NO-TILL CROP PRODUCTION—
Dryland Eastern Washington
No-Till in Plowless Farming

No-till is considered the ultimate in plowless farming. It is practiced on more than 7 million acres in the United States. Dryland eastern Washington has over 5000 acres—up from only a few acres several years ago.

There is concern that no-till is being adopted faster than desirable. Present knowledge leaves some questions unanswered. Research related to no-till has been greatly speeded up the past two years at Washington State University and elsewhere in the Northwest.

With no-till, crops are seeded into a chemically killed sod or residue of a previous crop. A special planter or drill is used that disturbs the soil very little. No-till has the potential to stop most of the erosion on hilly lands of eastern Washington and adjacent Idaho. It could also contribute to the cleanup of the region's waters as required by the Federal Water Pollution Control Act Amendments of 1972.

No-Till and the Crop Environment

Soil Water and Temperature. Soils stay cold and wet longer in a no-till environment. This is especially noted on north- and west-facing slopes and with spring seeded crops.

Fertilization. Most no-till drills apply all the fertilizer on the soil surface as a broadcast application. Much more information is needed on fertilizer placement and rates for no-till culture. Proper placement of fertilizer can reduce and minimize tie-up of nutrients in heavy surface residues.

Pest and Rodent Management. Field mice can be a problem with no-till. Extensive damage by mice was observed in several Whitman County fields seeded to no-till grain.

Toxicity of Residues to Seed Germination and Plant Growth. Poor plant vigor and reduced stands often result from direct seeding of

1 Information courtesy of V. Cochran and L. Elliott, Agricultural Research Service, Pullman.
winter wheat into heavy stubble of wheat and barley. This appears to be related to toxic products leached by water from the residue of these crops. Research at Washington State University has shown the following:

1. Water extracts from the straw of various crops allowed to decompose in the field contain a root inhibitor produced during decomposition.

2. The root inhibitor has not been found in the soil beneath the straw. It is important to plant the seed into soil beneath the straw, or remove the straw immediately above the seed row.

3. Root inhibitor production is related to the rate of crop residue decomposition. Pea and lentil residues decompose readily and the inhibitor appears soon after fall rains. Wheat, barley, and bluegrass residues, however, decompose much slower with the root inhibitor not appearing until late fall and early spring—in agreement with field plants exhibiting poor plant growth.

4. Plants in heavy residue set crowns in the residue rather than the soil. This may lead to herbicide damage, winter injury, and water stress in hot weather.

No-Till and Cropping Systems

Experiences with no-till in 1974, 1975, and 1976 indicate problems with certain crop sequences. For instance, volunteer wheat in barley or vice versa, reduces the quality of the crop. Also, volunteer plants could carry a disease to the following crop, decreasing both quality and yield.

No-Till Wheat-Fallow. Chemical fallowing with no-till seeding looks promising in the intermediate precipitation areas. In the drier areas, it is still unclear if full chemical fallow will retain enough moisture at seed depth to get early season

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2 Information courtesy of Roland Schirman, Donn Thill; Agricultural Research Service, Pullman.
crop establishment. For chemical fallow, a combination of a contact herbicide with a short residual herbicide is required. Repeat treatment or some tillage may be required to control late developing weeds.

Details of application are quite specific for a number of herbicides. Many are still in various stages of testing. It is essential that you have the latest information so your no-till operation is effective and you are in compliance with state and federal regulations. Your local county extension agent can help you get this information.

Continuous No-Till Winter Wheat. This system does not work at present. Inadequate weed control, especially annual grasses, and possible toxicity of water soluble materials in fresh residues to wheat seedlings are two difficult problems that must be overcome.

No-Till Spring Crops. No-till spring grain seedings can benefit shallow, eroded or steep soils not suited for winter crops because of limited moisture storage and excessive erosion. Acceptable weed control has been obtained with no-till spring crops with a three-way herbicide combination of pre-plant contact, a material for broadleaf weeds emerging after planting, and a selective wild oat herbicide. The contact materials should be applied when emerging weeds are small and, preferably, several weeks prior to planting. Choice of materials for weeds emerging after planting depends on the crop grown. Spring crops, especially peas, seeded with no-till often have not looked good. This may be related to colder and wetter soils under no-till.

Alternate No-Till Winter and Spring Crops. Acceptable crop yields can be obtained when the sequence of spring seeding-fall seeding is followed. Weed control would be the same as mentioned under no-till wheat fallow and no-till spring crops.

Conventionally Tilled Spring Seedings After No-Till Fall Seedings. Conventional spring tillage, following no-till grain residues, has been successful for both spring grain and pea or lentil
seedings. However, excessive spring tillage is common. A good job of minimum tillage can be achieved from fall chiseling with curved or straight shovels or spikes, plus spring weed control with chemicals. One drawback with tillage is that weed seeds are mixed into the soil instead of being kept on the surface. This makes control more difficult.

No-Till After Sod. No-till seeding of spring grain into chemically killed bluegrass seed fields free of noxious weeds looks promising. Also showing promise is winter wheat seeded with no-till into chemically killed alfalfa sod.

**No-Till Drill Characteristics**

No-till drills are new to the Palouse and the dryland Columbia Basin. Most of the no-till drills are 9 to 12 feet wide, with from one to three hitched to a tractor.

Seedings with a no-till drill will be more successful if straw is chopped and uniformly spread by the combine and if the straw is eliminated or minimized in the drill row. A maximum of standing stubble with fall no-till seedings gives better overwinter protection to plants and decreases snow blowing.

Currently there are three commercial and several experimental no-till drills in the area. With the commercially available units, capacity with weight is stressed in one, low cost and simplicity in another, and power take-off operated cutting coulters on the third unit. Split versus solid or no packer wheels and dry versus gaseous or liquid fertilizer applicators versus none are other features.

Furrow openers are in a state of flux. Single disks, straight, fluted, ripple, or sawtoothed coulters, or spear points or shovels are being tried. What works best in the fall may not work well in the spring. The opener that works well in sod may not work in light textured or clayey soils. Getting uniform depth of seed placement on some soils and in heavy residues is a problem.
Appropriate placement of the fertilizer is a concern with cereal grains. Some drills broadcast the fertilizer, one places starter fertilizer in the seed row while broadcasting the bulk of the fertilizer, another (experimental drill) places fertilizer below and to one side of the seed, still another shanks in anhydrous or liquid ammonia while applying the phosphorus and sulfur in the seed row.

NO-TILL DRILLS—COULTERS, OPENERS, AND PACKERS

Fluted coulter, double disc opener for starter fertilizer and seed tube, and solid press wheel.
Large, hydraulically controlled offset discs that serve as coulter and opener for seed and starter fertilizer tubes, depth gauge welded to disc, and angled mud and residue scraper. Bulk of fertilizer is broadcast ahead of openers.

Rippled disc coulter, spear point opener with separate seed and fertilizer tubes down the back side, and hydraulically controlled rubber tired depth gauge and press wheel.
Power take-off operated coulter and opener for seed tube and narrow, small press wheel. Fertilizer is broadcast.

Narrow chisel point opener for placing seed, followed by packer wheels. Fertilization is a separate operation.

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Issued by Washington State University Cooperative Extension Service, J. O. Young, Director, and the U.S. Department of Agriculture in furtherance of the Acts of May 8 and June 30, 1914. Extension programs are available to all persons without regard to race, color, or national origin. Published September 1976. 6M.