Successful no-till and conservation-till cropping systems require uniform distribution of chaff and straw from the combine (Veseth et al., 1986). Uniform spreading of residue makes planting the next crop easier, reduces immobilization of nutrients during decomposition by microbes, increases the efficiency of herbicides, and reduces diseases (Cook and Veseth, 1991).

Commercially available plot combines are not equipped with chaff and straw spreaders, although some late-model machines do have straw choppers. Farm-scale combine chaff and straw spreaders are too large and heavy and have excessive power requirements so they cannot be retrofitted to a plot combine. In addition, plot combines (except for a few extremely large models that contain features of farm-scale machines) utilize a transverse rub bar cylinder/concave screen threshing system that lacks the straw grinding ability of rotary threshing systems common on modern farm-scale combines.

A plot combine is specifically useful to allow for accurate harvest of plot research compared with a farm-scale combine and weigh wagon even if plot lengths range from 75 to 150 m as they do in our long-term cropping systems experiments. Our objective was to design and build a chaff and straw spreader for a plot combine for harvesting several different crops.

FABRICATION AND INSTALLATION

An air delivery chaff and straw spreader with dual manifold distribution was fabricated for a Hege 140 plot combine (Hege Maschinen, Niederlassung, Germany). The Hege 140 reported here has a custom-built 1.5-m-wide cutting platform and standard 0.78-m-wide sieves. There is a large flat platform behind the engine and above the sieves that was used to mount a high-pressure radial blade blower fan (Dayton model #4C131A) (Fig. 1). The fan is powered by a belt drive from a 14-cm-diameter accessory pulley on the engine to a 20-cm-diameter pulley on the fan shaft. A slot was cut in the engine cover to align and install the belt between the engine and fan pulleys. A simple spring-loaded idler sheave was added to the belt drive assembly to maintain belt tension and minimize vibration.

The fan wheel is 11 cm wide with a 34-cm diameter. With the 52-hp combine engine at full throttle driving the fan pulley at 2000 revolutions min$^{-1}$, the fan moves 30 m$^3$ of air min$^{-1}$ at 248 Pa. A simple dual outlet manifold was constructed from 18 × 15 cm rectangular steel tubing, capped with flat plate, and ported with two 10-cm-diameter rings used to attach flex hose (Fig. 1) to provide air delivery along both sides of the combine.

A flexible 10-cm-diameter wire-wound rubber ducting hose was used to connect the fan manifold to the two distribution pipes. The distribution pipes were fabricated from 9-cm-diameter polyvinyl chloride (PVC) pipe with five 2.5-cm-diameter holes circumferentially distributed to distribute air to the plot combine and to the plot below the point of combine sample collection.

**ABSTRACT**

Uniform distribution of crop residue is critical in long-term no-till and conservation-till cropping systems experiments. Many farm-scale combines utilize factory or aftermarket chaff and straw spreaders, but most plot combines for research lack this capability. We fabricated a high volume air system to evenly distribute chaff and straw behind a plot combine. The combine engine powered a high-pressure radial blade blower fan to deliver air via a dual manifold through rubber flex hose to two distribution pipes mounted under the sieves. Visual comparisons from the harvest of several crop species demonstrated that chaff and straw were effectively spread with the attachment compared with checks. Total cost and time for fabrication and installation of the chaff and straw spreader attachment was $710 for materials and 15 h of labor.