

12 English summary

Title: **From hay-seed to ley-seed. The Swedish seed provision during 1740-1870.**

12.1 The wider perspective

When looking back on the factors influencing the early supply, use and production of forage seed in Sweden, a wider perspective must be used. Ultimately, the total farm production was needed to meet the food demand. Traditionally, the way to do this was to grow cereals and grains on the cultivated fields around the farms and to get pasture and hay to the animals from natural stands on meadows located at shorter or longer distances. The old Roman saying: "The meadow is the field's mother" was valid and quite often referred to, because the manure from the animals was commonly given only to the cultivated fields. In fact, the proportions between the farm fields and the meadows determined the number of cattle and the amount of manure, and, thus, the yields were strongly dependent on the energy supplied.

At the end of the 18th century the Swedish population began to increase, which meant more demand for food. As a consequence, many farmers started to cultivate old meadows, to drain bogs and fens etc. in order to get more farm-land. For this reason, initially the natural areas used for pasture and hay decreased, which led to fewer animals and less manure, and, therefore, poorer yields on the cultivated fields.

The transition to a more balanced crop circulation was not easy, because the common farmer was not used to grow anything else on the farm-land than more or less cereals. Especially up in the north, but also in many other parts of the country, another limitation for introducing cultivated leys was lack of winter-hardiness of imported herbage seed. It took several decades to change the traditional farming. For a long time, the natural stands of grasses and herbs remained as the main sources for hay and pasture, even if it cost a lot of time and efforts to use them. However, up in the north the nutritional value and the digestibility of some of the wild plants many times were as high as of cultivated red clover in the south. The same was valid in Norway for hay collected from higher altitudes.

The scattered distribution of farm-land also hindered or hampered individual initiatives. In the first decades of the 19th century new land laws were established, but in practise the changes were not made just over night. Due to poverty and less obvious opportunities at home, from around 1850 many people emigrated, primarily to the United States of America. Thus, many factors influenced the agricultural development in Sweden, its forage seed programme included. This is reflected also by the Swedish references used in this review, where only 12-13 per cent were published before and all the rest after the year 1800, with a clear dominance of papers after 1850.

12.2 The period 1740-1800

More or less, the years 1740-1800 can be seen as a research and trial period in respect of plants suitable for cultivated pasture and hay. Initially, great initiatives were taken

by the Royal Academy of Science, where Linné, Faggot, Bielcke and others were paving the way, and later also by the Royal Patriotic Society. The pioneers were inspired by own scientific findings and practical experiences, but also by impressions from abroad, mainly Brittany, England and Holland. Several scientists and other educated people - such as noble, military, church men and wholesale dealers - made quite many attempts to introduce red clover (*Trifolium pratense* L.), sainfoin (*Onobrychis viciifolia* Scop.), "fromental" or tall oatgrass (*Arrhenatherum elatius* (L.) Beauv. ex J. et C. Presl), lucerne (*Medicago sativa* L.) etc. Most of the seed came from Holland, Germany, France and England. In 1765 seed of "Timothy-Grass" (*Phleum pratense* L.) bought from England caused a great surprise, when it was found to be one of the common grasses in Sweden, but imported under another name!

Looking closer at individual plant species suggested and tested as forage crops, it seems appropriate to start with Linné. In 1742 he wrote a paper on *Medicago falcata* L., which he named "Swedish hay-seed", to-day known as yellow lucerne. He found this leguminous species especially on the island of Gotland and considered it to have a great potential for cultivation, instead of using the expensive, imported red clover seed, called "Spanish clover", "trèfle" etc., which some few estate owners had begun to try at this time. He also noticed, that "Swedish hay-seed" had a late seed maturation, which could be a limitation. However, this observation was not always fully recognized by later enthusiasts.

Linné's short paper received great attention in the following 50 years, and quite many attempts were made to cultivate this plant. One successful grower was Lars Bergnehr on a Mälär-island just west of Stockholm. In 1751 he found some few *M. falcata* plants on a rather near-by churchyard, from where he got some seeds, which he multiplied. In 1777 he reported that his wife and three daughters from his farm fields with this crop had collected an amount of seed pods corresponding to 110 liters. The Royal Patriotic Society awarded him for his efforts under 25 years to cultivate and also to sell seeds of this species. In addition, he and his family had a lovely garden with hundreds of flowers and fruit trees.

At the Academy of Lund, in southern Sweden, Jörlin - one of Linné's students - made several field experiments with many forage species at "the Paradise croft". He could confirm the value of *M. falcata*, but also its late seed ripeness. Jörlin was also a dedicated seed collector and was awarded by the mentioned Society for gathering almost 1,800 liters of seed of different kinds.

As a rule, though, in practise the cultivation of *M. falcata* did not get a breakthrough, but its rumour did not die. - In 1826 the Royal Academy of Agriculture introduced a "lucern of Luddak" from the present Kashmir. Even if that type of the yellow lucerne had some advantages, it did not either get a response among the farmers.

In spite of the northern position some of the early introductions of red clover succeeded well on certain farms. Already at the end of the 1770s red clover seed was harvested at Kavlås in Västergötland, a south-western province of Sweden. A lot of details on how to thresh by beating and to clean the seed using a simple fanning machine were reported. Around 1790 red clover seed was collected also in the provinces of Uppland - on a farm near Uppsala - and Östergötland - on a plain farm some 150 km south of Stockholm. Characteristics of seed maturation, harvesting, drying and threshing of that type of seed were well described.

In the 1790s, detailed experience of forage seed harvesting was described also by a farmer in the province of Värmland, 300 km west of Stockholm. He had tested 12 grasses and 8 herbage legumes. Among the grasses he found timothy, smooth-stalked meadow-grass (*Poa pratensis* L.) and tufted hairgrass (*Deschampsia caespitosa* (L.) P. Beauv.), and among the legumes red clover and white clover (*T. repens* L.) to be the best. In addition, meadow fescue (*Festuca pratensis* Huds.) was grown by a neighbour, also for seed.

12.3 The period 1800-1870

At the beginning of the 19th century, the Royal Swedish Academy of Agriculture on the national and the Royal Agricultural Societies on the provincial levels became important stimulators of the Swedish agriculture. They established bridges between the agricultural research and the practical farming all over the country. During the entire period, the Academy was the central agency, to whom the Societies had to report. The Academy sent small packages of different, less common kinds of seed to the Societies for local trials, and models of farm equipment suitable for local make. In retrospect, it seems to have been more fruitful with the latter initiative. For a time the Academy also had seed for sale to farmers. In the 1830s its Experimental station was established and there a lot of plant trials - partly also plant introduction - were carried out. This station became the embryo of the present organisation for agricultural and horticultural, mainly applied research in Sweden.

From the start, the Academy published Annals and Proceedings, which contained quite many scientific papers and reports on the agricultural development in the different provinces. The provincial Agricultural Societies had also Proceedings, which, depending on available funding, were more or less regularly published. They contained mostly minutes from meetings, some reviews and also local advice. All these publications were, and still are, valuable sources of information.

The present review visualizes the importance of a decentralized system for seed extension and seed distribution. In Sweden, the early Agricultural Societies took the initiative and tried in first hand to provide locally produced seed. Timothy seed had some clear advantages in this respect. Its comparatively early ripeness and ease of collection made it possible to collect/ to grow also by the small-scale farmers. In the first decades of the previous century, it was reported from the provinces of Värmland, Uppsala, Skaraborg, Blekinge and Älvsborg.

At that time, the seed production of red clover started also in the province of Södermanland, alsike clover (*Trifolium hybridum* L.) in the provinces of Värmland, Örebro, Uppsala and Östergötland, meadow foxtail (*Alopecurus pratensis* L.) in Uppsala, meadow softgrass (*Holcus lanatus* L.) in Skaraborg and Kristianstad, and tall oatgrass in Skaraborg. Gradually, the interest for indigenous seed supply grew and from the 1850s local forage seed production was practised, at least to some extent, in most of the provinces all over the country. Totally, however, and for a long time, most of the red clover seed was imported, mainly from Holland. Provinces having good harbours and long foreign trade connections - such as Gothenburg and Malmö - seemed to rely more and longer on seed import than others.

In order to stimulate the farmers to improve their forage production, the Agricultural Societies initially provided seed on request i.e. they were functioning as "seed dealers" on an intermediary and non-profit basis. On recommendation by their community guilds, some Societies offered a certain discount or delivered seed free of charge to

farmers with scarce economy, but with verified skill. Initially, it was also rather common that estate-owners donated seed to the Societies for distribution. In addition and after a strict inspection system, state loans were provided for cultivation of new acreage and other farming improvement. Generally, repayment was due after two-three years.

In Halland, on the south-west coast, a system was tried with seed payment *in natura* i.e. the same amount of seed had to be delivered in return after the harvest in the next year, a kind of loan. This was perhaps educational, but not always successful, because, after some time, in this province the returned seed became rather mixed. However, in Östergötland this payment system seemed to contribute to both a local seed production, a possibility for villagers to buy small quantities of seed and an elimination of distribution problems. Such a system would still be of interest in countries, where the seed programme just has started, the distances are long to the central seed production areas and the transport facilities are limited, but it requires a local input of trained seed extensionists to keep the quality.

The role of farmer education was duly emphasized. The first agricultural school started in 1834 at Degeberg in the province of Västergötland. In the following 20-30 years several more were established in other provinces all over the country. Young farm-boys were taught how to make proper crop circulations including leys. In some schools they got also practice on how to grow grass and clover seed and how to make sowing machines and other tools.

From the end of the 1840s, forage seed was displayed at agricultural exhibitions on both national and district levels. Primarily, this was also a way to offer home-produced seed for sale and successful seed-growers were honoured and stimulated by some awards. At these meetings, seminars were arranged on specific topics and with the main questions prepared in advance. Around the 1860s, it was rather common to discuss appropriate forage seed mixtures for different soils. The seed quality became a frequent issue, because many farmers were concerned about lacking plant hardiness and sometimes also false identity and failing germinability of the imported red clover seed.

Mainly in red clover, alsike clover and timothy, many local landraces were developed at farm or community levels through natural selection during several seed generations. Most likely, also the imported seed of red clover represented landraces or mixtures thereof. Because red clover is a cross-pollinating plant and some wild-growing material existed in Sweden, probably hybrids between different types were obtained and in turn became the object of further local selection.

There is not so much of principal difference between Denmark, Finland, Norway and Sweden as to the development on the forage seed sector. However, Denmark started somewhat earlier and had a more rapid expansion of seed production, especially in red clover, white clover and perennial ryegrass. In Finland, meadow foxtail (*Alopecurus pratensis* L.) became more used than in the other countries. Iceland has been more relying on natural stands.

12.4 Bridges from 1870 to the future

125 years have passed since 1870, when in general the Swedish crop improvement began to take off. The entire cultivation landscape has been and still is changing. As to the size of the hay and pasture lands - and related traditions - first a rise and then a fall

have occurred. By now, much of the old meadows and other natural forage stands have disappeared, but some remain.

To protect - and to use - the most valuable, natural forage resources, two principal ways have been tried: *One* is the collection, description, conservation and use of unique material *ex situ*, which in the past - and still now and then - was made by the plant breeders and in later years by the Nordic Genebank. *The other* is to protect the most valuable, still existing plant sites, *in situ*.

Individual plants selected from wild stands and landraces formed the starting material for the first forage plant breeders. Therefore, valuable genes from the past are still present in at least some of the present cultivars. In addition, a seed collection of the 54 most important Swedish landraces of red clover was made in 1953 and is now available at the Nordic Genebank. Several landraces of timothy and alsike clover also existed, but the difference between them was less than in red clover. Probably none of these - except one of timothy from the north - remained, when the Genebank started. However, it has tried to cover the still existing variation by collecting local, wild-growing populations of these and other forage species, so far mainly in the north.

Recently, old, unique forage stands all over Sweden have been carefully examined and in 1994 the Swedish Environmental Protection Agency reported that 1,287 hectares of natural hay land and 39,257 hectares of pasture land are being protected all over the country. For the detailed inventory and the safe maintenance of these valuable areas continued efforts will be necessary by farmers, scientists, societies and agencies. A link to the Nordic Genebank would also be fruitful. This is a challenge of great environmental and cultural value!

In view of Agenda 21, it would be interesting to take a new look on some of the wild forage plants, which were used or tried in the past. Some of them were shown to have good nutritional value and long durability also under rather extensive conditions. It could be motivated to collect and evaluate different ecotypes of some of these wild plants in order to assess their potential value for cultivation. Further, with the modern biotechniques some of their valuable genes might be transferred to already cultivated species. Some interspecific crosses have already been made.

12.5 Main conclusions

The main conclusions of this review are:

- 1. It takes time to change a traditional cultivation system.*
- 2. The step from collecting seeds of more or less wild stands of forage plants to growing herbage seed on farm-land means per se a developmental process in several respects. The knowledge of the plants suitable for cultivation and the technique of their seed production are pre-conditions, which require testing and experience.*
- 3. The plant material must be adapted to the prevailing growth conditions.*
- 4. At an early stage, therefore, own local material of known fodder plants should be explored, collected, conserved and evaluated.*
- 5. In order to succeed, a forage crop must have not only a good value for cultivation and use, but also a satisfactory seed yielding capacity. In addition, the seeds must be easy to harvest and to sow, and have a high quality.*