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WINDROWER OPERATION

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Windrows described in PAMI evaluation reports are divided into four categories: parallel, angled parallel, herringbone and fantail. FIGURE 1 illustrates these four basic windrow types. Windrows are often a combination of two or more types.

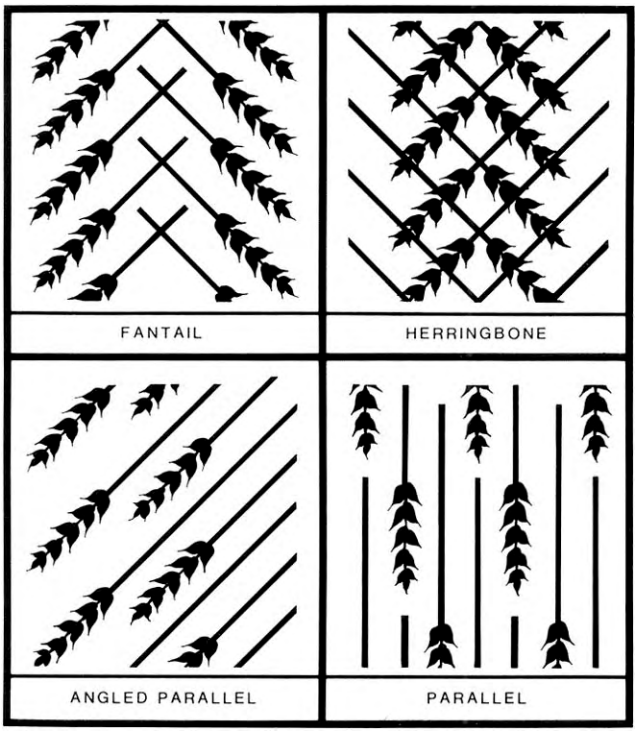

FIGURE 1. General Types of Windrows.

Factors influencing the formation of these various types include draper speed, header angle, crop type and state of maturity. Windrow formation, for centre delivery self-propelled windrowers, generally changes from parallel types in heavy crops to the interwoven herringbone and fantail types in lighter stands. End delivery windrowers usually produce parallel or angled parallel windrows. Increased draper speed, on centre delivery machines, and lower header angles tend to produce more parallel windrows with heads concentrated in the centre. Lower draper speed on these machines results in lower density herringbone windrows. In general, for machines with adjustable header angles, the low angles appear more suitable for grain crops while the steeper angles seem more appropriate for hay crops.

On all the SP windrowers evaluated, operating speed had little or no effect on windrow formation. Speed was limited by one of three factors, 1) the ability of the windrower to clear the cut material through the opening, 2) the cutting ability of the knife, or 3) the roughness of the field and the ability of the operator to properly control the machine. Clearing problems are characterized by bunching and non-uniform windrows while poor cutting is indicated by irregular stubble patterns and the up-rooting of plants. Stubble types are illustrated in FIGURE 2.

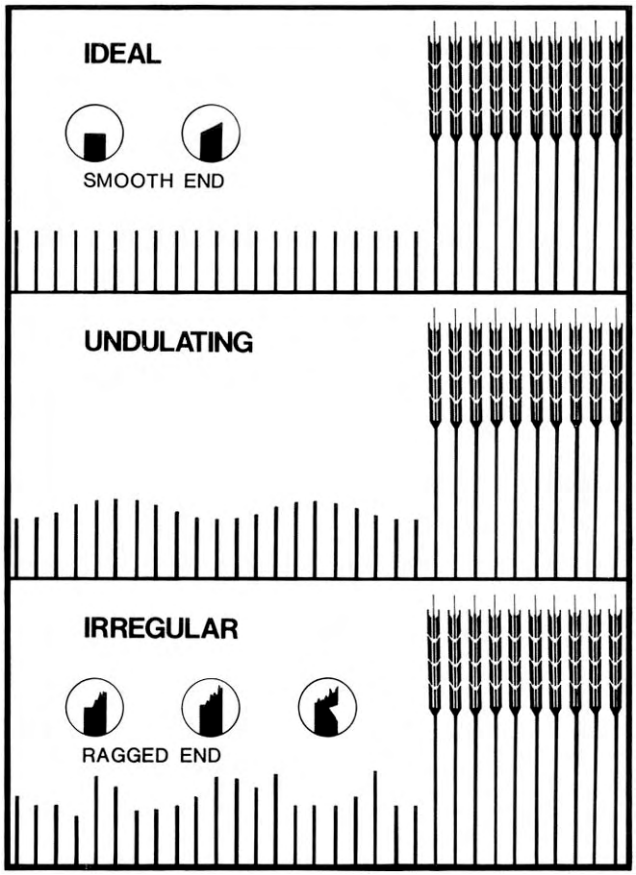

FIGURE 2. Types of Stubble.

Undulating stubble is usually caused by excessive speed in rough fields or inadequate header flotation. In all cases, of course, the guards and knife sections should be kept in top condition. The conclusion is that maximum efficiency will be obtained when operating at the maximum speed while maintaining smooth windrows, ideal stubble and operator control of the machine.

The performance of the reel is also important to proper windrow formation. In green and matted crops, smooth material flow is assured only by effective reel action. For optimum performance in grain it is best to have a reel tip speed equal to about 1.2 times the travel speed. This ratio is called the *reel index.* Experimental adjustments of the reel

index, especially in unusual crop conditions may result in better performance. Generally, higher reel indices are suitable for green crops and hay whereas a reel index close to 1.0 may be preferable for delicate crops which are easily shattered.

Three basic features which make up a good quality windrow are 1) an even distribution of heads or pods across the width of the windrow, 2) a loose structure with heads or pods near the top to assure proper curing and 3) the ability to withstand adverse weather conditions for extended periods. Of these three, the weatherability is the most difficult to assess unless the windrow has been exposed to periods of wind and rain. Windrows of mixed patterns seem to perform best in extended periods of wet weather.

Standard divider shapes are usually adequate for most conditions but on-site experimentation is very often rewarding for unusual crops or conditions. Many manufacturers now offer optional dividers for special situations. It is usually worthwhile to experiment with divider rods as well, to reduce hairpinning in leaning grain crops. Rapeseed is usually best handled by straightening divider rod loops which enables the divider to press the material down during separation. This path of compressed material can best be retrieved by cutting in the opposite direction on the next pass.

Proper header flotation is important to efficient operation, particularly in rough fields. Good flotation will permit close cutting of short crops, even with wide headers and still provide clearance over field obstructions. Poor flotation is often indicated by undulating stubble (FIGURE 2).

Since the windrowing is only one part of the harvesting operation, some care should be taken to ensure that the windrow formed can be effectively processed by the combine. Double swath attachments are available which can lay one windrow on another or two windrows side by side. Wide windrows are desirable for crop to be picked by large wide-bodied combines, to fully utilize the capability of the wide cylinders. PAMI combine evaluations done on one double axial rotor machine indicate that in some cases the machine capacity may be nearly doubled by providing two windrows side by side. Some windrowers have adjustable openings to permit formation of wide windrows for this purpose.

The laying of one windrow on top of another may be a useful method to reduce pick-up losses in light crop conditions.

Many windrowers are used for cutting some forage crops as well as grain. Most windrowers with wide draper headers can perform this job, however, many were not designed for this application. Where large quantities of hay are to be cut, serious consideration should be given to the purchase of an auger header. Pick-up reels are advantageous in most hay crops and tangled crops such as field peas. Baler evaluations done by PAMI indicate that significant drying time reduction and improvement in hay quality can be achieved by using a hay conditioner. Conditioned windrows not only cure more effectively but also feed better into the baler thus improving the efficiency of the baling operation.

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