FACTORS THAT INFLUENCE THE FUNCTION AND PRECISION OF POTATO PLANTERS

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After years of effort to understand how to enhance the performance and precision of potato planters, a number of universal TRENDS AND GENERALITIES have become apparent. To begin with, all the makes and models of modern potato planters examined so far are capable of excellent results when they are in like new mechanical condition, adjusted correctly and loaded with appropriate seed profiles.

Seed has a major impact on the planter's end result. BLOCKY SHAPED SEED IS THE MOST DESIRABLE SHAPE. Seed that has length, width and height dimensions approximately 1 to 1 to 1 in ratio is considered blocky. These shapes are preferred because of their similar roll characteristics, even when some variability in seed size exists.

ALL PLANTER MECHANISMS PERFORM BETTER WITH SINGLE DROP SEED. Correctly sized whole seed will feed through planter mechanisms with much greater uniformity than will any cut seed profile. This uniformity and consistency is critically important to precision seed spacing. Single drop seed has a greater tendency to roll than does cut seed and as a result, WHEN PLANTING SINGLE DROP SEED OF EQUAL SIZE TO CUT SEED, PLANTERS MUST RUN 0.1 MPH SLOWER.

The OPTIMUM SEED SIZE FOR PLANTER PERFORMANCE IS 1.5 TO 3.0 OUNCES. This is based on the engineered design of the functioning mechanisms. It is also fortunate the optimum seed size based on economics and productivity also falls in the 1.5 to 3.0 ounce range.

The changeable components of planter mechanism, especially PICK LENGTH and CUP SHAPE, MUST MATCH SEED SIZE AND SHAPE.

Small average seed size profiles can be planted very effectively with short picks or small bowl cups. Larger average seed size profiles require that longer picks and larger stainless steel be used. The most frequent problem encountered occurs when seed profiles contain sizes and shapes that do not fit the selected picks and cups. When this happens the seed that is too SMALL contributes to DOUBLES and the seed that is too BIG contributes to SKIPS. This occurs APPROXIMATELY 50% OF THE TIME when a mismatch exists. When considering planter performance, SEED SIZE can be divided into these categories.

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SMALL seed contributes to MORE DOUBLES, it has a LOW MOMENTUM which contributes to MINIMAL ROLL and often has a FLAT SHAPE. DESIRABLE seed sizes and shapes enhance the percentage of SINGLE planted seed pieces, they exhibit a more NORMAL ROLL that is very SIMILAR because of the BLOCKY SHAPE. LARGE seed contributes to SKIPS. It has a HIGH MOMENTUM because of the greater mass and will often produce an ERRATIC ROLL due to the DISSIMILAR SHAPES.

When considering SEED PRODUCTIVITY, SMALL seed will often produce WEAK PLANTS with LOW YIELDS, LOW STEM NUMBER and SMALL POTATOES at harvest time. DESIRABLE seed sizes will produce VIGOROUS plants with ACCEPTABLE YIELDS, DESIRABLE STEM NUMBERS and largely CARTON COUNT SIZE potatoes. LARGE seed may produce EXTRA VIGOR, A HIGH YIELD, A HIGHER STEM NUMBER and LARGER POTATOES if the season is long enough.

All planters are extremely sensitive to ground speed. Changes of only 0.1 MPH can produce very different results from the optimum performance that will occur when everything is adjusted correctly. GROUND SPEED MUST BE SLOW ENOUGH THAT ALL SEED PIECES HAVE SIMILAR ROLL CHARACTERISTICS. Due to momentum and inertial forces, as seed piece size increases ground speed must decrease. This is necessary to maintain the all-important similar roll characteristic. Also, AS WHOLE SEED TUBER (mother tuber) SIZE INCREASES, PLANTER SPEED MUST DECREASE. This is due to the erratic shape and roll properties of seed pieces cut from big tubers.

When selecting a desired seed spacing, it is important to remember that SHORTER SEED INTERVALS REQUIRE SLOWER PLANTER GROUND SPEEDS. Figure 1 illustrates a typical ground speed-seed interval relationship. DO NOT assume these interval-speed relationships are correct for your planter. *NO TWO PLANTERS ARE ALIKE! Your planter with your seed, may behave very differently

Among the planter mechanism adjustments, BOWL DEPTH IS A VERY IMPORTANT FACTOR. An overfull bowl is one of the most common situations encountered. SEED MUST FREEFALL INTO THE SEED BOWL FOR PROPER FUNCTION. Figure 2 illustrates this concept for some cup type planters. Figure 3 shows this relationship for some pick planters.

The amount of seed one puts into the planter each time it is refilled has a great deal to do with how well the mechanism performs. CONSISTENT HIGH LEVEL PERFORMANCE IS ALWAYS MORE DIFFICULT WITH FULL PLANTERS. Figure 4 illustrates the seed load pressure from an overfull hopper on the seed in the bottom of the load where the feeding mechanism is operating. It also illustrates the common modification of extending the height of the seed containment. This is generally a mistake as it makes it even more difficult to feed seed into the bowl uniformly. This is due to bridging within the seed load over the bowl feeding mechanism.

This often makes it necessary to have someone riding the planter and forcing a stick through the seed load to dislodge the bridging. This does a great deal of damage to the seed and thereby reduces productivity. A more desirable modification involves extending the seed containment to the front or rear depending on which side the mechanism is located.

In order for seed dropped by the cup or pick mechanism to have similar roll characteristics, SEED MUST NOT IMPACT ANY PLANTER PARTS ONCE RELEASED. Figure 5 illustrates seed hitting the drop chute after it is released by a cup. Impacting the planter as seed falls to the ground does two things. First it delays slightly the fall time so the seed lands out of place and secondly, seed that has hit the planter has a different spin and roll after it hits the soil. This combination causes seed spacing uniformity to deteriorate significantly.

Not all seed behaves similarly in a planter. There are important differences in what the planter can do with PRECUT vs. FRESHCUT SEED. PRECUT seed is more prone to BRIDGING, it is dehyrated and SPONGY, sometimes sprouting has begun and it may not stay on picks well. Also it is much more susceptible to BLACKSPOT BRUISE and may already have established DECAY INFECTION. FRESH CUT seed flows more freely in the planter and stays on picks better because it is FIRM. It is more susceptible to SHATTER BRUISE if mishandled, but is normally not infected with DECAY colonies at planting time.

Comparing PLANTER MECHANISM FUNCTION for WHOLE vs. CUT seed there are a number of significant differences. WHOLE SEED is more FREE FLOWING, and causes very FEW DOUBLES and very FEW SKIPS. Its' tendency to ROLL IS SIMILAR. It is often more BRUISE FREE and has a likelihood of MINIMAL DISEASE SPREAD. CUT SEED on the other hand is prone to BRIDGING and cause both DOUBLES and SKIPS. It rolls erratically and is EASILY BRUISED. It also has far GREATER INFECTION POTENTIAL.

The last item of importance to planter performance to be discussed is PLANTER SHOE DESIGN. Most of the shoes in use today can be loosely categorized as either FLAT BOTTOM or V-BOTTOM in terms of the shape of the displaced soil opening. In the FLAT BOTTOM furrow, seed tends to ROLL somewhat more but comes to rest all at the SAME DEPTH thereby enhancing UNIFORM EMERGENCE. The roll contributes to VARIABLE seed SPACING and non-uniform plant to plant competition throughout the entire season.

In the V-BOTTOM design, SEED is WEDGED thereby decreasing roll. This gives seed a more uniform roll characteristic and thus a more CONSISTENT SPACING and desirable plant to plant competition situation. On the negative side SMALL SEED ends up DEEPER and BIG SEED shallower in the Vee. This STAGGERS EMERGENCE even more than is normal for small vs. large seed. FIGURE 6.

It appears that uniform seed spacing is more important than uniform emergence since precise seed spacing with a non-uniform emergence produces a much better crop than does a uniform emergence of erratically spaced seed pieces.

To have the best of both conditions, one simply eliminates the small seed pieces and selects a V-bottom shoe design or modifications.

Figure 1.

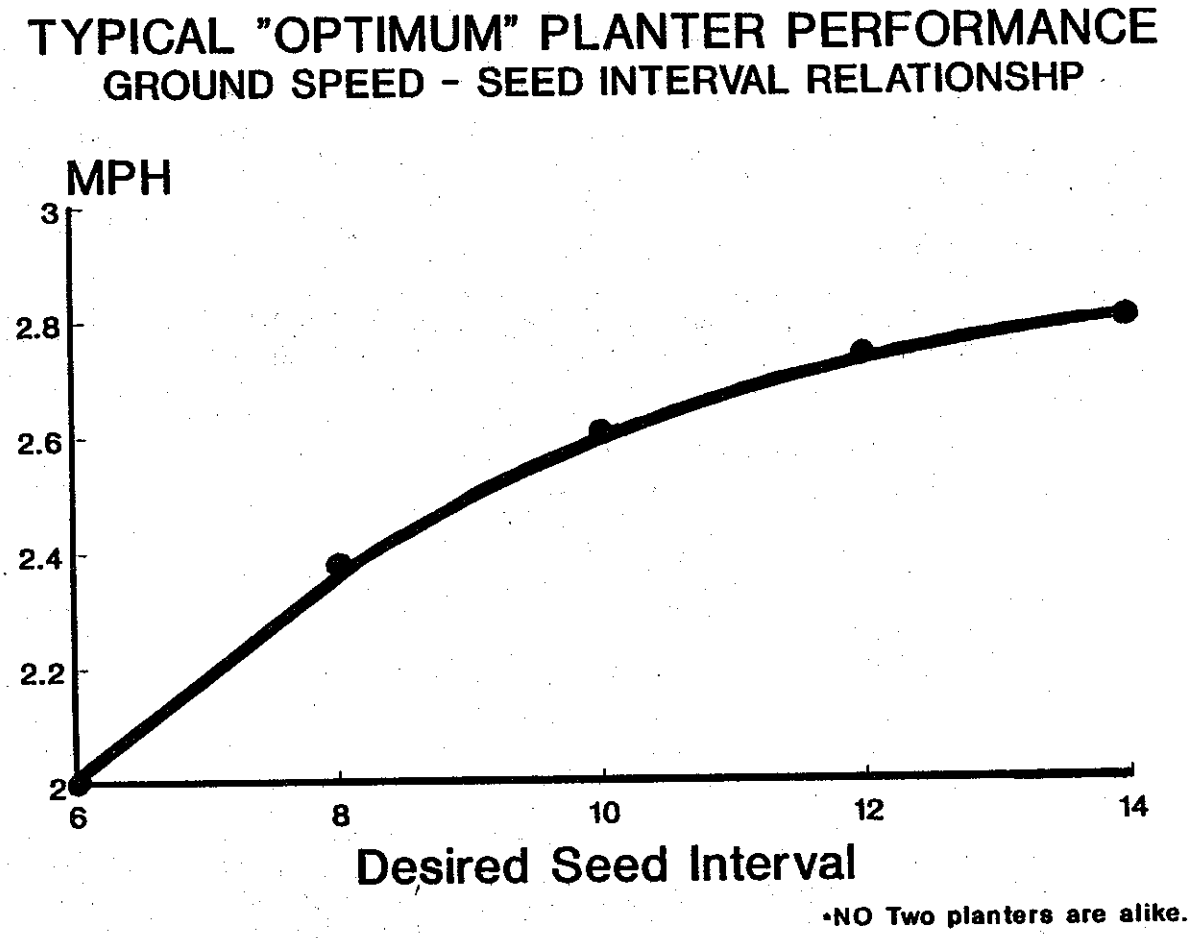

Figure 2

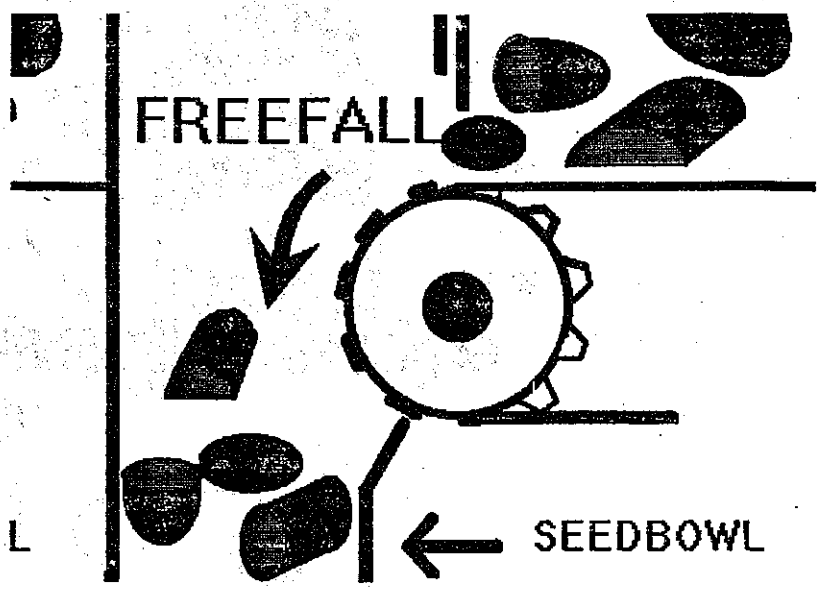

Figure 3

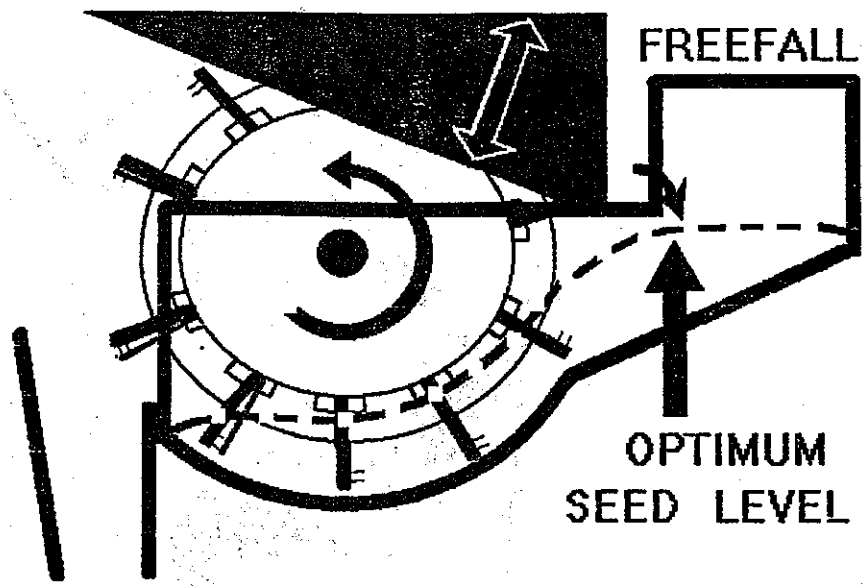

Figure 4

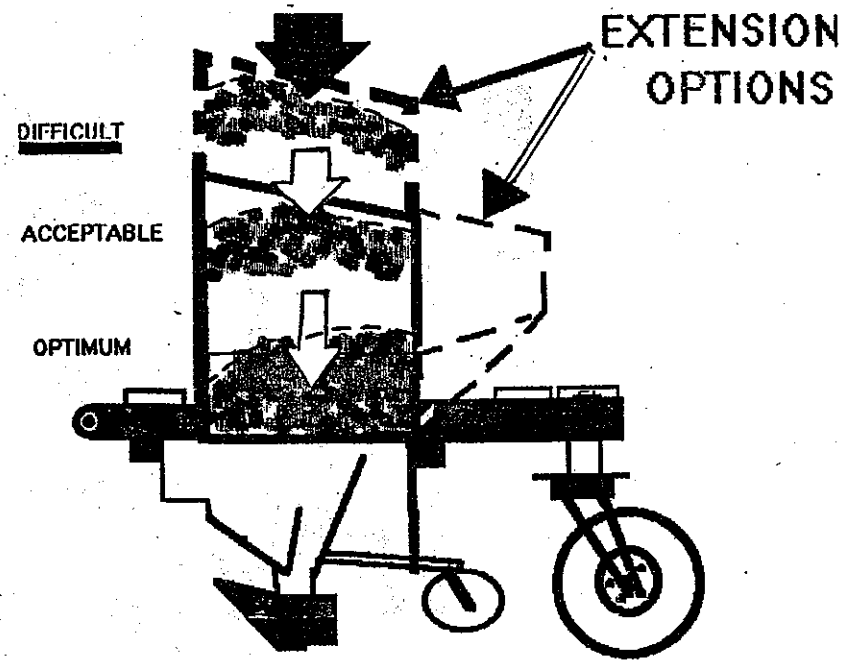

Figure 5

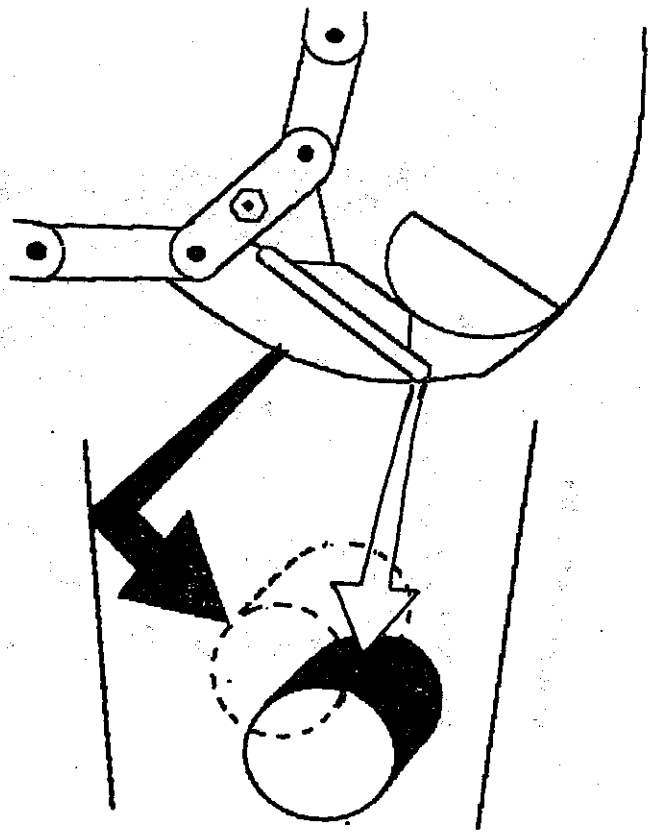

Figure 6