

# GRAIN LOSSES IN THE FIELD WHEN WINDROWING AND COMBINING BARLEY

M.E. Dodds  
Member CSAE  
Research Station  
Research Branch, Agriculture Canada  
Swift Current, Saskatchewan

## INTRODUCTION

The loss of grain in the field resulting from windrowing and combining operations has been the subject of much research since this harvesting system was introduced (4). Based on previously reported research methods (9), which were used later in combine performance studies (2, 8), preliminary field studies were conducted at Swift Current in 1948 and 1949 with the windrower and combine to develop a technique for determining and classifying harvesting losses. These were classified as natural and mechanical losses, the mechanical loss being further subdivided into windrowing, pickup, and combining losses (4). Pickup loss and combining loss have been renamed 'gathering loss' and 'processing loss' (1).

The purpose of this study was to determine the loss of grain in the field when harvesting barley by the windrower-combine method, and to observe the effects of windrowing at progressively later stages of crop maturity on the magnitude of four separate harvesting losses.

## PROCEDURE

This study was made in 1966, 1967, 1969, and 1970 using barley (*Hordeum vulgare* L.) cultivar Vantage, as a test crop. This cultivar is a six-rowed, smooth-awned feed barley with good kernel retention in the head, and a mid-long, relatively strong straw. Maturity is midseason to late.

The statistical design for this test was a randomized block consisting of four replicates of each treatment. Treatments were dates of windrowing, and provision was made in the field layout for at least 20 such dates. The numbers of treatments

varied from year to year depending on the rate at which the crop matured.

The cuts were made with a 12-ft (3.65-m) self-propelled windrower through the centre of a 30-ft (9.14-m) wide plot. The length of the plot varied with field location each year and ranged from 125 to 190 ft (38 to 58 m). The work was done by an experienced operator who attempted to maintain a constant forward speed of travel of 3 mph and a stubble height of 6 inches (15 cm).

Kernel moisture content, wet-weight basis, was used as a measure of grain maturity. It was suggested by previous research with barley (3, 5) that in tests of this kind, a practical range of kernel moisture to be observed was from approximately 50 to 14%. Windrowing then, was started when the grain was in the early dough stage of maturity, and continued until fully ripe. Plots were cut on consecutive days, when weather and field conditions permitted. A grab sample of the windrowed grain was gathered by hand from the length of the windrow immediately after cutting, threshed in a laboratory thresher and cleaned. Kernel moisture was determined by drying triplicate samples in a thermostatically controlled oven for 20 h at 98°C.

The windrowed grain was harvested with a self-propelled combine equipped with a draper pickup when the kernel moisture had decreased naturally to 14%.

Four types of losses were determined in this test. These were measured in grams per square foot (grams per 0.093 square meters) and converted to bushels per acre (kilograms per hectare) based on the bushel weight of the crop when harvested by the combine. The following field procedure was used:

- (1) Natural loss: Eight samples within each replicate of kernels and heads of grain on the ground were taken at random through the plot prior to windrowing on

each day of cutting. The samples were from an area one square foot (0.093m<sup>2</sup>) in size, four being taken on each side of the area where the windrow would be placed.

- (2) Windrowing loss: Similarly, after windrowing, eight samples of kernels and heads on the ground were taken at random within each replicate. Four samples were taken on each side of the windrow. This loss minus the natural loss is equal to the windrowing loss. It is realized that some further shattering may take place on the windrower canvasses and be conveyed and placed in the windrow or on the ground. Such a loss has not been measured separately in this test, but because it is not recoverable, has been considered to be part of the gathering loss.
- (3) Gathering loss: Square-foot (0.093-m<sup>2</sup>) collections of kernels and heads of grain on the ground were taken in an area from which all threshable material had been removed by the combine (i.e., the 50-ft (15.24-m) length in which the processing loss was determined). Eight samples were taken in 1966 and 1967 and four samples were taken in 1969 and 1970. The windrow was 4 ft (1.22 m) wide in most cases. The square-foot (0.093-m<sup>2</sup>) samples, which included the natural and windrowing losses already on the ground, represented a concentration of kernels and heads from a swath 12 ft (3.65 m) wide. The gathering loss therefore, was the total square-foot (0.093-m<sup>2</sup>) collection minus the natural and windrowing losses, divided by three.
- (4) Processing loss: This loss was obtained by gleaning the loose grain, broken kernels, and un-

RECEIVED FOR PUBLICATION JULY 13, 1972

