

A man in a white t-shirt and khaki pants stands behind a blue and red raised-bed peony mower. The mower has a red engine and a blue frame with 'PROFESSIONAL' written on it. The background is a field with trees and a dirt path.

REPORT

RAISED-BED PEONY MOWER

2009 ALASKA GROWN ALASKA AGRICULTURE
INNOVATION GRANT

SUBMITTED TO
ALASKA DEPARTMENT OF NATURAL RESOURCES
DIVISION OF AGRICULTURE

SUBMITTED BY

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SUMMARY

Midnight Sun Peonies was awarded a 2009 Alaska Grown Alaska Agriculture Innovative Grant to purchase a BCS power mower for cutting peonies planted in raised beds. The goal for the grant was to evaluate whether a power mower could shorten the time required to cut our field-grown peonies in the fall. Cutting peonies by hand had proven to be a time-consuming activity that must be performed before snow fall every year. We hoped that reducing the time required to cut the peony crop would allow us to expand our crop without significantly increasing labor costs or cutting the crop earlier than desirable. The purchased BCS power mower was compared to other cutting methods (by hand and weed-whacking) using four criteria: 1) time required to cut 200-feet of peonies, 2) the ability to control placement of the cuts, 3) damage to the plants, and 4) worker fatigue. Hand cutting had the fastest times in the trials and resulted in the least damage to the plants. The weed whacker had just slighter longer times than hand cutting but resulted in extensive damage to the plant stems and had the highest worker fatigue. The BCS had the longest cut time but resulted in less damage to the plants than the weed whacker and had the lowest worker fatigue. The BCS's poor showing in the cut times is thought to be unfamiliarity with the process compared with hand cutting and weed whacking and is expected to decrease with experience. Additional testing is planned for the 2010 season.

BACKGROUND

Midnight Sun Peonies has planted over 8,000 peonies to date, and we plan to continue expanding our crop for several more years. Alaska's short growing season results in the peonies needing to be left un-cut for as long as possible in the fall to give them as much grow time as possible. A dilemma we have encountered each fall, however, is being able to leave them un-cut as long as possible before it snows. As our crop increases each year, we could be forced to cut earlier and earlier unless we find a faster way to cut the plants. We had always cut the peonies by hand, a process we found to be very labor-intensive and tiring because of the need to remain bent over for long periods of time. We looked for a power mower that could cut plants in a raised bed, but we found that this is not a common piece of equipment. And to make matters worse, we have "improved" our bed spacing every time we planted a batch of peonies so that our bed spacings are not uniform. We started with single-row raised beds with row spacing that didn't fit our tractor, then we made single-row raised beds that do fit our tractor. Next, we made double-row raised beds, and finally we planted in double-row, non-raised beds.

BCS, a walk-behind tractor manufacturer with a distributor in Alaska, worked with us to provide a sickle-bar mower that can be modified to accommodate our situation. Extra-large tires raise the mower above the height of the raised beds, and the tires can straddle either single or double rows using



BCS mower with sickle bar attachment.

various combinations of axle extenders. We hoped that if this piece of equipment works satisfactorily, it would enable us to continue expanding our crop without shortening the time for our peonies to be left un-cut in the fall.

FIELD TESTS

Field trials were designed to make both quantitative and qualitative comparisons of cutting with: hand clippers, a Honda string weed-whacker, and the BCS walk-behind mower. Our evaluation criteria consisted of:

- **Time to cut 200 feet of peonies** (100 peonies planted at 2-foot spacings). The results of the time trials were then multiplied out to calculate the time required to cut the entire field of 7,000 peonies.
- **Ability to control the placement of the cuts.** We have drip lines on all our fields and we did not want to cut them while cutting the stems as short as possible.
- **Damage to the plants.** We feel that a ragged cut may be more susceptible to fungus infection than a clean cut.
- **Worker fatigue.** We qualitatively evaluated the effort and discomfort of each cutting method.



BCS cutting the double-bed.

The tests were conducted on both single raised beds and double raised beds. For the single-bed trials, we cut peonies in two side-by-side, 100-foot single beds. The hand-cutter went one way between the two beds and cut on both sides placing the peony stems into a wheel-barrow as they were cut. The weed-whacker and the BCS cutters both went up one row and down the other, and then raked and picked up the stems. For the double-bed trials, we cut one 100-foot double bed. The hand-cutter went one way between two beds and cut one row on either side placing the peony stems into the wheel-barrow as they were cut. The BCS cutter (we did not test the weed-whacker on the double row) cut both rows in the double-bed with a single pass and then raked and picked up the stems.

TEST RESULTS - OVERVIEW

We eliminated the double-bed test with the weed-whacker after its single-bed time trial because it shredded the peonies into small pieces and ripped the plant stems. Both effects are highly undesirable. It was impossible to pick up all of the small plant pieces which left potential fungus-carrying debris on the ground to over winter in the field thereby increasing the potential for fungus outbreaks the following spring. The ripped plant stems provide multiple sites for fungus to attach and grow. (When we presented our findings to the 2010 APGA Winter Conference, several growers commented that using a bladed weed whacker may alleviate both of these problems.) We also

found the weed whacker to be very noisy, tiring, and requiring excessive care to not cut the drip lines and row covers.



Stems cut by weed-whacker



Stems cut by hand cutters

Hand cutting, on the other hand, results in cleanly cut stems and a very clean field with little to no debris remaining after cutting. Hand cutting, surprisingly, also took the least amount of time in the time trials, primarily because it is a one-pass operation and does not require separate passes to rake and pick up the stems. Although we experienced little to no worker fatigue to complete the time trials, past experience shows that worker fatigue, primarily associated with the need to bend over, is a major drawback to this method when cutting an entire field.

The BCS was not as bad as the weed-whacker for shredding the plants or ripping the stems, but neither was it as clean as hand cutting. It performed worst on small, weak stems, but did a good job of cutting strong stems. The biggest problem we encountered was with peony stems falling under the sickle bar and getting cut more than once. Double-cutting the stems increased the amount of small debris to be raked rather than just whole stems.

TEST RESULTS - DETAILS

Time trials. The results of the time trials are shown below on Table 1. We timed how long it took to cut, rake, and pickup during the single-bed trials, but the results are somewhat mis-leading as the pickup time for the weed-whacker is actually much greater than shown. When we went back to the weed-whacker rows, it was obvious the debris had not been picked up sufficiently. The weed-whacker actually shredded the plants into small pieces making it very difficult to pick up all of the debris.

Table 1. Fall cutting time trials.

METHOD	CUT	RAKE	PICKUP	TOTAL TIME	TIME/ PLANT	TIME / 7000 PLANTS
SINGLE ROWS (2 X 100 FEET)						
WEED WHACKER	0:02:08	0:04:07	0:04:01	0:10:16	0:00:06	11:58:40
HAND CUT				0:09:51	0:00:06	11:29:30
BCS	0:03:11	0:06:09	0:06:28	0:15:48	0:00:09	18:26:00
DOUBLE ROW (1 X 100 FEET)						
HAND CUT				0:08:07	0:00:05	9:28:10
BCS				0:15:30	0:00:09	18:05:00

Time in hours:minutes:seconds

Several observations regarding the BCS time trial results:

- 1) The calculations for the time required to cut the entire field (last column) don't account for worker fatigue. Past experience proves that it would be very difficult, if not impossible, to hand-cut the entire field in one long day, because the workers must remain bent over the entire time. It does seem possible, however, to cut the entire field using the BCS since the only time workers need to bend over is to pick up the stems -- cutting and raking are done standing up.
- 2) Efficiency comes with experience. We have become quite efficient at cutting peonies by hand because we've done it for several years now. However, we had no experience cutting peonies with the BCS other than during these time trials. We are certain to develop efficiencies the more we use the BCS.
- 3) A few alterations to the sickle bar should keep the peonies from being re-cut, which could reduce the time spent raking.
- 4) As our plants mature, the stems will become thicker and stronger and more likely to cut without breaking up, which will also reduce raking time.

Cut placements. Hand cutting provides the best control over cut placement, and the BCS had no trouble going over the drip lines or row covers. Extreme care was required with the weed whacker, however, to cut the stems close to the ground without cutting the drip lines.

Plant damage. The weed whacker rendered the greatest damage to the plants whereas hand cutting was able to cleanly cut the stems. The weed whacker tended to rip the stems rather than cut them. The BCS tended to shred small weak stems but seemed to handle the larger stems well.

Worker fatigue. Worker fatigue could not be readily tested during the time trials because of their short duration. Past experience suggests, however, that worker fatigue is least for BCS and worst for hand cutting.

Table 2 below summarizes the results of the 2009 field trials.

Table 2. Summary of 2009 field trials, peony cutter.

CUTTING METHOD	ADVANTAGES	DISADVANTAGES
Weed-whacker	<ul style="list-style-type: none"> ▪ Relatively inexpensive equipment ▪ Does not require excessive bending over 	<ul style="list-style-type: none"> ▪ Rips rather than cuts stems ▪ Chops stems into bits ▪ A threat to drip lines ▪ Tiring and very noisy
BCS	<ul style="list-style-type: none"> ▪ Does not require excessive bending over ▪ Future modifications should reduce double-cutting of stems ▪ Time to cut entire crop will probably be less than calculated as experience is gained 	<ul style="list-style-type: none"> ▪ Re-cuts some stems ▪ Rips weak stems ▪ Requires separate raking and picking up passes ▪ Expensive equipment
Hand cutting	<ul style="list-style-type: none"> ▪ Single-pass operation ▪ Cuts stems cleanly ▪ Great time for detailed field observations ▪ Leaves fields very clean ▪ Quiet ▪ Inexpensive investment 	<ul style="list-style-type: none"> ▪ Requires bending over ▪ Tiring ▪ Time to cut entire crop is likely more than calculated because of worker fatigue factor

2010 PLANS

The bottom line is that we are certain that with a few modifications the BCS will be our preferred method for cutting strong, mature plants, but we also plan to continue hand-cutting young plants to minimize damage. We plan to modify the BCS and conduct additional field trials in 2010 as follows:

- Devise a system to push cut peonies away from the sickle bar to prevent double cutting
- Cut 1- and 2-year plants by hand to minimize damage to weak stems
- Cut 3+-year plants with the modified BCS
- Track and compare the time required to cut all of our mature plants using the BCS and all of our young plants using hand cutting
- Provide an update in the fall APGA newsletter.