

Effect of adding moraine soil or shell sand into peat soil on soil properties and grass yields in western Norway

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Introduction Cultivation and utilisation of peat soil leads to problems related to its high water content. The problems have become more pronounced with the increasing weight of agricultural machinery and more frequent harvesting. Increased particle density, reduced porosity and decreased potential plant-available water was found after incorporation of sand to peat in experiments conducted in the north of Norway (Sveistrup & Haraldsen, 1995). Peat soil has a weak soil skeleton, low bearing capacity, poor thermal properties and insufficient soil aeration. The objective of this study was to investigate the impact of added mineral material to peat soil to improve characteristics important for more optimal plant growth and management practices in the future.

Materials and methods A field experiment was conducted from 1978 to 1995 on peat soil (H5-H6 von Posts scale) at Fureneset Rural Development centre (61°18'N, 5°03'E) in Norway. In 1977 either moraine soil or coarse shell sand was added as evenly as possible in different amounts to experimental plots using bulldozers and tractors. The treatments were: no addition, 200, 400 and 800 m³/ha moraine soil or shell sand respectively. All plots were fertilised with 750 kg/ha compound NPK fertilizer (16-3-15/18-3-5) in spring and 500 kg/ha after first harvest. The grass was harvested two times each year.

Results Adding mineral materials to the peat led to an increase in grass production both in the first (1978-1987) and second period (1989-1995); the year 1988 was not included due to re-sowing. In the first 10-year period, the increase was most pronounced after shell sand compared to moraine soil addition. After re-sowing, the moraine soil treatments demonstrated an additional increase in dry matter yield (Table 1).

Table 1 Dry matter (DM) yields and herbage timothy contents in the periods 1978-87 and 1988-95 after the incorporation of moraine soil and shell sand in different amounts to a peat soil in 1977

	DM yield, kg/ha		Timothy, %	
	1978-87	1989-95	1978-87	1989-95
Control	1040	816	33.4	38.8
<i>Mineral type:</i>				
Moraine soil	1080	887	33.9	43.6
Shell sand	1153	865	42.7	49.0
<i>Applied amounts:</i>				
200 m ³ /ha	1123	858	38.1	41.5
400 m ³ /ha	1118	898	38.6	47.1
800 m ³ /ha	1108	873	38.2	50.3
Sign. of effects ^a :				
Control vs. material treatments	***	**	**	**
Material type	*	ns	**	*
Amount	ns	ns	ns	**
Material type* Amount	ns	***	ns	*
Year	***	*	***	***
Material type*Year	**	***	*** ^c	ns
Amount*Year	ns	ns	ns	ns

^a*, **, *** and ns; significant at P<0.05, P<0.01, P<0.001 and not significant, respectively

Conclusion Mineral materials added to a fuel peat soil improved conditions for plant growth. The observed increase in infiltration rates combined with reduced total porosity and soil water content after additions of mineral materials are considered to be important contributing factors to the improved growth conditions. For economical reasons, addition of more than 400 m³/ha mineral materials cannot be recommended.

References

Sveistrup, T. & T.K. Haraldsen (1995). Effects of sand application and soil compaction on yields of leys and soil properties in peat soils in northern Norway. *Norwegian Agricultural Research*, 9, 133-146.