statistics on landrace cultivation in Finland. Since 2000 the Decree for the conservation varieties, their seed production, approval and marketing has been applied to cereals, forage, pulses and some other arable land crops. There are 17 registered conservation varieties. Furthermore, 5 local strains of forages and one landrace potato are accepted to the National List of Plant Varieties.

The need for landrace *in situ* inventories has been stressed by international policies and strategies for a sustainable use of Plant Genetic Resources for Food and Agriculture, beside by many papers specifically referring to Europe (e.g. Veteläinen *et al.*, 2009). In Finland the first collecting missions were organized by professional plant breeders who collected and studied an extensive amount of landrace samples for breeding material during the early 1900s. The Nordic Center for Plant Genetic Resources (NordGen) conducted its inaugural landrace collecting missions of cereals and forages during the late 1970s and early 1980s in Finland. Later in the mid 1990s and 2000s cereal landrace inventories were conducted by the Seed Testing Department and MTT Agrifood Research Finland (Heinonen & Veteläinen 2009). During 2011-2014 within the EC FPVII funded PGR Secure project MTT Agrifood Research Finland has set up the nationwide *in situ* inventories on local apples, pears and potato onions as well as updates on landrace cereals.

The landrace cereal accessions both *ex situ* and *in situ* will be presented as well as conservation programme of conservation varieties. The description of landrace inventory process will be provided. The National Landrace *in situ* Conservation Strategy for Finland (Heinonen 2014) will be also discussed.

References:

HEINONEN M 2014. National Landrace *in situ* Conservation Strategy for Finland. MTT Report nro xx. Forthcoming in June.

HEINONEN M, VETELÄINEN M 2009. Cereal landrace inventories in Finland. In: European landraces: on-farm conservation, management and use / M. Veteläinen, V. Negri and N. Maxted (Eds). Bioversity technical bulletin 15: p. 70–78.

VETELÄINEN M, MAXTED N, NEGRI V (eds.) 2009. European Landraces: On-farm Conservation, Management and Use. Bioversity Technical Bulletin No. 15, Bioversity International publ., Rome, Italy. ISBN 978-92-9043-805-2 also available at http://www.bioversityinternational.org/index.php?id=19&user_bioversitypublications_pi1[showUid]=3252

Landraces in NordGen collections

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Nordisk genresourcecenter blev dannet i 1979. Siden da har NordGen modtaget prøver af alle dyrkede arter og af vilde slægtninge til de dyrkede arter. NordGen blev oprettet for at bevare den genetiske variation. Den genetiske variation var ved at forsvinde, da landbruget gik over til at anvende højt forædlede sorter, og de fleste sorter var desuden forædlet ud fra det samme oprindelige materiale. Mange landmænd anvendte de samme sorter, selvom der var mange sorter på markedet.NordGen har knapt 20.000 prøver (accessioner) af de forskellige kornarter i fryserne. Prøverne er modtaget fra forædlere, fra indsamlinger, fra forskere, fra sortsafprøvningsinstitutioner, fra repatrieringsprojekter, privatpersoner mm.

Tabel 1. Oversigt over landsorter og moderne sorter på NordGens lager af de fire kornarter

art	Antal accessioner i alt	Antal forædlerlinjer mm	Antal forædlede moderne sorter	**Antal landsorter**
Byg	14077	12612	562	**521**
Hvede	3648	2625	311	**712**
Havre	1051	900	70	**81**
Rug	485	254	81	**150**

Som det fremgår af tabellen er der relativt mange landsorter i forhold til antal forædlede moderne sorter. Landsorterne stammer fra alle de nordiske lande, men der er rigtig mange fra Finland, men også en del fra Sverige, se tabel 2. Dette skyldes, at der i 1980érne blev sat fokus på indsamling af landsorter i både Sverige og Finland. Desuden havde den førte landbrugspolitik og infrastruktur i især Danmark medført, at der var meget få landmænd, som anvendte egen udsæd, og de fleste landsorter fra Danmark er derfor nok gået tabt.

Tabel 2. Oprindelesland for landsorter i NordGens lage. De mange landsorter fra lande udenfor Norden stammer fra store indsamlingsekspeditioner for 30-70 år siden til Asien, Mellemøsten mm.

Oprindelses land	
Danmark	45
Norge	39
Sverige	99
Finland	254
Andre (Rusland, Afghanistan, Tyskland m.fl.)	1027

Udover landsorterne af de fire dyrkede arter af korn, har NordGen 71 prøver af landsorter af andre hvede arter (emmer, spelt, enkorn mm). Af de vilde slægtninge til de fire kornarter har NordGen i alt 1314 forskellige prøver.

Heritage Varieties in Estonia - cereals and other field plants

Michelson, Annika HAMK, University of applied sciences, Estonia

Cereal breeding have actively been carried out in Estonia for more than 150 years. Many of the active breeders were Baltic German landlords. One of the oldest and the most famous landrace is Sangaste rye, breeded in 1875 by Count Fredrik von Berg, owner of Sangaste castle.

Estonian landraces are shortly mentioned in a learning book from 1928 by Käsebier. He mentions Midsummer rye and four lined barley with short growing season and two lined straight and drooped barley. Among wheat only one is mentioned, "common wheat", a local landrace with high diversity that gives a lot of good material for breeding. Local landraces are mentioned to be winter weather proof but giving low yields. Õisu wheat is mentioned by name. From Õisu wheat Count Berg breeded Sangaste wheat. Oat was mentioned only as animal food. Local oats was breeded by Rathlef and Eisenschmidt (they were called improved local landraces). Käsebier mention also Kehra Tangu, Varane and Saagirikas as being new local oat breeds in 1928. However, there is little known about the local landraces cultivated by Estonian farmers. In the private sector many local breeds and plants survived also the Soviet era, but it is a huge challenge to make inventories in private gardens and among small farmers today.

At present there are on the list of Estonian local landraces two cereals, Sangaste rye and winter wheat Sani. Sangaste is an old variety whereas Sani is a new variety. There are several native potatoes in the Estonian Genebank, but only three are on the list of local landraces and available for people, Jõgeva yellow, Väike verev and Endla. Fodder beet "Jõgeva Eckendorf", turnip "Kohalik sinine" and Medicago falcata "Saaremaa kohalik" are also local landraces. A large group of local potato onions are found among Russian old believers in the villages on the shore of Lake Peipsi. These diverse onions are referred to as Peipsiäärne onions. Much work has still to be carried out in order to map possible heritage varieties of Estonia.

Wästgötarna ekonomisk förening - ett koncept för framgång - då - nu - framtiden

Anders Lunneryd www.wastgotarna.se

Vår förening består av åtta medlemmar med lika stor insats i föreningen.
Tillsammans brukar vi mer än 1000 ekologiska ha, de flesta har dessutom djurhållning.
Syftet med föreningen är att tillsammans förädla och sälja medlemmarnas spannmål.
Vi nyttjar fyra mindre kvarnar för malning och packning av produkterna.
Vi har egen distribution men säljer även till olika grossistföretag.
Våra kunder är små bagerier, restauranger, gårdsbutiker och stora handelskedjor som ICA,Coop och Hemköp.
Lejt arbete förutom kvarnarna är tillverkning av flingor / flak och bokföring / fakturering.

Heritage varieties of cereals in Norway

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Systematic plant breeding of cereals started in Norway around 1900-1920 at Norges Landbrukshøgskole in Ås. Initially, different landraces were gathered from farmers and tested. Many different varieties adapted to local climate, were found. The best varieties were used in further breeding, using simple selection techniques at first. Also official field trials were started, and in 1916, the first officially tested barley variety was marketed. 'Maskin' barley was a selection variety originating from landrace 'Bjørneby'. In 1926 the first selection variety of wheat was introduced, 'Ås'. This was a selection from landrace 'Børsum'. During this time, crossing techniques started, and many more varieties originated from that work. The first variety originating from crossing techniques was marketed in 1936, the wheat variety named 'Fram'.

Unfortunately only a small number of the original, Norwegian heritage varieties have been preserved until today. As of June 2014 Norway have 64 accessions of landrace cereal varieties in SESTO, NordGens gene bank documentation system. These accessions represent 25-35 different heritage varieties. Almost 20 of these are varieties of barley, 3-4 varieties of oats, 2 varieties of winter rye and about 5-6 varieties of wheat.

Among barley varieties there are many different strains, allegedly adapted to local climate. Barley varieties have not been much tested in field trials in recent years. The few varieties of oats represent one or two varieties of black-hulled oats, collected from Seed Savers Exchange in Canada and two varieties from Vavilov Research Institute of Plant Industry in Russia. These are varieties originally from Norway, yet stored in the Russian gene bank.

Of the 5-6 varieties of wheat only some have been tested in field trials. 'Børsum' and 'Østby' represents the two main types of landraces of wheat, found during the initial gathering of varieties in ca 1900. 'Børsum' has no or only small awns, short ears, long straw and generally small kernels. ' Børsum' was at it´s best in sandy soils and in warm weather.

'Østby' is more susceptible to diseases, but have generally better grain quality than 'Børsum', having larger kernels. 'Østby' also has a long straw, subjected to lodging.

Of all the Norwegian varieties 'Finnerug' has the most intriguing story to it. Finnerug is a special kind of rye, used in "slash and burn" type agriculture. It was assumed lost, and had not been in use for decades. Still, in 1973 ten kernels were discovered in a small, traditional building used for drying grains, by conservator Per Martin Tvengsberg. Seven of these were healthy and gave rise to Norway´s first officially approved conservation variety 'Svedjerug Tvengsberg'.

Heritage cereals in Denmark

Anders Borgen, Agrologica www.agrologica.dk

Denmark has taken a very strict line on the administration of the EU Seed legislation. In fact, no conservation varieties has so far been approved in Denmark, because the cost and burdens for administration exceed the benefit on growing the ancient grains. Danish seed savers and organic farmers have therefore been very active lobbying for a reform of the EU seed legislation, promoting both conservation varieties, heterogeneous populations and small scale seed production. The commission proposal for a revised Seed legislation was rejected by the parliament, but a new derogation for heterogeneous population has been opened within the existing legislation. We plan to use this derogation to promote populations of cereals as an alternative to the commercial pure line varieties.

The European consumption of spelt has in 2013-14 exceeded the production, and the price of spelt increased to over 2€/kg. This has led to an increased demand for alternatives to spelt, and in Germany Danish producers are promoting Ølands Wheat to replace spelt.

The evolution of rye, an obligatory cross-pollinator, from shattering to non-shattering required isolation from and drastic selection against the shattering form

Hannu Ahokas, MTT-Agrifood Research Finland, FI-31600 Jokioinen, Finland (retired)

The evolution of wild characteristics to non-shattering and domesticated forms took millennia in the self-pollinating cereals. Rye (*Secale*), a cross-pollinator would not have had time to evolve to a non-shattering crop ever during the era of agriculture without isolation from and drastic selection against shattering wild or weedy rye. The few occurrences of rye in the Prehistoric samples in Near-East, E and SE Europe originated either from exploitation of wild or weedy rye in other crops or incidental growing trials. Any rye declined and wheat usually became an overwhelming cereal when climate improved in the Prehistory. The growing of the domesticated rye spread from the Baltic region. Rye did not occur among the archaeological cereals e.g. in a farm house in Holland built in 1120-1135, or in hill dwellings in Smolensk (Russia) in 11-12th and in Bantserov (Belorussia) in 6-8th century AD, though being the most grown cereal in these Soviet areas in the 20th century. Rye was regarded as a weed in the Caucasus in the 19th century and in Iran in the 1950s. Recognized poisoning with ergots in the Antique Realms probably gave all rye a long-lasting noxious rumor. Rye and crop cultivation in general spread eastwards to Siberia in the 18th century after the Little Ice Age, and was associated with thousands of expelled, imprisoned Finns and people from the Baltic by Russians to Siberian mining and lumbering camps since about 1702, especially during the Great Hate. – The domesticated rye could not evolve where the shattering rye was sympatric. The *kytö* soil burning by the Finns since the Prehistory combusted the shattered crop seeds along with those of weeds, like wild oats (*Avena fatua*). Soil free from the weed-rye seed bank was also ensured by the slash-and-burn of virgin forest land. Rye, probably as a contaminant in winter cereals or buckwheat was introduced to the territory of Finland in the Prehistory 4000 years ago, or earlier. The only god of rye known was that of the Pre-Christian Finns. – In the early 1500s, only Finns of the Nordic peoples ate rye bread besides barley bread according to Olaus Magnus (1555) who also showed that the winter rye was sown at the set of Dog Constellation (i.e. in June). Spring sowing of winter rye made it possible to select spring-habit mutants (dominant in rye) to establish a summer rye stock, which I experimentally proved. Spring-sown winter rye was long co-cultivated in Finland with seasonal plants as the crops of the first summer. The Finnish seed rye dried in *riihi*, fortified with minerals from fire lands and practically free from ergot had demand abroad since the Prehistory to about 1900. – The Oxford English Dictionary (1989) gives the stem word **rugiz* for "*rye*" being nearly identical with the Finnish name *rukis* which also has an elision form, *rukis* > *ru'is*. The Swede J. Ihre (1769) listed the Finnish word for 'reed', 'grass', *ruoho* as a possible source for the Swedish *rog* (*råg*), 'rye'. *Ruoho*, originally *ruoko*, 'reed', also appears in archaic Finnish as *rogo* and *ronka*. – Like the *kytö* in Finland, the *guie* soil burning in Ethiopia was the decisive means of selection of some endemic cereals: non-shattering from shattering, like tef (*Eragrostis tef*), a very small-grained cereal from *E. pilosa*, finger millet (*Eleusine coracana* ssp. *coracana*) from ssp. *africana* and Abyssinian oats (*Avena abyssinica*) from *A. vaviloviana*. The Abyssinian oats, originally not being grown for any purpose, evolved as an unintentional secondary crop among barley in Ethiopia.

The Brockwell Bake Association and UK heritage wheat
Andrew Forbes, United Kingdom

http://www.brockwell-bake.org.uk/

The Brockwell Bake Association is a voluntary community organization based in South London. From an annual "real baking" event in 2008 we now have our own mill and oven for regular baking. We also have a mobile oven and threshing pen and mills that we take to local schools and public events to teach about the "staff of life" from "crop to crust".

We currently use modern variety cereals from organic and biodynamic farmers within 80km of London exclusively in all our milling and baking but we have the aspiration to be using British origin heritage wheats in the future and for this we are in a programme of bulking up from genebank saved germplasm. We also provide heritage wheat seed to school and community gardens across the UK.

British heritage wheat history
British land ownership and agriculture changed radically with early industrialization and urbanization during the mid-19th Century. The previous system of communally farmed and administered "common" land was ended by landlords in a process known as "Enclosure" and the new breed of landed "gentleman" farmer turned away from the good milling genetically diverse and locally adapted "landrace" wheats towards high yield low quality "early cultivars" principally destined for animal fodder usage – often known as "Square Head" or "Prolific" types. British urban bakers and millers were forced to turn to imported wheat first from the Baltic and the Ukraine, then from Northern America, India and Australia. The process is described in detail here http://www.brockwell-bake.org.uk/docs/UK_cereals_1760_1930.pdf.

In our BBA heritage wheat programme we have tried to find all remaining genebank stored examples of those wheats typically grown for milling before the mid to early-19th Century in the British Isles. For England we are following wheats such as Red Lammas, Old Kent Red, Kent Woolly Eared and Chidham and we have also forwarded to interested farmers and bakers wheats we have found in genebanks for cultivation in Scotland and Wales.**BBA online "wheat:gateway" database and website** http://brockwell-bake.org.uk/wheat/http://www.wheat-gateway.org.uk/

From some modest funding to create an online record of our own heritage wheat lines and their evaluation we have built a website containing records of the vast majority of wheat germplasm held in genebanks across the world. This includes the over 398,000 accessions in the Russian, USA, Australian, Nordic, CIMMYT, ICARDA and European countries' genebanks supplemented with extended collection site and genetic information from http://www.figs.icarda.net/, http://wheatpedigree.net/ and http://www.shigen.nig.ac.jp/wheat/komugi/genes/download.jsp.

Our main aim in this project is to aid others interested in low input cereal cultivation to find all accessions of the heritage lines important to them alongside as much available relevant information as possible and to create online tools for users to add to relevant information and share their evaluations of heritage lines.

Seed laws and farmers' rights

Dr. Regine Andersen, Executive Director, Oikos – Organic Norway

Plant genetic diversity for food and agricultural constitutes the basis for all food production around the globe. Professional plant breeders and farmers alike depend on this diversity, as it contains the traits necessary to develop plants with regard to their nutritional characteristics, taste, storage and processing. Not least, it contains the traits required to make plants resistant to pests and diseases, and capable of adapting to diverse farming conditions and climate change. For organic farming this is essential, as chemical pesticides are banned and thus organic plants need much resistance against such challenges. Plant diversity is essential not only for our nutrition, it is probably the single most important environmental factor in agriculture today, precisely because it determines the extent to which it will be possible to adapt food production to shifting environmental and climate conditions.

And yet, plant diversity has been disappearing at a rapid rate over much of the globe. In 1998, FAO reported that some 80% of the diversity estimated 100 years ago in important cultivated plants like wheat and maize had vanished from the countries generally deemed the centres of their historical origin. This is mainly due to the modernization of agriculture, with high yielding varieties and production systems which enabled radical and most necessary production increase, while, however, at the same time wiping out untold varieties of crops.

Regulations on plant variety release and the marketing of seed and propagating material have been introduced to ensure plant health and seed quality. Although their provisions vary, the result is increasingly that traditional varieties are excluded from the market, by prohibiting the exchange or sale of seeds from such varieties.

This presents us with a serious dilemma. Rules intended to stimulate innovation by plant breeders may reduce the genetic foundations of plant breeding; and rules intended to ensure plant health may actually compromise plant health because the diversity that could provide genetic robustness is reduced precisely because of such rules.

Furthermore, seed legislation increasingly tends to limit the legal space that farmers have to save, use, exchange and sell farm-saved seed. This constitutes a serious threat to these customary rights that farmers have had since the dawn of agriculture, and which is the basis of the rich genetic heritage of agricultural plants. Farmers' Rights have been recognized internationally under the International Treaty on Plant Genetic Diversity for Food and Agriculture, which provides an important international framework for regulations in this field.

In the EU, the situation has been difficult for organic breeders and farmers engaged in on-farm management of agrobiodiversity as well in breeding activities. After a long evaluation process, new regulations have been on their way which represented substantial improvements in many aspects. Nevertheless, a decision in the EU was stopped early 2014, mainly by NGOs and activists mobilizing against the proposal. Their argument was that it was not sufficient. However, as a result, European farmers and breeders are left with the 'old' legislation, which is much worse with regard to the objectives of the NGO, and without any clear prospects of improvements.

In this presentation, the process and reasons for the current situation with regard to the EU seed laws will be explored as background for considerations on the further development in this field – in light of the International Treaty and its provisions on Farmers' Rights.

Forskningen möter marknaden – spänning mellan teori och praktik.
Kristina Creutz , Malmgård, Finland

Det är en sak att odla gamla kulturssorter, men det är en helt annan sak att marknadsföra dem. För oss sk "lokala vidareförädlare" är det viktigt att vara bra på båda. I mitt föredrag kommer jag att fokusera på det senare, alltså marknadsföringen. Här tror jag att vi kan utbyta idéer mellan länderna och dessutom samarbeta mer än vad vi hittills gjort.
Vi lever just nu i en förändringens tid – vi vet att något är fel – allergier och sjukdomar ökar – vi vet att vi måste bli mer medvetna om vad vi äter och den miljö som vi lever i. Här ser jag vår chans! Jag tror starkt på att vi kan hitta en bra plats i den allmänna konkurrensen.
Runt om i världen ökar den närproducerade maten. Fler och fler vill veta varifrån maten kommer och på vilket sätt den gjorts. Man talar om en trend, men jag tror istället att det rör sig om en stor förändring, som vi står inför och som vi redan delvis påbörjat. Vad skulle annars vara alternativet? Det tycker jag faktiskt är en bra fråga…
Att de gamla kultursorterna trivs ekologiskt är ju knappast någon nyhet mera, men att de smakar mera, har mer näringsämnen, är renare och att de har långa traditioner är nytt för de flesta.
Här behöver vi forskningen till hjälp, men också kockar och bagare. Det gäller att kunna erbjuda "hela paketet" när man tex lyfter ut emmern på marknaden. Vad är det som är bra för hälsan, hur skiljer sig smaken, vad kan man göra med den.
Forskningens roll är utan tvekan stor. Men här finns det stora krafter som verkar styra och ha stor makt. Ena dagen är det viktigt att äta ekologiskt – andra dagen är växtgifterna inte farliga. Här finns många spänningsmoment som påverkar oss men som vi också borde kunna påverka med rätt marknadsföring.
Marknaden förändras snabbt, åtminstone har det varit så i Finland. En allmän trend har varit att små nystartade butiker med närmat kommit och gått, medan de större kedjorna nu under det senaste året börjat visa ett stort intresse för det lokala. Här gäller det att hänga med och kunna leverera snabbt, vilket inte alltid är så lätt i småskalig produktion.
Malmgård säljer idag ca 70 % av spannmålsproduktionen i bulk till större uppköpare. Detta gäller främst moderna spannmål, men – en fråga: "Är industrin, dvs större kvarnar, större bagerier en marknad för de gamla kultursorterna?" Åtminstone verkar det finnas ett visst intresse från industrins håll då det finns bröd på finska marknaden som heter något som urvetebröd.
Nyckelord: spänningsmoment, kulturväxter, marknad, hälsosamt, smak, hållbarhet, forskning, närmat, miljön, ekologiskt, samarbete

Health aspects of rye

Prof Kati Katina, The nordic rye group, Helsingfors university

Rye is a traditional part of Northern and Eastern Europe cuisine called the European rye belt. Among the grains, rye is unusual as it is mostly consumed as whole grain. The main rye foods include dark, sour and crisp breads. Also new types of rye breads and ingredients have been developed for the modern consumer.

Rye is an important source of dietary fibre in Northern European countries, e.g. almost 40% of dietary fibre intake comes from rye foods in Finland and Denmark. Rye contains both soluble and insoluble fibre and together with several bioactive components, the fibre complex is presumably largely responsible for the health benefits of rye. Epidemiological studies suggest that consumption of whole grain foods is associated with reduced incidence of chronic diseases, e.g. diabetes, cardiovascular disease, and certain cancers. EFSA has accepted a health claim for rye fibre to improve bowel function. This presentation highlight unique features of rye to regulate bowel functions, enhance beneficial glucose metabolism, help weight management, reduce cholesterol and even reduce risk of certain cancers.

Minerals in organically grown heritage cereals

Hans Larsson, Department of plant breeding, SLU , Alnarp

Wheat is an important source of minerals such as iron, zinc, copper and magnesium in the diet. The dietary intake of these nutrients has fallen in recent years because of a combination of reduced energy requirements associated with sedentary lifestyles and changes in dietary patterns associated with lower micronutrient density in the diet. Recent publications using data from food composition tables indicate a downward trend in the mineral content of foods and it has been suggested that intensive farming practices may result in soil depletion of minerals. The mineral concentration of archived wheat grain and soil samples from Wheat Experiment established in 1843 at Rothamsted, UK was determined and trends over time examined in relation to cultivar, yield, and harvest index. The concentrations of zinc, iron, copper and magnesium remained stable between 1845 and the mid 1960s, but since then have decreased significantly, which coincided with the introduction of semi-dwarf, high-yielding cultivars.

In our first study,(Abrar et al 2012) 321 winter and spring wheat genotypes were analysed for twelve nutritionally important minerals (B, Cu, Fe, Se, Mg, Zn, Ca, Mn, Mo, P, S and K). Some of the genotypes used were from multiple locations and years, resulting in a total number of 493 samples. Investigated genotypes were divided into six genotype groups *i.e.* selections, old landraces, primitive wheat, spelt, old cultivars and cultivars. Especially landraces and primitive wheats like emmer wheat had very high mineral values. This study showed that a very high mineral concentration, close to daily requirements, can be produced by growing specific primitive wheat genotypes in an organic farming system.

In our ongoing study 25 winter cereals and 25 spring cereals are grown on four different localities during three years. Some of the cereals are the same in all four localities so it is possible to see both the influence of locality and variety. The cereals have been analysed on Cu, Fe, Mg and Zn. We are presenting some of the results from the first two years in the study.

Abrar, H et al 2010 Mineral Composition of Organically Grown Wheat Genotypes: Contribution to Daily Minerals Intake . International journal of environmental research and public health 7: 3442-3456

Fan, M.; Zhao, F.; Fairweather-Tait, S.J.; Poulton, P.R.; Dunham, S.J.; McGrath, S.P. Evidence of decreasing mineral density in wheat grain over the last 160 years. *J. Trace Elem. Med. Biol.* **2008**, *22*, 315-324.

Aroma profiles of cooked wheat grain compared to whole meal bread

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Baking quality of wheat is in general evaluated by measurement of the gluten quality and bread volume. The flavour of bread is described as influenced by the dough fermentation and baking processes, and wheat varieties are recognized as being without influence on the bread flavour.
The aim of this work was to investigate if it is possible to recognize any flavour differences between wheat cultivars, and if wheat cultivars have any influence on the flavour of the corresponding bread. Therefore, 24 samples of cooked wheat grain representing different wheat species, landraces and cultivars were served to a trained sensory panel to assess the flavour and odour properties of the cooked grain. Based on the results, the wheat samples could be divided into groups based on their sensory properties. Ancient wheat species, landraces and older cultivars were dominated by flavour of oat porridge and bulgur, while the flavour of more recent cultivars were described as wild rice, cooked malt, bitter and cocoa. Bitter flavour positively correlated to dark appearance.
Eight varieties were selected for preparation of whole meal bread (75% whole meal) to be used for sensory evaluation. The sensory characteristics of the cooked grain could also be recognized in the corresponding bread samples indicating that sensory evaluation of cooked wheat grain can be used to predict the flavour character of the corresponding bread.

Evolutionary plant breeding in cereals with heritage varieties

Hans Larsson Plant breeding department, SLU, Alnarp

In evolutionary plant breeding crop populations with a high level of genetic diversity are subjected to the forces of natural selection. In a cycle of sowing and re-sowing seed from the plant population year after year, those plants favored under prevailing growing conditions are expected to contribute more seed to the next generation than plants with lower fitness. Thus, evolving crop populations have the capability of adapting to the conditions under which they are grown. The main focus is on the ability of evolving plant populations to deal with stressful, variable and unpredictable environments. Evolutionary plant breeding generates plant populations that are neither uniform nor stable, on the contrary they are genetically highly diverse and changing in their genetic constitution over time.

Evolutionary plant breeding has concentrated on Composite Cross Populations (CCP) with modern varieties and as evolving populations they are similar to traditional landraces and therefore they have been called 'modern landraces'. However, landraces are also characterized by additional properties such as local adaptation to climate and soil, historical origin and association with traditional farming systems.

With mixing landraces and older cultivars from Nordic cereal breeding up to the 1970ies it is possible to create new diversity very suitable for organic farming throughout the Nordic countries. Mixing can be made after testing the material in the region and selecting the best looking varieties for the population. The easiest diverse populations are done with the crosspollinating winter rye and spring rye. Other cereals normally have a small percentage of crosspollination which is enough for creating evolving populations. Populations can be created from two to 50 varieties and be used immediately as productive crops. Diversity in the field with different resistent genes will be the only efficient method to stop the spread of diseases. The ultimate goal is to have farm varieties for the organic farms.

Evolutionary plant breeding can be done by all interested farmers and in this way new diversity will be created of locally adapted populations with high quality for artisanal food production.

I will present some of the new diversity of populations in theory and in the field.

Döring T. F., Knapp S., Kovacs G., Murphy K. and Wolfe M.S. 2011 Evolutionary plant breeding in cereals- into a new era. Sustainability 3, 1944-1971.

Organic cereal breeding in Denmark

Anders Borgen Agrologica

Denmark has two commercial cereal breeders, Sejet and Nordic Seed. Sejet has started breeding barley for organic farming, and Nordic Seed is testing wheat and barley from the German biodynamic breeder Karl-Josef Müller for the marked potential in Denmark. They are also breeding bunt resistant spring wheat target for the organic marked. Nordic Seed and Sejet mainly work with the major crops like animal feed, malting barley and common baking wheat. Breeding is done on conventional conditions, but yield trials and some assessments are done on rented organic fields.

Organic plant breeding is not only a question on meeting the demands of organic farmers for adapted varieties, but also the make the breeding process and the breeding system more organic. The current use of plant genetic resources is not sustainable, as the loss of genetic resources is faster than the development of new varieties. Concentration to breeding on still fewer large companies promoting few pure line varieties decrease the biodiversity in the agricultural system. Conservation of plant genetic resources rely to increasing extend on *ex sity* conservation which cannot preserve the diversity of a true seed system, and which rely on uncertain economical support from the political priorities.

Agrologica (Anders Borgen) has started a small breeding program for alternative cereals in cooperation with Mørdrupgård Korn (Per Grupe) and other organic producers. This breeding program is organic at all stages of the breeding process, and the aim is to meet the demand for cereal niches other than large scale organic production, and to test the bottlenecks of purely organic plant breeding. Hence, the concept is diversity both within crops by way of populations, and between crops by developing new crops for novel markets. The program include naked winter and spring barley, millet, winter and spring oat, winter and spring wheat, purple wheat, durum, spelt, and exotic wheat species.

Presentation of our work with developing old Scandinavian grains for practical use in Norway

Johan Svärd, Aschimlinna, Brandbu

For us the story of ancient grains started in 1999, when we got a sample of rye seeds, "svedjerug", from Øystein Haugerud at the regional agricultural office in Buskerud. Øystein in his turn had got his seeds from "Domkirkeodden in Hamar", the garden where they took care of a few seeds found in the 1970s in an abandoned barn in Finnskogen. We sowed the few seeds given to us by Øystein and within 4 years we had over one ton. However, it turned out that no mill was interested in buying svedjerug, and we had to start thinking of what to do with our grain, as we wanted to continue growing it. This was when we bought our mill, an old stone mill.
On a conference in 2004, we met Hans Larsson, and we got very inspired by his work with ancient grains. Through Hans I got over twenty samples of old, forgotten grains from the Scandinavian genetic bank (SGB). After a few years we had at least 20 kilo each of all the old grains. Some of the grains we started to produce for sale. From 2007 we have exclusively grown ancient grains on the farm. Over the years we got some more varieties from Hans Larsson and also directly from the genetic bank.
From 2004 until 2006 we applied for, and got some sponsor money for our work with finding suitable grain varieties for organic farming in Oppland county.
In 2007 we, together with the regional office of **Norwegian Agricultural Extension Service** center, started a project sponsored by "Norsk Genresurssenter". This institution sponsors projects that gather information about, and inspire the use of, old plants and animal races.
Our project consists of three parts:

- Test the agronomy of old grain varieties for commercial use.
- Start up production of more grains from the SGB.
- Start up a practical genetic bank to develop the interest for old grains among farmers.

Each year the practical genetic bank sends out seed samples of one kilogram or more, to households and institutions that are interested. In the first years we sent out grain samples to about ten addresses. Last year, 2013, we sent out 36 samples, and this year we have sent samples to over 40 farmers, hobby farmers and institutions.
In 2014 we started the production of 15 new grain varieties from the SGB. In addition we started producing six samples of old Norwegian grains from the genetic bank of St Petersburg, which were collected by Soviet researchers in the late 1920s. We have also got a few samples from Anders Borgen in Denmark.

Seed production of heritage varieties in Norway

Anders Naess, Prestfoss, Norway

Økologisk Spesialkorn (established in 2008) is a company registered in Norway operating both as a traditional mill and as a company selling certified organic seeds to farmers. The company is approved by the Norwegian Food Safety Authorities (Mattilsynet) to be a commercial seed company selling any kind of agricultural seeds. According to the new seed laws it has been opened for farmers, with Norwegian Food Safety Authority approval, to produce certified seeds of conservation varieties of cereals. In Norway there is a few varieties listed as conservation varieties. The director of Økologisk Spesialkorn, Anders Naess will talk about the process of becoming approved by the Food Safety Authorities, what kind of seeds of conservation varieties the company can offer now and about their strategy for development of their commercial seed production.

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Demonstration Åland

Evolutionära sorter A-L

A Vårråg

B Våremmer

C Vårspelt

D Vårspelt Gotland

E Vårspelt Öland

F Vithavre

G Svarthavre

H Nakenhavre

I Brun vårvete: Öland 13, Fylgia, Öland 17,Västergötland, Öland6 , Dala urval,Lv Dalarna

J Brun borstig vårvete:Lv Dalarna 15, Lv Dalarna 2, Östby

K Vit vårvete:Vårpärl,Lv Dalarna vit,Svenno,Aurore,Lv Halland

L Vit borstig vårvete: Lv Dalarna 15,Algot,Diamant kort, Zaros

M Sol havre 1943 Utsädesföreningens västergötlandsfilial

N Orion tidig svarthavre 1946 Svalöv

O Engelbrekt svarthavre 1931 Svalövs Ultunafilial

P Sisu havre Hankkija, Tammisto ,Finland

Q Diamant II Svalöv 1938 Kolbenx Halländskt lantvete

R Lantvete Dalarna

S Ölands lantvete

T Kärn II 1947 Weibulls

U Kajsa 6radskorn 1977

V Ingrid 1958 Weibulls Balderx (BinderxOpal)

X Domen 1959 Norsk sort

Y Naket 2radskorn

Z Naket 6radskorn

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