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## Guest Column

L.J. Brun, Chairman,  
Department of Soil Science



### CLIMATE, SOIL AND THE OUTBACK

On October 9, 1989 *Newsweek* published an article titled "America's Outback" emphasizing the economic and environmental problems of six western states including North Dakota. While many North Dakotans took exception to the article's content, it does contain elements of truth. One point the authors marginally recognized was the climatic and soil resources of the region. In this article I will discuss the use and misuse of these resources in North Dakota.

Soil formation is the product of five factors: parent material, vegetation, time, topography, and climate. Most soils in North Dakota are young, having developed after glacial events that occurred about 10,000 years ago. However, the soils of southwestern North Dakota are much older, forming on marine deposits that are several million years old.

Two of the soil formation factors deserve special recognition in considering properties of North Dakota soils. In North Dakota the potential evapotranspiration is greater than annual precipitation. This means our soils are not leached and thus are rich in nutrients such as calcium, magnesium, and potassium. The second special factor is that almost all of our soils developed with grass as the native vegetation. This, along with a cool climate, allowed accumulation of high levels of organic matter and its store of plant nutrients.

Also, because of our climate, we have developed agricultural practices that contribute to the degradation of our soil resource.

The level topography, fine-textured soils, and rainfall patterns found in the Red River Valley support an intensive and diverse agricultural production. Small grains and longer-season crops are grown with considerable success. However, as we proceed westward the undulating topography and lower annual precipitation create a much more challenging agricultural production environment.

In this situation even small grain production can be uncertain. The practice of summer fallow has developed in an attempt to reduce risk and stabilize production. This practice can store additional soil water and increase the crop's nitrogen supply through organic matter decomposition. It also offers a degree of weed control and disease reduction. However, the practice of conventional summer fallow allows excessive wind and water erosion, loss of soil structure, and organic matter depletion. About half of the organic matter in North Dakota soils has been depleted since cultivation began. A viable agriculture can not be maintained with the rate of resource depletion that occurs with conventional summer fallow, excessive tillage, and cultivation of steeply sloping land.

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**On the Cover:** "Red sky at morning..." Countless generations of farmers have predicted the weather by scanning the skies or by various folk axioms. In this issue John Enz discusses more scientific means of collecting and interpreting weather data. Photo by James Berg.

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**H.R. Lund**  
*Dean of Agriculture, and Director  
of Agricultural Experiment Station*  
**EDITOR**  
**Gary Moran**

Maintaining a viable agriculture in North Dakota must be based on practices which protect the soil resource (sustainability) and allow use of the most economic production practices possible (efficiency). The goals of sustainability and efficiency can only be achieved with the combined effort of all those involved with food production and concerned about resource utilization.

Farm programs must be designed to encourage greater flexibility in crop choices. Farm program benefits should be "decoupled" from an emphasis on production and "recoupled" to an emphasis on conservation and environmental practices. Appropriate rotations or crop sequences make reduced-tillage or no-till cropping systems more viable as management systems. Weed, disease and insect problems can be reduced with appropriate rotations, reducing the need for chemical controls. Rotations containing legumes can reduce nitrogen fertilizer needs.

There is irony in the fact social interest in resource protection has intensified during a period when federal farm program structure has fostered increased summer fallow in the Northern Plains. Water management practices using crop residues can reduce the need for summer fallow. Farm programs should be designed that discourage or restrict summer fallow on erodible soils or landscapes and in higher rainfall areas. The practice of summer fallow in more favorable climatic zones is usually a reflection of farm program requirements.

When summer fallow must be practiced as a water conservation measure, the management system should maximize crop residue or surface cover. Farmers in western North Dakota should be allowed to adopt crop rotations which use summer fallow when stored soil water is low in the spring and allow for recropping when the soil water is high at seeding time.

The extreme variability of the Northern Plains climate makes it difficult to use climatic data for long-term prediction of crop performance. A better application of long-term climatic data might be in the form of probabilities of critical threshold levels of performance. However, I feel short-term monitoring of climatic conditions may have significant applications such as monitoring pest or disease development and the need for chemical control (see article by John Enz in this issue).

An ideal crop for marginal land would be a nitrogen-fixing, disease-resistant perennial with an edible seed. Is it possible to develop such an exotic plant? It will not be developed unless resources are applied to the problem.

North Dakota's agriculture can become more sustainable and economic by utilizing livestock. There are many tons of unused forage, unharvestable crop, weeds, crop residues, and low quality grain that could be utilized by livestock. Converting these potential resources to meat and animal fiber would enhance the viability of our agriculture.

Climate has been both our friend and foe. It has helped to produce very fertile soils in North Dakota. At the same time the unreliable nature and paucity of precipitation and temperature extremes make agriculture a challenging business. We obviously face major challenges to maintain an acceptable economic, cultural and educational environment in our state. Agriculture will continue to be a significant component of our state economy. Making the best use of our soil and climatic resources is a key element of agriculture and depends upon public and private support for research and education programs. Everyone must recognize that agriculture is a dynamic industry that is highly dependent upon intellectual capital. Hopefully, we can rediscover the cooperative "can do" pioneering spirit that will lead to a more prosperous North Dakota which must include a prosperous agriculture.

Agricultural Experiment Station  
**NORTH DAKOTA STATE UNIVERSITY**  
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*H.R. Lund*

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