

A GLANCE AT SELECTED RESEARCH PROJECTS

Economics of no-till crop production

Because no-till methods reduce labor, reduce power needs and reduce soil erosion, a study was made of the costs, yields and estimated reduction of soil erosion resulting from no-till production of barley, spring wheat and winter wheat. The study showed that no-till methods of raising spring-seeded crops under continuous cropping cost only slightly more than conventional tillage, and that no-till methods of raising winter wheat cost substantially less. Average yields for spring wheat and barley were found to equal those produced by conventional tillage. Yields for winter wheat were found to be higher due to better winter survival. Soil losses were found to be negligible, while losses resulting from conventional tillage average in excess of 5 tons per acre in North Dakota.

The feasibility of establishing agricultural processing plants in North Dakota

Feasibility studies are useful to companies trying to understand the advantages and disadvantages of locating in North Dakota. Thirteen such studies have been completed and one more is in progress. Partly on the basis of these studies, 35 plants have been constructed in North Dakota, which have led to initial capital investments of more than \$231 million, have provided direct employment for 528 people, have provided indirect employment for about 810 people, and have generated an estimated yearly business volume of \$64,534,000 as a result of direct and indirect expenditures.

Pesticide residue

To establish tolerance levels and to obtain EPA approval for use of particular pesticides, the Department of Biochemistry has done research on residues resulting from use of various insecticides, herbicides and fungicides on a variety of specialty crops, including flax, millet, sunflower, canary grass, stored sunflower, birdsfoot trefoil and eggplant.

To help assure production of high quality food free of harmful chemicals, studies were conducted to develop

improved methods for detecting chemical residues and for identifying chemical changes undergone by pesticides after application.

Basic leafy spurge biology

Basic research on leafy spurge is needed in order to determine the basis of this plant's unusual competitive ability and any weaknesses which may be exploited to control its rapid spread in North Dakota. A number of projects have been undertaken, including a study to determine whether hybridization between species has occurred and whether various plant types exist, a complete review of the taxonomic literature on the plant, a study of its floral and vegetative characteristics, a study to determine the nature and extent of bud growth regulation, an investigation of its susceptibility or resistance to powdery mildew, an investigation of the basis for differing herbicide sensitivity in different spurge plant types, and electron microscope studies of plant tissues.

Grasshopper control

Germ warfare may be one way to control grasshoppers. Study of the pathogen *Entomophaga grylli* has revealed that infections can be induced in grasshopper populations. Races of the pathogen which are specific to one or two species of grasshoppers or one or two groups of related species have been identified. Research in progress aims to more fully define the relationship between pathogen race and grasshopper species and to develop an efficient delivery system that will permit this pathogen to be used to control grasshoppers in North Dakota.

Calf scours

Studies of this major disease complex have led to development of a potential calf scours medicine which is administered as a powder or bolus and which has shown excellent results in limited field trials.

Other studies have led to new information about the longevity of pathogenic scours bacteria in the soil and manure of pens holding calves with scours, and this in turn has led to the postulate that clinical scours is the result of a tripping mechanism, possibly stress.

Ovine progressive pneumonia testing

Ovine progressive pneumonia is present, in varying degrees, in nearly all sheep flocks in the United States. It can cause considerable economic problems for producers. To see what effect various management systems might have on the incidence of the disease, the Hettinger Station's flocks managed through total confinement, through traditional farm flock methods, and through the traditional range grazing methods are being tested over a number of years.

A test to identify sheep infected with ovine progressive pneumonia has been developed and is being used in North Dakota to clean up infected flocks.

Fruit tree breeding

Hazen, an apple tree with large fruit on a naturally dwarf plant, was first planted in trial orchards in 1950 and will become widely available in the spring of 1983.

The tree begins fruiting at about three years, which is two to seven years earlier than most other commonly planted varieties. It shows promise of becoming one of the most important apply varieties in North Dakota.

Nitrogen fixation

One way to save on fertilizer costs is to develop plants which produce their own fertilizer. Leguminous plants produce their own nitrogen with the help of bacteria which live symbiotically in their roots. This study focuses on the genetic make up of such bacteria in the hope that it may be possible to create bacteria strains that produce nitrogen more efficiently.

Tractor pull efficiency

Field tests, farm surveys and field work records were used to determine the most efficient ways to use various kinds of tractors for selected field operations in varying terrain and soil conditions. Farmers cooperating in a fuel survey reported average yearly savings of .37 gallons per acre as a result of using a variety of techniques suggested by these studies, including using higher gears and lower throttle settings to pull light loads, replacing inefficient field operations, reducing field operations, changing tractor ballast and weight, and combining several field operations.