

The 7th Circumpolar Agricultural Conference

Circumpolar Agricultural and Land Use Resources - Prospects and Perspectives for Circumpolar Productions and Industries



The world northernmost sheep farmer at 70.9°N

photo: Oskar Puschmann

Abstract booklet

Alta, Finnmark, Norway
September 6 - 8, 2010



Welcome!

It is with great pleasure that we welcome you to Alta, Finnmark and the 7th Circumpolar Agricultural Conference. The Circumpolar Agricultural Association (CAA) along with our co-host Bioforsk is pleased to host this conference.

This year's theme is to further enhance the understanding for "Circumpolar Agricultural and Land Use Resources – Prospects and Perspectives for Productions and Industries". The primary focus of this conference will be to address such innovative topics as **Climate Change** - challenges and opportunities, **Unique qualities** – in Circumpolar products, **Traditional Knowledge** – a basis for New Business development and **Rural tourism** – supporting Multifunctional agriculture

Agriculture is changing rapidly and there's more and more changes coming. The world food situation is rapidly being redefined by financial crisis, climate changes, high energy prices, globalization and urbanization. The role of agriculture and food production is given a renewed global attention.

Agriculture in Northern Norway, like agriculture in all far northern latitudes, is facing great challenges but also opportunities due to the Global climate Change situation which seems to affect the Northern areas strongest. Norway is the northernmost country in the world with agricultural activity, due to mild climate along the coastline and in the valleys, even up to 70 ° N in Finnmark. It is important to be aware of how farming will be affected and how farming work to adapt to combat the climate change challenges so far north.

Quality aspects such as clean nature and good animal and plant health are stressed as comparative advantages for the northern agriculture. But also topics as genetic resources and biodiversity, landscape preservation, food security and safety, cultural heritage and rural viability influence the new possibilities in a Northern Multifunctional Agriculture. To be sustainable, the arctic communities need stable sources of income, probably through a mix of traditional harvest of natural resources and modern industry and tourism.

We are pleased to present interesting and informative line-up of top quality speakers for you to enjoy. The program offers many opportunities to learn how experts from industries, researchers, politicians and public management agencies from many countries are approaching the Northern Agricultural and Land Use management in the 21st Century.

Alta offers you beautiful views and wonderful accommodations. In September, Finnmark have good climate and the autumn color in nature is at the finest. The conference tours and activities will showcase the highlights of the Finnmark and Troms areas, with focus on nature and Sami and Norwegian culture and traditions.

We tank all who had contributed to the planning and organization of CAC 2010, our sponsors, Co-Organizers, guests, speakers and all participants.

Öystein Ballari
President of CAA 2007-2010

Harald Lossius
General director, Bioforsk

Innhold

Thanks to all who did an excellent work in the program committee: 4

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Thanks to all who did an excellent work in the organizing and program committee:

- Øystein Ballari, president of CAA 2007 – 2010
- Ulrike Naumann, Bioforsk, Secretariat of CAC 2010
- Ajna Nystad, North-Norwegian agricultural Council, Secretariat of CAC 2010

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Abstracts

Plenum Session

Tuesday, Sept. 7th

Arctic-eco certification

Author:

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Institution:

West Iceland Rural Development

Abstract:

Most agriculture certification systems are based on the rules of organic agriculture. They restrict the use of inorganic fertilizer, pesticides and feed additives. They stress free range production systems, use of straw or sawdust in bedding areas and the use of nitrogen fixating plants in crop production.

In most arctic regions, however, many of these restrictions are not applicable and some of the most common alternatives are not available. Eutrophication is virtually unknown problem and arctic ecosystems are often limited by lack of nutrients. Additionally, productive nitrogen fixating plants are not available in arctic regions.

Natural ecosystems in the high North are, however, extremely fragile and are already under much stress due to climate change. Summers are short and winters harsh, leaving rangeland vulnerable to uncontrolled utilization. Free-range production systems can also be severely stressful for farm animals in arctic climates.

Wednesday, Sept. 8th

A New Program for Education in Small to Medium Scale Northern Agriculture

Authors:

Margaret Johnston, Julie Rosenthal and William Wilson

Institution:

School of Outdoor Recreation, Parks and Tourism Lakehead University, Canada

Abstract:

Very little of the agricultural education currently available in Canada is aimed at meeting

the needs of either new or established small or medium scale farmers working in more northern, and marginal, agricultural areas of the country. Further, areas with this type of farming are widely distributed across Canada, spreading thousands of kilometers from the southern Yukon, in the west, to the Labrador in the east, and from southern Northwest Territories, in the north, to the Thunder Bay area in the south. None of these areas is large enough, in itself, to support an agricultural educational institution, and the distances between areas, along with different area priorities, have made collaboration difficult, thus far. In addition, extension services in these areas have been reduced or eliminated. To begin to address this gap in opportunities to study small-scale and northern agriculture, we have designed and implemented a full-credit, multi-pedagogical course involving a four-week field trip, independent study, and an applied service-learning project. This presentation highlights preliminary results of a pilot run of this course, which provides a group of 12 Canadian university students an opportunity to examine models of successful small-scale agriculture in northern Canada, Iceland, Estonia, Finland, and Norway. It is our intention that this course will develop into a larger distance education and student exchange program that will facilitate opportunities for collaboration between students, faculty, and community members in northern Canada and northern Europe to study and address issues related to small and medium scale agriculture in northern regions.

The Prairie PhD: Research Relevant to Reservations

Authors:

Diane Rickerl and Tim Nichols

Institution:

South Dakota State University, USA

Abstract:

The “Prairie PhD” was a cohort-based, distance delivered graduate program for tribal college faculty and tribal professionals leading to MS and PhD degrees in Biological Sciences from South Dakota State University. The overarching objectives of the program were to design and deliver the food systems/natural resource management curriculum, and to support students through completion of their degrees, thus building capacity at tribal colleges and communities that would contribute to stronger institutions, organizations, and an improved quality of life for Native people. Program experiences and outcomes will be presented.

A Basis for Community and Economic Development - 1st Circumpolar Agriculture Conference to 7th Circumpolar Agriculture Conference

Author:

Randy Lewis

Institution:

R.A. Lewis – R. L. Resource Management Ltd (1st Circumpolar Agriculture Conference (1992) – Program Director), USA

Abstract:

To review the goals and objectives of the 1st Circumpolar Agriculture Conference 1992, “Opportunities in Diversity to Meet Global Change – Promoting Economic and Agricultural Diversity North of 60”, provide a summary of the relative progress to 7th Circumpolar Conference 2010 and summaries the opportunities to 2020. The initial concept for the circumpolar agriculture association and conferences started with some local and regional building blocks with Yukon and Alaska local production, research, policy development and market development enthusiasts. The goal of the 1st Conference was to start to formalize the communications, relationships and create a forum for agriculture industry, local, regional national and circumpolar jurisdictions, to cooperate within all areas of circumpolar agriculture and develop an agriculture plan for the north.

The 1st Circumpolar Agricultural Conference (CAC) themes were refined through a planning process in response to feedback from potential sponsors and delegates. The CAC Program outlined the major topics that were to be discussed by the conference participants. The emphasis was to be “results oriented”

An International Board of Advisors was formed in 1990 to start the planning for the Conference, representatives from Canada, Denmark, Finland, Greenland, Iceland, Norway and Sweden, United States/Alaska as well as a Host Committee to facilitate the planning and implementation of the 1st Conference. One of the main goals was to continue developing a conference and an association that reflected the long-term values of: “Sustainable Agriculture in a Circumpolar Environment” Conference planning and research identified the need to have the conference serve as a catalyst for action, “To showcase success and formalize the transfer of technologies and information among participants” A successful conference was not to be seen as an end product but as a means to identify a multitude of goals and objectives. The information and network of contacts generated by the conference were to become a valuable asset for all and facilitate further circumpolar agricultural development.

The summary will identify the next steps and describe a plan to 2020 that incorporates the long-term values of: “Sustainable Agriculture in a Circumpolar Environment”

Climate Change

Monday, Sept. 16th

Emission of Nitrous oxide and other greenhouse gases from organic manure and soil

Author:

Ingunn Øvsthus

Institution:

Norwegian Institute for Agriculture and Environmental Research, Arctic Agriculture and Land Use, Bodø, Norway

Abstract

Emission of nitrous oxide from of organic materials added to agricultural soil. The amount of greenhouse gases (GHGs) in the atmosphere is increasing rapidly. GHGs originate from both natural ecosystems and human activities. The most important GHGs are carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O). N₂O is an about 310 times more potent GHG than CO₂.

Nitrification and denitrification are the main processes leading to production of N₂O in agricultural soils, which contributes about 60% of all N₂O emitted to the atmosphere and up to 5% to the anthropogenic greenhouse effect. Nitrification refers to biological oxidation of soil ammonium to nitrite and nitrate under aerobic conditions, with production of N₂O as a byproduct. When oxygen is limited, heterotrophic, denitrifying microorganisms use nitrate and, subsequently, increasingly reduced intermediates as electron acceptors, thereby releasing N₂O and, if conditions are conducive to complete reduction, eventually N₂.

The main cause of agricultural increase in N₂O emission is the application of N fertilizers and incorporation of organic materials. In addition to containing more or less N, the latter provide energy and increase the biological oxygen demand. From several experiments it has been concluded that biochemical and physical properties of added organic materials influence the emissions of N₂O through effects on decomposability, N mineralization and generation of anoxic microsites. A laboratory experiment at Bioforsk Nord Bodø showed that the physical properties of organic materials, leading to differences in the degree of mixing with the soil, markedly influenced the N₂O emission from soil. The results can be explained by generation of anoxic hotspots in soil with a heterogeneous distribution of added organic materials as compared to even mixing.

Climate challenges and agriculture

Author: *Jon Olav Brunvatne*

Institution: Norwegian Ministry of Agriculture and Food, Norway

Abstract

The Government presented in July 2009 a White Paper on climate challenges and agriculture (Report No. 39 (2008-2009)) to the Storting. The Government's proposal enlarges on and supplements the White Paper on Norway's ambitious climate policy (see Report No. 34 (2006–2007) to the Storting) in relation to agriculture.

Sustainable and climate-friendly production of sufficient food and energy for the world's population is a major challenge. All sectors, agriculture included, are expected to contribute to emission mitigation measures and other measures to ensure positive contribution to reduction of the world's emission of greenhouse gases.

In the new White Paper the Government consider emission and uptake of greenhouse gases in the agriculture sector in Norway, and the adaption and instruments necessary for robust, climate-adapted agriculture in the future.

Carbon Sequestered in Bison Ranges of South Dakota

Authors:

Joe French, Diane Rickerl, and Tom Schumacher

Institution:

South Dakota State University

Abstract:

The re-introduction of bison to the Northern Plains of the USA offers a unique opportunity to investigate carbon sequestration potential in South Dakota soils. This study investigated bison rangeland soils as a carbon sink and developed a dollar value based on current market reports. Soil organic carbon was determined (for the 0-15 cm depth, from four sites, in three slope positions) by subtracting inorganic values from total carbon. Tonnes/ha of organic carbon were converted to tonnes/ha of carbon dioxide. Dollar values were obtained from the Chicago Climate exchange published in 2006 and 2010. Values using this method and impacts of policy will be presented, based on varying landscape characteristics. Currently ranchers can be compensated only for carbon increases due to management changes and are not able to sell carbon sequestered in existing rangeland soils. Conversion of rangeland to cropland often leads to relatively rapid and significant depletion of soil organic carbon. Maintenance of soil organic carbon in current rangeland is in many ways preferable to the cycle of range to crop to range conversions that may be encouraged by current market and policy forces. Policy makers might consider at least

partial financial support for managers willing to maintain rangelands that have considerable carbon storage from past carbon sequestration.

Climate change and geometric outbreaks in birch forest in Northern Norway

Author:

Snorre B. Hagen

Institution:

Norwegian Institute for Agriculture and Environmental Research, Division of Soil and Environment, Svanhovd, Norway

Abstract

In the birch forests of northern Norway, outbreaks of the geometrid moths *Epirrita autumnata* and *Operophtera brumata* are a major natural source of forest death. In the period 2002-2009, northern Norway experienced the perhaps most severe geometrid outbreak in modern history, which has led to extensive forest death, in particular in Finnmark county. Several lines of evidence suggest that there may be a close link between climate change and increased forest damage by geometrid moths in northern Norway in recent years. This talk summarizes the recent literature on this topic and presents potential directions of future research.

Climate change and large scale grazing systems and its consequences on habitats of Arctic-alpine plants

Author:

Lauri Oksanen

Institution:

Department of Natural Sciences, Finnmark University College, Alta, Norway, and Department of Biology, Section of Ecology, University of Turku, Finland

Abstract:

Warming climate threatens to eliminate the habitats of arctic-alpine plants and butterflies dependent on these plants by preparing the ground for the invasion of taller and more competitive plants. This process can proceed much faster than the invasion of forests, because the expansion of shrubs, which are already present on the tundra, is enough to make the land unsuitable for small, light loving species. Besides threatening arctic-alpine biodiversity, the expansion of scrublands increases the amount of solar radiation absorbed and converted to heat, and thus speeds up global warming. Shrubby habitats also melt out earlier than the open tundra. Therefore, shrub expansion changes white, reflecting surfaces to absorbing ones prematurely in early June, which also contributes to global warming.

The geography of arctic and subarctic areas aggravates the problems: most of the arctic and northern-alpine tundra lies less than 200 km north of or less than 200 m above the climatic timberline

Fortunately, arctic shrubs have turned out to be sensitive to reindeer grazing, and the same also applies to the birches that form the timberline in north-western Europe, whereas the prostrate arctic-alpine plants are, as a rule, grazing tolerant. Large scale grazing systems, such as the migratory reindeer husbandry of the Sámi and the Norwegian livestock husbandry (sæterdrift) could thus preserve arctic-alpine biodiversity and prevent the vicious circle, where increasing cover of shrubs and trees at high latitudes and altitudes contributes to global warming by increasing the amount of solar radiation converted to heat by the vegetation.

The Steigen concept: A regional approach towards an integrated resource management

Authors:

Christian Uhlig, Ingunn Øvsthus, Celine Rebours, Åsbjørn Karlsen

Institution:

Norwegian Institute for Agricultural and Environmental Research, Arctic Agriculture and Land Use Division, Tromsø and Bodø, Norway

Abstract

In Norway there is an incomplete resource management of side products and residuals from the main primary sectors of agriculture, fish farming and fishery. For example is the theoretically hitherto unused energy content in animal manure estimated to approximately 2,5 TWh per year, while Norwegian fish farming annually emits about 40.000 ton nitrogen and 8400 ton phosphorous into the coastal environments. Furthermore, recycling of nutrients and energy from marine fish waste of approximately 3.2 million ton fish is still at its early stages.

The incomplete resource management results in environmental, economically and social costs. Consequently, an optimisation of national nutrient and energy cycling is required to increase sustainability.

The establishment of individual driven resource optimisation enterprises, e.g. local biogas reactors, are often challenging both logistically and financially, particularly at relatively remote sites. This paper presents an overall conceptual approach to optimize energy and nutrient cycling, due to a cooperatively and integrated resource management system on a regional scale in Steigen, Northern Norway (Figure 1)

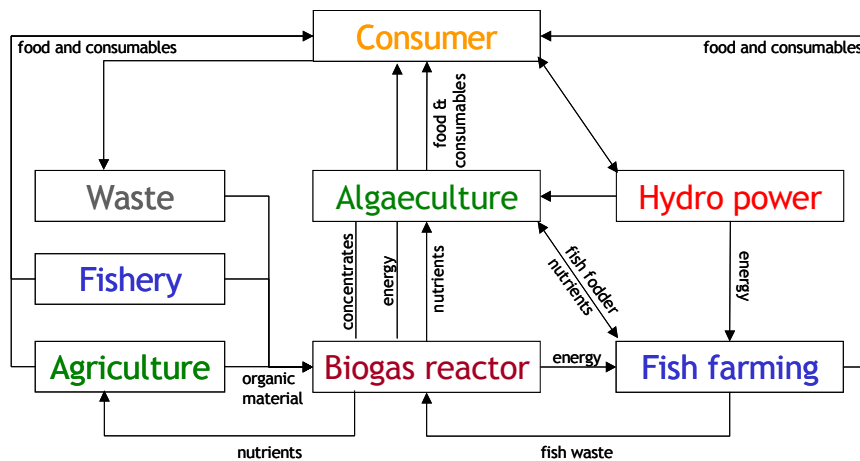


Figure 1. The Steigen concept: A regional approach towards an integrated resource management of coastal environments in Northern Norway.

Locally produced woodchips as bedding material for arctic animal production—An innovation process including The Prolocal project

Author:

Odd Arild Finnes

Institution:

Norwegian Institute for Agriculture and Environmental Research, Bioforsk Nord Holt, Tromsø, Norway

Abstract

Litter and other types of flooring material are of high significance for animal health and welfare. The rapidly increasing interest in carbon rich material for bio energy production implies higher costs for farmers purchasing wood, straw and other conventional bedding materials, and thus threatens the already weak farmer economy. In Northern Norway bedding materials traditionally have been bought from Southern Norway. Transportation costs are thus also considerable and increasing. From this starting point a group of farmers decided that they would try to produce bedding and litter material from local resources, primarily wood from their own forests. Their initiative led to a process involving several projects to develop and test new methods. It also led to a scientific project called Prolocal which in addition to animal welfare and economy also deals with energy recycling and nutrients turnover. The process has been successful, although challenges and technical problems have occurred. The [Prolocal](#) project is due to finish in 2011.

Tuesday, Sept. 7th

Yield capacity of perennial and winter rye (*Secale cereale L.*) in multiharvesting cultivation in Murmansk Region

Author:

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Institution:

Polar Experimental Station, N. I. Vavilov All-Russian Crop Research Institute, Apatity, Murmansk region, Russia

Abstract:

Husbandry in the northernmost regions depends heavily on the increasing food base. Early spring is critical period when green feedstuff is especially needed. To get the latter perennial and winter rye (*Secale cereale L.*) are of great significance.

Winter rye is a multi-purpose crop, and besides its significance as a food, it is widely used as a forage crop. One the most valuable biological features of winter rye is its ability to grow fast early in spring and to be one of the earliest crops to produce green forage for additional feeding animals. Forage yield makes up 15 -30 tons/ha. Perennial rye is winter crop. Under favourable growing conditions it demonstrates the height of up to 3 m, high winter hardiness and high ability for tillering. Forage yield ranges from 12 to 31 tons/ha depending on the growing conditions.

Winter rye and perennial rye were tested for the forage yield capacity with two and three harvesting, and biochemical composition of both crops was determined at the different harvesting time.

The total forage yield of perennial rye grown with three harvestings totally was higher by 3.1 tons/ha than that of twice-harvested crop. Results of biochemical analyses showed perennial and winter rye to accumulate high quantity of raw protein, digestible protein and micronutrients. Growing perennial rye in mixtures with cereals markedly increases yield capacity of the crops and thus reduces production costs for forage production.

Expected future effects of climate change on agriculture in Northern Norway – Study of the sectors vulnerability and adaptive capacity

Authors:

Ingrid Kvalvik¹, Sigridur Dalmannsdottir² and Eivind Uleberg²

Institution:

1 Nordlandsforskning

2 Bioforsk Nord Tromsø

Abstract:

In the last few years the consequences of climate change and political measures to deal with such changes have emerged at all levels of society. For the agricultural sector, climate change is expected to have both negative and positive consequences. In Northern Norway the overall consequences are thought to be positive, but there are challenges to be met and also regional differences. The effects are already observed and are likely to be intensified in the years to come. The mean temperature is expected to raise most in Northern Norway, as is precipitation. This may increase crop yields. However, more frequent and intense precipitation may increase the risk of leaching and erosion of susceptible soils, and frequent freeze-thaw events and more precipitation during winter may cause ice encasement or dehardening of plants.

This study will focus on the consequences of climate change for the agricultural sector in Northern Norway and the adaptive capacity of the sector to such changes. We will analyze the expected changes based on down scaled climate scenarios and biological factors as well as political and economic conditions. As climate change occurs in the context of wider ongoing social, economic and political transformations at the community level, it is necessary to take a cross disciplinary and integrated approach to assess the vulnerability and adaptive capacity of individual farmers in Northern Norway. This study aims to give policy makers and the industry a better foundation for future decisions on adaptation strategies to future climate change.

Better possibilities in agriculture due to climate change– but will there be framers left in Finnish Lapland in 2039?

Author:

Antti Hanukkula

Institution:

AgriFood Research, Finland

Abstract:

At the moment the agriculture in Finnish Lapland is based on animal production, especially on ruminants, dairy cows, beef cattle and sheep. So this dominates the use of fields, of 45000 hectares total field area, 38000 ha are grasslands and only 3000 ha cereals. According to best guess climate change scenarios the growing season will be about two weeks longer, 1 – 2 °C warmer and the winters two three weeks shorter by 2039 than it is today. That means the growing conditions could improve thus increase yields and bring new plants and production possibilities into Northern agriculture. In the other hand the winters would be more variable changing the overwintering requirements. This is enhanced by longer growing season in the autumn, which may be harmful for the hardening processed, especially because the light conditions will rain the same.

The relative decrease in dairy farms has been even bigger, from 934 in 2001 to 550 in 2008. The average age of farmers 2009 was 49,8 years compared to 46,7 years in 2001. At the same time the proportion of farmers under 40 years of age has dropped from 24,3 % to 16,2 % of all active farmers. If nothing is done that means after a generation there are very few farms to meet the challenges and possibilities of future climate in Finnish Lapland.

Forage breeding in a Northern changing climate

Author:

Arild Larsen

Institution:

Graminor AS, Bodø, Norway

Abstract

The climatic conditions for plant growth and wintering in the northern areas are changing as an affect of global warming. The situation influences the forage production and agriculture in Northern Norway. Special for the northern conditions are long photoperiod during the growth period with low temperature and a long wintering period. With changing climate the temperature and the precipitation pattern will change, while the photoperiod will remind. Higher temperature at short photoperiod in spring and autumn will occur. The overall outcomes of climate change are unpredictable and breeders must be able to react on different conditions by having a range of well-characterised germplasm available. It is important to continuously test new plant materials and develop new cultivars for the changing growth conditions. Plants well adapted to the north seems to regulate growth and acclimation to the change in photoperiod, while more southern adapted plants change from active growth to acclimation with fall in temperature. The change to milder a winter climate makes it possible to use more southern adapted and more productive forage cultivars. The present winter hardy cultivars have been shown to lose in competition with less winter hardy, but more productive cultivars. Most forage cultivars are populations with genetic variability. By selection under northern growing conditions, both between and within southern varieties, it will be possible to obtain new populations which combine winter adaptation and productivity. New cultivars in the last stage of testing before registration are produced after such a breeding scheme.

Unique Qualities in Circumpolar Food Products

Monday, Sept. 6th

Growth, survival and phytoecdysteroid production of an endangered plant species *Silene tatarica* (Caryophyllaceae) in relation to fertilization in tree soil types: A field experiment

Authors:

Erling Fjelldal, Marianne Svenske, Tone R. Aandahl, Vladimir Volodin, Paul Eric Aspholm, Snorre B. Hagen, Ingvild Wartainen

Institution:

Norwegian Institute for Agriculture and Environmental Research, Soil and Environment Svanhovd, Norway

Abstract:

Silene tatarica (Catchfly) is a red listed plant species which in Norway occurs only in Finnmark County. We carried out a field experiment over several years where we studied the performance of the species and its production of ectosteroids under various fertilization treatments in tree soil types. The primary aim of the study was to assess whether it is possible to cultivate the plant and to determine under which abiotic conditions cultivation is facilitated as part of a general conservation strategy. Another aim of the study was to carry out a screening test for the occurrence of phytoecdysteroids and to determine how these chemical compounds vary within the plant according to experimental treatments (fertilization and soil type). Phytoecdysteroids are substances that are considered health promoting for mammals and may be potentially interesting for possible future commercial use. At CAA 2010, we will present a paper/manuscript with a complete formal analysis of the data from this experiment.

Differences in metal concentrations in juniper (*Juniperus communis*) and bilberry (*Vaccinium myrtillus*) shoots collected from northern and southern Finland

Rainer Peltola and Sari Stark

Institution:

MTT Agrifood Research & Finnish Forest Research Institute

Abstract:

“Northern quality” is a part of the brand of many agricultural products originating from the Arctic area of the Nordic Countries. One scope of arctic quality is purity, i.e. it is

considered that arctic area faces less anthropogenic stress as compared to more industrialized areas. We analyzed metal concentrations (arsenic, cadmium, lead, cobalt, molybdenum, nickel) in two important natural product raw materials in Finland, juniper and bilberry shoots (*Vaccinium myrtillus* and *Juniperus communis*, used in, for example, herbal teas and muscle relaxants) collected in Finland along a latitudinal gradient. The average metal concentrations in all juniper samples (n = 19) originating from Finnish Lapland north from polar circle were lower than in southern samples (n = 28). The difference was statistically significant (one-way ANOVA, p = 0.05) for cadmium, cobalt and molybdenum. Three juniper samples were collected from north-east Lapland. These samples showed no elevated concentrations of analyzed metals, indicating that the atmospheric emissions from Russian ore mill areas do not lower the quality of studied raw material.

For bilberry, situation was different. Average arsenic, cadmium, lead and nickel concentrations were lower but cobalt and molybdenum concentrations were higher in northern (n = 19) than in southern samples (n = 38). The difference was significant (one-way ANOVA, p = 0.05) for cobalt and nickel.

Evaluation of cloudberry (*rubus chamaeorus* l). Clones for selection of high quality varieties

Authors:

Eivind Uleberg¹, Inger Martinussen¹, Gunnlaug Røthe¹ and Olavi Junttila²

Institution:

¹Norwegian Institute for Agricultural and Environmental Research, Bioforsk Nord Holt, Tromsø

²Department of Arctic and Marine Biology, University of Tromsø

Abstract

Two female and two male cultivars have previously been released as a result of clone evaluation at Bioforsk Nord Holt. Selection criteria have been number of pistils or stamens per flower, number of flowers and number of shoots per m². Currently a new group of clones are evaluated with the aim of finding new cultivars for release. The clones are collected from different parts of Norway, as well as from England and Spitsbergen. Preliminary results from harvesting 2005, 2006, 2007 and 2008 indicate good production potential for some of the tested clones. In addition to prior selection criteria based on berry yield, the levels of total anthocyanins and total phenols have been analyzed. This includes studies on the role of female clone, male pollinator and temperature on berry quality.

Honeybees are useful as pollinators of the dioecious cloudberry, a high value northern berry

Authors:

Kristine Næss and Madeleine Chagnon

Institution:

Centre de recherche Les Buissons, Québec, Canada

Abstract:

The cloudberry (*Rubus chamaemorus*) is a delicious plant growing in northern peatlands which produces a uniquely flavoured berry highly valued in Scandinavia and other northern regions.

Pollination in the wild is accomplished mainly by flies. Most seasons pollination is insufficient leading to poor fruit set and fruit size. Honeybees have been used by cloudberry producers both in Norway and in Finland to increase cloudberry pollination. In a comparative study between four bogs supplied with two honeybee hives and four control bogs without honeybees in north eastern Québec, Canada, honeybees were shown to collect significant quantities of cloudberry pollen, and pollen loads, fruitset, seedset and cloudberry yields were all significantly increased in bogs with hives compared to in the control bogs.

Cloudberry fertilization: a nutritional puzzle!

Author:

Valérie Hébert-Gentile

Institution:

Université Laval

Abstract:

The cloudberry (*Rubus chamaemorus*) exhibits low and variable annual fruit yields. Since it grows on oligotrophic soils, many fertilization trials have been run, first in Scandinavia and, more recently in Quebec (Canada) as well, with mixed results. We decided to seek specific nutrient deficiencies. Fruit abortion is correlated with low leaf phosphorus and low fruit potassium concentrations. Boron and copper concentrations are also very low (undetectable) in leaves. The Compositional Nutrient Diagnosis (CND) approach is presently being used to identify the most limiting nutrient(s) for cloudberry fruit yield. We also tried two fertilization techniques not yet tested on cloudberry. First, foliar applications were performed as a way to mitigate cloudberry low competitiveness for nutrient absorption at the root level. Three limiting nutrients, boron, copper and phosphorus, were applied, but none of them increased fruit yield. However cloudberry leaves did absorb boron= foliar application thus looks promising but dosage and chemical

composition including wetting agents will need to be optimised. Second, we applied an organo-mineral fertilizer, at rhizome depth, in two natural bogs. The fertilizer contained fish and crab meal, along with potassium chloride. We detected no impact on cloudberry yield even after three years of fertilization. Mineralization and dispersion of the fertilizer were then investigated. Mineralization appears to be very slow and dispersion restricted to a few cm. Better knowledge on limiting nutrients and on the fertilizer availability in natural bogs will help refine the next generation of fertilization trials in cloudberry culture.

Effect on plant development and fruit quality of European blueberry (*Vaccinium myrtillus*), at different climatic growing conditions in Norway

Author:

Rolf Nestby

Institution:

Norwegian Institute for Agricultural and Environmental Research, Grassland and Landscape, Bioforsk Kvithamar, Norway

Abstract:

Examination of European blueberry (EB) populations from different latitudes in Norway starting in 2008, have revealed results that indicate differences in growth, fruit yield and fruit quality. The examinations have been executed in subpopulations at latitudes 61, 64 and 69°N (respectively south, mid and north of Norway). Effects of fertilization, cutting of plants, climate etc have been examined in forest fields and on cultivated land. Plants have also been propagated and growth patterns have been examined under controlled conditions. Fruit samples from all locations have been analyzed for important biological components. This presentation will give an overview of some of the results obtained during the two first years of the project period.

Study of berries in Murmansk region, Russia.

Author:

Tatiana Kuvayeva

Institution:

Polar Experimental Station, Branch of N. I. Vavilov All-Russian Crop Research Institute , Apatity, Murmansk region, Russia

Abstract

Berry cultivation provides population all the year round with fresh or canned vitamin-containing products, possessing not only feeding value, but also medicinal properties.

Products of horticulture promote health of people and demand for berries in Russia is especially high in the northernmost regions. Therefore it is necessary to increase assortment of berries by acclimation and to create new cultivars adapted to the local climate conditions.

Aim of work is to study new species and cultivars of berries under climate conditions of Murmansk Region and select plant material for breeding new cultivars, which should combine winter hardiness, high yield capacity and early ripening with resistance to the most dangerous pests and diseases for Murmansk Region.

At the Polar Experimental Station since it has been founded in 1923 6 cultivars of black currant (*Ribes nigrum* L.), 5 cultivars of red currant (*Ribes rubrum* L), hybrids of raspberry (*Rubus idaeus* L), 1 cultivars of strawberry (*Fragaria ananassa* Duch) were bred. Cultivars of edible blue honeysuckle (*Lonicera Caeruleae* Rehd) were tested and selected for growing in the northern most areas. Study of new berry crops - juneberry/saskatoon (*Amelanchier canadensis* (L.) Medik. and gooseberry (*Ribes uva-crispa*, syn. *R. grossularia*) is carried out. Specimens of different cultivars of seabuckthorn (*Hippophaë rhamnoides*) - the most valuable crop for its medicinal properties - are tested.

Let colour influence your life - Antioxidants and human health

Author:

Kajetan Trost

Institution:

Wine research centre, University of Nova Gorica, Slovenia

Abstract:

In ideal conditions human body would neutralize influences of free radicals with their own antioxidants. But equilibrium can be destroyed by outside influences and normal physiological processes. Oxidative stress can be induced by decreased activity of immune system (glutathione peroxidase), increased formation of oxidized products (malonylaldehyde) and decreased input of antioxidants derived mainly from food. Oxidative stress can cause damaging or destruction of key biomolecules which can lead to formation of some, mostly age related diseases. The connections between oxidative stress and cardiovascular diseases, some forms of cancer, cataracts, neurodegenerative diseases and some immunological diseases have been determined during past years. Main antioxidants derived from food are ascorbic acid (vitamin C), tocopherols, flavonoids and carotenoids. Some of them are known to be plant pigments which give yellow, red and blue colour to fruits and vegetables. Their role in plants is very much the same as we claim it for a human body. Because of their antioxidant activity, they can be destroyed during processing and storage of prepacked food. For this food freshness is crucial.

Circumpolar Rangelands – How well do we know them?

Author:

Kari Anne Bråthen

Institution:

University of Tromsø, Norway

Abstract:

Rangelands in circumpolar areas are important to primary industries yet our knowledge about their status and functioning is poor. Also, management authorities often have low awareness of their importance. I will present the current knowledge status and provide arguments to why an increased awareness and focus on these rangelands is warranted.

Tuesday, Sept. 7th, parallel 1

Seasonal variation in fatty acid content of Wavy hair grass at a mountainous site in northern Norway

Author:

Jørgen Mølmann

Institution:

Norwegian Institute for Agriculture and Environmental Research, Arctic Agriculture and Land Use Division, Tromsø, Norway

Abstract:

Wavy hair grass (*Avenella flexuosa*) is one of the most abundant grasses in mountainous pastures of Scandinavia, where it is an important forage grass for grazing ruminants such as sheep. These pastures are often exposed to moderate to low temperatures in the growing season. Photosynthesis in plants at moderate temperatures have been shown to be dependent on the presence of polyunsaturated fatty acid alpha-linolenic acid (18:3n-3) in chloroplasts. Green photosynthetic leaves therefore have relatively high proportions of alpha-linolenic acid, often between 50-70% of the total content. This omega-3 fatty acid in forages is the main source of unsaturated fatty acids found in meat and milk of grazing ruminants, including the essential alpha-linolenic (18:3n-3) and linoleic acid (18:2n-6). The main aims of this study were to determine if the forage grass *Avenella flexuosa* at different growth stages and at different altitudes has more of omega-3 unsaturated fatty acid. Results of the seasonal variation in fatty acid content in wavy hair grass on a mountainous pasture in northern Norway will be presented.

Production systems for sheep in sub-arctic climate

Author:

Snorri Sigurdsson

Institution:

The Agricultural University of Iceland

Abstract

Demands to sheep farms within the area of subarctic climate are quite different than to sheep farms in areas with hotter climates. The sheep is kept for a longer period inside, which gives a challenge for the production system, especially with management and animal welfare.

In Iceland there are close to 2.500 sheep barns, housing close to half a million sheep with the average herd size close to 200 sheep pr. farm, ranging from 10 to 1.200 sheep. The housing period for sheep in Iceland is one of the longest in the world, where most of the farmland is considered to be in the subarctic climate. Usually the sheep is kept inside from middle of November until middle of May. The time, when sheep is kept inside may though vary considerably depending on the weather.

For century's sheep farmers developed different production systems, but for the last two or three decades the research community has yielded vital information with fundamental researches, which has taken the knowhow within sheep production systems further.

Icelandic sheep housing systems vary though considerably, especially between farms with smaller herds. Bigger farms, with more than 4-500 sheep, have the tendency to have a less variation in housing design, relying more on standard solutions especially within work rationalisation. When round bales became dominant as a method for forage conservation, the sheep production systems and housing design changed. Automatic system for round bale feeding was invented, decreasing the needed work drastically leading to possible increase in herd size pr. man year.

Studies have shown that despite the cold climate it is not necessary to isolate the sheep barns in arctic climate, the design of the facilities must though take the frosty weather into consideration. Ongoing research in Iceland, meant to end in 2011, to collect sheep housing experience from all the Icelandic sheep farmers, will give vital information regarding the knowledge within production systems for sheep kept in subarctic climate and their welfare.

Tuesday, Sept. 7th, parallel 2

Traditional Potato Production beyond the Arctic Circle in Alaska, USA

Author:

Alberto Pantoja

Institution:

Subarctic Agricultural Research Unit, Fairbanks, USA

Abstract:

The role of traditional agricultural production is receiving renewed attention, especially in circumpolar environments facing challenges and opportunities associated to climate change. Issues such as food security, biodiversity, natural resources preservation, and traditional farming are receiving attention of circumpolar communities interested in preserving fragile natural resources. Because of the remote geography and unique ecological character, native communities in Alaska practice subsistence or outpost agriculture practices. Subsistence agriculture complements wild food harvests and fills in the gaps created by variation in the harvest of wild game and by the unpredictable food supply chain from the main cities. Potatoes are a common vegetable grown by subsistence farmers. Knowledge of pest and beneficial insects is critical in establishing proper insect pest management techniques on subsistence farms. This work reports on the insect pests associated with potato production in subsistence farming in Wiseman, Alaska (67.4 N, 150.1 W). Insect sampling was conducted between 2006 and 2009. Insects were collected with sweep-nets, bucket traps, water pan traps, and sticky traps. Insects collected that are important to potato production include diseases vectors such as aphids and leafhoppers, root feeding pests such as wireworms, and aphid predators such as lady beetles. Two species of aphids, *Macrosiphum euphorbiae* and *Myzus persicae*, (Hemiptera: Aphididae) known to transmit potato viruses in the lower 48 states were collected, as were two species of leafhoppers, *Balclutha punctata* and *Macrosteles fascifrons*, (Hemiptera: Cicadellidae) known to transmit phytoplasmas to potatoes. One species of wireworm, *Hypnoidus bicolor*, (Coleoptera: Elateridae) known to feed on potatoes was collected. Four species of lady beetles, *Coccinella trifasciata perplexa*, *C. transversoguttata richardsoni*, *Calvia quatuordecimguttata*, and *Hippodamia parenthesis*, (Coleoptera: Coccinellidae) were collected.

Plant metabolites for healthy plants and healthy peoples

Author:

Matthias Zielke

Institution:

Norwegian Institute for Agriculture and Environmental Research, Bioforsk Nord Holt, Tromsø, Norway

Abstract

In recent years national food and environmental authorities put their focus on food such as vegetables and fruits produced in a sustainable manner with no or reduced use of pesticides. At the same time research has shown that several compounds of certain crops, especially the so-called secondary metabolites, have an effect on both human and plant health. One group of secondary metabolites classified as glucosinolates have been studied extensively in brassicaceous plants (e.g. cabbage and related species). Here more than hundred glucosinolates and their degradative products have been identified and ascribed to serve in plant protection and/or have an effects on human health such, e.g. anti-carcinogenic and anti-bacterial effects. However, several compounds of this group have also shown to protect plants against attack of herbivores and pathogen microorganisms. Although there is already a formidable research effort in this field, very little is known about crops produced in northern and subarctic regions. Thus, our project focuses on factors typical and unique for agricultural production in these regions. Among many other topics connected to agro ecosystems and climatic parameters, one sub-project focuses on the interactions between micro flora and glycosinolate producing crops in northern regions.

Effect of northern climate on health related properties in broccoli *Brassica oleracea* var. *Italica*

Authors:

Anne Linn Hykkerud Steindal, Jørgen Mølmann, Tor Johansen, Olavi Junttila, Gunnar B. Bengtsson

Institution:

Norwegian Institute for Agricultural and Environmental Research, Bioforsk Nord Holt, Tromsø, Norway

Abstract

The northern part of Norway is the northernmost area in the world where vegetables are grown. The differences in growth conditions compared to further south include cooler summers and midnight sun with in part different spectral composition of the natural light. Several *Brassica* vegetables are well suited for growth under these conditions. Broccoli is considered as a food of high nutritional value that has a positive effect on prevention of various chronic diseases. The way some of these health related properties are affected by pre-harvest light and temperature in a northern climate is the main objective of this study. The focus is on vitamin C and glucosinolates, and there will also be carried out sugar analyses.

Broccoli plants were grown under controlled environments in a phytotron to investigate the effect of different light and temperature regimes. The treatments were long and short day in combinations with high and low temperature. Also, effects of specific treatments with far-red, red and blue light have been studied in some experiments.

Preliminary results so far indicate that the vitamin C content was higher at low temperatures (from 12 °C to 6 °C) compared with constant high temperature (18 °C). Different glucosinolates seemed to respond differently to temperature and photoperiods.

Study of perennial forage legumes *Galega orientalis* L. and yellow alfalfa (*Medicago falcata*L.) under conditions of Murmansk region, Russia.

Author:

Irina Mikhaylova

Institution:

Polar experimental station (Branch of N. I. Vavilov All-Russian Institute of Crop Research, Apatity, Murmansk region, Russia)

Abstract

At present the limited assortment of the forage crops grown in Murmansk Region. Perennials are meadow timothy, meadow fescue, smooth brome grass (*Bromus inermis*). Annual crop is vetch grown in association with oat. Of winter crops winter rye is grown on small scale. Perennial legumes, the most valuable forage crops due to high protein content are not introduced into cultivation. At the Kola Peninsula, situated largely above the Arctic Circle, specific climatic conditions during growing season – polar day (midnight sun) period along with low temperatures – are unfavourable for growing forage crops used in Central Russia. Breeding and study of special cultivars of perennial legumes adapted to the local growing conditions is of great significance. In 2003-2009 different specimens of *Galega orientalis* L. and yellow alfalfa (*Medicago falcata* L.) were tested at Apatity (67°34'N, 33°22'). Results of study showed *Galega* to be promising forage crop for the northernmost regions. Specimens of *Galega orientalis* adapted for the growing in Murmansk region demonstrate high winter survival (98-100 %), forage yield of 20 tons/ha (dry weight) and seed yield of 1.05 tons/ha. Winter survival of yellow alfalfa cultivars was ca. 76 % and yields were up to 16 tons/ha. Ripening of alfalfa seeds observed is of great importance for obtaining breeding plant material adapted to local climate conditions. Breeding work resulted in appearance of *Galega orientalis* 'Zapolyarny' and *Medicago falcata* 'Valentina' for growing in Murmansk Region.

Traditional knowledge as Basis for commercial business

Monday, Sept. 6th

Medicinal and nutritional values of wild plants of the Northern Boreal Forest and their many applications

Author:

Bev Gray

Institution:

Aroma Borealis Herb Shop Yukon, Canada

Abstract

Bev will talk about the medicinal and nutritional values of wild plants of the Northern Boreal forest and their many applications in traditional herbalism, naturopathic medicine, aromatherapy, and cosmetic industry and in the natural health markets. Bev started an herbal business over 15 years ago in Yukon making value added botanical products for the Yukon and Canadian herbal markets, in her talk she will touch on the many opportunities and possibilities for micro herbal businesses in the boreal north to be created and serve local and international communities.

Bev will be releasing her new book, *The Boreal Herbal Food and Medicine Plants of the Northern Forest*, early in 2011.

The Boreal Herbal: Food and Medicine Plants of the Northern Forest is an indispensable guide to identifying and using healing plants of the Northern Boreal forest. Whether hiking in remote areas or gardening in your own backyard, with this easy-to-use guide you will be able to recognize and use 55 common plants with extraordinary healing properties.

With this reference and recipe book, you will learn how to use willow to soothe aches and pains, yarrow to staunch a bleeding wound, bearberry to treat a urinary tract infection, and wild rose to create a delicate and soothing skin cream.

In addition, author Beverly Gray, has created dozens of healthy and tasty recipes for use in the northern kitchen, including wild-weed spanakopita, dandelion wine, and cranberry-mint muffins.

The role of indigenous breeds of livestock in conserving rare disturbance-dependent vegetation in Eastern Finland

Author:

Julie Rosenthal

Institution:

Lakehead University, Canada

Abstract:

This presentation highlights findings of a case study that explores the role of indigenous cattle and sheep as vectors of disturbance in rare habitats in Koli National Park in eastern Finland. Across Europe, habitats associated with traditional agricultural practices are becoming increasingly rare as pastureland is abandoned, converted to cropland, or subjected to intensive rather than extensive grazing systems. Meanwhile, there has been a global reduction in the diversity of livestock breeds, mainly due to the replacement of indigenous breeds with a select few breeds preferred in industrial agricultural production systems. Since 1994, Koli National Park has re-established the practice of swidden cultivation (a cyclical practice of felling a stand of trees, burning it, sowing cereal or root crops for a limited number of years, and then allowing the land to regenerate into forest) as a means of restoring threatened vegetation communities in eastern Finland. Swidden cultivation was a major anthropogenic influence on the boreal forest in Finland in the 18th and 19th centuries, but had fallen out of practice in the early 20th century. In Koli National Park, some of the restoration sites are also grazed by indigenous cattle (Eastern Finncattle) and sheep (Finnsheep a.k.a. Finnish Landrace) breeds, in part to replicate traditional practices of the past. Comparisons between sites with and without grazing reveal significant differences in tree survival rates and in the percentage cover of some herbaceous species, suggesting that restoration without livestock grazing may not accurately restore past ecological communities associated with traditional breeds of livestock.

Northwest Territories Native Seed Development Project

Author:

Annika Trimble

Institution:

Aurora Research Institute, Inuvik, Canada

Abstract:

The Aurora Research Institute initiated a project in 2005 to develop seed sources from native plant species in the Northwest Territories, Canada. This project has been designed in order to develop technologies to propagate and cultivate native plant species. The main

deliverable will ultimately provide a system whereby these species will become available for commercial production and the seed can be used in revegetation and reclamation in the Northwest Territories (NWT). The need for native plant seed for reclamation and restoration purposes has been identified because of increased industrial development in the territory and the need to improve land reclamation practices and environmental mitigation strategies. This project involves a number of partnerships with organizations from across the NWT and Alberta. Between 2005 and 2008, over 400 seed collections were made from 65 plant species native to the NWT. The majority of the species targeted included grasses, forbs, and legumes and were selected based on species growth characteristics, literature reviews, consultation with northern reclamation specialists and field observations on pre-existing disturbances. One hundred of these collections demonstrated high seed viability ($\geq 70\%$ germination) within a lab setting and are currently being evaluated through field and growth trials in the NWT and Alberta.

Coping with Intellectual Property Rights in the garden of biodiversity

Author:

Trygve Berg

Institution:

Norwegian University of Life Sciences/Noragric, Norway

Abstract:

The Convention on Biological Diversity put an end to the old regime of ‘common heritage’ and instead referred to the principle of national sovereignty over resources. Two years later (1994) we got the GATT agreement with its chapter about ‘Trade-related Intellectual property rights’. It says, in one of its articles that plant varieties must be protected either by patents, or by an effective *sui generis* system. Most countries in the world are parties to the convention and are either members or in the process of negotiating for membership in WTO. We all struggle with the challenge of how to implement these requirements in our national laws and policies. We must regulate access to biodiversity according to the convention and we must protect intellectual property rights according to TRIPs.

In the earlier days when no laws or policies existed, collectors could travel all over the world and get whatever seed they asked for. When doing so, they found more than what they set out to find. They discovered farmers, their culture of seed management and their knowledge about their biological treasures. We need continued access to genetic resources for so many urgent issues; higher yields to feed an increasing world population, culinary diversity to provide income opportunities in rural areas, adaptation to changing diseases, pests and climates. How can we sustain the virtues of the old culture of sharing when we also have to protect the interests of those who turn genetic valuables into commercial products?

I shall discuss this with reference to the great pioneer of germplasm collection and exploration, the Russian N. I. Vavilov, the persistence of local knowledge, and the troubles of reconciling 'Farmers Rights' with intellectual property rights.

Presentation of ALGEBAKT project – Antibacterial effect of arctic macroalgae species

Author:

Margarita Novoa-Garrido

Institution:

Norwegian Institute for Agriculture and Environmental Research, Arctic Agriculture and Land Use Division, Bodø, Norway

Abstract

In today's society there is great demand for natural products with therapeutic and health improving effects for agriculture, aquaculture, pharmaceutical and dietary supplements industries.

Algae and / or algal extracts have been reported to have different health improving biological effects when used as supplements in humans or as dietary additives in animal feeding. Marine macroalgae are therefore very interesting natural sources of new compounds with biological activities. Macroalgae can be cultivated, have a rapid growth and it is possible to control the production of certain bioactive compounds by manipulating culture conditions.

ALGEBAKT is a project initiated in 2010 and supported by the MABIT program with the objective to generate knowledge on bioactive components with antibacterial effects in the macroalgal species adapted to the Northern Norwegian climate. Due to the increased understanding of the importance of a good bacterial balance in the gut for the health and well-being of both humans and animals, the project will focus on normal gastrointestinal microbiota.

This work will generate an overview of the potential for developing new products based on the antibacterial properties and potential prebiotic effects.

Influence of parent rocks on the properties of Podzols in northern Fennoscandia

Author:

Marina Strelkova

Institution:

Murmansk State Technical University (Department of Geocology)

Abstract:

13 pairs of the virgin and cultivated Podzols formed from the different parent rocks (morainic sands, glaciofluvial sands, fluvial and sea sands, eluvio-deluvium of shists) were investigated in northern Norway (Troms and Finnmark counties) and Kola Peninsula in Russia. Properties of the studied soils are in general similar, but there are peculiarities caused by the origin and composition of parent rocks.

Podzols in the morainic sands are stony, unsorted, contain high abundance of primary minerals and display the highest level of the organic matter in mineral horizons. High stoniness hampers tillage, but primary minerals provide for reserve of plant nutrients. In Podzols, formed from the sands, rewashed by glaciofluvial, fluvial and sea waters, fractions of medium and fine sands predominate and thus tillage is not limited by presence of stones. But they are poor in nutrients, especially podzols on the sea sands. The latter are characterized by the lowest values of soil water content, saturation and content of exchangeable bases.

Podzols, formed from the schists, show unusual bluish colour of the eluvial horizon, presence of fine dust and silt along with gravel, low calcium and the highest potassium content of among studied soils, heightened phosphorus content. Maximum in the organic matter content is displaced downward from the illuvial horizon due to close occurrence of bedrock.

Tuesday, Sept. 7th

Forms of Finnish and Scandinavian agriculture along north-western Lake Superior

Author:

William Wilson

Institution:

Lakehead University

Abstract:

One of the least know agricultural regions of Canada lies from just north of the Pigeon River to Nipigon, along the North Shore of Lake Superior, an area of distinctly northern climate and landscape due to its location in the center of the North American continent. This hinterland of what is now Thunder Bay, ON (formerly the towns of Fort William and Port Arthur) was colonized by large numbers of Finnish and Scandinavian farmers, who constructed a thriving local community from approximately 1890 to the early 1970s, based on a successful form of northern farming derived from centuries of agricultural traditions from Finland and Scandinavia. Such agriculture provided the roots to sustain a rich cultural life of sports, theater, politics, and heritage industry, in addition to meeting much of the local food needs in the then thriving port cites on Lake Superior. The transformation of North American agriculture to an industrial model beginning in the 1970s severely damaged this agricultural community. However, our research using

archival material, particularly photographs, newspapers, private papers, and maps, is being used to help reconstruct local agriculture as a part of a local initiative to improve food security and sustainably re-inhabit the North Shore.

Developing food and drink markets for Orkney cereals

Author:

Peter Martin

Institution:

Agronomy Institute, Orkney College, Scotland.

Abstract:

Several factors, including a shortage of cheap oil and direct and indirect effects of international commitments to reduce greenhouse gas emissions, make it likely that world oil and food prices will continue to rise in the near future. Price rises will probably be disproportionately high in peripheral areas because of the high costs of transportation to these locations and should encourage greater self-sufficiency.

Orkney is a group of islands off the north of Scotland with fertile soils but a cool growing season. Although its agriculture is dominated by grassland for livestock, cereals could be grown for several local companies. The Agronomy Institute (AI) is helping to develop local cereal markets and is identifying varieties which are well-suited to the local climate and investigating appropriate agricultural practices for them. Research on Bere, a Scottish barley landrace, identified early-planting as a means of increasing yield and obtaining an earlier harvest. This has allowed the development of reliable supply chains, producing Bere for niche-market beer and whisky production. Screening of modern UK malting barley varieties in Orkney identified two which combined good agronomic performance and malting quality. One of these is now being grown locally for an Orkney whisky distillery. Collaboration between the AI, a local mill and bakeries showed that short-season Finnish varieties of oat and wheat grew well in Orkney and could be milled locally. Flour from these varieties is now being used by Orkney bakery companies. As a result of these developments, Orkney is now the most northerly part of the UK growing malting barley and cereals for milling.

Rural Tourism Industries

Monday, Sept. 6th

Hurtigrutens industrial experience production and how this affects group dynamics

Author:

Christian Ekeland

Institution:

Finnmark University College

Abstract:

The article is about product synergy for nature based experiences. It handles Hurtigrutens industrial experience production and how this affects group dynamics and experiences. The data is produced through a three day observation of an English tourist group. They are part of a concept called "Hunting the light"

Rural Tourism Industries in Circumpolar Areas Supporting multifunctional Agriculture - Prospects of rural and ethnographic tourism development in rural municipalities of the Murmansk region

Authors:

Galina.N. Kharitonova and Ludmila.V. Ivanova

Institution:

Institute for Economic Studies, Kola Science Centre, Russian Academy of Sciences
Apatity, Murmansk region, Russia

Abstract:

Share of agricultural lands in the Murmansk region is less than 2%. At present the agriculture is specialized in cattle breeding, reindeer herding, fishing in inland reservoirs, sea animal hunting, egg production, growing potatoes and fodder.

The main mission of the agriculture is supply of diet foodstuffs to certain categories of population. For the rest of population 90% of foodstuffs is delivered from more southern regions of the country as well as from the neighbouring Nordic countries. Local foodstuffs are not competitive to the imported products.

The transformation crisis of 1992 negatively influenced the agriculture of the Murmansk region and welfare of the rural population. Fur animal farms and greenhouse planting of vegetables were closed down as well as most of fish growing factories. Due to environmental restrictions hunting volumes of sea animals decreased sharply. Reindeer

herding traditional for the local minorities also became unprofitable that influenced number of reindeer.

Development of the market economy and state support made it possible to keep cattle breeding, egg and pork production. Reindeer herding became profitable because of the state support, technical modernization funded by investments from Finland. Also the Sami people became owners of reindeer, therefore their number increased.

In remote rural districts over ten tourist camps for fishing and hunting tourists, several mini-hotels, cafes and camps were built.

Due to tourism development outflow of young people from rural settlements went down. Measures on development of “countryside” and ethnographic tourism have been included in the tourism development plan of the region.

Public reactions to utilization of everyman’s rights in wild berry business

Authors:

Rainer Peltola and Ville Hallikainen

Institution:

MTT Agrifood Research & Finnish Forest Research Institute, Rovaniemi Finland

Abstract:

We investigated attitudes concerning recruiting of foreign wild berry pickers in Finland. The survey was directed for nature-orientated people, as 92 % of respondents (n = 495) picked wild berries for household use (80 %) or incomes (12 %). We constructed sum variables based on two dimensions: residency of the berry pickers (local, unlocal, foreigner) and purpose of picking (own use, for incomes, organized commercial picking). We detected significant differences between attitudes concerning residency and purpose of berry picking. On score scale 1 – 4 (1 = no limitations, 2 = minor limitations, 3 = moderate limitations, 4 = major limitations for berry picking), the widest acceptance faces a local resident (average score = 1.35). The most condemning attitude faces a foreigner (average score = 2.03). The similar trend was found based on the purpose: own use (average score = 1.35), organized commercial picking (average score 1.92). About 92 % of the respondents accepted totally (score = 1) local inhabitants’ picking for own use”, the proportion of “foreigners organized picking” being only 28 %. Persons who picked berries for incomes wanted to limit foreigners berry picking slightly more compared to those who didn’t pick berries (p=0.013). Respondent’s income, forest owning, sex, education and age didn’t affect significantly (p < 0.05) on attitudes. These results should be considered carefully not only in berry industry, but also in nature tourism development.

Agricultural development in Northern Norway, 1969 – 2006

Authors:

Oskar Puschmann, Grete Stokstad

Institution:

The Norwegian Forest and Landscape Institute, Norway

Abstract

The total area of agricultural land in Northern Norway has remained relatively unchanged over recent decades. This might give an impression of stability. Yet the number of farms has declined by 83 % between 1969 and 2006, accompanied by large changes in the structure of farm ownership. These changes clearly affect the landscapes of Northern Norway. In 1969, the majority of farms (71 %) had less than 5 hectares of land, whilst in 2006 most farms were in the category 10 to 50 hectares and only 9 % had less than 5 hectares. In many coastal and fjord districts the area of agricultural land has strongly declined, whilst some inland municipalities have increased their area. There has been a geographical 'redistribution' of agricultural land in northern-Norway.

Ownership has direct implications for landscape and environmental qualities. The proportion of farmland in early stages of abandonment is higher for rented land than for land that is farmed by the owner. When land is rented, only the best areas are managed. On average, around a third of the agricultural area on a property seems to be abandoned when the property is rented out.

Cage fish farms in Karelia: industrial, environmental and social problems

Authors:

Anna Volkova and Svetlana Shalina

Institution:

Petrozavodsk State University, Russia

Abstract

Aquaculture - one of the fastest growing sectors of food production. Production volumes grown in artificial hatcheries produce have increased According to FAO; they are already about 30 % of the global catch of aquatic organisms steadily. One of the most dynamic in the field of aquaculture regions of the Russian Federation is Karelian Republic. Over the past 10 years in the republic founded on the merits of a new branch of the economy - fishing. The quantity of fish production in the country in 2009 was more than 13 tons of rainbow trout grown in the cage. It is more than 70% of total Russian trout production. 16 thousand tons of commercial trout are planned to produce in 2010. The most promising area of aquaculture in the Republic of Karelia is cage fish farms. The development of this direction is connected to presence of a plenty natural freshwater reservoirs with clean

water, favourable climatic conditions, affinity of the big markets for selling and other factors.

Poster session

Geographic variation in chemical composition in roseroot (*Rhodiola rosea*) in Finnmark County

Authors:

Erling Fjelldal, Marianne Svenske, Inger Martinussen, Vladimir Volodin, Bertalan Galambosi

Institution:

Norwegian Institute for Agriculture and Environmental Research, Soil and Environment Svanhovd, Norway

Abstract:

Roseroot (*Rhodiola rosea*) is a traditional medicinal plant and produces pharmacological metabolites, such as rosavin and salidroside. Extracts from the plant are used in many commercially available products, primarily aimed at fighting fatigue. To produce high quality metabolites from roseroot it is necessary to have access to plants that produce a certain concentration of pharmacological metabolites. In particular, it has been proposed that the rosavin content should be at least 2-2.5%. However, in wild plants, the content is known to show considerable variation, and little is known about the mechanisms underlying this variation. In 2006, we collected ca. 200 plants distributed equally among 10 geographic regions in Finnmark County in northern Norway. Root samples were taken from several individuals within each region, and one mixed sample from each region was subject to chemical analysis. Total content of rosavin varied between 0.067%-2.7% (6.7 to 27mg/g dry weight), with a mean value of 1.54% (15.4mg/g dry weight) for all 10 geographic regions. In 2007, additional samples of plants from the two regions which showed the highest rosavin content and the whole root of several plants from each area were collected and subjected to chemical analysis. In the region with highest concentration, total rosavin content ranged from 1.37-3.40 % (13.7 – 33.98mg/g dry weight), with a mean value of 2.67% (26.73mg/g dry weight), while the salidroside concentration ranged from 1.11-4.98% (11.13 - 49.75mg/g dry weight), with mean 2.27% (22.66mg/g dry weight). The results show large geographical variations in the content of pharmacological metabolites, with promising levels in some of the regions. Further studies will aim at understanding the causes for these observed variations.

Reindeer calf meat, a unique product?

Authors:

Morten Heide and Tove Aagnes Utsi

Institution:

Nofima, Marked, Tromsø, Norway

Finnmark University College, Faculty of Business and Social Work, Norway

Abstract

In the Norwegian market for game meat there is little tradition for product differentiation. An example of this is reindeer meat. Even though more than half of the products sold in the market are calf meat, no distinction is made between meat from calves and adult reindeer. This is contrary to other forms of meat production, such as lamb and mutton, and veal and beef. The aim of this study was to determine if there are unique quality attributes that may help to differentiate meat from calves and adult reindeer. To investigate how the quality of these two products were perceived, chefs of 30 restaurants in Oslo, Stavanger, Troms and Alta were recruited to blind test beef sirloin of both products. The results show that the reindeer veal is perceived to have a lighter colour, milder game flavour and a tender texture than meat from adult reindeer. More than 50% of the chefs responded that they would buy reindeer veal if it became available. At the same time only seven of the chefs were willing to pay more for veal than other reindeer meat. This study shows that it may be possible to introduce reindeer veal as a product with unique qualities in the Norwegian restaurant market. However, as the product seems to be little known in the market, it will be important to make an effort in the marketing of reindeer veal in order to achieve a premium price.

Soil Treatment effect on biomass production in the Yukon, Canada

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Abstract

The Legume cultivation plays an essential role as forage and green manure in organic agriculture. Cultivation of legumes in colder regions can be very challenging which is mostly related to climate factors, soil temperature or inadequate species adaptation. Although soil fertility is also essential for a successful legume growth, little attention has been paid to soil nutrients. To test the influence of soil nutrients on legume growth (biomass) six legume species were grown on four farms (M'Clintock Valley, Lendrum Ross, Dowdell/Digby and Aurora Mtn.) in a randomized block design with two soil

treatments over 5 years (2005-2009). Soil treatments (Sulphur; Borax; Copper, Rk., Pot., Iron, Zinc and Mang. Sulphate; Calcium Carbonate, Gypsum) were applied on every farm on 6 out of 12 plots every year, using different concentrations depending on soil conditions. The rest of the plots did not receive any treatment and are considered a control group.

Soil treatment affected biomass (g/50 cm²) significantly positively on the MC Clintock farm. The average annual biomass (g/50 cm²) was significantly lower in 2008 compared to 2007 on treated and untreated plots on M'Clintock, Dowdell/Digby and Aurora Mtn. farm. Additional differences in biomass (g/50 cm²) during the individual years could only be detected for Dowdell/Digby and Aurora Mtn. farms on untreated plots and on Mc Clintock farm on treated plots.

The response of soil treatments on the M'Clintock farm may be related to its sandy/loam soil which has a lower *nutrient-holding* capacity than a clay soil. The decrease of biomass in 2008 may be connected to the average number of "Growing degree days (GDD)" which were the fewest in the whole period and to the amounts of total annual precipitation (mm) which were the highest for the whole period.

Selecting roses (*Rosa* sp.) for use in cold, northern climates: A field trial from Eastern Finnmark

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Abstract:

Most of the rose species that are available in Norway are designed for a warmer climate, and the selection of roses adapted to our cold climate in the north is rather limited. Finland have for several centuries been cultivating roses adapted to different climate zones. In the botanical garden at Bioforsk Svanhovd, we have planted 13 different varieties of rose imported from Oulu, Finland in summer 2009. Five of the 13 varieties belong to the species *Rosa pimpinellifolia*. This is a group of hardy shruboses, which has been cultivated since the 1600s. They form 1-2 m tall shrubs, with decorative, simple leaves and leaflets densely packed freshly scented flowers. They are easily arable, and rarely attacked by diseases. Only a few varieties are preserved and cultivated today. The other roses belong to the species *R. centifolia*, *R. harisonii*, *R. rugose*, *R. francofurtana* and wild roses (*Rosa* spp.). At Bioforsk Svanhovd, the roses are grown in cold, northern inland climate: The aim is to monitor the rose growth and survival in the cold northern climate, to see whether they are suitable as ornamental plants in Finnmark. To evaluate this, we will record budding, foliation, flowering, fading, rose hips formation, leaf abscission, growth and any attack by disease or pests weekly throughout the growing season over a

period of 3 years. The Poster presented at CAA 2010 will include the results from the first year (i.e. summer 2010).

THE CIRCUMPOLAR AGRICULTURAL ASSOCIATION - CONSTITUTION & BYLAWS

INTRODUCTION

The Circumpolar Agricultural Association is a non-governmental organization concerned with northern agricultural science, practices and policies. It was founded in 1995 in Tromsø, Norway on the ideas set out at the 1st Circumpolar Agricultural Conference (CAC) which was held in Whitehorse, Yukon, Canada in 1992. The CAA is responsible for arrangement of CAC every 3rd year.

ARTICLE 1 - NAME AND SEAT

The name of the Association shall be Circumpolar Agricultural Association (CAA). The seat of the Association is in the country and city where the Secretariat is established.

ARTICLE 2 - CHARACTER

The Association is a Non Governmental Organization (NGO) as understood by the United Nations definition.

ARTICLE 3 - OBJECTIVES

- 3.1 To organize Circumpolar Agricultural Conferences.
 - 3.2 To encourage the change of information, material and technology of agriculture and rural development in circumpolar areas.
 - 3.3 To circulate a newsletter for agriculture and rural development in circumpolar areas.
- To establish and maintain relations with other organizations whose interests are related to the objectives of the Association.

ARTICLE 4 - MEMBERSHIP

The membership consists of

- 4.1 Individual members
- 4.2 Institutions, universities, national or subnational organizations, companies etc
- 4.3 Affiliated members
- 4.3 Honorary members

ARTICLE 5 - ORGANS

The organs of the Association shall be

- 5.1 The General Assembly
- 5.2 The Board of Directors

ARTICLE 6 - THE GENERAL ASSEMBLY

The General Assembly is the highest organ of the Association, both in terms of legislation and decision making. It shall be composed of nominated delegates representing countries or districts in the circumpolar areas.

ARTICLE 7 - THE BOARD OF DIRECTORS

The Board of Directors is the executive organ of the Association. It shall consist of

7.1 The President

7.2 The Vice-Presidents (4).

These officers shall be elected in such manner and shall hold office for such term and shall have and enjoy duties, powers and privileges as may be determined by the bylaws. The Board of Directors shall set up a Secretariat to administer the affairs of the Association.

ARTICLE 8 - OFFICIAL LANGUAGES

8.1 The official languages used during the meetings of the General Assembly are English and Russian.

8.2 The working language of the Secretariat is English.

ARTICLE 9 - AMENDMENTS

9.1 Any amendment of these articles shall require the affirmation of two thirds of the votes cast by the members of the General Assembly present and voting.

9.2 The proposed amendment must be submitted to the Secretariat not less than six months before the meeting at which it is to be considered. The Secretariat shall forward the proposal to the members four months prior to the meeting.

ARTICLE 10 - DISSOLUTION

A decision to dissolve the Association shall require the content of at least two thirds of the votes cast by the members present and voting. It may only be taken at a meeting of the General Assembly specially called for this purpose.

ARTICLE 11 - BYLAWS AND CONFERENCE RULES

11.1 In order to regulate the affairs of the Association, the Board of Directors shall draw up Bylaws and Conference Rules to be approved by the General Assembly.

11.2 Alterations to these Bylaws and Conference Rules shall only be made by the General Assembly at any of its meetings provided members are advised at least four months in advance by the Secretariat.

ARTICLE 12 - FINAL REGULATIONS

This Constitution was adopted by the General Assembly on the 2nd Circumpolar Agricultural Conference, the 5th September 1995.

BYLAWS

CHAPTER 1 - MEMBERSHIP

1.1 Individual members

Any individual created to promote the aims and objectives of the Association.

1.2 Institutions, universities, national or subnational organizations, companies etc.

Anybody who promotes the aims and objectives of the Association.

1.3 Affiliated members

Individuals and national or subnational organizations of special interest for the Association

1.4 Honorary members

Distinguished persons who are granted membership. Nomination for such membership shall be made by a national or district delegation to the Board of Directors who shall decide on submission to the General Assembly for approval.

1.5 Application for membership

Application for membership shall be made on special form supplied by the Secretariat.

1.6 Membership of the Association shall terminate

- by voluntary resignation - by not abiding the Constitution and Bylaws - by failing to pay the subscription, unless a special reason for the non payment is given.

CHAPTER 2 - VOTING

2.1 In the General Assembly, representatives of the following countries or districts in the circumpolar area each have three(3) votes; Alaska, Yukon Territory, North West Territory, Greenland, Iceland, Norway, Sweden, Finland, North West Russia, Central Northern Siberia, The Sakha Republic (Yakutia), The Far North East Siberia. The General Assembly can accept other countries or districts and decide how many votes they will have. New partners in the assembly can vote on the following setting of the General Assembly.

Decision regarding

- Amendments of the Constitution, Bylaws and Conference Rules
- Dissolution of the Association

require two thirds of the votes cast. In all other cases, decisions may be taken with simple majority of the votes cast. Voting shall take place by show of hands. Secret votes will be taken if so wished by any delegate.

2.2 No decision of the General Assembly may be made unless there is available a quorum of one third of the number of the total votes.

2.3 The names of the voting delegates and the situation for proxy voting should be notified to the Secretariat in advance of the meeting.

2.4 The President does not vote, except in case a vote is equally divided. In that case the President shall have a casting vote.

CHAPTER 3 - FUNCTIONS OF THE ORGANS; SITE OF THE SECRETARIAT

3.1 The General Assembly shall meet at least once every year to

- 3.1.1 consider the progress made towards the goals of the CAA
- 3.1.2 consider new goals
- 3.1.3 discuss the annual and financial report, the future budget and other general matters of the Association
- 3.1.4 have the resolutions of the previous Conference executed and report to the Conference on their result
- 3.1.5 approve the budget for the current period
- 3.1.6 elect the President, the Vice-Presidents of the Association in accordance with chapter 4
- 3.1.7 determine the site of the next Circumpolar Agricultural Conference
- 3.1.8 consider and approve the Resolutions proposed at the Conference.

3.2 Extraordinary meetings may be held if requested by one third of the representatives or at request of the Board of Directors.

3.3 The Board of Directors The Board of Directors is the executive organ of the Association. Among its functions are

3.3.1 to advise the General Assembly on any matter submitted to it

3.3.2 to make recommendations regarding items to be discussed by the General Assembly

3.3.3 to approve the minutes of the previous meeting of the Board of Directors

3.3.4 to recommend to the General Assembly to approve action meant to accomplish the objectives of the Association mentioned in the Constitution

3.3.5 The Board of Directors shall meet immediately before and immediately after each General Assembly meeting, and as often as required throughout the period.

3.4 The Secretariat The site of the secretariat shall be decided by the General Assembly following a recommendation from the Board of Directors.

CHAPTER 4 - NOMINATION AND ELECTION OF OFFICERS

4.1. The President and Vice- Presidents shall be nominated and elected from among the members of the General Assembly. Their term of office shall commence the day after the Conference is closed and terminate at the end of the day the subsequent Conference ends. Written nominations must have reached the Secretariat three months prior to the meeting during which the election take place.

4.2 All elections shall take place at the meetings of the General Assembly by secret ballot. For the election of a candidate, an absolute majority is required. In case no nominee receives a majority of the votes cast, the two nominees who have received the highest number of votes shall be retained and new ballot take place.

4.3 The President shall be elected for a period of three years and cannot be reelected.

4.4 At the General Assembly, the place of a delegate who is elected President shall be taken by another representative from the same country or district.

4.5 Three of the Vice-Presidents shall be elected to represent each of the following regions; The Northern America, The Northern Europe west of Russia and The Northern Russia / Siberia. The forth Vice- President can be elected without representing any particular region.

4.6 Nominations of the Vice- Presidents shall be made by the members of the Association within each region. All Vice-Presidents shall be elected for a period of three years with the possibility of once reelection for a second term of three years.

4.7 Replacement of the President If the President is unable to act or is removed from office, The General Assembly shall elect, at its next meeting, a new President. Until a new President is elected, The Vice- President who is senior in office shall act as interim President. If there are two or more Vice- Presidents of the same seniority, a decision is reached by drawing lots.

CHAPTER 5 - DUTIES OF OFFICERS, THE SECRETARIAT AND DELEGATES

5.1 The duties of the President are:

- 5.1.1 To promote the activities of the Association.
- 5.1.2 To represent the Association.
- 5.1.3 To preside over meetings of the General Assembly and the Board of Directors.

5.2 The duties of the Vice- Presidents are:

- 5.2.1 To represent the Association in their region.
- 5.2.2 To promote the Circumpolar Agricultural Association in their region.
- 5.2.3 To maintain regular contact with the members of the Association in their region, to attend the annual meetings of the General Assembly and submit to this body and activity report.
- 5.2.4 On request of the majority of officers, to replace the President in the event the latter being unable to act.
- 5.2.5 To carry out any special tasks which the President may assign to them.

5.3 The duties of the secretariat are:

- 5.3.1 To prepare the minutes of the meetings of the General Assembly, The Board of Directors and subcommittees and forward these to the members.
- 5.3.2 To forward documents to the members in order to keep them informed about the activities of the Association.
- 5.3.3 To conduct correspondence on all matters of concern to the Association.
- 5.3.4 To execute the decisions of the President.
- 5.3.5 To prepare an annual report on the Associations Activities during the preceding period in good time before the meeting of the General Assembly.
- 5.3.6 To collect the contributions of members, render an annual account of income and expenses of the Association and pay the expenses of the Secretariat.
- 5.3.7 To elaborate an annual budget of income and expenditure in accordance with the items approved by the General Assembly and report the results of the previous financial year.

5.4 Duties of the delegates to the General Assembly

- 5.4.1 To promote the activities of the Association in their country or district.
- 5.4.2 To provide information about the national activities.
- 5.4.3 To ensure that the subscription are promptly paid.
- 5.4.4 To make efforts to encourage individuals and organizations to join the Circumpolar Agricultural Association.

CHAPTER 6 - FINANCE

6.1 Association Fund The Fund of the Association is constituted from annual subscriptions of members, income from the Associations capital, from Conferences and donations.

6.2 Subscription Members shall pay into the Fund of the Association the subscriptions which shall become due on 1st January of each year or, in the case of members joining during the year, from the date of joining. The rate of subscription shall be determined by the General Assembly based on recommendation of the Board of Directors.

6.3 Use of the Fund of the Association meets the expenses approved by the General Assembly.

CHAPTER 7 - AMENDMENTS

The Bylaws may be amended by the General Assembly provided

7.1 written notices of the amendments is circulated to the members at least four months prior to the meeting at which they are to be considered,

7.2 two thirds of the votes cast by the delegates are in favor of the amendments.

CHAPTER 8 - FINAL REGULATION

These bylaws were adopted by the General Assembly of the Association 5th September, 1995.

Proud partners of CAC 2010:

