

Technological change and its impact in Arctic regions: Lapps introduce snowmobiles into reindeer herding

(Utsjoki and Inari, Northern Finland)¹

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Zusammenfassung: Einführung und Anwendung des kleinen, wendigen Motorschlittens in der Rentierwirtschaft Nordfinlands (Gemeinden Utsjoki und Inari), Anpassung der Arbeitsmethoden an ökologische Gegebenheiten und Auswirkungen der Mechanisierung auf Rentierwirtschaft und einheimische Bevölkerung (sozialer Wandel) werden dargestellt. Material über Aufnahme von Schneefahrzeugen in der kanadischen Arktis wird als Vergleich herangezogen.

Summary: Introduction and application of the small, versatile snowmobile in reindeer herding in northern Finland (Utsjoki and Inari parishes), adaptation of work organization to the new ecological conditions, and impact of mechanization on reindeer herding and on the native population (social change) are described. Material on the adoption of snow vehicles in the Canadian Arctic is taken as a comparison.

Technological change, which is often more directly observable to the "naked eye" than is social change, is taking place at a rapid pace all over the world. Traditional cultures are experiencing the accelerated impact of technological innovations introduced by Western civilization. For many years, because of inaccessibility and extreme ecological conditions, Arctic regions were almost bypassed by modern technological changes. During the last four decades, however, the northernmost regions of the world have experienced tremendous socio-technological changes, particularly because of the economic and political effects of World War II.

Since about 1960 a revolution has been taking place in Arctic transportation patterns which will have profound effects on economic and cultural systems. A small vehicle, the one-person snowmobile suitable for traveling in any snow-covered country, has been rapidly replacing such ancient traveling devices as dog and reindeer sleds, and has greatly accelerated the pace of Arctic travel.

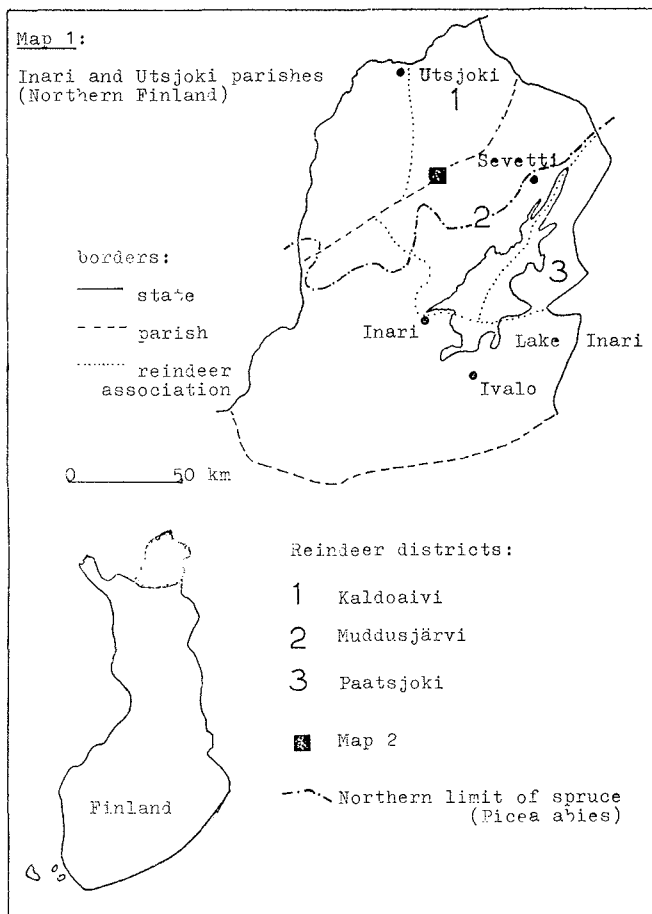
In this article we will examine some details about the diffusion of the snowmobile and the process of its adoption into reindeer herding in Northern Finland, and we will compare these findings with available information from the Canadian Arctic (cf. Pelto et al. 1968; Pelto and Müller-Wille, in press).

Setting of the area: The landscape of the northernmost part of Finland (Inari and Utsjoki parishes, Map 1) consists mainly of low hills with heights from 200 to 600 m. Inari parish (Muddusjärvi and Paatsjoki reindeer districts) is covered by coniferous forests, Utsjoki parish (Kaldoaivi district) is open country with low birch wood and tundra vegetation. These differences in ecological setting were important in affecting patterns of adoption of the snowmobile in these areas. The climate is influenced by both maritime and continental elements, causing rapid changes in temperature and a wide range of temperatures (in winter normally -10° to -25° C and occasionally -40° C). The annual snow cover, reaching an average height of 60 cm, normally covers the ground from the end of October to the middle of May (Aario 1966). That means that there is a seven- to eight-month snowmobile driving season.

In 1970, the two parishes had a population of more than 9,000, including about 2,500 Lapps, the rest Finns. The Finns are mostly employed in administration, construction, and services whereas most of the Lapps still follow their traditional occupations — fishing, trapping, small farming, and reindeer herding. Settlements are scattered and

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small but the newly developing market centers (Utsjoki, Inari, and Ivalo) are growing rapidly.

The snowmobile revolution in Utsjoki: Before the snowmobile was introduced in Utsjoki (1962), the general means of transportation were boats with outboard motors (introduced during the 1930's) during the summer months and reindeer sleds in winter. In 1957 a new road to Norway linked Utsjoki with the Southern parts of Lapland. Although the road facilitated travel and communication for at least one part of the population, other populated areas, especially in the river valleys, remained isolated. The snowmobile, a small and versatile cross-country vehicle, is not dependent on roads or tracks, and has made almost every part of the area easily accessible.

The process of adoption of a technological innovation is a learning process. In this process, the stages of "awareness", "interest", "evaluation", "trial", "final adoption" and "application" have been defined (Rogers 1967). In the case of the snowmobile in Utsjoki, these stages in technological innovation occurred very rapidly because the first advocates (or innovators) were leaders in reindeer herding with strong influence in the area.

Diffusion of the innovation: The snowmobile was first developed in Canada (about 1960) and imported to Northern Finland at the end of 1961. The new import was exhibited

at the market in Rovaniemi and other places in Lapland (Pelto et al. 1968). Information and enthusiasm for the vehicle was quickly communicated throughout Lapland. Already in late 1962 four reindeer Lapps from Utsjoki (Kaldoaivi reindeer association) bought snowmobiles and used them during the following winter in their herding activities². These innovators, wealthy, young, and active men occupying influential positions in their herding association, were the opinion leaders who persuaded other Lapps, especially reindeer herders, in the area to acquire snowmobiles.

The rapid adoption of the snowmobiles in reindeer herding during the next three or four years was the result of personal interaction and exchange of experiences among the reindeer herders of Kaldoaivi and other reindeer associations. Kaldoaivi was the first instance in Finland (winter, 1962/63) of mechanization in reindeer herding (Alaruikka 1964: 134—135; Utsjoki informants). The rapid adoption and application of the snowmobile was made possible by the favorable ecological setting of the Kaldoaivi district which offers ideal conditions for the maneuverability of such a vehicle. The mechanical aptitude and pragmatic attitudes of the reindeer Lapps also facilitated the change. These are people who readily accept new ideas if they promise to enhance their capabilities as reindeer herders. Within four years after the introduction of the innovation, the traditional reindeer sled was completely abandoned in favor of the snowmobile. The last man in Utsjoki to travel by reindeer sled as late as 1966/67 was a 70-year-old Lapp, who finally decided to buy a snowmobile for himself. The suddenly superfluous draft reindeer were sold to other parts of Lapland, where they are used for racing (mainly by Finns).

The snowmobile has become important for winter sports, as well as for trapping, fishing, and general transportation; but its greatest impact has been in reindeer herding where it has revolutionized working methods. The introduction of the snowmobile paved the way for easy acceptance of other innovations. Some of these changes appear to improve the competitive position of the reindeer industry³.

Application of snowmobiles in reindeer herding: When the four reindeer Lapps — the innovators — started to use their snowmobiles in herding activities during the winter season of 1962/63, they had no guideline of how to apply this vehicle in their work. Until then herding in Kaldoaivi had been done by men with reindeer sleds and skis. This usually meant that the herdsman had to remain in the backlands with their animals for several weeks at a time. Only one or two main roundups could be arranged during a herding season. The snowmobile changed this situation completely.

During the trial stage the snowmobile was used for transportation and found to be extremely advantageous for communication. More and more herders bought snowmobiles because they saw that it was also applicable for gathering reindeer. But only wealthier reindeer herders had the financial means for such a vehicle (about \$ 1,000 to 1,400 in 1969). The advantage these reindeer herders gained by using snowmobiles in their work forced the remaining reindeer herders either to acquire a machine (a severe financial burden) or to drop out of herding. By 1964 snowmobiles were already, after one year of trial, in general use for reindeer herding. During the next three or four years special methods for gathering and tending reindeer were developed by the Kaldoaivi reindeer Lapps. These methods were highly successful and led to adoption of the snowmobile by other reindeer associations, especially by Muddusjärvi and Paatsjoki district, to the south of Kaldoaivi (see below).

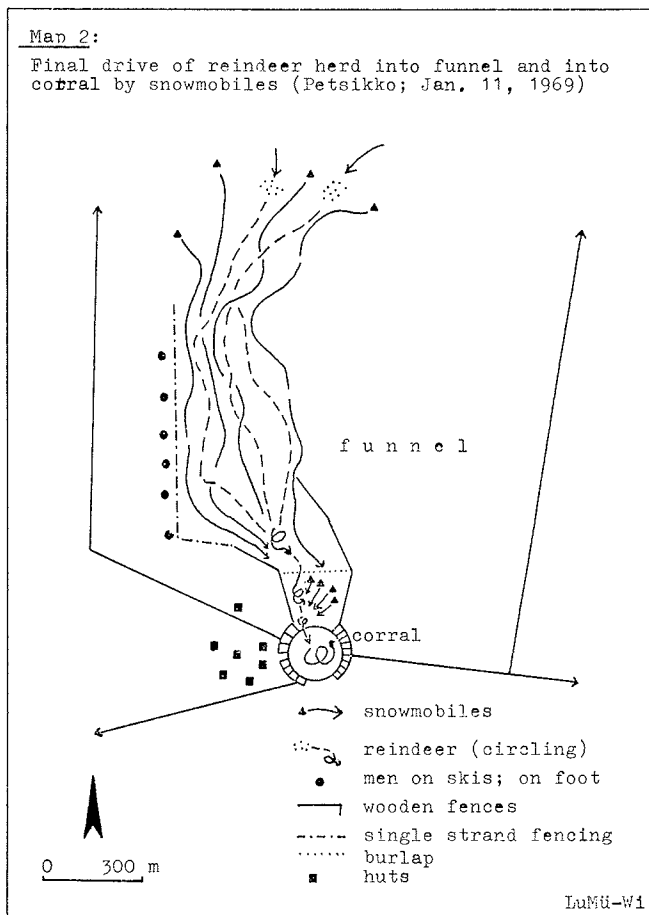
During the 1968/69 season, 5,110 reindeer were gathered for 6 main roundups in Kaldoaivi, where 1,750 (32.5 %) were sold (Poromies June 1969)⁴. During the season's activities about 40 snowmobiles were engaged. The following working methods were observed in Kaldoaivi during that particular season.

When a roundup is to be held, 8 to 10 snowmobilers leave from different starting points

to search the district (about 2,000 km²) for the small, scattered groups of reindeer, which are allowed to graze unattended. These animals are then driven to an already agreed upon point (a top of a ridge) and are left there for the night, unguarded, since a herd will not usually leave a grazing ground during a single night. The snowmobilers return home (some 30 to 60 km) and repeat this process on the following days until a large enough herd for a roundup (ca. 1,000 to 1,500 head) has been gathered. The whole herd is then driven to the roundup place by a group of snowmobilers deployed at the rear and sides of the herd. This drive takes 2 or 3 days, depending on the distance from the corral (a herd can normally travel 25 km a day).

The corral is built so that the herd can be led or driven through a funnel-shaped fence leading into the main corral (Map 2). When the herd is inside the funnel, it can be closed by burlap drawn across the opening. (The use of burlap for temporary fencing is also an innovation of the 1960's.) The group of snowmobilers drives the herd into the funnel and leaves it there to calm down. The herd begins circling for protection in front of the narrow entrance to the main corral.

The final stage of moving the herd into the corral is the most difficult for the drivers. In the funnel the snowmobiles' maneuverability is limited and the vehicles coming close to the herd frighten them, so that it is not possible to lead them in the desired direction.



Therefore the Lapps decided to combine traditional methods with the modern in this tricky maneuver. Snowmobiles drive very slowly at the back of the herd and skiers or men on foot surround the circling animals, urging them carefully towards the opening until several lead animals break out of the circle and pass into the corral (Fig. 1—2). The use of herd dogs in this stage was abandoned at the beginning of the snowmobile age but after reevaluation was again taken up the Lapps in Utsjoki.

The success of the final drive into the funnel and into the corral depends on the proper placement of the corral fences in the natural landscape. Their location must take advantage of open country, hills, and valleys which the reindeer would naturally follow. In Kaldoaivi district the landscape is favorable for the use of snowmobiles in the different phases of reindeer herding because the open "fjelds" provides good visibility and wide-open maneuvering.

Response to different ecological settings: Following the example set by Kaldoaivi reindeer herders, other reindeer associations in Lapland adopted snowmobiles in their work. Reindeer herders from the Muddusjärvi and Paatsjoki districts south of Utsjoki (Map 1) were especially eager to learn from the experiences of the Kaldoaivi herders. Early in 1963 leaders of the Kaldoaivi association were invited to demonstrate their machines during a roundup in Muddusjärvi district (Pelto et al. 1968: 16). As mentioned above, the terrain and vegetation in Inari parish are different from Utsjoki and required different approaches and responses. Coniferous forests, steep hills, and a complicated drainage network called for a combination of traditional and modern working methods. The methods developed in Utsjoki, the first for snowmobile use in reindeer herding, were fitted to their particular environment and could not be transferred to different ecological conditions without modifications. Reindeer herders from Muddusjärvi and Paatsjoki, especially Skolt Lapps, have found it more practical to employ a complex mixture of snowmobiles plus herdsman on skis. Herding dogs continue to be indispensable. Although more work is involved, men and dogs can lead a reindeer herd into the corral more easily than snowmobiles.

The ecological differences of these two areas partly explain why the snowmobile was adopted earlier in Kaldoaivi and later in the southern districts, as well as explaining the differences in working methods (Pelto et al. 1968: 17).

Prospects for reindeer herding: The introduction of the snowmobile and other technological devices into reindeer herding appears to have made the work more efficient, especially in Utsjoki. Reindeer can be gathered faster, resulting in several roundups in a season and more sales. Better road conditions, field slaughterhouses, and refrigerator trucks have opened new outlets to more distant markets. In the cities to the south, reindeer meat is no longer considered an unappetizing food but rather a delicacy, and prices of reindeer meat have risen. Any economic gains brought about by the mechanization of reindeer herding have been limited to a rather small group of herders who were able to afford snowmobiles. Reindeer herding as a part of the livelihood of most Lapps in northern Finland has apparently been reduced to a great extent to a special occupation group — professional reindeer herders. This is a restructuring of the economic and social system which seems inevitable if the mechanization of the reindeer herding is to succeed.

Developments in other Arctic regions: Today snowmobiles are known in most Arctic regions. They have brought great changes in speed of travel and appear to have important social and cultural consequences. Some information about the technological developments in the Canadian Arctic is available for comparison with northern Scandinavia (Pelto 1968 — interviews at the "Intermediate Adaptation" colloquium held at the Memorial University of Newfoundland). Although different natural environments account for some significant variations in adoption and uses of snowmobiles, there are

some important similarities in the patterns of adoption of the snowmobile. The time of introduction of snow vehicles in the Canadian Arctic is about the same as in Lapland — the early 1960's. As in northern Finland, the innovators (Whites and Eskimos) in the Canadian Arctic were for the most part wealthy and influential persons who had been in contact with a cash economy (e. g., Eskimos who were employed at DEW line stations). The first adopters had the means to buy these expensive vehicles and were in a relatively "low risk position" financially as well as socially. The application of the snowmobile in transportation, fishing, trapping, and hunting has changed working methods in these areas. Dog teams have been partly abandoned and hunting and trapping have been expanded, although snow and ice conditions presented a greater hazard for the snowmobile than in northern Finland. The adoption process in Eskimo communities has often been very rapid — and was hastened by the influence of Government agencies which used these vehicles extensively for general transportation and duties. (This is in contrast to the case in northern Finland, where the border patrol and other governmental agencies were, in the beginning, reluctant to introduce these vehicles.)

Conclusions: Innovations can be defined as thoughts, behaviors or things which are different from existing forms (Barnett 1953). Adapting them to fit the existing system implies adjustment of one or the other or both forms. A few observations can be made on some general aspects of the changes brought about by technological innovations in the traditional societies of northern Finland and the Canadian Arctic.

Lapps and Eskimos seem to be very open-minded to new technical devices and are able to adapt them to their own systems with great skill. In northern Scandinavia as well as in the Canadian Arctic new settlement patterns have arisen because of the new means of transportation. For example, reindeer nomads in northern Sweden (Lapps) have become commuters between their homes and the reindeer pastures (Sjölin, 1967: 24). As a consequence of the speed of travel, social contacts among Lapps from different areas have become more frequent than before, and the Lapps in northern Scandinavia are feeling a new ethnic identity and a somewhat greater solidarity.

One of the potentially far-reaching social effects of the "snowmobile revolution" in Arctic communities is the apparent increase in social stratification among peoples who had previously had little class differentiation. In both Lapp and Eskimo groups there may be an increasing gulf between the "haves" and the "have nots" — especially concerned with ownership of the economically important snow vehicles. This development is probably reinforced by the complicated processes of accumulating capital needed for the deployment of modern technology, and the new social and economic stratification arising from the redistribution of capital.

1: The authors did field research among Lapps (Skolts) and Finns in northern Finland: Pelto in Seveti 1958—59 and 1967 (Pelto 1962, 1970; Pelto et. al. 1968); Müller-Wille in Utsjoki 1968—69 supported by DAAD (Bad Godesberg, Germany) and Finnish Ministry of Education. Material on the Canadian Arctic was gathered by Pelto in 1968.

2: 'Reindeer Lapps' — Lapps who are occupied in reindeer herding; not a distinct ethnic group.

3: The rapid change and growing success in reindeer meat marketing called for new legislation which is especially concerned with meat control. Since 1968 field slaughterhouses on trucks offer clean slaughtering etc.; motorcycles are used for drives in Aug. to Oct.; radios and airplanes are coming in use.

4: Each reindeer district (Finn. „paliskunta“) has a fixed limit of reindeer; since 1965 the limit has been 7,500 head in Kaldoaivi. The 1967—68 season was particularly bad for reindeer herding because of extreme climate conditions. Several hundred reindeer died of starvation in Kaldoaivi in spring 1968.

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Deutsche Island-Expedition 1970

Von W. Torge, Hannover*

Von Juli bis September 1970 wurden in Nordostisland im Rahmen der „Deutschen Island-Expedition 1970“ *Gravimetermessungen* durchgeführt. Ziel dieser von Prof. Dr. A. Schleusener und Prof. Dr. W. Torge (Institut für Theor. Geodäsie der T. U. Hannover) geleiteten und aus Mitteln der Deutschen Forschungsgemeinschaft geförderten Arbeiten war es, das Schwerfeld im Gebiet zwischen 65° und 66° nördlicher Breite und zwischen 18° und 16° westlicher Länge zu bestimmen. Die Messungen erstreckten sich über die junge Vulkanzone und die westlich und östlich angrenzenden Teile der tertiären Plateaubasaltzone. Die Arbeiten schlossen an die von Prof. Schleusener während der deutschen Island-Expedition 1938 (Prof. Niemcyk), 1964, 1965 und 1967 vorgenommenen umfangreichen gravimetrischen Messungen an. Insbesondere wurde 1970 das vorhandene Punktfeld durch profilmäßig angelegte Messungen so verdichtet, daß eine bessere Korrelation der bisher festgestellten Schwerestrukturen möglich wird. Die vermarkten Stationen eines 1938 angelegten und 1965 erneuerten und neu gemessenen Schwereprofiles von Akureyri nach Grimsstadir (100 km, Punktabstand 0,8—1,5 km) wurden mit hoher Genauigkeit erneut beobachtet, um evtl. zeitliche Schwereänderungen in der jungvulkanischen Zone nachzuweisen.

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