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## Grassland production under various meteorological conditions in Xilingol, Inner Mongolia, China

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**Introduction** In the area of the Xilingol steppe in Inner Mongolia, farmers were previously nomadic. Today, however, they graze mainly sheep and goats at permanent residences. The meteorological characteristics of this area are long, severe winters, warm summers, and little rainfall. Primary and secondary grassland productions are largely restricted by these meteorological conditions. In the present situation, long term meteorological forecasts by observatories are impossible, we propose an alternative method.

**Materials and methods** A system model was used to analyze the Xilingol steppe ecosystem (Figure 1). Meteorological data on daily mean air temperature and rainfall from 1953 to 2000 (48 yrs) were numerically classified into six typical year patterns using 10-day means/totals of these meteorological variables from April to October, which is the growing season for grassland vegetation, based on a numerical classification technique (*k*-means).

**Results and discussion** The six meteorological patterns in Xilingol are shown in Figure 2. We applied the system model to each meteorological pattern. The simulated results for aboveground biomass of grassland vegetation from 20 April to 10 September are shown in Figure 2. Meteorological Pattern 1, which has little rain in summer, is characterized as drought and there is little plant biomass. The plant biomass of pattern 4, which has relatively little rainfall in early summer, follows pattern 1. The other patterns have more rainfall in summer and plants show vigorous growth. Farmers can select an expected meteorological pattern based on the present weather conditions and their empirical knowledge, predict grassland production, and plan a grazing schedule. This procedure may not only assist in the creation of a grazing schedule but also help prevent degradation and desertification, and facilitate the recovery of production.

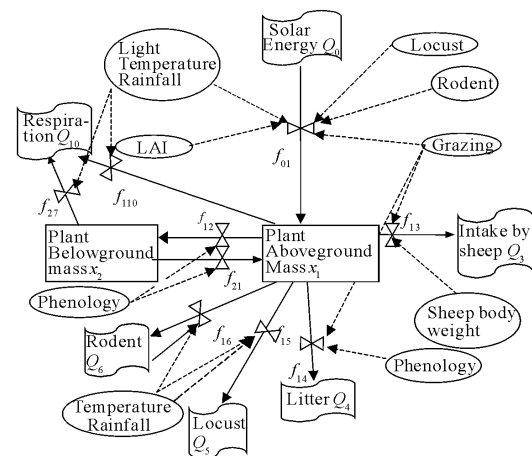


Figure 1 System model of the Xilingol steppe ecosystem.

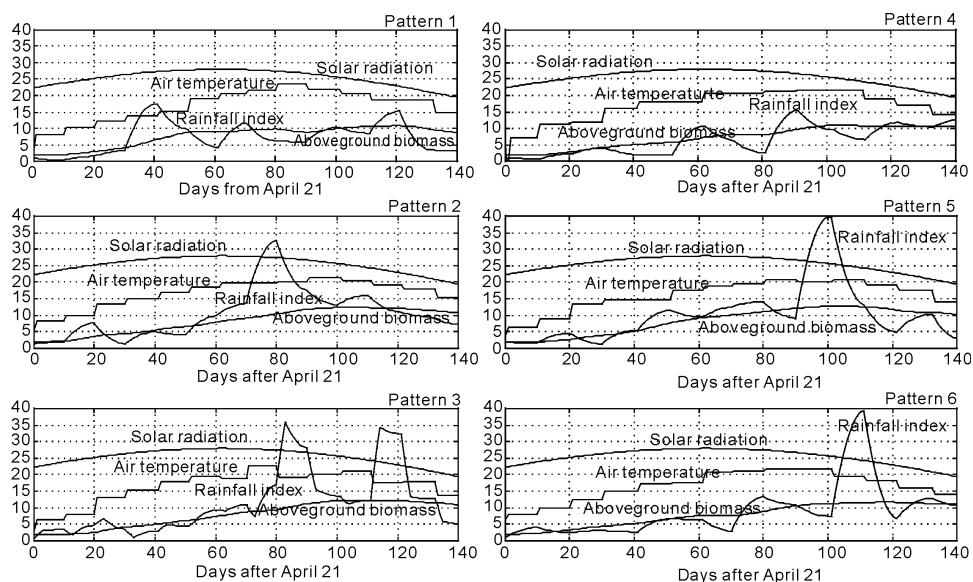


Figure 2 Changes in solar radiation (Mj/ha/day), air temperature (°C), rainfall (mm/day) and biomass (10<sup>2</sup> kg/ha) for the six meteorological patterns.