Rit LbhÍ nr. 50

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**Abstract**

Eight experiments with monoculture of 24 varieties of grass and clover species and one mixture of two grass species and two clover species were established in the Faroe Islands (Kollafjørður), Greenland (Upernaviarsuk and Qassiarsuk), Iceland (Korpa and Möðruvellir), Norway (Fureneset and Holt) and Sweden (Lännäs). The main goal of this project was to evaluate important forage species and varieties, in terms of yield, persistence and adaptation to variable climate in the West Nordic countries. Timothy had on average the highest cover after three years in the experiments (63%) together with Knut, a smooth meadow grass variety (67%). Perennial ryegrass had the lowest cover after three years, or 28%. Meadow fescue had a similar cover as timothy in Iceland and Sweden and cocksfoot a similar cover as timothy in Iceland, Sweden and Fureneset. On average cocksfoot (Laban) and timothy varieties related to Grindstad gave the highest yield, 8.85 and 8.71 t/ha, respectively. These species were followed by tall fescue (Swaj), festulolium, perennial ryegrass, northerly timothy varieties and meadow fescue, yielding 8.51, 8.47, 8.23, 8.18 and 7.98 t/ha, respectively. Smooth meadow grass and common bent grass had lower yields, 7.52 and 7.30 t/ha, respectively. The results from these experiments show that we have a wide range of species and varieties usable in the West Nordic areas. We can meet an increase in temperature to a certain level by moving the more southern species and varieties farther north but this can be limited because of factors such as day length requirements or tolerance to diseases. Our most winter hardy varieties are still important to maintain. If the climate changes in the opposite direction these winter hardy varieties could be valuable for other areas as well.

## Introduction

Climatic conditions, characterized by moderate to low summer temperature and very variable winter conditions, limit the potential of crop production in the West Nordic countries. Under these climatic conditions, husbandry based on grass and clover forage is of greatest importance. As the plants have to survive harsh winter conditions the grass and clover species used must have great tolerance to frost, ice cover and temperature fluctuation (Gudleifsson et al. 1986; Bélanger et al. 2006; Höglind et al. 2010) as well as diseases (Larsen 1994). Furthermore, the grasses have to tolerate intensive grassland management (Hermannsson & Helgadóttir 1991). It is therefore important to consider both climate and management when evaluating forage species and varieties for use in these countries.

There is a general consensus among scientists that the temperature on earth is increasing because of the green house effects (IPPC 2013). Small temperature changes can strongly affect agricultural production and may affect the choice of species and varieties. If climate conditions within the West Nordic area change as a result of global warming it is important to have information about which species and varieties can grow well under varied climatic conditions and which have limitations. The main goal of this project was to evaluate important forage species and varieties used in the West Nordic countries for future use and to find which varieties have a wide adaptation and can be used in a wide range of climatic conditions. Furthermore, we wanted to elucidate which are limited to specific conditions. For testing persistence and agronomic values of selected varieties (cultivars) of forage species, a series of uniform experiments under a range of different climatic conditions was performed. Twenty four varieties of grass and clover species were sown at seven locations in the West Nordic countries and at one location in Sweden in 2009 and 2010. In addition one treatment with a mixture of four species was included.

Fig. 1. Harvest at Korpa 2011 (GÞ).

## Material and methods

The experiments were at the following locations:

| Location | Latitude | Longitude | Altitude m |
|---|---|---|---|
| Korpa in South-west Iceland | N 64° 09’ | V 021° 45’ | 45 |
| Möðruvellir in Northern Iceland | N 64° 34’ | V 021° 45’ | 12 |
| Upernaviarsuk in Greenland | N 60° 44’ | V 045° 53’ | 15 |
| Qassiarsuk in Greenland | N 61° 09’ | V 045° 30’ | 20 |
| Kollafjørður in the Faroe Islands | N 62° 06’ | V 006° 58’ | 15 |
| Holt, Tromsø in Northern Norway | N 69° 39’ | E 018° 55’ | 15 |
| Fureneset in Western Norway | N 61° 34’ | E 005° 21’ | 10 |
| Lännäs in Northern Sweden | N 63° 09’ | E 017° 39’ | 31 |

Fig. 2. Location of the experiments.

The following persons were responsible for the experiments:

Guðni Þorvaldsson, Agricultural University of Iceland, for the experiment at Korpa in South-west Iceland and direction of the project. gudni@lbhi.is.
Þóroddur Sveinsson, Agricultural University of Iceland, for the experiment at Möðruvellir In Northern Iceland. thorodd@lbhi.is.
Liv Østrem, Bioforsk West, for the experiment at Fureneset in Western Norway. liv.ostrem@bioforsk.no.
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Linda Öhlund, Lantmännen Lantbruk, for the experiment at Lännäs in Northern Sweden. linda.ohlund@lantmannen.com
Rólvur Djurhuus, The Agricultural Center, for the experiment at Kollafjørður in The Faroe Islands. rd@bst.fo.
Kenneth Höegh, Agricultural Consulting Services, for the experiments in Greenland. keho@kujalleq.gl.

Soil conditions at the experimental stations were as follows:

Lännäs: Silt loam containing 6-12% organic matter, pH 5.8.

Fureneset: The bulk density (g $cm^{-3}$) for the soil was 0.86 and loss on ignition 26.1% (w/w), pH 5.7.

Korpa: The bulk density was 0.70 (grass) and 0.85 (legumes), pH 6.0 and 6.5, respectively. Loss on ignition was 25.4% (grass) and 21.1 (legumes).

Möðruvellir: The bulk density was 0.88 and loss on ignition 16%, pH 6.1.

Holt: The bulk density for the soil was 1.2 and loss on ignition 9%, pH 5.8.

Kollafjørður: pH was 5.2.

Upernaviarsuk: Little organic matter, pH 4.6.

Qassiarsuk: pH 5.0.

The experiments were sown in 2009 and 2010 and the first observations were made on the plots in the seeding year. The following three years, survival of the varieties were registered. According to the plan the experiments should have been harvested for two years. However, yield was not measured in Greenland because of damage that occurred in the experiments. The experiments at Korpa and Fureneset were harvested for three years. The experiment at Kollafjørður was harvested for two years but results for only the first year were published because of the high proportion of weeds in the second year. The cover of seeded varieties in Kollafjørður was also low the first year for some species. The experiments at Fureneset and Lännäs were harvested 3 times each year but 2 times at the other locations.

The experimental design consisted of randomized blocks with three replicates. Plot size was around 10 $m^2$.

Fig. 3. The experiment in Qassiarsuk (GÞ).

Fertilization at each experimental site:

Korpa: At seeding the experimental plots received 50 kg N/ha using a 12-5-14 mixture. Yearly after that the grasses were fertilized with 100 kg N/ha in the spring and 50 kg N/ha after the first cutting with a 16-7-13 mixture. The clover was given yearly 40 kg N/ha in the spring and 40 kg N/ha after the first cutting with a 12-5-14 mixture. Dates for fertilization in the spring were 7 May 2010, 7 May 2011, 4 May 2012.

Möðruvellir: At seeding 25 kg N/ha was applied on the experimental plot using a 12-5-14 mixture. Yearly after that 120 kg N/ha was applied in the spring and nothing after the 1st cutting. Dates for fertilization in the spring were 12 May 2010 and 7 May 2012.

Lännäs: No fertilizer at seeding. In 2010 and 2011 the experimental plot received 80 kg N/ha in the spring, 60 kg N/ha after the 1st cutting and 50 kg N/ha after the 2nd cutting. The fertilizer mixtures were 18-4-14 for all dates 2010 and for the spring fertilization in 2011. After the 1$^{st}$ and 2$^{nd}$ cuttings in 2011 22-7-12 was used. Dates for fertilization in 2010 were 19 May, 24 June and 28 July and for 2011 11 May, 23 June and 22 July.

Kollafjørður: 20 August 2009 the plot was fertilized with 84 kg N/ha in 21-3-10. 31 May 2010 it was fertilized with 120 kg N/ ha in 16-4-13 and 17 July with 60 kg N/ha in 16-4-13. 4 June 2011 it was fertilized with 120 kg N/ha in 16-4-13. 21 May 2012 it was fertilized with 120 kg N/ha in 16-4-13.

Upernaviarsuk: In 2010 the experimental plot received 60 kg N/ha, 13 kg P and 64 kg K on August 10. In late May 2012 the experiment was fertilized with 100 kg N/ha in a fertilizer mixture.

Qassiarsuk: The experiment was a part of a farmer’s grass field and was fertilised on the same dates as the grass field and with the same amount of fertilizer.

Fureneset: The fertilizer before sowing in 2010 was 3 tons cattle slurry and 36 kg N/ha, and 2500 kg/ha of limestone was added. In 2011 (April 28), 2012 (April 30) and 2013 (May 14) the grass received 137 kg N/ha in 18-3-15 fertilizer, 95 kg N/ha after the first cutting and 63 kg N/ha after the second cutting. The clover was given 0-5-17 fertilizer, in 2011 600 kg/ha at 28 April, 170 kg/ha after the first cutting, 230 kg/ha after the second cutting. In 2012 the clover was given 700 kg/ha on 3 May and 170 kg/ha after the first cutting and nothing after the second cutting. In 2013 the clover was given 700 kg on 22 May, 170 kg/ha after the first cutting and nothing after the second cutting.

Holt: In 2010, the seeding year, 63 kg N/ha in 18-3-15 was applied on both grass and clover. In 2011 and 2012 108 kg N/ha was applied in the spring on grass (18-3-15) and only P and K on the clover, 300 kg/ha in 0-5-17. After the first cutting 54 kg N/ha were applied in 18-3-15 on the grass and only P and K on the clover, 300 kg/ha ( 0-5-17).

Fig. 4. Harvest machine transported to Qassiarsuk 2010 (GÞ).

One to six varieties of each species were tested. Some of the varieties have shown good winter survival in northern areas while varieties of more southern origin are less winter hardy. Recently introduced market varieties or ones approved on a national variety list were are also included. The following species and varieties were included:

| | |
|---|---|
| *Phleum pratense* | Snorri (Nordic), Noreng (Graminor), Grindstad (Norway), Lidar (Graminor), Rakel (SW), Switch (SW) |
| *Poa pratensis* | Kupol (SW), Knut (Graminor) |
| *Festuca pratensis* | Norild (Graminor), Kasper (SW) |
| *Festuca arundinacea* | Swaj (SW) |
| *Festulolium* | Felina (DLF) |
| *Dactylis glomerata* | Laban (Graminor) |
| *Lolium perenne* | Birger (SW), Ivar (Graminor), Figgjo (Graminor) |
| *Agrostis capillaris* | Leikvin (Graminor) |
| | |
| *Trifolium pratense* | SW Torun, SW Yngve, Lavine (Graminor), Lea (Graminor) |
| *Trifolium repens* | Norstar (Graminor), Litago (Graminor) |
| *Trifolium hybridum* | Alpo (Graminor) |
| | |
| Mixture | Korpa (Iceland) + Sobra (SW) + Norstar + Lea (25% of each) |

*T. pratense* and *T. hybridum* were sown in a mixture with *Phleum pratense* (var. Korpa) but *T. repens* in a mixture with *Poa pratensis* (var. Sobra).

The local staff at each location took care of the experiments. Gudni Thorvaldsson visited the experiments in Greenland and the Faroe Islands twice during the experimental period and estimated the experiments.

The experiments were seeded on the following dates and years:

| | |
|---|---|
| Upernaviarsuk | August 6th 2009 |
| Qassiarsuk | August 12th 2009 |
| Kollafjørður | August 20th 2009 |
| Korpa | May 27th 2009 |
| Möðruvellir | July 4th 2009 |
| Lännäs | July 10th 2009 |
| Fureneset | June 16th 2010 |
| Holt | July 7th 2010 |

Statistical analysis were performed with SAS (2013).

Fig. 5. The experiment in Kollafjørður 2010 (GÞ).

Fig. 6.  The experiment in Upernaviarsuk (GÞ).

Fig. 7.  The experiment in Holt (SD).

## Results and discussion

*Dry matter yield (DMY)*

A summary of the DMY results is shown in Table 1 and the results from each site and each year are shown in Appendix 1. On average cocksfoot (Laban) and timothy varieties related to Grindstad (Grindstad, Rakel, Lidar and Switch) gave the highest DMY, 8.85 and 8.71 t/ha, respectively. These species were followed by tall fescue (Swaj), festulolium, perennial ryegrass, northerly timothy varieties and meadow fescue yielding 8.51, 8.47, 8.23, 8.18 and 7.98 t/ha, respectively. A little lower DMY gave smooth meadow grass and common bent grass, 7.52 and 7.30 t/ha, respectively. The lowest yielding grass species gave 1.5 t/ha lower DMY than the highest yielding ones.

The red clover varieties gave 6.6 t/ha and the other clover varieties 5.4 t/ha so red clover in a mixture with timothy gave 2.0 t/ha less yield than pure timothy. This was in contradiction to new results from experiments performed in different countries where it was found that the legume mixtures gave a higher yield than monocultures (Sturludóttir et al. 2013; Finn et al. 2013). One reason for this difference could be the higher application rates of nitrogen fertilizer on grass in monoculture in our experiments.

According to Table 1 it varied between locations which species gave the highest yield. However, it is important to keep in mind that the results are based on only a few years of harvest from each location. At Korpa, Möðruvellir and Lännäs cocksfoot and meadow fescue were among the highest yielding species while timothy performed best at Fureneset and Holt. Tall fescue, perennial ryegrass and festulolium were variable, high at some locations but lower at others. The cover of the species in Kollafjørdur was low, which make species comparison difficult. The yield in clover plots was especially high at Lännäs and Fureneset but also high at Möðruvellir.

Variance analyses were performed on the whole yield data set for grasses and clover separately (Table 2 and 3). Site, year and the interaction between these accounted for a large part of the variation in the data set. However, there were significant effects of varieties as well as interaction between variety and year or site. The models explain a large part of the total variation.

Fig. 8. The experiment in Lännäs (LÖ).

**Table 1.** Mean yield over the trial period (1, 2 or 3 years) for each experimental site and mean overall yield for all harvest years (13 years) ranked from highest overall yielding for each species. The last column is the rank over all species averaged over 13 harvest years.

| | DM yield, t/ha | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | **Korpa 3 yrs** | **Möðruv. 2 yrs** | **Lännäs 2yrs** | **Kollafj. 1 yr** | **Fureneset 3 yrs** | **Holt 2 yrs** | **Mean 13 yrs** | **Overall ranking** |
| ***Phleum pratense*** | | | | | | | | |
| Rakel | 7.99 | 8.58 | 10.77 | 5.49 | 11.51 | 6.76 | 8.85 | 1-2 |
| Lidar | 7.61 | 7.92 | 10.48 | 5.46 | 11.78 | 7.21 | 8.72 | 3 |
| Grindstad | 7.52 | 7.72 | 10.62 | 4.83 | 12.04 | 6.68 | 8.64 | 4 |
| Switch | 7.60 | 7.91 | 10.21 | 5.99 | 11.61 | 6.88 | 8.64 | 5 |
| Snorri | 7.09 | 7.63 | 10.21 | 5.84 | 10.77 | 7.15 | 8.30 | 10 |
| Noreng | 6.96 | 7.47 | 9.73 | 5.44 | 10.69 | 6.47 | 8.06 | 11 |
| ***Festuca pratensis*** | | | | | | | | |
| Norild | 8.01 | 8.47 | 11.02 | 4.63 | 9.40 | 4.87 | 7.99 | 12 |
| Kasper | 8.21 | 8.33 | 10.09 | 4.19 | 9.73 | 5.42 | 7.96 | 13 |
| ***Dactylis glomerata*** | | | | | | | | |
| Laban | 8.38 | 8.45 | 13.17 | 3.92 | 10.41 | 6.15 | 8.85 | 1-2 |
| ***Poa pratensis*** | | | | | | | | |
| Kupol | 7.92 | 7.28 | 8.53 | 4.00 | 9.72 | 4.90 | 7.68 | 15 |
| Knut | 6.58 | 6.53 | 9.50 | 5.74 | 8.63 | 5.53 | 7.36 | 16 |
| ***Agrostis capillaris*** | | | | | | | | |
| Leikvin | 7.74 | 6.88 | 8.44 | 5.30 | 8.06 | 5.57 | 7.30 | 17 |
| ***Lolium perenne*** | | | | | | | | |
| Figgjo | 7.51 | 8.46 | 9.51 | 6.29 | 11.99 | 5.98 | 8.39 | 8 |
| Birger | 7.93 | 8.11 | 10.59 | 4.81 | 11.07 | 6.95 | 8.37 | 9 |
| Ivar | 8.03 | 8.16 | 9.58 | 4.99 | 10.70 | 5.10 | 7.92 | 14 |
| ***Festulolium*** | | | | | | | | |
| Felina | 7.70 | 7.60 | 10.62 | 6.39 | 11.87 | 5.61 | 8.47 | 7 |
| ***Festuca arundinacea*** | | | | | | | | |
| Swaj | 8.19 | 6.95 | 12.26 | 4.90 | 11.04 | 5.66 | 8.51 | 6 |
| ***Trifolium repens*** | | | | | | | | |
| Litago | 3.25 | 7.60 | 7.11 | 4.15 | 7.13 | 3.89 | 5.66 | 23 |
| Norstar | 3.03 | 6.99 | 5.98 | 3.42 | 6.80 | 3.91 | 5.22 | 25 |
| ***Trifolium hybridum*** | | | | | | | | |
| Alpo | 3.06 | 6.54 | 6.74 | 3.05 | 7.32 | 4.33 | 5.32 | 24 |
| ***Trifolium pratense*** | | | | | | | | |
| Lea | 4.65 | 7.00 | 9.55 | 4.23 | 9.52 | 4.99 | 6.66 | 18 |
| SW Torun | 4.42 | 7.50 | 9.90 | 3.66 | 9.64 | 4.32 | 6.62 | 19 |
| Lavine | 4.44 | 7.45 | 9.51 | 4.09 | 9.28 | 4.48 | 6.57 | 20 |
| SW Yngve | 4.43 | 7.06 | 9.58 | 3.67 | 9.63 | 4.44 | 6.55 | 21 |
| **Equal mixture[*)]** | 3.90 | 7.39 | 9.68 | 3.88 | 9.21 | 4.17 | 6.44 | 22 |

[*)] *Phleum pratense*, *Poa pratensis*, *Trifolium repens* and *Trifolium pratense* in equal proportions at sowing.

**Table 2.** Results from variance analyses of the yield data set of grasses, all varieties, sites and years.

| Source | DF | F-value | Pr>F |
|---|---|---|---|
| Site | 5 | 178.08 | <0.0001 |
| Year | 2 | 42.58 | <0.0001 |
| Variety | 16 | 4.09 | <0.0001 |
| Site × year | 5 | 35.49 | <0.0001 |
| Site × variety | 73 | 1.88 | <0.0031 |
| Year × variety | 32 | 4.34 | <0.0001 |
| Error | 80 | | |
| Yield mean = 8.35 t DM/ha | | | |
| Root MSE = 0.81 | | | |
| CV = 9.70 | | | |
| $R^2$ = 0.95 | | | |

**Table 3.** Results from variance analyses of the yield data set of clover, all varieties, sites and years.

| Source | DF | F-value | Pr>F |
|---|---|---|---|
| Site | 5 | 180.0 | <0.0001 |
| Year | 2 | 17.5 | <0.0001 |
| Variety | 7 | 4.4 | <0.0014 |
| Site × year | 5 | 12.3 | <0.0001 |
| Site × variety | 35 | 1.6 | <0.0736 |
| Year × variety | 14 | 2.6 | <0.0113 |
| Error | 35 | | |
| Yield mean = 6.05 t DM/ha | | | |
| Root MSE = 0.63 | | | |
| CV = 11.0 | | | |
| $R^2$ = 0.97 | | | |

*Cover in spring*

A summary of the spring cover (%) of the varieties after three years in the experiments (two years in Lännäs) is presented in Table 4. The timothy varieties together with Knut (smooth meadow grass) had on average the best cover after three winters in the experiments. Snorri (timothy) was highest of all varieties followed by var. Knut and var. Noreng (timothy). Laban (cocksfoot) had a little lower cover than the timothy varieties, followed by Kasper (meadow fescue), Kupol (smooth meadow grass) and Leikvin (common bent grass). The ryegrass varieties were variable in cover and most of them were among the lowest of the grass species. The clover varieties were not comparable to the grasses because they were sown in a mixture with grasses. Most of the clover varieties had around 30% cover, with Alpo (alsike clover) lowest at 21%.

The average cover for all species was highest at Korpa (79%), Lännäs (68%), Fureneset (66%), Möðruvellir (54%) and Upernaviarsuk (34%). It was lower at the three other locations, Holt (19%), Kollafjørður (16%) and Qassiarsuk (10%). Estimates of cover for the seeding year were not available from Kollafjørður, Qassiarsuk, Upernaviarsuk and Holt.

In Iceland the cover was also estimated in the spring of 2013, after four winters in the experiments. At Möðruvellir there was ice cover on the experiment for several months during the fourth winter and most of the varieties died. Knut smooth meadow-grass tolerated this best and had 40% cover and Kupol 17%. The timothy varieties had 13-32% cover, Rakel and Switch 32% cover, Lidar 27%, Snorri 23% and Noreng and Grindstad 13%. Other varieties had 0-1% cover.

There was no ice cover at Korpa during the winter of 2012-2013. February and March were relatively warm but April and May cold. Laban tolerated these circumstances better than other varieties and had 100% cover in the spring of 2013. Leikvin had 80% cover followed by Kasper (78%), Swaj (tall fescue) (68%), Norild (meadow fescue) (53%) and Knut (45%). The timothy varieties were all similar, with about 30% cover. The reason for the low cover of timothy at Korpa after the fourth winter was not a bad winter; it has often been shown in Icelandic experiments that the cover of timothy decreases quickly the first years after seeding, especially if it is harvested early in the summer (Jónatan Hermannsson & Áslaug Helgadóttir 1991; Guðni Þorvaldsson 1994, 1999). Even though timothy is a winter hardy species it can disappear in competition from other species (Jørgensen & Junttila; Jørgensen et al. 1994). Perennial ryegrass had 20-30% cover. The clover varieties had 17-28% cover.

Fig. 9. The experiment in Kollafjørður 2010 (GÞ).

**Table 4.** Spring cover (%) of the varieties after three winters in the experiments (two winters in Lännäs) for each experimental site, ranked from highest cover to lowest within species. In the last column the varieties are ranked over all species.

| | Cover at the end of experiment, % | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Korpa** | **Möðruv.** | **Lännäs** | **Kollafj.** | **Fureneset** | **Holt** | **Upern.** | **Qass.** | **Mean** | **Rank** |
| **Phleum pratense** | | | | | | | | | | |
| Snorri | 93 | 80 | 80 | 14 | 86 | 57 | 92 | 66 | 71 | 1 |
| Noreng | 92 | 80 | 87 | 17 | 92 | 58 | 88 | 10 | 66 | 3 |
| Grindstad | 94 | 83 | 77 | 7 | 89 | 50 | 80 | 27 | 63 | 4 |
| Rakel | 94 | 87 | 77 | 7 | 92 | 40 | 87 | 6 | 61 | 5 |
| Switch | 93 | 85 | 70 | 4 | 89 | 52 | 77 | 1 | 59 | 6 |
| Lidar | 94 | 85 | 78 | 9 | 92 | 33 | 72 | 2 | 58 | 7 |
| **Festuca pratensis** | | | | | | | | | | |
| Kasper | 90 | 92 | 75 | 17 | 55 | 30 | 12 | 9 | 48 | 9 |
| Norild | 83 | 85 | 83 | 13 | 38 | 12 | 5 | 10 | 41 | 13 |
| **Dactylis glomerata** | | | | | | | | | | |
| Laban | 99 | 87 | 93 | 16 | 80 | 37 | 28 | 5 | 56 | 8 |
| **Poa pratensis** | | | | | | | | | | |
| Knut | 87 | 82 | 93 | 13 | 93 | 17 | 87 | 60 | 67 | 2 |
| Kupol | 18 | 73 | 82 | 16 | 93 | 1 | 77 | 6 | 46 | 10 |
| **Agrostis capillaris** | | | | | | | | | | |
| Leikvin | 91 | 58 | 67 | 13 | 25 | 13 | 77 | 8 | 44 | 11 |
| **Lolium perenne** | | | | | | | | | | |
| Birger | 80 | 55 | 77 | 12 | 15 | 7 | 0 | 0 | 31 | 18 |
| Ivar | 82 | 48 | 53 | 17 | 17 | 3 | 0 | 0 | 28 | 23 |
| Figgjo | 82 | 35 | 37 | 13 | 15 | 27 | 0 | 0 | 26 | 24 |
| **Festulolium** | | | | | | | | | | |
| Felina | 72 | 55 | 83 | 4 | 83 | 34 | 0 | 1 | 42 | 12 |
| **Festuca arundinacea** | | | | | | | | | | |
| Swaj | 73 | 38 | 90 | 7 | 72 | 7 | 0 | 1 | 36 | 16 |
| **Trifolium repens** | | | | | | | | | | |
| Norstar | 78 | 10 | 30 | 60 | 83 | 0 | 17 | 10 | 36 | 15 |
| Litago | 40 | 5 | 33 | 37 | 82 | 0 | 17 | 14 | 29 | 20 |
| **Trifolium hybridum** | | | | | | | | | | |
| Alpo | 45 | 7 | 30 | 5 | 78 | 0 | 0 | 0 | 21 | 25 |
| **Trifolium pratense** | | | | | | | | | | |
| SW Yngve | 82 | 37 | 60 | 9 | 55 | 0 | 2 | 0 | 31 | 17 |
| SW Torun | 72 | 25 | 70 | 8 | 50 | 0 | 3 | 0 | 29 | 19 |
| Lea | 85 | 23 | 50 | 11 | 52 | 0 | 4 | 0 | 28 | 21 |
| Lavine | 80 | 22 | 63 | 7 | 48 | 0 | 6 | 1 | 28 | 22 |
| **Equal mixture[*)]** | 77 | 10 | 63 | 60 | 68 | 2 | 11 | 4 | 37 | 14 |

[*)] *Phleum pratense*, *Poa pratensis*, *Trifolium repens* and *Trifolium pratense* in equal proportions at sowing.

*Nutritional value*

In vitro digestibility of several varieties were performed on samples from the 1st cutting at Korpa (two dates) and Lännäs (one date) 2010. The harvest in Lännäs was later than normal for this location. The results are shown in Table 5. Furthermore, NIR analyses of different feeding qualities were performed on samples from Fureneset 2012. Those results are presented in Table 6. According to Table 5 Birger (perennial ryegrass) had the best digestibility followed by Snorri (timothy) and Kasper (meadow fescue). A little behind these three varieties were Knut, Swaj and Laban. Leikvin had the lowest digestibility. All varieties were harvested at the same time, however, which means that they were harvested at different developmental stages and it was not feasible to harvest each variety at its optimal developmental stage. The pattern in Table 6 is not very different from this except that Leikvin and Swaj were unexpectedly high in digestibility. Thorvaldsson & Kristjánsdóttir (2010) presented results from some of these species where perennial ryegrass was highest in digestibility, followed by timothy and meadow fescue and cocksfoot a little lower. Festulolium var. Felina is a festucoid type (*L. multiflorum x F. arundinacea*) very much resembling tall fescue, also shown by a stronger similarity to tall fescue var. Swaj than with the perennial ryegrass varieties which more resemble the loloid type festulolium (Østrem et al., 2014).

**Table 5**. In vitro digestibility (% DM) of several varieties at Korpa (two dates) and Lännäs (one date) for 1st cutting, 2010.

| | | **Korpa** | | **Lännäs** | |
|---|---|---|---|---|---|
| Variety | Species | June 19 | June 24 | June 24 | Average |
| Birger | *L. perenne* | 74.2 | 74.0 | 72.3 | 73.5 |
| Snorri | *P. pratense* | 72.1 | 69.9 | 72.0 | 71.3 |
| Kasper | *F. pratensis* | 69.5 | 69.3 | 72.5 | 70.4 |
| Knut | *P. pratensis* | 67.2 | 69.7 | 70.4 | 69.1 |
| Swaj | *F. arundinacea* | 68.7 | 68.5 | 68.7 | 68.6 |
| Laban | *D. glomerata* | 67.4 | 67.9 | 69.6 | 68.3 |
| Leikvin | *A. capillaris* | 65.1 | 63.4 | 66.6 | 65.0 |
| Rakel | *P. pratense* | | | 69.3 | |
| Felina | x *Festulolium* | | | 69.4 | |

Fig. 10. Clover plots at Fureneset (LØ).

**Table 6**. Results from NIR analysis of nutritional value at Fureneset, Norway in year 2012, for 2 out of 3 cuttings.

**Result from NIR analyses, % DM - Fureneset 2012**

| | Digestibility | | Crude protein | | ADF[1)] | | ADL[2)] | | UNDF[3)] | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Variety** | **1st cut** | **2nd cut** | **1st cut** | **2nd cut** | **1st cut** | **2nd cut** | **1st cut** | **2nd cut** | **1st cut** | **2nd cut** |
| **Timothy** | | | | | | | | | | |
| Snorri | | 72.6 | | 18.9 | | 28.6 | | 2.9 | | 5.7 |
| Noreng | | 73.0 | | 19.3 | | 28.7 | | 2.6 | | 5.1 |
| Grindstad | | 68.5 | | 15.2 | | 34.0 | | 2.9 | | 7.7 |
| Lidar | | 69.4 | | 15.0 | | 33.4 | | 2.8 | | 6.8 |
| Rakel | | 69.8 | | 15.5 | | 33.4 | | 2.9 | | 7.2 |
| Switch | | 69.7 | | 16.1 | | 30.9 | | 2.7 | | 6.9 |
| **Perennial ryegrass** | | | | | | | | | | |
| Birger | 80.0 | 69.9 | 14.7 | 16.1 | 22.9 | 29.9 | 1.6 | 2.5 | 4.6 | 8.2 |
| Figgjo | 78.6 | 70.6 | 14.7 | 16.5 | 24.5 | 30.1 | 1.6 | 2.4 | 5.2 | 8.3 |
| Ivar | 79.6 | 71.8 | 15.3 | 15.5 | 22.9 | 28.8 | 1.6 | 2.3 | 4.7 | 7.8 |
| **Festulolium** | | | | | | | | | | |
| Felina | 72.6 | 72.5 | 15.8 | 16.8 | 28.1 | 28.7 | 2.0 | 2.0 | 8.5 | 8.7 |
| **Meadow fescue** | | | | | | | | | | |
| Norild | 75.1 | 73.2 | 14.8 | 18.7 | 26.6 | 28.8 | 2.1 | 2.2 | 6.5 | 5.1 |
| Kasper | 74.4 | 73.2 | 15.8 | 19.1 | 26.7 | 28.8 | 2.1 | 2.1 | 6.8 | 4.8 |
| **Smooth meadow grass** | | | | | | | | | | |
| Kupol | 65.9 | 67.3 | 14.6 | 17.0 | 32.2 | 34.6 | 2.8 | 2.5 | 12.4 | 10.4 |
| Knut | 72.6 | 71.7 | 18.9 | 17.0 | 26.8 | 28.3 | 2.3 | 2.2 | 8.4 | 7.5 |
| **Cocksfoot** | | | | | | | | | | |
| Laban | 66.7 | 69.3 | 14.8 | 21.4 | 30.7 | 29.0 | 2.7 | 2.8 | 10.1 | 6.9 |
| **Tall fescue** | | | | | | | | | | |
| Swaj | 73.5 | 70.4 | 16.4 | 15.1 | 27.8 | 30.0 | 2.0 | 2.0 | 7.1 | 8.5 |
| **Common bent grass** | | | | | | | | | | |
| Leikvin | 76.0 | 68.7 | 19.6 | 21.0 | 23.8 | 28.9 | 2.2 | 2.6 | 6.7 | 7.6 |
| **Average grasses** | **74.1** | **70.7** | **15.9** | **17.3** | **26.6** | **30.3** | **2.1** | **2.5** | **7.4** | **7.2** |

| | Digestibility | | Crude protein | | ADF[1)] | | ADL[2)] | | UNDF[3)] | | Clover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Variety** | **1st cut** | **2nd cut** | **1st cut** | **2nd cut** | **1st cut** | **2nd cut** | **1st cut** | **2nd cut** | **1st cut** | **2nd cut** | **1st cut** | **2nd cut** |
| **Red clover** | | | | | | | | | | | | |
| SW Torun | 66.4 | 70.1 | 21.4 | 24.1 | 29.2 | 26.2 | 4.3 | 3.9 | 7.4 | 5.1 | 78 | 69 |
| SW Yngve | 66.4 | 71.5 | 21.7 | 23.9 | 29.6 | 26.6 | 4.1 | 3.6 | 5.9 | 4.7 | 65 | 54 |
| Lavine | 66.1 | 70.6 | 20.8 | 24.4 | 29.9 | 26.4 | 4.2 | 3.7 | 6.0 | 5.1 | 74 | 60 |
| Lea | 66.9 | 70.2 | 21.3 | 23.4 | 28.2 | 27.0 | 4.3 | 3.7 | 6.1 | 5.5 | 86 | 58 |
| **White clover** | | | | | | | | | | | | |
| Norstar | 69.8 | 71.4 | 20.0 | 19.5 | 30.5 | 28.3 | 2.9 | 2.9 | 6.8 | 7.5 | 15 | 26 |
| Litago | 69.9 | 70.8 | 21.8 | 18.4 | 30.0 | 28.7 | 3.2 | 3.0 | 6.0 | 8.3 | 26 | 30 |
| **Alsike clover** | | | | | | | | | | | | |
| Alpo | 72.9 | 74.5 | 21.5 | 20.8 | 28.2 | 26.5 | 3.3 | 3.1 | 4.5 | 5.1 | 37 | 32 |
| **Mixture** | | | | | | | | | | | | |
| Red and white | 68.8 | 69.8 | 21.5 | 24.1 | 30.1 | 26.2 | 3.8 | 4.0 | 5.5 | 5.0 | 52 | 70 |
| **Average clovers** | **68.4** | **71.1** | **21.3** | **22.3** | **29.5** | **27.0** | **3.8** | **3.5** | **6.0** | **5.8** | **54.1** | **49.9** |

[1)] Acid detergent fibres. [2)] Acid detergent lignin. [3)] Undigestible neutral detergent fibres.

*Timothy*

The varieties Rakel, Lidar, Grindstad and Switch were among the highest yielding in the experiments without significant differences in total yield. However, there was a significant difference between these varieties and var. Noreng and also between var. Rakel and var. Snorri. When the second cutting was analysed separately the results were similar. Significant differences were not found between the varieties Rakel, Lidar, Grindstad and Switch but were between these varieties and the varieties Snorri and Noreng. The difference between the varieties Snorri and Noreng in the second cutting was not significant. The interaction between variety and site was not significant, which means that the varieties rank in a similar way at different sites, at least while the plots are not damaged ($R^2$ = 0.97, CV = 5.4, Root MSE = 0.456, Mean = 8.53 t/ha). The varieties can have different resistance to winter climate and harvest treatments which at a certain time will affect the yield. But while the varieties have a good cover the yield ranking was similar at different sites. The timothy varieties Engmo and Vega were compared in Iceland, Greenland and the Faroe Islands (Thorvaldsson et al. 2000). Results from these experiments also showed no interaction between sites and varieties. Helgadóttir (1989) found similar results in comparing timothy varieties at seven locations in Iceland and the northern parts of Norway, Sweden and Finland. The same results were found by Helgadottir & Björnsson (1994) where timothy did not show variety x location interaction whereas meadow fescue, smooth meadow grass and red fescue did. This is of course dependent on the genetic variation within the plant material we were using and how variable climatic conditions were included. Björnsson (1993) divided the five Nordic countries into five zones based on this kind of calculation. Consistency for the entries investigated was also found between the locations (61 °N and 67 °N) in a Norwegian experiment including festulolium, perennial ryegrass, meadow fescue and timothy (Østrem et al., 2013).

Fig. 11. Regrowth of timothy at Korpa, Snorri (left), Switch (middle) and Rakel (right) (GÞ).

Our study showed, after three years, that Snorri had the best average cover (71%) and Lidar the lowest (58%) when all sites were included. Even though Snorri had the best average cover it was only in Qassiarsuk that it was much better than other varieties. Together with Noreng, Snorri also had better cover than other species at Holt, Kollafjørður and Upernaviarsuk. At Korpa, Möðruvellir, Fureneset and Lännäs, Snorri had similar or less cover than the other varieties. Snorri, and to some extent Noreng, seem to be more winter tolerant at extreme situations than the other varieties. On the other hand Snorri and Noreng are not the best choice for locations in the West Nordic region with more moderate climatic conditions due to their inherent adaptation to more limited climatic conditions in the high north. In these locations more productive varieties like Rakel, Lidar and Grindstad would be preferable. The breeding history of var. Grindstad implies continual natural selection over decades and is therefore also well adapted to many northern locations (Østrem et al., 2013). The varieties specifically bred for the northern regions are easily outcompeted by more southern adapted varieties when the winters are not very harsh. When the growing seasons are longer the more southern adapted varieties could perform better than the northern adapted varieties partly due to better regrowth abilities.

*Perennial ryegrass*

There was no significant difference in yield between varieties. Site, year and interaction between these factors were the main factors behind the variation in the yield data ($R^2$ = 0.90, CV = 12.0, Root MSE = 0.91, Mean = 8.29 t/ha). The interaction between years and varieties also had significant effects. The Nordic countries are in a critical zone for growth of perennial ryegrass which results in large site and year effects. When perennial ryegrass is cultivated in this environment it can easily vanish after a difficult winter or spring. In the experiment at Korpa 2011 the cover of perennial ryegrass was bad in early spring and it seemed to be dead though it did recover. Yield for the first cutting was low but both cover and yield were good for the second cutting.

The cover of perennial ryegrass varied a lot between locations after three years in the experiments. All varieties were dead in Greenland. The difference between varieties at Korpa, Möðruvellir and Fureneset was not so large. The variation between varieties was larger at Lännäs and Holt. Because of this variation it is very important to find the right varieties for each location.

*Meadow fescue*

The meadow fescue varieties gave an especially high yield in Iceland and Sweden and the average yield of these two varieties over all locations was the same, 8.0 t/ha. The cover of the meadow fescue varieties was also similar after 3 years in the experiments, 48% for Kasper but 41% for Norild. Kasper was usually a little higher. The cover of these varieties was especially low in Qassiarsuk, Upernaviarsuk, Kollafjørður and Holt. In a comparison with festulolium, perennial ryegrass and timothy at two locations in Norway, the digestible DMY in meadow fescue equalled that of timothy but was lower than festucoid festulolium (Østrem et al., 2013).

*Smooth meadow grass*

On average there was little difference in yield between Kupol (7.68 t/ha) and Knut (7.36 t/ha) and it varied between locations which of these yielded more. It has been found earlier that the yield of smooth meadow grass interacts with locations more than timothy does (Helgadóttir 1989, Thorvaldsson et al. 2000).

The cover of these varieties was even more variable, 67% for Knut on average and 44% for Kupol. In most cases Knut had higher cover.

*Cocksfoot*

Laban was among the highest yielding varieties in the experiments. The average cover after 3 years was 56% if all locations are included. The cover of Laban was low in Kollafjørður and Qassiarsuk from the beginning. If these sites are excluded the cover after three years was on average 71%. When the cover of Laban was estimated at Korpa after 4 years it was 100%, much better than any other variety. Even though cocksfoot is not very resistant to ice cover, it seems to have good tolerance against some other types of winter stress. It is also good in competition with other species.

Fig. 12. Cocksfoot at Möðruvellir (ÞS).

*Tall fescue and festulolium*

Swaj was among the highest yielding varieties in the experiments. The average spring cover after 3 years was 36% if all locations were included, highest at Lännäs, Fureneset and Korpa. The cover of Swaj was low in Kollafjørður and Qassiarsuk from the beginning. If these sites are excluded the cover after three years was 47%. High spring cover and DMY have also been seen in Norwegian trials for tall fescue (Østrem & Larsen, 2012).

In DMY var. Felina was similar to perennial ryegrass and tall fescue. In cover it was similar to tall fescue and a little higher than perennial ryegrass.

*Common Bent grass*

Leikvin was among the lowest yielding grass varieties in the experiments. The cover after three years was on average 44% if all sites were included.

*Red clover*

There was not a significant difference in yield between varieties of red clover. Site, year and interaction between these contributed to almost all the variation in the yield data set ($R^2$ = 0.98, CV = 6.4, Root MSE =0.412, Mean=6.43 t/ha).

Even though there was no difference in yield between varieties some variability could be seen in cover after three years in the experiments. Almost all red clover died at Holt and Qassiarsuk and very little was left in Upernaviarsuk. In Kollafjørður the cover was between 7 and 11%. In Fureneset all varieties had about a 50% cover. In Lännäs the cover was between 50 and 70%; SW Torun was highest and Lea lowest. At Korpa the cover of all varieties was between 72 and 85%; SW Torun was lowest but the other varieties similar. At Möðruvellir the cover was between 22 and 37%; SW Yngve had the best cover but other varieties were similar.

The fourth winter (2012-2013) was hard for plants in Iceland. All clover at Möðruvellir died because of ice cover for several months. At Korpa there was no ice but cold weather in April and May after a relatively warm period in February and March. The cover of clover at Korpa decreased substantially from 2012 to 2013. In spring 2013 the cover at Korpa was as follows: SW Torun 7%, SW Yngve 28%, Lavine 15% and Lea 22%. SW Yngve and Lea, the 2n varieties, had little better cover than the others.

At Korpa in the spring of 2014 the cover was estimated as 27% for SW Yngve , Lea 22%, Lavine 14% and SW Torun 6%. SW Yngve and Lea were still with better cover than the others.

Fig. 13. Clover at Korpa 2010 (GÞ).

*White clover and Alsike clover*

The average yield for these three varieties was 5.66 t/ha for Litago and 5.32 for Alpha and Norstar. The same pattern was found for these varieties as for red clover; there was no significant difference between varieties in yield. Site, year and interaction between these factors accounted for most of the variation in the data set, especially site ($R^2$ = 0.94, CV = 10.8, Root MSE =0.586, Mean=5.4 t/ha).

After three years the cover of these varieties varied a lot between locations and varieties. Alpo had disappeared in Qassiarsuk, Upernaviarsuk and Holt. The white clover varieties had disappeared in Holt. In Kollafjørður Alpo had 5% cover, Litago 37% and Norstar 60%. In Fureneset all varieties had around 30% cover. In Lännes all varieties had around 80% cover. At Möðruvellir the cover was 5-10%. At Korpa Alpo had 45% cover, Litago 40% and Norstar 78%.

During the fourth winter in Iceland all varieties died at Möðruvellir because of ice cover and at Korpa Alpo had 9% cover, Litago 37% and Norstar 13%. The cover of Norstar decreased considerably between 2012 and 2013. In the spring of 2014 the cover was estimated again and then Norstar had 20% cover, Litago 10% and Alpo 6%.

Fig. 14. Litago white clover at Fureneset (LØ).

*Winter tolerance*

Ice cover was not observed in these experiments except during the last winter at Möðruvellir. All the varieties in the experiments presented here were also tested in 17 experiments which were located in farmers‘ grass fields in Iceland (Þorvaldsson et al., 2014). Those experiments were harvested by the farmers at the same time as the grass fields and if the grass fields were grazed, the experiments were grazed as well. The yield was not observed but survival of the varieties observed every spring.

Some of these experiments in Iceland were covered with ice for more than two months, whereas others had no ice or ice for a short period only. It is interesting to compare the survival of the varieties in these two groups. In the group with a long period of ice cover the varieties can be divided into three groups according to their survival. The first group consisted of timothy, common bent grass and smooth meadow grass with about 30% cover. The second group consisted of meadow fescue and cocksfoot with 10-13% cover. The third group consisted of perennial ryegrass and tall fescue with less than 2% cover. The clover was not comparable to the grasses because it was seeded in a mixture with grass but the clover seemed to give similar results as meadow fescue and cocksfoot. White clover seemed to tolerate ice cover better than red clover. At sites with no or limited ice cover the species lined up differently. Cocksfoot had better cover than timothy, and meadow fescue only slightly lower cover than timothy. The cover of perennial ryegrass and tall fescue was not good but better than in the group with a long period of ice cover.

These results agree with results from Gudleifsson et al. (1986) and Gudleifsson (2010) where ice tolerance of meadow plants was tested both on fields *in situ* and in artificially controlled ice experiments. In those tests Bering hairgrass (*Deschampsia beringensis*), tufted hairgrass (*D. caespitosa*), timothy and smooth meadow grass were most tolerant of ice. In the second group were creeping foxtail, reed canarygrass, red fescue and meadow foxtail. Meadow fescue, cocksfoot and perennial ryegrass constituted the third group. The rank changed when cold hardiness was tested. Timothy, smooth meadow grass and red fescue were among the best, followed by meadow foxtail, meadow fescue, creeping foxtail, tufted hairgrass and Berings hairgrass. Cocksfoot was a little behind and reed canary grass last.

Fig. 15. The experiment at Möðruvellir (ÞS).

*Latitude*

Native grass species in northern regions cease growth early in autumn and start preparation for the winter climate. Non-native grasses, however, do not cease growth early enough for successful acclimation to the cold, which increases the risk of winter killing. Perennial ryegrass and festulolium hybrids are examples of species that have been moving from south to north during recent decades. Their adaptation to the Nordic climate has been increased by breeding work even though they are still behind the native species in winter survival. Østrem et al. (2014) found, in a study of perennial ryegrass, Festulolium hybrids and meadow fescue, that increased photosynthetic activity in autumn had a positive effect on winter survival at Fureneset (61°N) whereas at Vågønes (67°N) increase in photosynthetic activity in autumn had no or a negative effect on winter survival. This difference in response was mainly due to low light conditions in the north, which require an alternative mechanism for triggering growth cessation. Low photosynthetic activity in autumn was associated with better spring cover in meadow fescue var. Norild and two northern adapted varieties of perennial ryegrass. Increased temperature in late summer/early autumn has shown a decrease in frost tolerance in timothy and perennial ryegrass (Dalmannsdottir et al., 2013). These findings show that a temperature x photoperiod interaction has to be taken into account in future plant breeding.

However, the results from Iceland show that we can to some extent use species that are aimed for more southern areas like our experience with meadow fescue, cocksfoot and perennial ryegrass show. In warm periods they have given good results.

Fig. 16. Grass species at Korpa 2009 (GÞ).

**Conclusions**

The results from these experiments show that we have a wide range of species and varieties usable in the West Nordic areas. We can meet an increase in temperature to a certain level by moving the more southern species and varieties farther north. For non-native species such as perennial ryegrass, more specific selection of plant material which is able to cease autumn growth and then harden properly will be a challenge due to the temperature – photoperiod interaction, which of course varies with the latitude. However, the most winter hardy varieties are still important to maintain. If the climate changes in the opposite direction these winter hardy varieties will be valuable for other areas as well.

Timothy had in general the widest adaptation of the species in the experiment. It survived relatively well at all locations but there was a difference between varieties. In general it was among the highest yielding species but not the highest at all locations. If timothy varieties survive at different locations they tend to give the same yield ranking at all locations. Even though timothy is winter hardy it does not live for many years with early cutting dates as is practiced in some West Nordic countries, and breeding of timothy that will tolerate more cuttings and with increased regrowth capacity is indeed important to fit in an extending growing season.

Smooth meadow grass also has a wide adaptation but it seems to be more important than, in the case of timothy, to use the right variety at different locations. This species gave in general a lower yield than many other species in the experiments. This species will probably mainly be needed in a cold climate and where grass fields are grazed.

Laban, the only cocksfoot variety, was surprisingly stable at different locations in the experiments even though it is not as winter hardy as timothy. It was among the highest yielding varieties. The feeding value is not among the best but with early cutting it can give acceptable values. Cocksfoot might need more attention at certain locations in the Nordic countries.

Meadow fescue seemed to be more unstable than timothy, among the best at some locations but not good at others. It should be avoided where there is a risk of long standing ice cover. When grown under preferable conditions it is high yielding with good feeding value.

Nordic Bent grass used to be winter hardy but like some other species it responds selectively to climate. It is more a maritime species than continental. The yield and feeding value is not among the best so it will not be widely used.

Perennial ryegrass, tall fescue and festulolium were not among the most winter hardy species in these experiments. However, they were high yielding at locations where they survived. Perennial ryegrass has in addition a good feeding value.

White clover survived at most of the locations and red clover was not far behind. Alsice clover was a little behind the other clover species.

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**Appendix 1.**

Yield (t DM/ha), cover (%) and some other information for each site, each year and each cutting during the experimental period.

**Korpa** **DM yield, t/ha, 2010 – 2012**

| | 2010 | | | 2011 | | | 2012 | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1st cut 24/6 | 2nd cut 5/8 | Total | 1st cut 24/6 | 2nd cut 15/8 | Total | 1st cut 2/7 | 2nd cut 9/8 | Total |
| **Phleum pratense** | | | | | | | | | |
| Rakel | 5.98 | 2.19 | 8.17 | 5.27 | 3.83 | 9.10 | 5.36 | 1.34 | 6.70 |
| Lidar | 5.48 | 2.36 | 7.84 | 4.88 | 3.56 | 8.44 | 5.23 | 1.31 | 6.54 |
| Grindstad | 5.12 | 2.22 | 7.34 | 5.01 | 3.83 | 8.84 | 5.19 | 1.18 | 6.37 |
| Switch | 5.46 | 2.21 | 7.67 | 5.10 | 3.67 | 8.77 | 4.99 | 1.36 | 6.35 |
| Snorri | 5.85 | 1.56 | 7.41 | 4.83 | 3.11 | 7.94 | 4.85 | 1.07 | 5.92 |
| Noreng | 5.54 | 1.49 | 7.03 | 4.79 | 2.94 | 7.73 | 4.88 | 1.24 | 6.12 |
| **Festuca pratensis** | | | | | | | | | |
| Norild | 5.52 | 2.44 | 7.96 | 4.80 | 4.24 | 9.04 | 4.24 | 2.80 | 7.04 |
| Kasper | 6.02 | 2.46 | 8.48 | 4.69 | 4.61 | 9.30 | 3.90 | 2.95 | 6.85 |
| **Dactylis glomerata** | | | | | | | | | |
| Laban | 4.77 | 3.15 | 7.92 | 4.82 | 4.33 | 9.15 | 4.64 | 3.43 | 8.07 |
| **Poa pratensis** | | | | | | | | | |
| Kupol | 4.78 | 2.58 | 7.36 | 5.09 | 4.22 | 9.31 | 4.30 | 2.78 | 7.08 |
| Knut | 3.70 | 3.06 | 6.76 | 3.83 | 3.71 | 7.54 | 3.94 | 1.51 | 5.45 |
| **Agrostis capillaris** | | | | | | | | | |
| Leikvin | 4.56 | 2.22 | 6.78 | 4.69 | 4.33 | 9.02 | 4.95 | 2.47 | 7.41 |
| **Lolium perenne** | | | | | | | | | |
| Figgjo | 4.82 | 3.36 | 8.18 | 2.62 | 5.48 | 8.10 | 4.57 | 1.69 | 6.26 |
| Birger | 5.30 | 3.35 | 8.65 | 2.59 | 5.63 | 8.22 | 4.92 | 2.01 | 6.93 |
| Ivar | 4.57 | 3.28 | 7.85 | 3.76 | 5.40 | 9.16 | 4.62 | 2.46 | 7.08 |
| **Festulolium** | | | | | | | | | |
| Felina | 3.37 | 2.59 | 5.96 | 4.17 | 4.52 | 8.69 | 5.16 | 3.28 | 8.44 |
| **Festuca arundinacea** | | | | | | | | | |
| Swaj | 3.75 | 2.71 | 6.46 | 4.68 | 4.75 | 9.43 | 5.37 | 3.31 | 8.68 |

| | 1st cut | 2nd cut | Total | Clover % in yld | 1st cut 6/7 | 2nd cut | Total | Clover % in yld | 1st cut | 2nd cut | Total | Clover % in yld |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Trifolium repens** | | | | | | | | | | | | |
| Litago | 0.99 | 2.38 | 3.37 | 29 | 1.29 | 1.70 | 2.99 | 10 | 2.01 | 1.39 | 3.40 | 9 |
| Norstar | 0.67 | 2.31 | 2.98 | 41 | 1.21 | 1.61 | 2.82 | 22 | 1.79 | 1.51 | 3.30 | 19 |
| **Trifolium hybridum** | | | | | | | | | | | | |
| Alpo | 2.06 | 1.43 | 3.49 | 16 | 2.11 | .53 | 2.64 | 11 | 2.44 | 0.61 | 3.05 | 9 |
| **Trifolium pratense** | | | | | | | | | | | | |
| Lea | 1.95 | 2.02 | 3.97 | 46 | 4.70 | 0.76 | 5.46 | 79 | 3.97 | 0.54 | 4.51 | 52 |
| SW Torun | 2.52 | 2.13 | 4.65 | 34 | 4.02 | 1.14 | 5.16 | 70 | 2.81 | 0.66 | 3.46 | 29 |
| Lavine | 2.17 | 2.16 | 4.33 | 30 | 4.03 | 1.18 | 5.21 | 69 | 3.06 | 0.73 | 3.79 | 44 |
| SW Yngve | 2.09 | 2.18 | 4.27 | 46 | 3.96 | 0.80 | 4.76 | 70 | 3.73 | 0.54 | 4.27 | 43 |
| **Equal mixture** *) | 1.53 | 2.02 | 3.55 | 33 | 3.10 | 114 | 4.24 | 47 | 2.75 | 1.17 | 3.92 | 24 |

*) Phleum pratense, Poa pratensis, Trifolium repens and Trifolium pratense in equal proportions at sowing.

## Korpa — Cover, heading and colour, 2009 – 2013

| | Cover, % | | | | | | | Heading, 0-5 | Color, 0-9 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **2009** | **2010** | | **2011** | | **2012** | **2013** | **2010** | **2010** | **2011** | | **2012** |
| | 19/9 | 16/5 | 19/7 | 26/5 | 30/7 | 1/6 | 22/6 | 23/6 | 18/10 | 8/5 | 18/10 | 20/4 |
| **Phleum pratense** | | | | | | | | | | | | |
| Rakel | 93 | 95 | 95 | 95 | 94 | 94 | 43 | 1 | 7 | 8 | 7 | 4 |
| Lidar | 92 | 93 | 94 | 95 | 92 | 94 | 33 | 1 | 7 | 7 | 7 | 4 |
| Grindstad | 92 | 92 | 94 | 95 | 93 | 94 | 32 | 1 | 7 | 7 | 7 | 4 |
| Switch | 90 | 93 | 93 | 95 | 94 | 93 | 33 | 1 | 7 | 8 | 7 | 4 |
| Snorri | 88 | 95 | 93 | 95 | 91 | 93 | 30 | 1 | 5 | 7 | 6 | 4 |
| Noreng | 83 | 93 | 91 | 95 | 90 | 92 | 22 | 1 | 5 | 7 | 6 | 4 |
| **Festuca pratensis** | | | | | | | | | | | | |
| Norild | 58 | 87 | 70 | 85 | 82 | 83 | 53 | 4 | 6 | 7 | 6 | 5 |
| Kasper | 82 | 95 | 88 | 95 | 96 | 90 | 78 | 4 | 6 | 8 | 6 | 5 |
| **Dactylis glomerata** | | | | | | | | | | | | |
| Laban | 90 | 95 | 96 | 95 | 99 | 99 | 100 | 4 | 4 | 9 | 7 | 7 |
| **Poa pratensis** | | | | | | | | | | | | |
| Kupol | 75 | 93 | 38 | 77 | 33 | 18 | 15 | 3 | 6 | 6 | 5 | 3 |
| Knut | 68 | 95 | 77 | 90 | 82 | 87 | 45 | 3 | 4 | 6 | 6 | 3 |
| **Agrostis capillaris** | | | | | | | | | | | | |
| Leikvin | 90 | 95 | 87 | 92 | 84 | 91 | 80 | 1 | 5 | 8 | 4 | 4 |
| **Lolium perenne** | | | | | | | | | | | | |
| Figgjo | 93 | 62 | 92 | 20 | 82 | 82 | 28 | 3 | 8 | 3 | 8 | 4 |
| Birger | 92 | 83 | 93 | 18 | 85 | 80 | 28 | 3 | 8 | 3 | 8 | 4 |
| Ivar | 85 | 67 | 87 | 47 | 85 | 82 | 55 | 3 | 8 | 5 | 8 | 4 |
| **Festulolium** | | | | | | | | | | | | |
| Felina | 80 | 32 | 18 | 27 | 30 | 72 | 20 | 4 | 8 | 7 | 8 | 6 |
| **Festuca arundinacea** | | | | | | | | | | | | |
| Swaj | 52 | 32 | 23 | 75 | 80 | 73 | 68 | 4 | 8 | 7 | 7 | 6 |
| **Trifolium repens** | | | | | | | | | | | | |
| Litago | 90 | 52 | 80 | 48 | 77 | 40 | 7 | | 9 | 9 | | |
| Norstar | 88 | 58 | 82 | 42 | 83 | 78 | 13 | | 9 | 9 | | |
| **Trifolium hybridum** | | | | | | | | | | | | |
| Alpo | 77 | 32 | 37 | 43 | 58 | 45 | 9 | | 9 | 9 | | |
| **Trifolium pratense** | | | | | | | | | | | | |
| Lea | 78 | 53 | 60 | 73 | 75 | 85 | 22 | | 9 | 9 | | |
| SW Torun | 73 | 42 | 53 | 72 | 73 | 72 | 7 | | 9 | 9 | | |
| Lavine | 73 | 42 | 45 | 75 | 70 | 80 | 15 | | 9 | 9 | | |
| SW Yngve | 82 | 52 | 67 | 73 | 73 | 82 | 28 | | 9 | 9 | | |
| **Equal mixture**[*)] | 75 | 47 | 67 | 63 | 80 | 77 | 17 | | 9 | 9 | | |

[*)] Phleum pratense, Poa pratensis, Trifolium repens and Trifolium pratense in equal proportions at sowing.

**Möðruvellir** **DM yield and cover 2010 – 2013**

| | Yield, t DM/ha | | | | | | Winter kill, % | Cover, % | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | | | 2012 | | | | | | | | |
| | 1st cut 29/6 | 2nd cut 25/8 | Total | 1st cut 26/6 | 2nd cut 24/8 | Total | 2010 26/5 | 2010 28/6 | 2011 9/5 | 2011 19/6 | 2012 26/6 | 2013 10/6 |
| **Phleum pratense** | | | | | | | | | | | | |
| Rakel | 6.99 | 1.89 | 8.88 | 6.92 | 1.37 | 8.29 | 0 | 92 | 88 | 95 | 87 | 32 |
| Lidar | 5.52 | 2.17 | 7.69 | 6.50 | 1.65 | 8.15 | 0 | 88 | 83 | 92 | 85 | 27 |
| Grindstad | 6.39 | 2.04 | 8.43 | 5.72 | 1.28 | 7.00 | 2 | 87 | 82 | 90 | 83 | 13 |
| Switch | 6.00 | 2.15 | 8.15 | 6.45 | 1.23 | 7.68 | 0 | 85 | 85 | 93 | 85 | 32 |
| Snorri | 6.58 | 1.28 | 7.86 | 6.40 | 1.00 | 7.40 | 0 | 88 | 83 | 92 | 80 | 23 |
| Noreng | 6.39 | 1.89 | 8.28 | 5.68 | 0.98 | 6.66 | 2 | 88 | 82 | 92 | 80 | 13 |
| **Festuca pratensis** | | | | | | | | | | | | |
| Norild | 6.41 | 2.27 | 8.68 | 6.69 | 1.58 | 8.26 | 15 | 75 | 75 | 83 | 85 | 1 |
| Kasper | 6.43 | 2.49 | 8.92 | 5.96 | 1.78 | 7.74 | 2 | 92 | 82 | 87 | 92 | 1 |
| **Dactylis glomerata** | | | | | | | | | | | | |
| Laban | 6.04 | 2.50 | 8.54 | 6.35 | 2.01 | 8.37 | 0 | 88 | 90 | 96 | 87 | 0 |
| **Poa pratensis** | | | | | | | | | | | | |
| Kupol | 3.05 | 2.78 | 5.83 | 6.70 | 2.02 | 8.72 | 3 | 62 | 80 | 83 | 73 | 17 |
| Knut | 2.21 | 2.95 | 5.16 | 6.12 | 1.79 | 7.90 | 17 | 63 | 73 | 82 | 82 | 40 |
| **Agrostis capillaris** | | | | | | | | | | | | |
| Leikvin | 3.06 | 2.82 | 5.88 | 6.09 | 1.79 | 7.88 | 13 | 63 | 43 | 62 | 58 | 1 |
| **Lolium perenne** | | | | | | | | | | | | |
| Figgjo | 7.57 | 3.04 | 10.61 | 4.46 | 1.85 | 6.30 | | 95 | 30 | 63 | 35 | 0 |
| Birger | 6.97 | 2.75 | 9.72 | 4.57 | 1.93 | 6.50 | 2 | 95 | 35 | 75 | 55 | 1 |
| Ivar | 6.37 | 2.98 | 9.35 | 4.91 | 2.05 | 6.96 | 3 | 95 | 55 | 78 | 48 | 1 |
| **Festulolium** | | | | | | | | | | | | |
| Felina | 4.17 | 3.06 | 7.23 | 5.66 | 2.30 | 7.96 | | 67 | 70 | 68 | 55 | 0 |
| **Festuca arundinacea** | | | | | | | | | | | | |
| Swaj | 2.90 | 2.59 | 5.49 | 6.25 | 2.17 | 8.42 | 15 | 58 | 67 | 70 | 38 | 0 |
| **Trifolium repens** | | | | | | | | | | | | |
| Litago | 5.49 | 2.17 | 7.66 | 5.21 | 2.34 | 7.55 | 22 | 10 | 38 | 27 | 5 | 0 |
| Norstar | 4.37 | 1.79 | 6.16 | 5.55 | 2.28 | 7.83 | 18 | 8 | 52 | 25 | 10 | 0 |
| **Trifolium hybridum** | | | | | | | | | | | | |
| Alpo | 5.18 | 1.31 | 6.49 | 5.56 | 1.04 | 6.60 | 10 | 7 | 35 | 13 | 7 | 0 |
| **Trifolium pratense** | | | | | | | | | | | | |
| Lea | 5.16 | 1.53 | 6.69 | 5.68 | 1.62 | 7.30 | 5 | 13 | 62 | 42 | 23 | 0 |
| SWTorun | 5.61 | 1.82 | 7.43 | 5.33 | 2.23 | 7.56 | 10 | 13 | 47 | 35 | 25 | 0 |
| Lavine | 5.93 | 1.44 | 7.37 | 5.75 | 1.78 | 7.53 | 5 | 13 | 65 | 52 | 22 | 0 |
| SW Yngve | 4.87 | 1.68 | 6.55 | 5.30 | 2.27 | 7.57 | 2 | 10 | 67 | 53 | 37 | 0 |
| **Equal mixture** *) | 5.48 | 1.70 | 7.18 | 5.61 | 1.98 | 7.59 | 15 | 10 | 45 | 27 | 10 | 0 |

*) Phleum pratense, Poa pratensis, Trifolium repens and Trifolium pratense in equal proportions at sowing.

**Lännäs** **DM yield and cover 2010 – 2011**

| | Yield, t DM/ha | | | | | | | | Cover, % | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | | | | 2011 | | | | | | |
| | 1st cut 24/6 | 2nd cut 28/7 | 3rd cut | Total | 1st cut 17/6 | 2nd cut 20/7 | 3rd cut 1/9 | Total | 2009 | 2010 7/10 | 2011 30/5 |
| **Phleum pratense** | | | | | | | | | | | |
| Rakel | 5.73 | 4.18 | 2.95 | 12.86 | 5.71 | 1.68 | 1.29 | 8.67 | 83 | 88 | 77 |
| Lidar | 4.71 | 4.56 | 2.73 | 12.00 | 5.69 | 2.05 | 1.22 | 8.96 | 77 | 90 | 78 |
| Grindstad | 5.76 | 4.13 | 2.77 | 12.66 | 5.57 | 1.66 | 1.33 | 8.57 | 82 | 80 | 77 |
| Switch | 5.10 | 3.90 | 2.83 | 11.83 | 5.27 | 1.95 | 1.36 | 8.58 | 73 | 83 | 70 |
| Snorri | 6.07 | 3.27 | 2.62 | 11.96 | 5.91 | 1.31 | 1.24 | 8.46 | 80 | 90 | 80 |
| Noreng | 5.60 | 2.73 | 2.79 | 11.12 | 5.51 | 1.26 | 1.58 | 8.34 | 82 | 89 | 87 |
| **Festuca pratensis** | | | | | | | | | | | |
| Norild | 4.79 | 3.70 | 3.65 | 12.14 | 5.75 | 2.33 | 1.82 | 9.90 | 98 | 99 | 83 |
| Kasper | 4.53 | 3.59 | 3.38 | 11.50 | 5.43 | 1.68 | 1.58 | 8.68 | 80 | 88 | 75 |
| **Dactylis glomerata** | | | | | | | | | | | |
| Laban | 5.24 | 4.19 | 3.70 | 13.13 | 7.71 | 3.03 | 2.46 | 13.20 | 88 | 97 | 93 |
| **Poa pratensis** | | | | | | | | | | | |
| Kupol | 3.28 | 2.82 | 2.41 | 8.51 | 4.39 | 2.41 | 1.74 | 8.54 | 62 | 87 | 82 |
| Knut | 3.95 | 3.15 | 3.11 | 10.21 | 4.54 | 2.35 | 1.89 | 8.79 | 80 | 91 | 93 |
| **Agrostis capillaris** | | | | | | | | | | | |
| Leikvin | 3.40 | 3.17 | 2.00 | 8.57 | 4.75 | 2.11 | 1.44 | 8.31 | 57 | 60 | 67 |
| **Lolium perenne** | | | | | | | | | | | |
| Figgjo | 4.01 | 4.30 | 3.70 | 12.01 | 2.57 | 2.38 | 2.05 | 7.00 | 77 | 80 | 37 |
| Birger | 4.69 | 3.83 | 3.55 | 12.07 | 4.96 | 2.43 | 1.72 | 9.10 | 78 | 88 | 77 |
| Ivar | 5.66 | 3.31 | 3.68 | 12.65 | 2.74 | 2.04 | 1.72 | 6.50 | 90 | 88 | 53 |
| **Festulolium** | | | | | | | | | | | |
| Felina | 3.17 | 3.22 | 3.77 | 10.16 | 6.11 | 2.73 | 2.24 | 11.08 | 75 | 93 | 83 |
| **Festuca arundinacea** | | | | | | | | | | | |
| Swaj | 5.04 | 3.85 | 3.85 | 12.74 | 6.81 | 2.85 | 2.11 | 11.77 | 88 | 85 | 90 |
| **Trifolium repens** | | | | | | | | | | | |
| Litago | 3.32 | 2.05 | 1.32 | 6.69 | 4.73 | 1.53 | 1.25 | 7.52 | 85 | 90 | 33 |
| Norstar | 3.30 | 1.44 | 1.07 | 5.81 | 3.96 | 1.34 | 0.85 | 6.14 | 75 | 85 | 30 |
| **Trifolium hybridum** | | | | | | | | | | | |
| Alpo | 5.89 | 0.99 | 0.82 | 7.70 | 4.47 | 0.33 | 0.97 | 5.77 | 33 | 40 | 30 |
| **Trifolium pratense** | | | | | | | | | | | |
| Lea | 5.54 | 2.27 | 2.63 | 10.44 | 6.29 | 0.84 | 1.53 | 8.66 | 75 | 75 | 50 |
| SW Torun | 5.37 | 2.75 | 2.48 | 10.60 | 6.57 | 1.06 | 1.57 | 9.20 | 92 | 92 | 70 |
| Lavine | 5.67 | 2.47 | 2.37 | 10.51 | 6.17 | 0.96 | 1.38 | 8.51 | 75 | 92 | 63 |
| SW Yngve | 5.70 | 2.28 | 2.42 | 10.40 | 6.05 | 1.02 | 1.69 | 8.76 | 90 | 93 | 60 |
| **Equal mixture*)** | 5.65 | 2.83 | 2.32 | 10.80 | 6.04 | 1.02 | 1.49 | 8.55 | 70 | 80 | 63 |

*) Phleum pratense, Poa pratensis, Trifolium repens and Trifolium pratense in equal proportions at sowing.

**Kollafjørður** **DM yield and cover 2010 – 2012**

| | Yield, t DM/ha, 2010 | | | Cover, % | | |
|---|---|---|---|---|---|---|
| | 1st cut 16/7 | 2nd cut 20/9 | Total | 2011 12/8 | | 2012 9/7 |
| **Phleum pratense** | | | | | | |
| Rakel | 3.01 | 2.48 | 5.49 | 82 | 33 | 7 |
| Lidar | 3.13 | 2.33 | 5.46 | 67 | 38 | 9 |
| Grindstad | 3.19 | 1.64 | 4.83 | 63 | 27 | 7 |
| Switch | 3.07 | 2.92 | 5.99 | 73 | 23 | 4 |
| Snorri | 3.73 | 2.11 | 5.84 | 63 | 37 | 14 |
| Noreng | 3.07 | 2.37 | 5.44 | 32 | 25 | 17 |
| **Festuca pratensis** | | | | | | |
| Norild | 2.43 | 2.20 | 4.63 | 9 | 12 | 13 |
| Kasper | 1.68 | 2.51 | 4.19 | 15 | 22 | 17 |
| **Dactylis glomerata** | | | | | | |
| Laban | 1.88 | 2.04 | 3.92 | 5 | 1 | 16 |
| **Poa pratensis** | | | | | | |
| Kupol | 1.80 | 2.20 | 4.00 | 13 | 12 | 16 |
| Knut | 3.11 | 2.63 | 5.74 | 12 | 3 | 13 |
| **Agrostis capillaris** | | | | | | |
| Leikvin | 2.62 | 2.68 | 5.30 | 12 | 18 | 13 |
| **Lolium perenne** | | | | | | |
| Figgjo | 3.45 | 2.84 | 6.29 | 48 | 43 | 13 |
| Birger | 2.63 | 2.18 | 4.81 | 28 | 28 | 12 |
| Ivar | 2.59 | 2.40 | 4.99 | 18 | 25 | 17 |
| **Festulolium** | | | | | | |
| Felina | 4.08 | 2.31 | 6.39 | 10 | 2 | 4 |
| **Festuca arundinacea** | | | | | | |
| Swaj | 2.76 | 2.14 | 4.90 | 10 | 7 | 7 |
| **Trifolium repens** | | | | | | |
| Litago | 2.55 | 1.60 | 4.15 | 73 | 57 | 37 |
| Norstar | 2.24 | 1.18 | 3.42 | 68 | 33 | 60 |
| **Trifolium hybridum** | | | | | | |
| Alpo | 2.35 | 0.70 | 3.05 | 17 | 12 | 5 |
| **Trifolium pratense** | | | | | | |
| Lea | 3.19 | 1.04 | 4.23 | 53 | 47 | 11 |
| SW Torun | 3.12 | 0.54 | 3.66 | 27 | 22 | 8 |
| Lavine | 3.24 | 0.85 | 4.09 | 33 | 45 | 7 |
| SW Yngve | 2.62 | 1.05 | 3.67 | 43 | 35 | 9 |
| **Equal mixture[*)]** | 2.73 | 1.15 | 3.88 | 45 | 40 | 60 |

[*)] Phleum pratense, Poa pratensis, Trifolium repens and Trifolium pratense in equal proportions at sowing.

**Greenland** **Cover, %, 2010 – 2012**

| | Qassiarsuk | | | Upernaviarsuk | | |
|---|---|---|---|---|---|---|
| | **2010** | **2011** | **2012** | **2010** | **2011** | **2012** |
| | 20/7 | 28/7 | 12/7 | 21/7 | 16/7 | 11/7 |
| **Phleum pratense** | | | | | | |
| Rakel | 58 | 6 | 6 | 67 | 80 | 87 |
| Lidar | 20 | 1 | 2 | 68 | 85 | 72 |
| Grindstad | 32 | 22 | 27 | 62 | 83 | 80 |
| Switch | 41 | 0 | 1 | 72 | 87 | 77 |
| Snorri | 32 | 62 | 66 | 73 | 92 | 92 |
| Noreng | 38 | 8 | 10 | 63 | 88 | 88 |
| **Festuca pratensis** | | | | | | |
| Norild | 11 | 18 | 10 | 5 | 42 | 5 |
| Kasper | 35 | 12 | 9 | 20 | 73 | 12 |
| **Dactylis glomerata** | | | | | | |
| Laban | 11 | 8 | 5 | 18 | 58 | 28 |
| **Poa pratensis** | | | | | | |
| Kupol | 48 | 21 | 6 | 42 | 85 | 77 |
| Knut | 80 | 50 | 60 | 47 | 82 | 87 |
| **Agrostis capillaris** | | | | | | |
| Leikvin | 40 | 6 | 8 | 43 | 75 | 77 |
| **Lolium perenne** | | | | | | |
| Figgjo | 16 | 1 | 0 | 32 | 1 | 0 |
| Birger | 19 | 0 | 0 | 53 | 4 | 0 |
| Ivar | 10 | 1 | 0 | 15 | 3 | 0 |
| **Festulolium** | | | | | | |
| Felina | 12 | 1 | 1 | 10 | 18 | 0 |
| **Festuca arundinacea** | | | | | | |
| Swaj | 7 | 0 | 1 | 3 | 23 | 0 |
| **Trifolium repens** | | | | | | |
| Litago | 8 | 12 | 14 | 10 | 43 | 17 |
| Norstar | 3 | 4 | 10 | 8 | 32 | 17 |
| **Trifolium hybridum** | | | | | | |
| Alpo | 3 | 0 | 0 | 2 | 4 | 0 |
| **Trifolium pratense** | | | | | | |
| Lea | 2 | 0 | 0 | 3 | 12 | 4 |
| SW Torun | 0 | 0 | 0 | 3 | 10 | 3 |
| Lavine | 1 | 0 | 1 | 3 | 7 | 6 |
| SW Yngve | 1 | 0 | 0 | 7 | 5 | 2 |
| **Equal mixture**[*)] | 2 | 2 | 4 | 4 | 25 | 11 |

[*)] Phleum pratense, Poa pratensis, Trifolium repens and Trifolium pratense in equal proportions at sowing.

**Fureneset** **DM yield 2011 – 2013**

| | Yield, t DM/ha | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2011 1) | | | | 2012 2) | | | | 2013 3) | | | |
| | 1st cut 10/6 | 2nd cut 14/7 | 3rd cut 29/8 | Total | 1st cut 11/6 | 2nd cut 24/7 | 3rd cut 29/8 | Total | 1st cut 21/6 | 2nd cut 1/8 | 3rd cut 10/9 | Total |
| **Phleum pratense** | | | | | | | | | | | | |
| Rakel | 6.43 | 3.53 | 1.83 | 11.79 | 5.99 | 3.05 | 2.19 | 11.23 | 5.95 | 3.27 | 1.11 | 10.33 |
| Lidar | 6.35 | 3.61 | 2.02 | 11.98 | 6.41 | 2.98 | 2.20 | 11.59 | 5.87 | 3.44 | 1.03 | 10.34 |
| Grindstad | 6.45 | 3.88 | 2.01 | 12.34 | 6.46 | 3.07 | 2.22 | 11.74 | 6.13 | 3.46 | 1.19 | 10.78 |
| Switch | 6.44 | 3.55 | 2.13 | 12.12 | 5.89 | 3.11 | 2.11 | 11.10 | 5.64 | 3.45 | 1.18 | 10.26 |
| Snorri | 6.23 | 2.60 | 1.83 | 10.66 | 6.11 | 2.57 | 2.21 | 10.89 | 5.58 | 2.47 | 1.17 | 9.22 |
| Noreng | 6.68 | 2.43 | 1.67 | 10.78 | 5.81 | 2.51 | 2.27 | 10.60 | 6.37 | 2.27 | 1.07 | 9.71 |
| **Festuca pratensis** | | | | | | | | | | | | |
| Norild | 4.19 | 2.46 | 2.85 | 9.51 | 3.56 | 3.01 | 2.73 | 9.30 | 3.22 | 2.77 | 1.63 | 7.62 |
| Kasper | 4.28 | 3.05 | 2.60 | 9.93 | 3.87 | 2.96 | 2.71 | 9.53 | 3.01 | 2.92 | 1.65 | 7.58 |
| **Dactylis glomerata** | | | | | | | | | | | | |
| Laban | 2.99 | 3.72 | 2.87 | 9.58 | 4.39 | 3.69 | 3.15 | 11.23 | 4.27 | 3.34 | 2.00 | 9.61 |
| **Poa pratensis** | | | | | | | | | | | | |
| Kupol | 3.27 | 2.92 | 2.32 | 8.51 | 4.42 | 3.55 | 2.96 | 10.93 | 5.75 | 3.26 | 2.20 | 11.22 |
| Knut | 2.90 | 2.04 | 2.07 | 7.00 | 3.98 | 3.12 | 3.15 | 10.25 | 4.63 | 2.89 | 2.23 | 9.76 |
| **Agrostis capillaris** | | | | | | | | | | | | |
| Leikvin | 3.42 | 2.42 | 1.52 | 7.36 | 3.66 | 2.89 | 2.21 | 8.76 | 4.12 | 2.87 | 1.51 | 8.50 |
| **Lolium perenne** | | | | | | | | | | | | |
| Figgjo | 3.98 | 4.52 | 3.02 | 11.52 | 5.29 | 3.93 | 3.23 | 12.45 | 2.07 | 3.94 | 2.31 | 8.32 |
| Birger | 4.43 | 3.80 | 2.72 | 10.95 | 4.65 | 3.65 | 2.88 | 11.19 | 1.69 | 3.21 | 1.86 | 6.76 |
| Ivar | 4.48 | 4.15 | 2.74 | 11.38 | 3.97 | 3.43 | 2.63 | 10.02 | 1.70 | 3.40 | 1.78 | 6.88 |
| **Festulolium** | | | | | | | | | | | | |
| Felina | 4.59 | 3.64 | 3.34 | 11.57 | 4.76 | 4.01 | 3.39 | 12.16 | 3.45 | 3.02 | 2.27 | 9.24 |
| **Festuca arundinacea** | | | | | | | | | | | | |
| Swaj | 4.00 | 3.21 | 3.11 | 10.32 | 4.92 | 3.91 | 2.92 | 11.75 | 4.26 | 2.96 | 2.08 | 9.30 |
| **Trifolium repens** | | | | | | | | | | | | |
| Litago | 3.15 | 2.49 | 1.18 | 6.82 | 3.68 | 1.93 | 1.83 | 7.44 | 4.30 | 2.47 | 1.44 | 8.21 |
| Norstar | 2.95 | 2.25 | 1.38 | 6.58 | 3.48 | 1.86 | 1.69 | 7.03 | 4.34 | 2.20 | 1.40 | 7.94 |
| **Trifolium hybridum** | | | | | | | | | | | | |
| Alpo | 5.92 | 1.75 | 1.13 | 8.81 | 3.35 | 0.89 | 1.59 | 5.82 | 4.34 | 1.65 | 1.11 | 7.10 |
| **Trifolium pratense** | | | | | | | | | | | | |
| Lea | 6.22 | 2.60 | 1.80 | 10.32 | 4.69 | 1.46 | 2.57 | 8.72 | 3.48 | 1.80 | 1.06 | 6.33 |
| SW Torun | 6.65 | 2.38 | 1.55 | 10.58 | 4.80 | 1.52 | 2.38 | 8.70 | 3.69 | 1.70 | 0.99 | 6.38 |
| Lavine | 6.20 | 2.28 | 1.80 | 10.28 | 4.67 | 1.51 | 2.10 | 8.28 | 3.69 | 1.79 | 1.02 | 6.49 |
| SW Yngve | 6.32 | 2.44 | 1.62 | 10.38 | 4.92 | 1.67 | 2.29 | 8.87 | 3.74 | 1.79 | 1.21 | 6.75 |
| **Equal mixture** *) | 5.85 | 2.36 | 1.38 | 9.59 | 5.02 | 1.49 | 2.32 | 8.84 | 4.17 | 1.89 | 1.18 | 7.24 |

*) Phleum pratense, Poa pratensis, Trifolium repens and Trifolium pratense in equal proportions at sowing.
1) In 2011 timothy variety and clover were harvested 21/6, 3/8 and 19/9.
2) In 2012 timothy was harvested 15/6, 25/7 and 3/9 but clover 19/6, 25/7 and 3/9
3) In 2013 timothy and clover were harvested 25/6, 8/8 and 19/9; other grass species on given dates.

**Fureneset** **Cover, %, 2010 – 2013**

| | 2010 | 2011 | 2012 | | 2013 | |
|---|---|---|---|---|---|---|
| | Autumn | Spring | Spring | Summer | Spring | Autumn |
| **Phleum pratense** | | | | | | |
| Rakel | 100 | 92 | 98 | 98 | 92 | 96 |
| Lidar | 100 | 92 | 99 | 99 | 92 | 97 |
| Grindstad | 99 | 95 | 98 | 99 | 89 | 96 |
| Switch | 99 | 87 | 97 | 97 | 89 | 96 |
| Snorri | 98 | 57 | 93 | 95 | 86 | 95 |
| Noreng | 97 | 63 | 94 | 95 | 92 | 96 |
| **Festuca pratensis** | | | | | | |
| Norild | 98 | 47 | 88 | 93 | 38 | 37 |
| Kasper | 98 | 92 | 94 | 94 | 55 | 70 |
| **Dactylis glomerat** | | | | | | |
| Laban | 96 | 87 | 94 | 97 | 80 | 92 |
| **Poa pratensis** | | | | | | |
| Kupol | 73 | 1 | 83 | 87 | 93 | 83 |
| Knut | 82 | 0 | 83 | 92 | 93 | 92 |
| **Agrostis capillaris** | | | | | | |
| Leikvin | 17 | 0 | 58 | 50 | 25 | 28 |
| **Lolium perenne** | | | | | | |
| Figgjo | 100 | 100 | 90 | 99 | 15 | 67 |
| Birger | 100 | 100 | 87 | 97 | 15 | 68 |
| Ivar | 99 | 100 | 89 | 96 | 17 | 43 |
| **Festulolium** | | | | | | |
| Felina | 99 | 95 | 99 | 99 | 83 | 91 |
| **Festuca arundinac** | | | | | | |
| Swaj | 97 | 38 | 94 | 96 | 72 | 72 |
| **Trifolium repens** | | | | | | |
| Litago | 83 | 32 | 17 | 22 | 82 | 86 |
| Norstar | 75 | 3 | 8 | 23 | 83 | 86 |
| **Trifolium hybridu** | | | | | | |
| Alpo | 83 | 70 | 5 | 7 | 78 | 88 |
| **Trifolium pratens** | | | | | | |
| Lea | 92 | 77 | 77 | 80 | 52 | 86 |
| SW Torun | 92 | 80 | 80 | 82 | 50 | 88 |
| Lavine | 91 | 67 | 80 | 76 | 48 | 82 |
| Sw Yngve | 92 | 80 | 80 | 78 | 50 | 88 |
| **Equal mixture[*)]** | 88 | 63 | 68 | 67 | 68 | 86 |

[*)] Phleum pratense, Poa pratensis, Trifolium repens and Trifolium pratense in equal proportions at sowing.

**Holt** **DM yield and cover 2011–2013**

| | Yield, t DM/ha | | | | | | Cover, % | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2011 | | | 2012 | | | | | |
| | 1st cut 14/7 | 2nd cut 8/9 | Total | 1st cut 11/7 | 2nd cut 7/9 | Total | 2011 2/9 | 2012 Autumn | 2013 Late June |
| **Phleum pratense** | | | | | | | | | |
| Grindstad | 4.12 | 4.09 | 8.21 | 2.76 | 2.40 | 5.16 | 85 | 68 | 50 |
| Lidar | 5.56 | 4.44 | 10.00 | 2.97 | 1.45 | 4.42 | 93 | 65 | 33 |
| Noreng | 5.11 | 2.66 | 7.77 | 3.36 | 1.81 | 5.17 | 87 | 63 | 58 |
| Switch | 5.89 | 3.15 | 9.04 | 3.03 | 1.69 | 4.72 | 87 | 65 | 52 |
| Snorri | 5.58 | 2.84 | 8.42 | 3.84 | 2.04 | 5.88 | 75 | 48 | 57 |
| Rakel | 5.22 | 2.87 | 8.09 | 3.04 | 2.39 | 5.43 | 82 | 73 | 40 |
| **Festuca pratensis** | | | | | | | | | |
| Norild | 3.84 | 1.52 | 5.36 | 3.10 | 1.28 | 4.38 | 10 | 32 | 12 |
| Kasper | 4.02 | 2.05 | 6.07 | 2.95 | 1.82 | 4.77 | 57 | 95 | 30 |
| **Dactylis glomerata** | | | | | | | | | |
| Laban | 4.71 | 2.42 | 7.13 | 3.03 | 2.15 | 5.18 | 72 | 95 | 37 |
| **Poa pratensis** | | | | | | | | | |
| Knut | 4.15 | 2.01 | 6.16 | 3.37 | 1.53 | 4.90 | 25 | 85 | 17 |
| Kupol | 4.00 | 1.24 | 5.24 | 3.04 | 1.52 | 4.56 | 48 | 20 | 1 |
| **Agrostis capillaris** | | | | | | | | | |
| Leikvin | 4.51 | 2.04 | 6.55 | 3.25 | 1.35 | 4.59 | 33 | 67 | 13 |
| **Lolium perenne** | | | | | | | | | |
| Birger | 5.98 | 4.11 | 10.09 | 2.44 | 1.38 | 3.82 | 83 | 4 | 7 |
| Ivar | 4.54 | 2.04 | 6.58 | 2.01 | 1.60 | 3.61 | 37 | 20 | 3 |
| Figgjo | 5.59 | 3.10 | 8.69 | 2.32 | 0.96 | 3.28 | 58 | 0 | 27 |
| **Festulolium** | | | | | | | | | |
| Felina | 4.84 | 2.21 | 7.05 | 3.14 | 1.03 | 4.17 | 48 | 8 | 34 |
| **Festuca arundinacea** | | | | | | | | | |
| Swaj | 4.15 | 1.87 | 6.02 | 3.45 | 1.86 | 5.31 | 13 | 28 | 7 |
| **Trifolium repens** | | | | | | | | | |
| Norstar | 3.53 | 0.83 | 4.36 | 2.75 | 0.72 | 3.47 | 57 | 15 | 0 |
| Litago | 3.54 | 1.02 | 4.56 | 2.56 | 0.66 | 3.22 | 42 | 7 | 0 |
| **Trifolium hybridum** | | | | | | | | | |
| Alpo | 4.93 | 0.72 | 5.65 | 2.59 | 0.43 | 3.02 | 23 | 1 | 0 |
| **Trifolium pratense** | | | | | | | | | |
| SW Torun | 4.33 | 1.53 | 5.86 | 2.50 | 0.28 | 2.78 | 47 | 3 | 0 |
| SW Yngve | 4.77 | 1.49 | 6.26 | 2.17 | 0.44 | 2.62 | 57 | 3 | 0 |
| Lavine | 4.54 | 1.62 | 6.16 | 2.35 | 0.45 | 2.80 | 52 | 7 | 0 |
| Lea | 5.25 | 1.69 | 6.94 | 2.33 | 0.71 | 3.03 | 55 | 1 | 0 |
| **Equal mixture**[*)] | 4.20 | 1.15 | 5.35 | 2.69 | 0.29 | 2.98 | 48 | 15 | 2 |

[*)] Phleum pratense, Poa pratensis, Trifolium repens and Trifolium pratense in equal proportions at sowing.

## Appendix 2.

Monthly values for temperature and precipitation at the experimental sites, all years.

**Korpa**

| | Temperature, °C | | | | |
|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| January | 1.5 | 1.0 | 1.3 | 0.0 | 2.7 |
| February | -0.8 | -0.6 | 1.5 | 2.7 | 3.6 |
| March | -0.1 | 2.8 | -0.2 | 2.9 | 1.2 |
| April | 5.0 | 2.5 | 4.3 | 4.3 | 1.9 |
| May | 7.6 | 8.1 | 6.9 | 6.2 | 5.6 |
| June | 10.2 | 11.8 | 9.1 | 10.5 | 9.8 |
| July | 12.8 | 13.3 | 12.4 | 12.4 | 10.9 |
| August | 11.5 | 12.0 | 10.8 | 12.4 | 10.2 |
| September | 8.1 | 9.9 | 9.2 | 7.3 | 7.1 |
| October | 4.5 | 5.6 | 4.4 | 4.3 | 4.0 |
| November | 2.4 | -1.0 | 4.0 | 1.5 | 2.0 |
| December | -0.5 | -0.4 | -3.3 | 1.3 | -0.5 |
| Average | 5.2 | 5.4 | 5.0 | 5.5 | 4.9 |

| | Precipitation, mm | | | | |
|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| January | 128 | 124 | 80 | 185 | 164 |
| February | 59 | 37 | 130 | 184 | 122 |
| March | 97 | 83 | 135 | 158 | 61 |
| April | 127 | 42 | 167 | 75 | 58 |
| May | 81 | 32 | 69 | 26 | 64 |
| June | 43 | 30 | 19 | 31 | 95 |
| July | 11 | 43 | 53 | 50 | 113 |
| August | 70 | 74 | 29 | 65 | 100 |
| September | 98 | 121 | 104 | 121 | 101 |
| October | 95 | 54 | 131 | 108 | 29 |
| November | 49 | 39 | 123 | 104 | 119 |
| December | 58 | 80 | 96 | 138 | 94 |
| Total | 914 | 759 | 1134 | 1246 | 1120 |

**Möðruvellir**

| | Temperature, °C | | | | |
|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| January | -0.1 | -0.7 | 0.0 | -0.3 | 0.5 |
| February | -4.5 | -3.5 | -0.6 | 1.6 | 1.5 |
| March | -1.4 | 0.5 | -1.6 | 2.4 | -1.8 |
| April | 3.3 | 0.9 | 4.8 | 1.8 | -0.8 |
| May | 7.0 | 6.3 | 5.1 | 5.4 | 5.4 |
| June | 9.4 | 11.5 | 6.9 | 8.6 | 11.1 |
| July | 11.0 | 11.1 | 11.7 | 11.4 | 11.0 |
| August | 10.1 | 11.2 | 9.5 | 11.6 | 10.0 |
| September | 7.1 | 8.8 | 7.4 | 5.8 | 5.9 |
| October | 2.2 | 3.9 | 3.0 | 1.4 | 2.3 |
| November | 0.9 | -1.9 | 1.9 | -1.6 | 0.1 |
| December | -1.5 | -0.8 | -4.6 | -1.9 | -2.4 |
| Average | 3.6 | 4.0 | 3.6 | 3.8 | 3.6 |

| | Precipitation, mm | | | | |
|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| January | 41 | 3 | 37 | 18 | 29 |
| February | 17 | 19 | 21 | 28 | 14 |
| March | 18 | 1 | 12 | 17 | 9 |
| April | 25 | 20 | 16 | 11 | 6 |
| May | 24 | 10 | 19 | 2 | 26 |
| June | 15 | 4 | 10 | 5 | 8 |
| July | 17 | 25 | 8 | 21 | 26 |
| August | 47 | 42 | 34 | 10 | 9 |
| September | 56 | 26 | 53 | 153 | 139 |
| October | 34 | 32 | 96 | 13 | 43 |
| November | 40 | 26 | 20 | 29 | 46 |
| December | 39 | 27 | 24 | 26 | 34 |
| Average | 373 | 235 | 350 | 332 | 387 |

**Lännäs**

| | Temperature, °C | | |
|---|---|---|---|
| | 2009 | 2010 | 2011 |
| January | | -13.6 | -9.2 |
| February | | -13.4 | -10.9 |
| March | | -3.5 | -1.6 |
| April | | 3.2 | 5.8 |
| May | | 9.8 | 8.8 |
| June | 12.5 | 11.9 | 14.9 |
| July | 15.4 | 17.8 | 17.1 |
| August | 15.0 | 14.0 | 14.7 |
| September | 10.8 | 9.5 | 11.6 |
| October | 1.7 | 3.6 | |
| November | 2.0 | -4.6 | |
| December | -8.1 | -14.6 | |
| Average | | 1.7 | |

| | Precipitation, mm | | |
|---|---|---|---|
| | 2009 | 2010 | 2011 |
| January | | 34 | 62 |
| February | | 41 | 18 |
| March | | 23 | 14 |
| April | | 25 | 33 |
| May | | 41 | 79 |
| June | 26 | 61 | 85 |
| July | 132 | 59 | 41 |
| August | 63 | 67 | 183 |
| September | 35 | 87 | 108 |
| October | 51 | 33 | |
| November | 85 | 19 | |
| December | 38 | 35 | |
| Total | | 525 | |

**Kollafjørður**

| | Temperature, °C | | | |
|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 |
| January | 4.7 | 3.4 | 4.6 | 4.1 |
| February | 3.5 | 1.0 | 5.5 | 5.7 |
| March | 4.8 | 5.0 | 4.1 | 7.3 |
| April | 7.5 | 5.0 | 8.1 | 9.1 |
| May | 8.8 | 7.3 | 8.4 | 7.3 |
| June | 10.1 | 10.4 | 9.6 | 8.8 |
| July | 12.2 | 11.6 | 11.2 | 10.7 |
| August | 12.4 | 11.7 | 11.7 | 11.5 |
| September | 10.7 | 10.1 | 10.7 | 9.7 |
| October | 8.0 | 7.6 | 8.5 | 6.7 |
| November | 6.3 | 3.9 | 8.1 | 5.6 |
| December | 3.9 | 2.0 | 2.4 | 3.9 |
| Average | 7.7 | 6.6 | 7.7 | 7.5 |

| | Precipitation, mm | | | |
|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 |
| January | 375 | 202 | 171 | 260 |
| February | 142 | 109 | 306 | 250 |
| March | 312 | 212 | 226 | 242 |
| April | 244 | 263 | 175 | 120 |
| May | 146 | 110 | 244 | 207 |
| June | 60 | 77 | 125 | 29 |
| July | 48 | 116 | 77 | 81 |
| August | 128 | 133 | 126 | 164 |
| September | 303 | 99 | 231 | 381 |
| October | 346 | 302 | 374 | 187 |
| November | 311 | 222 | 355 | 248 |
| December | 162 | 131 | 300 | 262 |
| Total | 2577 | 1976 | 2710 | 2431 |

**Fureneset**

| | Temperature, °C | | | | |
|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| January | | -2.6 | 2.0 | 2.6 | -0.1 |
| February | | -2.2 | 0.9 | 2.9 | 0.1 |
| March | | 2.6 | 2.9 | 5.7 | 0.2 |
| April | | 5.8 | 8.2 | 4.8 | 4.4 |
| May | | 7.5 | 9.9 | 9.0 | 10.3 |
| June | | 11.4 | 12.2 | 11.8 | 12.3 |
| July | | 14.7 | 14.5 | 13.8 | 14.5 |
| August | | 14.8 | 14.3 | 14.3 | 14.6 |
| September | | 11.6 | 12.7 | 9.9 | 11.7 |
| October | | 7.7 | 9.8 | 6.4 | 8.9 |
| November | | 0.3 | 8.1 | 5.8 | 5.3 |
| December | | -2.9 | 3.3 | -0.9 | 5.3 |
| Average | | 5.7 | 8.2 | 7.2 | 7.3 |

| | Precipitation, mm | | | | |
|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| January | | 47 | 233 | 191 | 180 |
| February | | 23 | 153 | 280 | 103 |
| March | | 242 | 218 | 230 | 51 |
| April | | 196 | 143 | 87 | 195 |
| May | | 57 | 169 | 117 | 150 |
| June | | 54 | 239 | 67 | 62 |
| July | | 195 | 131 | 174 | 220 |
| August | | 106 | 175 | 112 | 246 |
| September | | 278 | 327 | 366 | 125 |
| October | | 355 | 348 | 226 | 351 |
| November | | 86 | 301 | 296 | 359 |
| December | | 136 | 345 | 144 | 374 |
| Average | | 1775 | 2782 | 2290 | 2414 |

**Holt**

| | Temperature, °C | | | | |
|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| January | | -2.4 | -3.0 | -2.5 | -1.5 |
| February | | -6.5 | -3.7 | -2.2 | -2.4 |
| March | | -3.8 | -1.0 | 0.4 | -3.9 |
| April | | 1.9 | 3.4 | 0.4 | 1.3 |
| May | | 7.3 | 6.7 | 4.5 | 8.7 |
| June | | 7.4 | 11.3 | 9.1 | 11.7 |
| July | | 11.6 | 11.3 | 10.9 | 11.9 |
| August | | 9.8 | 12.1 | 9.9 | 11.9 |
| September | | 8.2 | 10.2 | 7.6 | 10.2 |
| October | | 3.8 | 6.4 | 3.2 | 3.5 |
| November | | -1.7 | 4.4 | 1.6 | 0.3 |
| December | | -2.4 | 0.3 | -3.1 | 0.0 |
| Average | | 2.8 | 4.9 | 3.3 | 4.3 |

| | Precipitation, mm | | | | |
|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | 2013 |
| January | | 88 | 72 | 13 | 110 |
| February | | 55 | 50 | 84 | 134 |
| March | | 91 | 132 | 158 | 83 |
| April | | 61 | 112 | 58 | 42 |
| May | | 43 | 34 | 107 | 12 |
| June | | 94 | 32 | 36 | 52 |
| July | | 110 | 61 | 90 | 130 |
| August | | 52 | 33 | 29 | 95 |
| September | | 64 | 49 | 84 | 40 |
| October | | 184 | 135 | 82 | 134 |
| November | | 62 | 163 | 74 | 146 |
| December | | 110 | 76 | 11 | 105 |
| Average | | 1014 | 949 | 826 | 1083 |

**Upernaviarsuk**

| | Temperature, °C | | | | | Precipitation, mm | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | | 2009 | 2010 | 2011 | 2012 |
| January | -3.2 | 0.1 | -2.5 | -6.1 | January | 22 | 12 | 40 | 97 |
| February | -2.3 | 2.0 | -4.3 | -4.8 | February | 18 | 6 | 65 | 205 |
| March | -4.5 | -0.5 | 0.9 | -5.6 | March | 27 | 18 | 35 | 57 |
| April | -0.1 | 1.4 | -3.9 | 1.9 | April | 29 | 8 | 40 | 172 |
| May | 0.8 | 7.6 | 2.0 | 4.5 | May | 42 | 37 | 59 | 82 |
| June | 5.7 | 8.1 | 5.5 | 6.3 | June | 74 | 2 | 15 | 21 |
| July | 8.2 | 7.5 | 8.9 | 10.4 | July | 9 | 12 | 32 | 97 |
| August | 8.2 | 10.6 | 8.7 | 8.3 | August | 62 | 85 | 129 | 117 |
| September | 4.8 | 8.4 | 5.8 | 6.6 | September | 59 | 56 | 73 | 160 |
| October | 2.5 | 5.0 | 0.5 | 4.7 | October | 26 | 35 | 23 | 182 |
| November | -2.2 | 2.9 | -3.9 | -0.1 | November | 20 | 74 | 31 | 129 |
| December | -1.3 | 1.9 | -6.6 | -0.6 | December | 15 | 75 | 142 | 23 |
| Average | 1.4 | 4.6 | 0.9 | 2.1 | Average | 403 | 420 | 684 | 1342 |

**Qassiarsuk**

| | Temperature, °C | | | | | Precipitation, mm | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2009 | 2010 | 2011 | 2012 | | 2009 | 2010 | 2011 | 2012 |
| January | | | | | January | | | | |
| February | | | | | February | | | | |
| March | | | | | March | | | | |
| April | | | | | April | | | | |
| May | | | | | May | | | | |
| June | | | | | June | | | | |
| July | | | | | July | | | | |
| August | | | | | August | | | | |
| September | | | | | September | | | | |
| October | | | | | October | | | | |
| November | | | | | November | | | | |
| December | | | | | December | | | | |
| Average | | | | | Average | | | | |