SEEDING WINTER GRAINS IN FURROWS TO PREVENT WINTERKILLING.¹

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INTRODUCTION.
About 70 percent of the wheat grown in the United States is sown in the fall. Winter wheat yields better, matures earlier, more often escapes hot winds, insects, diseases, and drought, and permits better distribution of labor; hence it is usually preferred to spring wheat wherever it can be successfully grown. Most of these advantages apply also to winter oats and barley, but because they are less hardy than winter wheat probably less than 10 percent of these grains are sown in the fall.

The principal factor which limits the area that may be successfully cropped to winter grain is winter injury, or winterkilling, which may be defined as the injury resulting directly or indirectly from low temperature during the winter. The importance of winterkilling is indicated by the area unadapted to winter grains and also by the damage that frequently occurs in areas where they are generally grown. Any factor, therefore, which lessens the danger from winterkilling is of considerable importance.

It is fairly well known that seeding in furrows similar to those made with a lister, but smaller, will protect plants from winter injury to a certain extent, and this method is used in northern Alabama and Georgia for seeding winter oats. Winter grains sown with a drill survive better than those sowed broadcast, which is probably due in part to the protection afforded by the small furrows in which the grain is placed. This advantage is recognized by farmers in the hard winter wheat belt, where wheat fields are seldom harrowed after seeding, the land being left slightly ridged by the drill. Because of these facts the relative advantages of seeding in furrows as compared to other methods of seeding seem worthy of serious consideration.

EARLY EXPERIMENTS.

Probably the first and most extensive experiments to determine the value of seeding in furrows were undertaken by the Kansas Agri-

¹ Received for publication April 7, 1916.