SECTION 2

The Effects on Agricultural Potential

2.1. Introduction

This section is concerned with the impact of climate on various aspects of agriculture in Iceland. As discussed in the preceding section, grass growth and hay yield is of fundamental importance in Icelandic farming. Because of this the greater part of this chapter is devoted to the impact of climate on hay yield. A related concern for the farmers is the impact of climate on the winter and summer grazing of animals. The farmers are thus affected by two related problems: poor hay yield after cool seasons and increased need for fodder in severe winters. These two conditions often occur together, and the cumulative effect of a cold winter can be that farmers are faced in the summer with unusually little grass growth, when the fodder consumption in the preceding winter has been especially heavy. To compound matters, such severe years often tend to occur in clusters. An additional limiting factor is the carrying capacity of the summer pastures. In this respect it is therefore advisable to restrict livestock grazing to the carrying capacity of the coldest periods that can be expected in the climatic era. The question of how best to react to climatic impacts in order to avoid fluctuations in livestock numbers is also discussed. Finally, in Subsection 2.7, it is shown that present conditions for growing trees and cereal crops are marginal in Iceland. Their sensitivity to climate and their growth under different climatic conditions are estimated here in terms of the percentage area in Iceland suitable for their growth.

Regression equations have been developed in each of these analyses utilizing historical agricultural data aggregated at the national level and climatic data either from Stykkishólmur alone, or from the station network across Iceland (*see Figure 1.7*). The equations are used to estimate the effects of the five main climatic scenarios described in Subsection 1.10, and to assess some possible adjustment measures to adapt to climatic variations.

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2.2. The Effects on Hay Yields

For this study, the effects of temperature and precipitation on annual hay yield for the whole of Iceland during the period 1901–1975 are considered. Precipitation will be considered first.

2.2.1. Effects of precipitation

In the southern parts of the country, the summer (May–September) precipitation ranges from about 250–600 mm (*see* Subsection 1.6). It falls mainly in the relatively warm southerly winds, blowing onshore. As the summer temperature, and hence rates of evapotranspiration, are low, droughts are uncommon in this region. Excessive precipitation, however, may cause some damage to the hay crop. Thus the beneficial growth effects of warm periods will be somewhat reduced when there is a surplus of rain. In the northern part of the country, the summer precipitation is, on average, 150–250 mm. Drought occurs occasionally, mainly with southerly *föhn* winds, blowing from the mountains. This reduces the positive effect of the relatively warm southerlies on plant growth. With cold northerly winds, precipitation in northern Iceland is sufficient but seldom excessive; moreover, the cold air prevents any significant rotting of the hay during the haymaking. Curiously enough, production of silage is very limited in this rainy country. In conclusion, although precipitation is locally important during certain years, it is little related to hay yield for the whole country. Because of this, only temperature and fertilizer application are used as variables in the regression equation expressing the yield shown below.

2.2.2. Effects of temperature

In designing a model of hay yield with respect to temperature, it is necessary to consider the summer (May–September) and winter (October–April) separately. While the use of the summer (growing season) temperature needs no justification, some explanation is required as to why winter temperature is an important parameter (Bergthórsson, 1966). One of the reasons is the winter kill of grass. This may occur as the direct result of severe cold, particularly in relatively snow-free winters (although it should be noted that cold winters are more frequently accompanied by long-lasting snow cover). With the unstable Icelandic climate, another factor which may have an adverse effect on grass is the occurrence of thaws. If these are only light, as is usual in cold winters, the snow does not melt properly but simply becomes wet. When temperatures fall below freezing point again, the partly melted snow refreezes and turns into ice. The result is the formation of a crust of ice on the ground. If this persists for two or three months in late winter (Gudleifsson, 1975), it can be very detrimental to the grass.