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The Jet Harvester: A Shop Built Tool for Harvesting Forb and Shrub Seed

Charles Bair, NRCS Plant Materials Center, Aberdeen, Idaho
Derek J. Tilley, NRCS Plant Materials Center, Aberdeen, Idaho



This Technical Note introduces a new seed harvester developed by the Aberdeen Plant Materials Center farm staff. The information presented here covers the design and use of the Jet Harvester. This technology significantly decreases the time and effort spent harvesting seed of native forbs and shrubs that are not readily harvested by traditional methods.

Introduction

The past several years have seen many improvements in technologies for harvesting and processing seed. The harvesting of native forbs and shrubs, however, remains a significant obstacle to large-scale production of these species. Many of our native forbs and shrubs bear light, easily-shattered seed which is not readily harvested by direct combining or by swathing followed by combining. Additionally, many native species have a pappus, awns or other appendages which further exacerbate the harvesting process. Many species mature indeterminately requiring multiple seed harvest dates which is not feasible when using common harvesting methods. These harvesting problems prevent many seed growers from adopting native forbs and shrubs for production and result in high prices because of the extra labor required for harvesting and processing seed lots.

Aberdeen Plant Materials Center farm staff, Charlie Bair and Dan Thomsen, developed a machine, coined the jet harvester, which quickly and easily removes ripe seed from plants with minimal losses. The machine is non-destructive, resulting in reduced inert material in the harvested product reducing the time and effort required in seed cleaning. Features of the jet harvester include:

- PTO driven
- Fully adjustable airspeed
- Easy cleanout
- Useable on numerous species
- Easy to manufacture
- Allows multiple harvests

The attached figures and parts list illustrate how to build a jet harvester. The Aberdeen PMC field staff is available to answer technical questions.

Design

The Jet harvester is powered by the power take off (PTO) of a tractor which drives a fan acquired from a potato harvester. The fan causes negative pressure which pulls the seed into a collection tank. Because the fan is PTO driven, airspeeds are variable by adjusting the PTO's rpm. Additional adjustments can be made by changing pulley ratios.

The original model developed at the PMC was constructed from parts found in junk yards. Its simple design means that other, similar parts can be used to achieve similar results. Specifications and measurements of parts used to create the Aberdeen Jet Harvester can be used as a guide from which other, equally effective harvesters can be manufactured. Reference to any specific commercial products by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, or recommendation.

Parts

Trailer

The unit is mounted on a single-axle trailer with a single point hitch. The trailer we use has a 6 foot axle and is mounted with 16 inch tires.

Collection tank

The seed collection tank was manufactured from a used pressure tank and was cut and retrofitted with attachment points for the hoses. The tank measures 60 inches tall by 20 inches in diameter (approximately 80 gallons). The bottom of the tank is fitted with a trap door for evacuating seed. The trap door pulls tight against the bottom of the tank using springs and a rubber bungee strap. The tank is mounted high enough that a full-size garbage can will fit under it with the trap door open.

Fan

The fan is a vine blower fan from a Lockwood® potato harvester with an 84 x 23 cm (33 x 9 in) housing.

Pulleys and belts

Our pulleys are geared at a 3 to 1 ratio and connected with a 3-way grooved belt. The drive pulley is 18 inches in diameter and the fan is attached to a 6 inch pulley. The pulleys and other moving parts are shrouded in an expanded metal guard to prevent accident or injuries.

PTO

The PTO is a 1,000 rpm PTO shaft from a Logan® potato windrower.

Clutch

The centrifugal clutch allows the fan to keep turning and slow down once the PTO has been shut off. This prevents belts from burning against the pulleys and keeps the fan shaft from abruptly stopping and breaking.

Hoses

There are two hoses on the jet harvester, one running from the fan to the collection tank, and one from the collection tank used to vacuum seed. The fan-to-tank hose is an 8 inch John Deere® lawnmower suction hose. This hose is elevated above the tank to avoid crimping of the hose. The vacuum hose is a 4 inch suction hose with smooth insides to facilitate seed flow and prevent bridging.



Figure 1. Rear view of Jet Harvester showing fan and pulley assembly and collection tank with trap door.



Figure 2. Side view of Jet Harvester showing hose attachments and profile of collection tank.

Operation

Airflow is adjusted using the PTO drive. Higher speeds are useful to pick up heavier seed or mature seed which is still clinging to the plant. Caution should be used when setting the PTO speed; excessively high speeds result in seed being sucked through the fan and not dropping into the collection tank. We have found that PTO speeds of 1,000 to 1,600 rpm (fan speeds of 3,000 to 5,000 rpm) give good results for most species. Some minor experimentation is required with each species to determine the optimum operating speeds and techniques. Separating seed from the inflorescence can be assisted by hand or with a toothed attachment which is run through the flower head. Seed travels through the hose and is released into the collection tank without travelling through the potentially damaging fan impellers.

Seed is dumped into bins or garbage cans using the trap door located at the base of the collection tank (figure3). Cleaning the tank and hose between species or lots can be achieved by revving the PTO. Additional cleaning is done by scraping the inside of the tank or blowing air from a compressor, however this is rarely necessary. Occasionally stems, sticks and other inert matter get lodged in the hose. This can usually be removed by increasing the rpm on the PTO.



Figure 3. Clockwise from upper left: harvesting fourwing saltbush (*Atriplex canescens*), harvesting biscuitroot (*Lomatium* sp.), dumping seed from collection tank into a garbage can, and harvesting Douglas' dustymaide (*Chaenactis douglasii*).

Discussion

The jet harvester significantly improves our ability to harvest many forbs and shrub species. It has been used at the PMC to harvest fourwing saltbush (*Atriplex canescens*), winterfat (*Kraschennikovia lanata*), Gray's biscuitroot (*Lomatium grayi*), nine-leaf biscuitroot (*L. triternatum*), fernleaf biscuitroot (*L. dissectum*), Douglas' dustymaiden (*Chaenactis douglasii*) and sulphurflower buckwheat (*Eriogonum umbellatum*). It is much more efficient than hand harvesting and effectively reduces time spent harvesting as well as post-harvest cleaning. The jet harvester is also very easy to clean between seed lots and species, and allows for multiple harvest of indeterminately maturing species.