

# **Specific Objectives of the Deep Furrow Drill Project**

## **Overview**

Numerous technological advances, environmental problems, and sociological factors have influenced dryland (i.e., < 12 inches annual precipitation) wheat farming in the Inland Pacific Northwest since its inception in 1880. The wheat-based economy traces back to the pioneers who faced many challenges that included scarcity of water and wood, unprecedented wind erosion, drought, and minimal equipment. Throughout the years, major technological breakthroughs include: (i) horse farming to crude crawler tractors to the 400+ horse power tractors of today, (ii) transition from sacked grain to bulk grain handling, (iii) nitrogen fertilizer and herbicides, (iv) the rotary rodweeder, and (v) the deep furrow split-packer drill to allow early planting of winter wheat into stored soil water. Cultural practices have evolved from repeated passes with high-soil-disturbance tillage implements to today's conservation tillage management. The 2-year winter wheat–summer fallow rotation continues as the dominant cropping system as it is less risky and more profitable than alternative systems tested so far. Improved wheat cultivars for deep furrow planting continue to be developed with good emergence, disease resistance, winter hardiness, grain quality, and other values. In the past 125 years, average farm size has grown from 160 to 3500 acres and wheat grain yield increased from <15 to 50 bu/acre.

## **Justification**

A deep-furrow split-packer drill invented in the early 1960s by a wheat farmer named Robert Zimmerman enabled late summer planting of winter wheat seed to a depth of seven inches below the soil surface to reach water for germination and emergence. This implement markedly changed the way of WW-SF farming to what it is today. In addition to deep placement of the seed, the drill kept dry surface soil from diluting the seed zone by positioning the seed

opener between split packer wheels. The seed opener penetrates the dry soil layer, whereas the packer wheels keep dry soil from cascading into the opener slot, and simultaneously at their base, pack moist soil firmly against both sides (not above) of the seed row to ensure seed contact with moist soil. This unique development made it possible for farmers to plant winter wheat into carry-over water in late August-early September, well in advance of fall rains, with a high probability of achieving successful stands in 8 to 12 days. Moreover, the deep furrows created by the drill provided for snow catch and protection to seedlings from cold, desiccating winds. Despite the greater incidence of fungal root diseases such as fusarium foot rot, late August to early September planting increased wheat yields by 30% and was adopted by essentially all dryland farmers within a few years of the invention of the Zimmerman drill. The patent to the drill was purchased by John Deere & Co. and was manufactured with the logo John Deere HZ. A competitor for this drill, the International Harvester Co. Model 150, was developed soon thereafter.

Essentially all wheat growers in the winter wheat–summer fallow region use either John Deere HZ or International 150 deep-furrow drills for planting. Existing drills have not been manufactured for decades and are wearing out and need to be replaced. Conservation tillage methods have been developed that allow farmers to preserve ample residue during fallow, but existing deep-furrow drills cannot pass through heavy residue. Farmers are therefore reluctant to retain heavy residue during fallow when they know it will likely plug their drills, cause a major inconvenience, and slow them down during planting, - their most time-sensitive and critical farming operation of the entire year.

Two major meetings were held during 2010 in Ritzville to discuss the need for new deep-furrow drills and to set the stage for building some “conservation-friendly” deep-furrow drill

prototypes. More than 100 wheat growers, agricultural industry personnel, and scientists participated in both these meetings. There was a general consensus at the meetings on features that should be developed in deep-furrow drill prototypes. As a result, there are two design efforts underway. One effort is led by personnel at the WSU Lind Research Station at Lind and the other by the McGregor Company headquartered at Colfax.

### **Specific Objectives**

To evaluate the effectiveness of deep-furrow drill prototypes to plant winter wheat into very high surface residue in tilled summer fallow. Prototypes are expected to:

1. Easily pass through and retain 30 percent or more surface residue after seeding.
2. Place seed as deep and as accurately and achieve as good or better stands as existing John Deere HZ and International 150 drills.
3. Work successfully in the toughest of planting conditions (for example, deep tillage mulches with marginal seed-zone moisture such as in the Horse Heaven Hills).