Preparing for a Successful Harvest

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Harvest season is almost here. With it will come concerns about field operations, weather, timing, and a host of other issues. A successful harvest begins with proper preparation. Harvesting equipment falls into two categories: field equipment and curing equipment. Each has its own unique demands. Pre-season checks and maintenance may save you costly downtime.

Field operations start with the Digger-Shaker-Inverter (DSI) which is a very unique implement. There are several areas that will need some attention before going to the field. First, check out the DSI drive. If it is an older DSI, it may be PTO powered. Check the driveshaft for wear or damage. Pay particular attention to the driveshaft shielding, make sure it is in place and rotates freely on the driveshaft. Second, check the universal joint bearings for wear. If worn, replace the bearings or the driveshaft as needed. Newer diggers are likely hydraulically driven. For these models, make sure the hoses are not cracked or damaged. Make sure the quick connectors are clean and match the tractor remote outlets. Dirt is the biggest enemy of a hydraulic system. If you plug a dirty connector into the tractor remote, you are exposing the tractor hydraulic system and transmission to potential damage and costly repairs. Finally, check the condition of any drive belts and pulleys on the DSI. Replace any components that are badly worn. These will not transmit power effectively. Sway blocks or shims at the three point hitch of the tractor used should be adjusted for one inch of travel or less. If the DSI is not level, one side may dig deeper than the other side resulting in increased digging losses. After adjusting tractor tire pressures and attaching the digger to the tractor, levelling can be checked by lifting the DSI and measuring from the ends of the toolbar down to a flat surface; adjust lift arms until measurements match each other.

Now turn your attention to the harvest elements on the DSI. These are the blades, the shaker chain and the inverter section. Blades should be clean and sharp. A worn blade will not sever the tap root effectively, instead dragging plants forward through the soil and increasing digging losses. Additionally, worn blades may not shear the soil effectively to begin the separation. Some blades can be installed with the beveled edge facing up or down. This choice is based on soil conditions with bevel-up being more aggressive and generally being preferred in harder, drier, or tighter soils where engagement is difficult. With the digger levelled as explained earlier, positioned on a flat surface, and lifted slightly, all rear blade tips should measure the same distance from the ground surface. If not, then the shanks or frogs supporting the blades may need to be replaced, adjusted, shimmed, or straightened. It is also important to observe the blade gang angles (as viewed from above) across the digger to ensure that they are consistent. The shaker section typically consists of rods mounted on chains or belts. In either case, it is important to check for proper tension according to manufacturer specifications. Some designs use kicker wheels or other types of shaker mechanisms, which are important for removing soil from pods and roots. Poor soil removal will extend field curing time and may also cause plants in the windrow to fall over from the weight of the soil. Check the condition of the rods and the fingers on the rods, make sure the rods are not bent. If the shaker uses chains to carry the rods, check the condition of the chains. A worn or damaged chain should be replaced. If the shaker uses belts to carry the rods, belt condition is important.

Studies have shown that significant harvest losses can occur if the DSI is not properly prepared, adjusted, and operated. Some losses have been documented as high as 20% or more, depending on harvest conditions. Losses of that magnitude cut into the farmer's profit. With a little care and attention, the farmer can minimize those losses and keep them at an acceptable level. The first step is proper DSI adjustment. Most manufacturers have a recommended speed range for their implements. Ground speed within this range should be selected to match soil and vine conditions, but with harvest timeliness in mind. Digging capacity (ac/hr) can be calculated by multiplying ground speed (mph) by DSI width (ft) and dividing by 9.7. Slower speeds should be used where digging losses are more likely, such as with larger pods, suboptimal maturity, heavier soils, and drier soils. Driving too slowly will reduce your ability to dig on a timely basis, but driving too fast can cause higher yield losses. A recent study showed more than 200 lb/ac additional digging losses for each mph above the optimum ground speed. In this study the optimum ground speeds were 2 mph and 3 mph (depending on conditions) for Virginia type peanuts.

Once you have set your ground speed, you should carefully synchronize the shaker chain or conveyor to ground speed. A recent study demonstrated that a conveyor travelling 20% faster than the ground speed can result in increased digging losses of 100-200 lb/ac, presumably from vines being snatched from the soil by the conveyor prior to the blades severing the tap roots and shearing the soil. Peanuts should fall back to the ground about two feet down-field from where they were growing. In the same study, conveyors moving too slowly were not shown to increase digging losses, but soil removal from the windrow may not be adequate at lower conveyor speeds. Proper blade depth is another important adjustment to be considered and is a factor that requires a great deal of operator attentiveness. Blade depth is generally proper when about one inch of tap root is exposed beyond the pod zone. Studies have shown that digging too deep and digging too shallow will both result in increased digging losses, but that greater digging losses are incurred from digging too shallow than from digging too deep. Observation of the vines as they travel up the conveyor while digging can sometimes be a helpful indicator of digging depth. If you are digging too shallow, the vines from a pair of rows will generally concentrate inwards on the conveyor section, as opposed to being distributed across its entire width. Vines that have been dug too shallow also may not invert as well as vines that have been dug to the proper depth.

The combine can easily add to harvest losses. A simple walk behind the combine to observe the tailings in addition to observation of the peanuts in the basket can go a long way towards suggesting combine adjustments that should be made. The primary areas to focus on are threshing aggressiveness and cleaning air. If the threshing is too aggressive, pods will be shattered in the combine and you will have higher numbers of cracked or shelled pods in the trailer. If the threshing is not aggressive enough, the vines will not be shredded enough and pods can remain attached to the vines and thrown out the back of the combine. Incorrect threshing adjustments can allow increased foreign material may make its way into the basket. Threshing aggressiveness can also be accomplished by varying PTO speeds within the manufacturer's specified range, with higher speeds providing more aggression. Cleaning air contributes to foreign material as well, too little air increases foreign material; however, too much air will result in blowing peanuts out of the back of the machine. It is normal and desirable for "pops" or unfilled pods to be discharged with the tailings; if a significant number of pods are observed in the combine discharge, check to see if they are mostly pops before making hasty adjustments. Elevator or conveying air should also be adjusted so that it is sufficient to deliver pods to opposite side of basket, but not excessive, which can increase incidence of LSKs.

Curing starts in the windrow. In most cases, peanuts remain in the windrow and dry down to a manageable level for curing in the trailer. Poor inversion and poor soil removal from pods will reduce field curing efficiency, which will either increase field curing time requirement or increase drying costs. Weather conditions after digging will also have an impact on windrow curing times. Farmers should be careful to coordinate their digging and combining schedules for best results. During times of uncertain weather conditions, digging should not get too many days ahead of combining. On a good day, typical combining capacities in most of the Virginia-Carolinas area are in the range of 2.8 to 5.6 acres per day per row of combine capacity. As an example application of this concept: if an operation has 12 rows of combine capacity at 4 ac/day/row and desires to maintain no more than four days of digging ahead of combining, then there should never be more than 192 acres of peanuts on top of the ground. Farmers should also keep in mind that we are well into hurricane season. Heavy rains associated with a hurricane will severely impact harvesting schedules. Peanuts are generally better left in the ground to over-mature, than to be dug and left exposed to several consecutive days of persistent wet weather prior to combining.

If heavy rains occur after digging, the vines may get beat down and tend to stick to the soil. You may want to consider using a vine lifter. This implement is designed to lift the vines from the soil, provide a light shaking action to loosen some dirt and lay the vines back down. They do not re-invert the vines. There are two types of vine lifters; the chain type and the blade type. The chain type uses a short, flat shaker chain assembly to lift the vines from the soil. The blade type uses a blade much like a digger blade, with lift fingers to elevate and lightly loosen the soil. The blade type will run just below the soil surface so it may be useful to break the soil crust and promote soil drying. Unfortunately, there is little data available to estimate harvest losses caused by vine lifting or to compare to losses seen without vine lifting.

When loading a peanut trailer for curing, be sure to keep the load leveled so that you have uniform depth in the trailer. Uneven loading or piling peanuts up in the center of the trailer will increase the risk of uneven curing. Uneven curing often results in over-drying, which reduces grade and sale weight. If the peanuts are harvested at higher moisture contents, it is going to take a lot more energy (LP or natural gas and electricity) to dry them down to market levels. Curing time in a trailer is based on the initial moisture content of the peanuts, air flow rate through the trailer and relative humidity of the air. Energy consumption is based on air flow rate in cubic feet per minute (CFM) through the trailer and temperature rise (degrees) above ambient air temperature. For example:

BTU/Hour = CFM x Temp Rise x 1.08

This assumes the burner is constantly on which it will likely be if the ambient air temperature plus the temperature rise are below the thermostat set point in the curing system. If the burner cycles on and off, no gas will be consumed during the burner off part of the cycle.

Natural gas contains 1,010,000 BTU/MCF, (1 MCF = 1,000 cubic feet) and LP gas contains 91,500 BTU/gallon. Using these factors you can estimate your fuel consumption. As a rule of thumb, higher air flow rates will shorten the curing time and will minimize the moisture content differential between the top of the trailer and the bottom. Curing temperature should be limited to 95°F or 15°F above ambient temperature. Higher curing temperature can lead to reduced quality and lost revenue. Pay very close attention to your curing controls to insure quality curing.

Air flow recommendations are typically 10 to 12 CFM/ft^3 of peanuts. In some cases, higher airflow rates are used for curing in large semi-trailers. These rates may be in the range of 13-15 CFM/ft^3. The justification here is to provide some insurance for dirtier peanuts that may be dumped in the trailer. As discussed, the higher airflow rates will cure or dry the peanuts faster and perhaps more uniformly, but it will require more gas consumption. The reduced drying time may or may not offset the higher fuel consumption.

Be sure to check the curing equipment installation. Traditional trailers are often connected to multiple port drying plenums. Air leaks from the plenum or the transitions between the plenum and the trailers can lead to wasted energy and increase curing cost. The larger semi-trailer drying systems typically have an individual fan dedicated to each semi-trailer. Again, check for leaks and make sure you are using all the curing air you are producing.

Drying trailers in current use range from the more traditional 14 foot long curing trailers up to 48 foot long semi-trailers fitted with curing floors and plenum adapters. Pay close attention to trailer loading. You do not want to get into a situation where the trailer load exceeds the towing vehicle's capacity or the trailer load exceeds the highway load limit.

Be sure to check all equipment, harvesting and curing, before the harvest begins. Correct any equipment problems on the diggers or combines to improve performance, increase recovered yield, and reduce costly downtime. If weather conditions are challenging for peanut harvest, equipment downtime can result in substantial revenue losses from reduced grades and reduced yield recovery. Check the curing system as well. Perform any maintenance needed on the trailers, plenums and transitions as well as the fans and burners. Well maintained and properly adjusted equipment is the key to a successful harvest season.

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