

Oregon Processed Vegetable Commission

Reports 2023-2024

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Research/Extension Progress Report for 2023-2024 Funded Projects
Progress Report for the Agricultural Research Foundation
Oregon Processed Vegetable Commission

Title: Enterprise Budgets for Organic and Conventional Green Beans, Sweet Corn, Broccoli, and Cauliflower for the Processed Market

Project Leader(s): Tim Delbridge; OSU Dept of Applied Economics; 2591 Campus Way, Corvallis, OR 97331

Cooperator(s): Kristie Buckland

Funding History:
2023-2024: $18,058

ABSTRACT

The purpose of this project is to develop a series of enterprise budgets for organic and conventional processing green beans, sweet corn, broccoli, and cauliflower. These budgets are intended to provide objective and representative estimates of the costs of producing these crops, including cash costs and typical overhead expenses. Profitability of each crop is calculated at different price and yield outcomes, which can provide context for growers considering changes to their rotations or production plans. Other stakeholders, such as lenders, processors, and researchers often find such budgets valuable for a variety of uses. These budgets will include a pdf report for each crop along with editable spreadsheet tools which can be used to update or adapt baseline scenarios according to individual farm characteristics or shifts in input prices.

As of early January, 2024, progress has been made on data collection and analysis, though more data and grower information must be collected in the coming weeks to ensure that the budgets are representative of typical grower experiences. We anticipate that with further input from crop producers we will be able to disseminate draft budgets by early April 2024, and publish final reports in June 2024.

KEY WORDS: broccoli, sweet corn, cauliflower, bush beans, organic, enterprise budget, cost of production, cost and returns, profitability.

OBJECTIVES

The goal of this project is to develop eight enterprise budgets. One budget each will be completed for conventional and organic green beans, broccoli, cauliflower, and sweet corn. This process can be broken down into 3 distinct objectives.

> Objective 1: Establish scenarios for each of the eight crops and production systems that are representative of typical Oregon processed vegetable operations.

Objective 2: Develop budgets for each scenario using cost data solicited from participating processed vegetable growers and input suppliers.

Objective 3: Conduct ranging and sensitivity analyses for each crop and distribute the budgets and the accompanying Excel files via the Oregon State University Applied Economics Enterprise Budgets website.

PROCEDURES

Objective 1: The production scenarios (including farm size, equipment complement, rotational crops, land tenure, and operational assumptions) will be developed through conversation with a group of growers of each crop. Connections with growers will be made through cooperation with the OPVC and with guidance from cooperator Kristie Buckland. Once a rough scenario is outlined, it will be distributed over email to the group of growers for confirmation that the scenario is representative of a typical production system for the area and crop in question.

Objective 2: Individual growers will be asked to share their thoughts and/or records of production costs to inform the completion of the budget. Data gathered from growers may include typical expenses for each cost category, the amount of time spent performing different tasks, and typical yields and crop prices. This data collection will be done individually to maintain anonymity and privacy of grower information. No individual data will be reported, and grower data will be stored during the project without names or other identifying information attached. This step will be carried out by Tim Delbridge, with support from a student assistant where appropriate. Cooperation from growers of target crops and the OPVC is critical for success of this step.

Objective 3: Enterprise budget spreadsheets will be constructed using the data gathered in Objective 2. Budget values will be the averages reported by growers. In the event of grower responses that are significantly different from those of other respondents, the project team will follow up to identify the source of the discrepancy. Once complete, the basic enterprise budget will again be circulated to a larger group of growers for feedback.
Ranging and sensitivity analysis will be conducted for each budget for different crop price and yield outcomes, as well as key expense categories. The spreadsheet work will be carried out by a student assistant and overseen by Tim Delbridge.

ACCOMPLISHMENTS

As of the date of writing (1/7/24), we are still in the data collection phase. We have successfully gathered information on typical yields and prices for each of the eight crops and we have begun gathering updated prices on inputs and equipment. However, we need to interview more growers to finalize production scenarios and typical practices. Kristie Buckland and the OPVC have been helpful in identifying growers and processors that may be willing to participate, but we need more input to avoid relying too heavily on individual grower experiences or the assumptions used in previous budgets.

In the original proposal we anticipated distributing draft budgets during February and March. We might end up being a month behind on this schedule, though I anticipate finishing budgets on time (June 2024). Spreadsheet work, which includes adapting formulas for machinery cost depreciation and repair expenses, has already been mostly completed. Once additional production information is gathered, spreadsheets can be finalized and the profitability analysis will go quickly.

RELATION TO OTHER RESEARCH

Production costs and farm-level profitability are central to several other ongoing projects.

- I am in the initial stages of a project exploring the costs that growers of orchard crops (sweet cherries, pears, and hazelnuts) incur to comply with state and federal regulatory requirements. This project is funded by Oregon Department of Agriculture.
- I am working on a project exploring the economic impact of wolf depredation on Oregon livestock producers. This project is funded by the Oregon Beef Council.
- I am in the process of finalizing an enterprise budget for blackberry for the processing market. This project is a collaboration with Washington State University and my time is not funded.
- I am involved in a number of other interdisciplinary projects and proposals for which production costs and farm-level profitability are important components. These include a study of bee disease and the impacts on beekeeper and crop farm profitability (USDA-NIFA); a study targeting solutions for post-harvest decay of apples and pears (USDA-NIFA); a study on developing more efficient hemp production systems (USDA-AFRI),

Research/Extension Progress Report for 2023-2024 Funded Projects
Progress Report for the Agricultural Research Foundation Oregon Processed Vegetable Commission

Title: Broccoli Breeding and Evaluation

Project Leader(s): James R. Myers

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Cooperator(s): N/A

Funding History: $8,775

Abstract: Oregon has had a favorable climate for summer production of broccoli, with mild temperatures and a long growing season. However, the long-term trends are towards warmer summers with more extremes in weather. This presents challenges to broccoli growers that affects the cost of production and whether broccoli will remain profitable. The challenges facing processors are finding cultivars with the desired quality and ease of processing characteristics, along with productivity. Mechanization has reduced labor costs in many crops, but cole crop harvest remains relatively non-mechanized. Large labor crews are typically needed to harvest broccoli and the cost and access to labor are the two main problems for broccoli harvest. The industry is progressing towards mechanization but problems remain in developing systems that would achieve efficiency in the field and deliver quality product to the processing plant. Our program focuses on the plant genetics. The OSU broccoli breeding program has worked for over 20 years to develop cultivars that have architectural traits that make the cultivar more amenable to machine harvest. In 2023, the broccoli breeding program reorganized to make heat tolerance a high priority breeding objective. This was done by developing a general improvement population originally consisting of 34 inbreds and commercial hybrids allowed to randomly mate and produce seed. This was done again in the field in 2023, and seed has been harvested from this project. In addition, we took cuttings from the 2022 field season and rooted these in the greenhouse, where inbreds were selfed and cytoplasmic male sterile lines were crossed to fertile inbreds to preserve the lines.

Key Words: plant breeding, *Brassica oleracea* var. *italica*, mechanical harvest, heat tolerance, processing

Objective(s):

1. Breed broccoli cultivars with excellent processing quality and field productivity.
    a. Bring in new genetics from non-cytoplasmic male sterile commercial hybrids to broaden the genetic base in order to increase yields and stability with a goal of increasing heat tolerance.
    b. Select for field traits that include exserted heads with reduced leaves and resistance to lodging. Hybrids should be high yielding, have solid stems, and large and heavy heads with shallow branches.
    c. Processing traits include segmented heads that produce uniformly colored florets that are dark green in color with fine beads and short pedicles. Florets should be <2½" in size.

2. Develop seed production systems using cytoplasmic male sterility (CMS) to produce field scale quantities of F_1 hybrid seed.

Procedures: This year, we substantially changed the direction of the program. While the overall goals and objectives remain the same, we took a step back to re-prioritize breeding objectives, and elevated breeding for heat tolerance as a main objective. In 2022, we established an isolation nursery consisting of 34 cultivars and OSU inbreds (table 1) and allowed them to randomly mate and produce seed. In 2023 we again planted this nursery in isolation, but without keeping track of maternal parentage. These plants were again allowed to randomly mate and seed was harvested at the end of the season. The goal of this project is to broaden the genetic base of the OSU broccoli breeding program and facilitate breeding higher yielding broccoli hybrids with good head quality, desired architecture, and processing quality traits in the presence of heat.

Cuttings from inbred lines were taken from the fall 2022 field plots and grown in the greenhouse during the 2022-2023 winter. The fertile inbreds were bud-pollinated to perpetuate the line and for generation advancement for lines that have not yet reached homozygosity. Because of the retooling process, we did not cross among inbreds to produce F_1 hybrids for evaluation. Seed produced from these crosses was archived until the 2024 growing season. Backcrossing of selected hybrids to place the nuclear genome in the Ogura cytoplasmic male sterile (CMS) background continued (table 2) to develop CMS forms of the inbreds S454, S463, S471, S473, and S475.

Accomplishments: The general improvement population initiated in 2022 was direct seeded in isolation on 19-May 2023. The plot consisted of about 420 plants spaced at one foot in 15 rows 30 in. apart. Although seeding was later than we would have wished, plants reached flowering by August, and a substantial portion produced seed by late November (figure 1). Head production, flowering and seed set occurred during the hotter time of the summer. Our intent was to allow natural selection for heat tolerance, and no other artificial selection was practiced. A sampling of racemes from the majority of plants with mature seed were harvested and brought into the high tunnel for drying, and is being threshed. This seed will be used to sow another isolation plot in 2024 with intent to select the most productive plants with desired traits to feed into the inbreeding program.

One of the main reasons to focus on developing the general improvement population is that more and more commercial broccoli hybrids rely on CMS for F_1 seed production. Because CMS is only passed through the female line, and because restorer genes are lacking in *B. oleracea*, it is only possible to introduce nuclear genes into a CMS background. Thus, we can backcross the OSU inbreds into a CMS background, but cannot access the genetics of commercial hybrids that have been created with CMS. One of the unfortunate consequences of this is that all of the commercial broccoli hybrids identified to date with heat tolerance and stability over the growing season are produced using CMS, and cannot be used directly. However, the genes associated with heat tolerance, although not highly expressed, are very likely present in other non-CMS hybrids. Our intent is to capture this genetic variability before even more hybrids are converted to CMS.

Impacts: The long-term benefits of the breeding program are hybrids with higher and stable yields, adapted to mechanization, with improved quality traits and abiotic tolerance. In the short term, we would generate new knowledge about the genetic control of yield, quality, and abiotic stress traits.

Relation to Other Research: We are in the process of developing a trial for fee system for evaluating commercial broccoli F_1 hybrids for production in Oregon.

Table 1. Broccoli inbreds and non-CMS cultivars used to initiate a population improvement program. The S_1 generation was grown at the OSU Vegetable Research Farm in 2023.

Plot No.	Cultivar	Plot No.	Cultivar
1	S483	18	Batavia
2	S479	19	Emerald Pride
3	Covina F1	20	S463
4	Durapak 16	21	S481
5	S475	22	S454
6	Burney	23	Gypsy
7	S473	24	Patron
8	Diplomat	25	S469
9	S465	26	S462
10	Early Green	27	Marathon
11	Green Magic	28	CR1
12	S474	29	Arcadia
13	S466	30	Vallejo
14	S471	31	S411
15	S486	32	S446
16	S482	33	S480
17	Corato F1	34	CR2

Table 2. OSU broccoli inbreds, early generation lines and cytoplasmic male sterile (CMS) lines grown in the OSU greenhouse in 2023 and self-pollinated or crossed (in the case of the CMS lines) for generation advance and to maintain the lines.

Entry	No. plants	Self	Cross	No. of seeds
		Inbreds		
S446	3	X		0
S454	3	X		92
S462	2	X		32
S463	5	X		18
S465	5	X		8
S466	2	X		1
S469	1	X		4
S471	5	X		124
S473	1	X		0
S475	2	X		33
S479	2	X		5
S481	6	X		14
S483	5	X		3
S487	2	X		7
S486	5	X		3
S488	5	X		19
(S463/S473)-1-2-1-1	3	X		0
(S463/S473)-1-1-1-1	3	X		0
(S475/(S463)-1-1-4-1	1	X		131
(S475/(S463)-1-1-5-1	1	X		0
(S475/(S463)-3-1-1-1	1	X		35
(S475/(S463)-3-1-1-2	3	X		24
(S475/S463)-1-1-7-1	3	X		0
(S475/S463)-1-1-7-2	2	X		0
(S471/(S490)-1-1-2	2	X		3
(S471/S483)-1-2-1	3	X		3
(S471/S483)-1-2-2	3	X		0
(S471/S486)-1-1-1	1	X		74
(S471/S490)-1-1-1	3	X		6
		Early generation inbreds		
(S471/S463)-1	1	X		13
(S471/S463)-2	2	X		121
(S471/S463)-3	1	X		40
(S475/S481)-1	1	X		5
(S475/S481)-2	1	X		12

Entry	No. plants	Self	Cross	No. of seeds
(S475/S488)-1	1	X		43
(S475-1 Glossy/S471)-1	3	X		12
(S475-1 Glossy/S471)-2	2	X		51
(S475-1 Glossy/S471)-3	3	X		36
(EP/S455)-1	2	X		104
(EP/S471)-1	3	X		3
(EP/S471)-2	3	X		17
(EP/S471)-3	1	X		11
(EP/S475)-1	1	X		0
(EP/S475)-2	3	X		0
(EP/S475)-3	1	X		0
(EP/S475)-4	4	X		2
(EP/S475)-5	3	X		4
(EP/S475)-6	1	X		1
(EP/S481)-1	3	X		7
(EP/S481)-2	2	X		111
(EP/S481)-3	3	X		11
(EP/S481)-4	6	X		9
(EP/S483)-1	2	X		40
(EP/S483)-2	1	X		7
(EP/S483)-3	3	X		232
(EP/S483)-4	2	X		31
OSU OP-10-1	1	X		28
OSU OP-10-3	2	X		32
OSU OP-1-1	1	X		0
OSU OP-11-1	3	X		73
OSU OP-11-2	3	X		148
OSU OP-11-3	2	X		40
OSU OP-11-4	1	X		95
OSU OP-1-2	2	X		3
OSU OP-2-1	1	X		36
OSU OP-2-2	2	X		0
OSU OP-2-3	2	X		14
OSU OP-2-4	3	X		56
OSU OP-2-5	2	X		28
OSU OP-3-1	1	X		229
OSU OP-3-2	2	X		0
OSU OP-7-1	2	X		0
OSU OP-7-3	2	X		4

Entry	No. plants	Self	Cross	No. of seeds
OSU OP-7-4	1	X		0
OSU OP-8-1	2	X		11
OSU OP-8-2	1	X		0
Cytoplasmic male sterile lines				
A463/S463	1		S463	0
A463/S463	4		S464	0
O446	5		S446	0
O446*2-1/S462-1/S454)-2	3		S454	48
O454-2*3-1	3		S454	12
O463-4*4-1	1		S463	0
O463-4*4-2	1		S463	0
O463-4*4-3	2		S463	0
O473-3*3-1	2		S473	0
O473-3*3-2	2		S473	0
(O446*2-1/S462-1/S454)-2	1		S454	0
(O473-1*2/475)-1	3		S475	14
(O473-4*2/475)-1	1		S475	0
(O473-4*2/475)-2	1		S475	0
(OS473-1*3-2/S471)-1	3		S471	2
(OS473-1*3-2/S471)-2	1		S471	15
(OS473-1*3-2/S471)-3	1		S471	56

Figure 1. Broccoli improvement population approaching flowering.

Research/Extension Progress Report for 2023-2024 Funded Projects
Progress Report for the Agricultural Research Foundation Oregon Processed Vegetable Commission

Title: **Green Bean Breeding for Abiotic and Biotic Stress Resistance, Yield and Quality**

Project Leader(s): James R. Myers and Zachary Wiegand, Departments: Horticulture & Food Science & Technology, OSU, Corvallis, OR. Email: james.myers@oregonstate.edu; zak.wiegand@oregonstate.edu

Cooperator(s): N/A

Funding History: $11,964 breeding + $9,442 processing = **$21,405 total**

Contributions from the OSU breeding program: $19,247

Abstract: Green beans grown for processing in the Willamette Valley contribute significantly to the Oregon state economy each year ($20.6 million in 2020). The industry produces a high-quality product with a unique flavor, color, and appearance based on the Bush Blue Lake (BBL) class of green beans. Based on genetic studies we have conducted, Blue Lake green beans form a distinct gene pool compared to other snap beans. Furthermore, the growing environment in Western Oregon is unlike any other green bean production area in the United States, and the OSU BBL cultivars have been bred for this environment for more than half a century. Developing productive varieties that are adapted to Western Oregon requires a dedicated breeding effort. BBL green beans have higher yield potential than those bred for the Midwestern U.S. A factor contributing to BBL pod quality is that these types typically have very low fiber pods. A tradeoff of the higher yields is that BBL beans allocate fewer resources to vegetative growth, which can compromise plant architecture and lead to lodging when pod loads are heavy. Lodging and low fiber content contributes to susceptibility to white and gray mold by BBL types. Objectives include: 1. Breed improved Bush Blue Lake green bean varieties with tolerance to abiotic stresses, white mold resistance, improved plant architecture, high economic yield, and improved pod quality (including straightness, color, smoothness, texture, flavor and quality retention, and delayed seed size development) and 2. Conduct yield and quality trials with processed product evaluation of advance lines. In 2023, two yield and quality trials were conducted: one a preliminary yield trial of experimental lines, the other a trial of lines from commercial companies. We also grew an early generation breeding line nursery for generation advancement and production of seed stocks of advance lines being considered for release. We also advanced crosses made for breeding for heat tolerance to the F2 generation. The first trial flowered and podded during adverse growing conditions and this was reflected in the very low yields and poor quality pods observed at harvest maturity. Germination was uneven in this trial due to dry soil conditions, which led to uneven maturities. The second trial produced more normal yields and quality. Under adverse conditions, OSU7318 was among the best performing lines, but did not do as well in the second trial. This line and OSU7066 were sent to seed companies for evaluation for release.

Key Words: snap bean, common bean, plant breeding, genomics, large-seeded legumes

Objective(s):

1. Breed improved Bush Blue Lake green bean varieties with:

a. Tolerance to abiotic stresses
b. White mold resistance
c. Improved plant architecture
d. High economic yield
e. Improved pod quality (including straightness, color, smoothness, texture, flavor and quality retention, and delayed seed size development)

2. Conduct yield and quality trials with processed product evaluation of advance lines.

Procedures:

Breeding for abiotic stress resistance:
Germplasm with reputed heat tolerance was obtained from public and private sources and crossed to OR BBL lines to create populations for selection. F_1s were grown in the field, and F_2 seed was produced.

Varietal Development:
An early generation nursery of experimental bean lines was grown in unreplicated 20 ft. plots for observation and selection. The majority of crosses were made to incorporate white mold resistance into a BBL background, but the newest crosses are being made to incorporate heat stress tolerance. Lines are advanced using pedigree and single seed descent breeding methods. During the selection process, we continue to select for improved plant architecture and productivity.

Yield and processing quality trials:
A preliminary yield trial of 21 advanced lines was planted 25-May (table 1). Plots consisted of a single 20 ft. row from which 5 ft. sections were harvested at 3 different time points for graded yield and raw product evaluation. Plots were thinned to even stands of 157,000 plants/A. Lines were evaluated for growth habit, yield and graded samples were evaluated for pod smoothness, straightness, cross-sectional shape, color, and seed development (tables 1-4).

A commercial bean trial consisting of 26 lines from five commercial companies along with two checks and two OSU experimental lines was grown (table 5). This trial was similar in design to the preliminary trial, except it had six replicates, of which four were harvested for evaluation. A similar set of field and raw product traits were evaluated (Tables 6-9).

A panel of 10 individuals evaluated frozen sample quality at the OSU Food Science and Technology Pilot Plant on 01-Nov (table 10). Traits evaluated included color, flavor, sweetness, toughness, and overall liking. Frozen material was also displayed at the PNVA meetings in Kennewick, WA on 11-Nov.

Advanced Lines:
Thirty single plant families for OSU7066 and OSU7318 were grown and evaluated for variation among families. These will be used to develop stock seed for these two advanced lines.

Accomplishments:

In the first yield trial, germination was uneven due to dry soil conditions at the time of emergence. Yields in this trial were extremely low and pod quality was poor (tables 1-3). In addition to uneven maturities, a strong split set was evident. Pods show a high degree of blanking and many polywogs. Additionally, there were many hooked parthenocarpic pods in the upper canopy which are a symptom of heat stress. Most lines out of this trial were not sent for processing because of the low yields and poor quality of the pods. The highest yielding line in the trial was OSU7567, a romano type with a yield of 4.8 T/A (table 1). Pods tended to be very mature as shown by seed development data (table 4).

While not stellar, yields in the commercial trial were more similar to historical norms. Uneven germination and split set were not apparent. Lines were harvested three times with an attempt made to harvest prior to optimum, at the best harvest time, and a day or so past prime (table 6). In all cases, the second harvest was sent for processing (table 7). The trial did show some evidence of pods becoming seedy without sizing up based on %1-4 sieve pods. This was apparent for five and full sieve lines such as OSU5630 and OSU6318. The change in %1-4 sieve pods was also rather rapid in this trial, with some lines showing a drop of as much as 50% over five or six days. Quality was generally good as evident by raw product evaluation (table 8) and seed development (table 9).

Approximately 200 lines were grown in the early generation nursery. The plants in this nursery also showed heat stress similar to that observed in the first yield and quality trial. Single plant families of OSU7066 and OSU7318 were evaluated for uniformity, with approximately 80% of families retained. Seed was harvested to serve as stock seed should either of these lines go forward for release.

Impacts: The long-term benefits of the breeding program are cultivars with higher and stable yields, improved quality, and durable disease resistance. In the short term, we would generate new knowledge about the genetics of disease resistance and other snap bean traits. I am optimistic that OSU7318 will be picked up by seed companies and may replace OSU5630 as the main BBL type bean to grow in the Willamette Valley.

Relation to Other Research:

The commercial yield and quality trial, with processing continues to be supported through fees. It provides processors and growers with a look at beans from a number of seed companies. The National Sclerotinia Initiative continues to support our work to improve white mold resistance in snap beans. We grew a MAGIC (multi-parent advanced generation intercross) population in the field which consisted of 996 lines derived from an 8-way cross among 6 snap bean and 2 dry bean cultivars. The seed produced will be screened using the straw test in the greenhouse to identify new sources of improved white mold resistance. We also continue to offer a fee based nursery for screening for white mold to commercial seed companies. The trial has been variable in the amount of disease in the past 3-4 years due to our warm and dry fall conditions, but we continue to have 4-5 companies participating each year.

Table 1. Snap bean checks and experimental lines days to harvest and total yield for a preliminary yield trial grown at the OSU Vegetable Research Farm in 2023[z].

Line	Sieve size/type	Purpose	Days to harvest	Yield (T/A)
Banga	2	small sieve check	67	1.2
Cornell501	5	white mold check	--	--
OSU5630	5-6	check	64	0.8
OSU5630-2[y]	--	--	67	2.1
Sahara	4	small sieve check	69	1.5
Tapia	romano	check	76	1.4
7048	2-3	experimental	74	1.6
7066	6	experimental	63	0.9
7261	5	experimental	74	0.4
7262	4	experimental	69	0.7
7263	5	experimental	71	1.5
7318	6	experimental	64	1.1
7318-2	--	--	67	1.9
7370	5	experimental	63	0.9
7370-2	--	--	67	1.2
7377	4	experimental	71	1.6
7385	5	experimental	71	0.8
7388	5	experimental	71	1.0
7390	5	experimental	69	0.6
7400	4	experimental	76	0.7
7403	4	experimental	71	1.0
7500	4	experimental	74	1.0
7513	6	experimental	76	1.7
7529	4	experimental	71	1.4
7536	4	experimental	69	1.0
7554	3	experimental	74	0.7
7562	romano	experimental	74	1.7
7567	romano	experimental	76	4.8
LSD 0.05			0	1.0

[z]Mean of 3 replications; subplots of 5' were harvested from 18' plots in rows 30 in. apart. [y]Second harvest of entries that were picked twice were sent for processing; yields are unadjusted for sieve size.

Table 2. Sieve size distribution of cultivars and experimental snap bean lines grown in a preliminary yield trial at the OSU Vegetable Research Farm in 2023[z].

		Sieve class														
entry	Days to harvest	1	2	3	4	5	6	1-4	total	1-4	1	2	3	4	5	6
		T/A								Percent						
Banga	67	0.7	1.0	1.0				2.8	2.8	100.0	25.0	37.5	37.5			
OSU5630	64	0.2	0.2	0.2	0.7	0.3		1.2	1.6	77.8	11.1	11.1	11.1	44.4	22.2	
OSU5630-2	67	0.5	0.5	0.3	0.9	2.4	0.5	2.3	5.2	43.3	10.0	10.0	6.7	16.7	46.7	10.0
Sahara	69	0.7	0.7	0.7	1.0	0.7		3.1	3.8	81.8	18.2	18.2	18.2	27.3	18.2	
7048	74	0.3	1.2	0.9	0.7	0.2		3.1	3.3	94.7	10.5	36.8	26.3	21.1	5.3	
7066	63	0.2	0.2	0.2	0.2	0.7	0.5	0.7	1.9	36.4	9.1	9.1	9.1	9.1	36.4	27.3
7261	74	0.2	0.1	0.2	0.5	0.3		1.0	1.3	73.3	13.3	6.7	13.3	40.0	26.7	
7262	69	0.2	0.2	0.3	0.7	0.2		1.4	1.6	88.9	11.1	11.1	22.2	44.4	11.1	
7263	71	0.5	0.3	0.7	1.2	0.5	0.2	2.8	3.5	80.0	15.0	10.0	20.0	35.0	15.0	5.0
7318	64	0.3	0.1	0.5	1.4	0.3		2.4	2.7	87.1	12.9	3.2	19.4	51.6	12.9	
7318-2	67	0.5	0.3	0.3	1.4	1.7	0.2	2.6	4.5	57.7	11.5	7.7	7.7	30.8	38.5	3.8
7370	63	0.2	0.2	0.5	1.4	0.3		2.3	2.6	86.7	6.7	6.7	20.0	53.3	13.3	
7370-2	67	0.3	0.5	0.2	0.7	1.0		1.7	2.8	62.5	12.5	18.8	6.3	25.0	37.5	
7377	71	1.0	0.3	0.3	1.0	0.3		2.8	3.1	88.9	33.3	11.1	11.1	33.3	11.1	
7385	71	0.3	0.2	0.2	0.3	0.3		1.0	1.4	75.0	25.0	12.5	12.5	25.0	25.0	
7388	71	0.2	0.5	0.3	1.0	0.7		2.1	2.8	75.0	6.3	18.8	12.5	37.5	25.0	
7390	69	0.2	0.3	0.1	0.3	0.5	0.2	1.0	1.7	57.9	10.5	21.1	5.3	21.1	31.6	10.5
7400	76	0.3	0.2	0.2	0.5	0.5		1.2	1.7	70.0	20.0	10.0	10.0	30.0	30.0	
7403	71	0.3	0.3	0.5	0.9	0.3		2.1	2.4	85.7	14.3	14.3	21.4	35.7	14.3	
7500	74	0.2	0.2	0.2	0.9	0.3		1.4	1.7	80.0	10.0	10.0	10.0	50.0	20.0	
7513	76	0.2	0.1	0.2	0.5	1.6	2.1	1.0	4.6	20.8	3.8	1.9	3.8	11.3	34.0	45.3
7529	71	0.3	0.5	0.9	1.4	0.3	0.3	3.1	3.8	81.8	9.1	13.6	22.7	36.4	9.1	9.1
7536	69	0.5	0.7	0.5	0.3	0.5	0.2	2.1	2.8	75.0	18.8	25.0	18.8	12.5	18.8	6.3
7554	74	1.0	0.1	0.2	0.3			1.7	1.7	100.0	63.2	5.3	10.5	21.1		

[z]Percent calculated as % of total of 1-6 sieve beans.

Table 3. Grading notes on snap bean cultivars and experimental lines grown in a preliminary yield trial at the OSU Vegetable Research Farm in 2023[z].

			Pod					Flavor			
Entry	Days to harvest	sieve size	Length (cm)	Straight-ness	Shape[y]	Smooth-ness	Color[x]	Swee-ness	Astring-ency	Perfumi-ness	Notes[w]
Banga	67	2	9	5	r	9	4	3	9	1	Pithy 3 sv, becoming pithy in 2 sv. Generally good appearance & few polywogs.
OSU5630	64	5	12	3	r	5	5	7	7	1	Variable germ in trial - few plants with large pods but most still flowering. Many polywogs & blanks. Overall, short pods.
OSU5630-2	67										Severe split set - 3 & 4 sv; very junky; 1 & 2s quite nice.
Sahara	69	4	11	5	r	9	6	7	7	3	Bad split set, mainly in 3 & 4 sv. 5 sv becoming pithy; mix of seed sizes in 4 sv.
Tapia	76	romano	13	3	flat	3	3	3	9	1	11.1cm 10 seed ln.; pod height: 2cm; highly variable maturity, many blanks & polywogs.
7048	74	3-4	11	5	r	7	5	7	9	1	More productive than others, split in 3 sv and production of 5 sv unexpected, but these are mostly over mature pods. Mixed seed dev in lower sv.
7066	63	6+	16	3	r-cb	5	6	7	8	1	Many curved pods, junky w/ lots of polywogs, quality is still ok.

Entry	Days to harvest	sieve size	Pod: Length (cm)	Pod: Straight-ness	Pod: Shape[y]	Pod: Smooth-ness	Pod: Color[x]	Flavor: Swee-ness	Flavor: Astring-ency	Flavor: Perfumi-ness	Notes[w]
7261	74	5	10	7	r	5	5	7	7	1	Short junky in 4 & 5 sv, 3 sv ok.
7262	69	4-5	10	5	r	4	4	7	7	1	V. short pods in all svs; 3 & 4 sv particularly junky.
7263	71	5	13	5	o	7	5	7	7	1	Wax mix & oval – discard.
7318	64	5	12	3	r-cb	7	6	7	9	1	Most productive bean in very stressful trial.
7318-2	67										3 sv are mostly polywogs; other sieve sizes better but getting seedy.
7370	63	4-5	13	3	r	7	4	5	7	1	Too light, many stubby pods & polywogs.
7370-2	67										Short pods in all sv sizes but particularly junky 3 & 4 sv.
7377	71	4	10	5	r-cb	7	7	7	9	1	Fairly short shiny pods.
7385	71	5	10	5	o-r	5	4	7	7	1	Short & junky in all sv sizes.
7388	71	4-5	12	8	r	5	5	5	7	1	$ wax; 2nd rep stunted - weeds.
7390	69	5	10	7	r-cb	5	5	7	9	1	V. short pods in all svs; 3 & 4 sv particularly junky.
7400	76	5	11	4	r	9	5	7	7	1	Short & junky in all sv sizes.
7403	71	4-5	11	7	r	7	4	7	7	1	Ez pick but short & junky in all sv sizes.
7500	74	5	12	5	r	9	4	5	5	5	Tough skin; junky 3 & 4 sv, 5 sv is good.
7513	76	6	14	3	r	5	6	7	7	1	Vigorous & robust plant in the field w/ extensive roots & well nodulated. Only negative is tendency for pods to curve.

Entry	Days to harvest	sieve size	Pod					Flavor			Notes[w]
			Length (cm)	Straight-ness	Shape[y]	Smooth-ness	Color[x]	Swee-ness	Astring-ency	Perfumi-ness	
7529	71	5	14	7	h-r	7	5	9	5	1	Ck for oval tendency; little evidence of split set.
7536	69	5	12	5	r, $o	5	5	5	7	1	Oval mix in all sizes; has potential to produce long pods; 4 sv v. junky but other sv sizes better.
7554	74	3	12	5	r	7	5	7	5	5	Severe split set, many short polywog pods; large set of 1 sv coming on.
7562	74	romano	15	5	flat	5	5	9	9	3	10cm/10 seeds; variable seed maturity; pod height (1.7 cm) not as great as Tapia; many small hooked parthenocarpic pods at top.
7567	76	romano	16	7	flat	4	4	7	9	3	14cm/10 seeds; 1.6cm pod height; good yields & pod production, but is pod ht too low?

[z]Scale of 1 - 9 where 1 is least or worst and 9 is most or best. [y]r = round, cb = creaseback, h = heart and o =oval; $ indicates segregating. [x]Scores based on a 1 - 9 scale with 9 darkest. Standard BBL color is rated as 5. [w]Abbreviations: sv = sieve, dev = development, RC = reverse curve, v = very, sl = slight, grn = green, upr = upright, ht = height; polywogs are short and poorly developed pods with just one or two ovules fertilized and developing; Ez pick beans have pedicles that detach easily from the raceme; split set occurs when adverse environmental conditions cause a set to drop, leaving only very mature pods and very young pods.

Table 4. Seed development for snap bean lines grown in a preliminary yield and quality trial at the OSU Vegetable Research Farm in 2023[z].

		Sieve size					
Entry	**Date**	**6**	**5**	**4**	**3**	**2**	**1**
Banga	67				7	5	3
OSU5630	67	9	8	7	3		
Sahara	69		9	5	1		
7048	74		9	7	7	5	
7066	63	6	5	4	1		
7261	74	9	7	7	3	1	
7262	69		7	7	5		
7263	71		5	3	1		
7318	64		5	3	1		
7318	67	7	7	6	5		
7370	63		7	5	3		
7370	67	9	9	9	5		
7377	71		5	3	1		
7388	71		6	3	1		
7390	69	5	5	3	3		
7400	76		7	5	3		
7403	71		5	3	1		
7500	74		7	5	3		
7513	76	7	5	3	2		
7529	71	7	3	3	1		
7536	69	7	6	4	1		
7554	74			9	7	3	

[z]Scale of 1 - 9 for seed development where 1 = none, 3 = beginning, 5 = moderate, 7 = becoming seedy & 9 = very seedy.

Table 5. Commercial snap bean lines and checks grown in a yield trial at the OSU Vegetable Research Farm in 2023.

Entry	Source	Sieve size
OSU5630	OSU (check)	5-6
OSU7066	OSU	6
OSU7318	OSU	5
Sahara	HM Clause (check)	4
BEX098	Brotherton	4-5
BEX100	Brotherton	3-4
BEX162	Brotherton	3-4
BEX174	Brotherton	4-5
BEX175	Brotherton	Romano
Hudson	Brotherton	4-5
Black Diamond	Syngenta	4-5
Emotion	Syngenta	1-2
SB4829	Syngenta	4-5
Star2006	Starke Ayres	3
Star2007	Starke Ayres	3
Star2007/5	Starke Ayres	3
Star2007/11	Starke Ayres	3
Star2008	Starke Ayres	3
PL 0005	Pure Line	3
PL 0008	Pure Line	4-5
PL 0062	Pure Line	3
RR 3006	Pure Line	4-5
RR 3009	Pure Line	5
F-26	Pure Line	6
B17	Seneca	5
B59	Seneca	5
1720	Seneca	5
1729	Seneca	5
1733	Seneca	5
1737	Seneca	5

Table 6. Yield and maturity of commercial green bean lines in a yield trial planted June 14 at the OSU Vegetable Research Farm, Corvallis, 2023[z].

	1st harvest		2nd harvest[y]		3rd harvest	
Entry	Days to harvest	T/A	Days to harvest	T/A	Days to harvest	T/A
OSU5630	58	3.0	62	6.5	64	7.8
OSU7066	58	1.6	61	3.2	63	6.1
OSU7318	61	4.1	63	5.8	65	5.5
Sahara	59	2.3	62	4.3	64	5.0
B17	58	3.0	62	5.9	64	6.8
B59	61	5.4	63	7.7	65	8.6
BEX098	59	3.3	62	4.7	64	6.0
BEX100	61	3.4	63	4.9	65	5.7
BEX162	63	3.6	65	5.1	68	6.3
BEX174	61	3.7	63	5.7	65	7.0
BEX175	62	6.1	68	8.5	70	10.0
Black Diamond	62	5.1	64	5.9	66	6.4
Emotion	58	2.2	61	3.3	63	4.4
F-26	58	3.7	59	4.8	61	5.5
Hudson	61	3.1	63	5.3	65	7.1
PL 0005	58	2.6	61	4.2	63	5.5
PL 0008	58	3.2	62	5.6	64	8.0
PL 0062	62	3.7	64	4.7	66	4.9
RR 3006	58	3.6	61	5.4	63	7.6
RR 3009	61	7.1	63	9.5	65	10.4
SB4829	59	3.4	62	6.6	64	7.7
1720	58	3.5	62	7.6	64	10.1
1729	57	5.1	59	6.3	61	7.8
1733	58	2.9	61	5.4	63	5.5
1737	56	4.0	59	6.8	61	8.3
Star2006	58	2.9	61	4.6	63	5.9
Star2007	57	2.6	61	4.7	63	5.1
Star2007/11	61	3.7	62	4.3	64	5.1
Star2007/5	57	2.8	59	3.3	61	5.0
Star2008	58	1.7	61	3.8	63	4.8
LSD0.05	0.0	1.2	0.0	1.4	0.0	1.7

[z]Mean of 4 replications; subplots of 5' were harvested from 18' plots in rows 30 in. apart. [y]Second harvest was sent for processing; yields are unadjusted for sieve size.

Table 7. Grades of commercial green bean lines in a yield trial planted June 15 OSU Vegetable Research Farm, Corvallis, 2023.[z]

Entry	Harvest DAP	Sieve size (T/A) 1	2	3	4	5	6	1-4	total	% 1-4	Sieve size (%) 1	2	3	4	5	6
5630	58	2.8	3.3	2.6	2.4	0.3	0.2	11.2	11.7	95.5	23.9	28.4	22.4	20.9	3.0	1.5
5630	62	1.4	2.3	4.5	11.2	6.1	0.2	19.3	25.6	75.5	5.4	8.8	17.7	43.5	23.8	0.7
5630	64	1.0	1.2	2.4	9.8	14.3	1.0	14.5	29.8	48.5	3.5	4.1	8.2	32.7	48.0	3.5
7066	58	1.2	1.6	1.0	0.9	0.7	0.2	4.7	5.6	84.4	21.9	28.1	18.8	15.6	12.5	3.1
7066	61	1.4	1.4	1.9	3.5	2.8	0.7	8.2	11.7	70.1	11.9	11.9	16.4	29.9	23.9	6.0
7066	63	1.4	1.4	2.4	5.9	8.2	3.8	11.2	23.2	48.1	6.0	6.0	10.5	25.6	35.3	16.5
7318	61	2.1	2.8	5.6	4.2	0.3		14.6	15.0	97.7	14.0	18.6	37.2	27.9	2.3	
7318	63	1.7	1.7	4.0	10.5	4.0	0.2	17.9	22.1	81.1	7.9	7.9	18.1	47.2	18.1	0.8
7318	65	1.4	1.6	2.3	9.9	5.6	0.2	15.2	20.9	72.5	6.7	7.5	10.8	47.5	26.7	0.8
Sahara	59	2.4	2.4	2.4	0.9			8.2	8.2	100.0	29.8	29.8	29.8	10.6		
Sahara	62	1.6	2.3	5.1	6.6	0.2		15.5	15.7	98.9	10.0	14.4	32.2	42.2	1.1	
Sahara	64	0.9	1.2	3.5	11.3	1.2		16.9	18.1	93.3	4.8	6.7	19.2	62.5	6.7	
BEX098	59	1.4	2.4	3.5	3.7	0.3		11.0	11.3	96.9	12.3	21.5	30.8	32.3	3.1	
BEX098	62	1.0	1.7	4.2	9.1	1.2		16.0	17.2	92.9	6.1	10.1	24.2	52.5	7.1	
BEX098	64	0.5	1.4	3.3	11.3	4.9		16.6	21.4	77.2	2.4	6.5	15.4	52.8	22.8	
BEX100	61	2.4	3.8	4.2	1.7	0.2		12.2	12.4	98.6	19.7	31.0	33.8	14.1	1.4	
BEX100	63	1.6	3.1	8.0	5.7			18.5	18.5	100.0	8.5	17.0	43.4	31.1		
BEX100	65	1.2	2.3	7.5	10.1	0.2		21.1	21.3	99.2	5.7	10.7	35.2	47.5	0.8	
BEX162	63	2.3	3.1	5.1	3.3	0.2		13.8	13.9	98.8	16.3	22.5	36.3	23.8	1.3	
BEX162	65	2.1	2.8	6.4	7.3	0.2		18.6	18.8	99.1	11.1	14.8	34.3	38.9	0.9	
BEX162	68	1.4	2.4	6.6	12.5	0.2		23.0	23.2	99.2	6.0	10.5	28.6	54.1	0.8	
BEX174	61	1.9	1.9	3.7	4.9	1.2		12.4	13.6	91.0	14.1	14.1	26.9	35.9	9.0	
BEX174	63	1.6	1.6	4.2	10.3	4.2	0.2	17.6	22.0	80.2	7.1	7.1	19.0	46.8	19.0	0.8
BEX174	65	1.6	1.6	4.0	11.3	8.0	0.3	18.5	26.8	68.8	5.8	5.8	14.9	42.2	29.9	1.3
BEX175	62	Romano - not graded														
BEX175	68	Romano - not graded														
BEX175	70	Romano - not graded														

Entry	Harvest DAP	Sieve size (T/A) 1	2	3	4	5	6	1-4	total	% 1-4	Sieve size (%) 1	2	3	4	5	6
Hudson	61	1.4	2.8	3.3	3.1	1.0		10.6	11.7	91.0	11.9	23.9	28.4	26.9	9.0	
Hudson	63	1.6	2.1	3.1	6.1	7.0	0.5	12.9	20.4	63.2	7.7	10.3	15.4	29.9	34.2	2.6
Hudson	65	1.4	1.9	2.6	5.7	12.9	3.0	11.7	27.5	42.4	5.1	7.0	9.5	20.9	46.8	10.8
F-26	58	1.0	1.7	2.4	4.5	2.8	0.5	9.8	13.1	74.7	8.0	13.3	18.7	34.7	21.3	4.0
F-26	59	1.0	1.4	2.3	5.9	5.7	1.4	10.6	17.8	59.8	5.9	7.8	12.7	33.3	32.4	7.8
F-26	61	1.0	1.0	1.7	6.1	7.8	2.3	9.9	20.0	49.6	5.2	5.2	8.7	30.4	39.1	11.3
PL 0005	58	3.3	3.8	2.1	0.2			9.4	9.4	100.0	35.2	40.7	22.2	1.9		
PL 0005	61	2.4	7.7	5.2	0.2			15.5	15.5	100.0	15.7	49.4	33.7	1.1		
PL 0005	63	1.7	5.6	12.2	1.0			20.6	20.6	100.0	8.5	27.1	59.3	5.1		
PL 0008	58	2.1	3.1	3.3	3.0	0.2		11.5	11.7	98.5	17.9	26.9	28.4	25.4	1.5	
PL 0008	62	0.9	1.4	4.0	12.0	3.3		18.3	21.6	84.7	4.0	6.5	18.5	55.6	15.3	
PL 0008	64	0.7	0.9	2.4	14.5	12.2		18.5	30.7	60.2	2.3	2.8	8.0	47.2	39.8	
PL 0062	62	2.3	6.4	5.4	0.0	0.0		14.1	14.1	100.0	16.0	45.7	38.3	0.0	0.0	
PL 0062	64	1.2	6.1	9.8	0.9	0.0		17.9	17.9	100.0	6.8	34.0	54.4	4.9	0.0	
PL 0062	66	1.6	5.9	11.5	0.5	0.0		19.5	19.5	100.0	8.0	30.4	58.9	2.7	0.0	
RR 3006	58	2.1	2.6	2.3	3.8	2.1	0.3	10.8	13.2	81.6	15.8	19.7	17.1	28.9	15.8	2.6
RR 3006	61	1.4	2.3	4.2	7.3	4.4	0.5	15.2	20.0	75.7	7.0	11.3	20.9	36.5	21.7	2.6
RR 3006	63	0.3	1.0	2.3	9.9	14.1	0.9	13.6	28.6	47.6	1.2	3.7	7.9	34.8	49.4	3.0
RR 3009	61	1.7	3.1	7.0	10.5	4.5	0.5	22.3	27.4	81.5	6.4	11.5	25.5	38.2	16.6	1.9
RR 3009	63	1.2	1.6	4.7	14.6	12.9	1.6	22.1	36.6	60.5	3.3	4.3	12.9	40.0	35.2	4.3
RR 3009	65	1.2	1.2	3.5	14.8	16.7	2.4	20.7	39.9	52.0	3.1	3.1	8.7	37.1	41.9	6.1
1720	58	2.8	3.7	2.8	2.6	0.9	0.3	11.8	13.1	90.7	21.3	28.0	21.3	20.0	6.7	2.7
1720	62	1.6	2.3	3.3	8.0	11.3	2.1	15.2	28.6	53.0	5.5	7.9	11.6	28.0	39.6	7.3
1720	64	1.2	1.4	2.3	6.6	20.0	7.7	11.5	39.2	29.3	3.1	3.6	5.8	16.9	51.1	19.6
1729	57	2.3	3.7	5.1	4.9	2.4	0.5	15.9	18.8	84.3	12.0	19.4	26.9	25.9	13.0	2.8
1729	59	1.6	2.8	4.9	8.2	4.7	1.4	17.4	23.5	74.1	6.7	11.9	20.7	34.8	20.0	5.9
1729	61	1.0	1.9	4.9	11.8	8.9	1.6	19.7	30.1	65.3	3.5	6.4	16.2	39.3	29.5	5.2
1733	58	1.9	2.6	2.8	2.3	0.2		9.6	9.8	98.2	19.6	26.8	28.6	23.2	1.8	

	Harvest			Sieve size (T/A)									Sieve size (%)			
Entry	**DAP**	**1**	**2**	**3**	**4**	**5**	**6**	**1-4**	**total**	**% 1-4**	**1**	**2**	**3**	**4**	**5**	**6**
1733	61	1.2	1.9	4.7	10.8	1.4		18.6	20.0	93.0	6.1	9.6	23.5	53.9	7.0	
1733	63	0.9	1.4	3.1	11.3	4.2	0.2	16.7	21.1	79.3	4.1	6.6	14.9	53.7	19.8	0.8
1737	56	2.4	2.8	3.7	3.5	1.9	0.5	12.4	14.8	83.5	16.5	18.8	24.7	23.5	12.9	3.5
1737	59	1.4	2.8	4.7	8.9	6.8	1.0	17.8	25.6	69.4	5.4	10.9	18.4	34.7	26.5	4.1
1737	61	1.4	1.9	3.7	9.4	11.8	3.8	16.4	32.1	51.1	4.3	6.0	11.4	29.3	37.0	12.0
B17	58	2.1	2.8	3.1	2.3	0.5		10.3	10.8	95.2	19.4	25.8	29.0	21.0	4.8	
B17	62	1.0	1.6	3.7	11.7	4.5	0.2	17.9	22.7	79.2	4.6	6.9	16.2	51.5	20.0	0.8
B17	64	0.7	0.7	2.3	11.2	10.3	0.5	14.8	25.6	57.8	2.7	2.7	8.8	43.5	40.1	2.0
B59	61	1.4	2.4	5.6	8.7	2.1		18.1	20.2	89.7	6.9	12.1	27.6	43.1	10.3	
B59	63	0.7	1.2	3.1	10.1	12.5	1.4	15.2	29.1	52.1	2.4	4.2	10.8	34.7	43.1	4.8
B59	65	0.5	1.0	2.1	8.7	16.2	4.2	12.4	32.8	37.8	1.6	3.2	6.4	26.6	49.5	12.8
Star2006	58	2.4	3.1	3.5	1.2	0.2		10.3	10.5	98.3	23.3	30.0	33.3	11.7	1.7	
Star2006	61	1.4	2.6	6.6	6.1	0.2		16.7	16.9	99.0	8.2	15.5	39.2	36.1	1.0	
Star2006	63	0.9	1.9	4.7	14.3	1.2		21.8	23.0	94.7	3.8	8.3	20.5	62.1	5.3	
Star2007	57	2.3	1.7	2.6	2.3	0.3		8.9	9.2	96.2	24.5	18.9	28.3	24.5	3.8	
Star2007	61	1.2	2.4	6.3	6.6	0.7		16.6	17.2	96.0	7.1	14.1	36.4	38.4	4.0	
Star2007	63	0.5	1.2	4.7	10.5	2.4		16.9	19.3	87.4	2.7	6.3	24.3	54.1	12.6	
Star2007/11	61	1.4	2.3	5.6	4.5	0.5		13.8	14.3	96.3	9.8	15.9	39.0	31.7	3.7	
Star2007/11	62	0.9	1.7	5.1	7.3	0.9		15.0	15.9	94.5	5.5	11.0	31.9	46.2	5.5	
Star2007/11	64	0.3	1.2	4.4	10.3	2.4		16.2	18.6	86.9	1.9	6.5	23.4	55.1	13.1	
Star2007/5	57	1.7	1.6	2.4	3.3	1.2		9.1	10.3	88.1	16.9	15.3	23.7	32.2	11.9	
Star2007/5	59	1.7	2.4	3.1	3.5	1.0		10.8	11.8	91.2	14.7	20.6	26.5	29.4	8.8	
Star2007/5	61	1.4	2.8	7.0	5.4	1.6		16.6	18.1	91.3	7.7	15.4	38.5	29.8	8.7	
Star2008	58	1.7	1.4	1.0	1.0	0.2		5.2	5.4	96.8	32.3	25.8	19.4	19.4	3.2	
Star2008	61	1.2	2.1	4.0	5.7	1.0		13.1	14.1	92.6	8.6	14.8	28.4	40.7	7.4	
Star2008	63	0.9	1.2	2.8	7.5	5.4	0.2	12.4	17.9	68.9	4.9	6.8	15.5	41.7	30.1	1.0
Black Diamond	62	1.4	3.1	9.9	4.7			19.2	19.2	100.0	7.3	16.4	51.8	24.5		
Black Diamond	64	1.0	1.7	9.6	10.5	0.2		22.8	23.0	99.2	4.5	7.6	41.7	45.5	0.8	

Entry	Harvest DAP	Sieve size (T/A) 1	2	3	4	5	6	1-4	total	% 1-4	Sieve size (%) 1	2	3	4	5	6
Black Diamond	66	1.0	1.6	7.8	13.2			23.7	23.7	100.0	4.4	6.6	33.1	55.9		
Emotion	58	6.1	1.4	0.0	0.0			7.5	7.5	100.0	81.4	18.6	0.0	0.0		
Emotion	61	7.0	5.1	0.0	0.0			12.0	12.0	100.0	58.0	42.0	0.0	0.0		
Emotion	63	6.1	11.0	0.2	0.0			17.2	17.2	100.0	35.4	63.6	1.0	0.0		
SB4829	59	1.7	2.1	4.5	3.5	0.2		11.8	12.0	98.6	14.5	17.4	37.7	29.0	1.4	
SB4829	62	1.2	1.4	4.5	16.2	1.7		23.3	25.1	93.1	4.9	5.6	18.1	64.6	6.9	
SB4829	64	0.9	1.0	2.8	17.4	7.0		22.1	29.1	76.0	3.0	3.6	9.6	59.9	24.0	

[z]Percent calculated as % of total of 1-6 sieve beans. Highlighted date indicates harvest that was sent for processing. DAP = days after planting.

Table 8. Notes on a commercial green bean yield trial planted Jun 15 at the OSU Vegetable Research Farm, Corvallis, 2023[z].

Entry	Harvest (DAP)	Sieve size	Length (cm)	Straightness	Cross-sectional shape[y]	Smoothness	Color[x]	Sweetness	Astringency	Perfuminess	Notes[w]
5630	58	5	14	5	r	5	5	7	7	1	Oval OT in sv szs up to 4 sv. Otherwise, pod quality is excellent.
5630	62										Becoming seedy w/o sizing up.
5630	64										Mixed seed dev in all sv sizes.
7066	58	6	16	3	r-cb	7	5	7	9	1	Pale green podded OT; long attractive pods but indeterminate; mixed seed dev in 6 sv.
7066	61										Not quite prime but becoming seedy in 6 sv.
7066	63										Jumped 20% between pickings perhaps due to irrigation scheduling. Many curved pods; 2 types of OTs: small flat stringy & large stringless oval.
7318	61	5	14	5	r-cb	9	6	9	9	1	Pods becoming seedy without sizing up; otherwise ex quality bean.
7318	63										Pods still not sizing up.
7318	65										Seedy but still small pods.
Sahara	59	3-4	13	6	r	9	6	7	7	1	A few polywogs.
Sahara	62										Stringy OT, many curved pods in this trial.
Sahara	64										Still good quality.
BEX098	59	4-5	13	8	o-r	9	6	7	7	1	Mix of pod cross section shape slight ovals + round.

Entry	Harvest (DAP)	Sieve size	Length (cm)	Straightness	Cross-sectional shape[y]	Smoothness	Color[x]	Sweetness	Astringency	Perfuminess	Notes[w]
BEX098	62										Seems to be a mix of several types: main one is a long dk grn ace podded type w/ tendency to ovals. A 2nd type is tall & late flowering w/ pods similar to main type. The 3rd type is a compact 2 sv w/ light green pods. Pithy in 4 & 5 sv. Not very seedy.
BEX098	64										Many ovals; 1 w/ WM.
BEX100	61	3-4	14	7	r	9	5	9	7	1	A few 5 sv that are seedy but other svs much less developed. May be size mix. Otherwise, attractive bean.
BEX100	63										No 5 sv - previous picking may have been carryover from previous plot.
BEX100	65										
BEX162	63	3-4	14	7	r-o	9	5	7	5	1	Strong upright plant but late & indeterminate; mostly round but a few ovals.
BEX162	65										Some pithy pods in 4 sv.
BEX162	68										Upright plant are brittle at base & snap easily; pithy 5 sv mixed pithy in 4 sv.
BEX174	61	4-5	18	3	h-o	7	7	5	9	1	Very long ace pods; mostly heart & oval, a few round. Little seed dev.
BEX174	63										Mixed seed dev in all sv sizes
BEX174	65										
BEX175	62	romano	17	7	f	3	3	7	9	3	10cm seed ln 7.2cm.
BEX175	68										10 seed ln: 10.0 cm; pod ht 1.5 cm.

Entry	Harvest (DAP)	Sieve size	Length (cm)	Straightness	Cross-sectional shape[y]	Smoothness	Color[x]	Sweetness	Astringency	Perfuminess	Notes[w]
BEX175	70										10 seed ln: 10.8 cm.
Hudson	61	4-5	14	5	r-cb	7	5	9	7	1	Long BBL pods.
Hudson	63										Many lower leaves senescing perhaps due to heat; appears to be pc; a very stable yielding & uniform line.
Hudson	65										
F-26	58	6	17	4	r-cb	5	5	7	7	1	Has immature white seeds; BBL type with long good quality pods.
F-26	59										would be at 50% 1-4 on Sunday; ovals in plot 118.
F-26	61										Flat pod OT in smaller sv; v large pods that are not becoming seedy.
PL 0005	58	3	11	9	r	9	5	3	7	7	Attractive bean but not much flavor.
PL 0005	61										Significant seed dev in all sv sizes.
PL 0005	63										
PL 0008	58	5	12	9	r	9	6	9	7	1	Pc type? Impressive uniform straight green pods, w/ ex flavor.
PL 0008	62										Slow seed dev.
PL 0008	64										
PL 0062	62	3	10.5	9	r	9	5	7	7	1	Attractive 3 sv.
PL 0062	64										
PL 0062	66										Seedy but still good quality.
RR 3006	58	5	14.5	4	r	7	4	8	9	1	BBL type but a little light. Some battering in grader.

Entry	Harvest (DAP)	Sieve size	Length (cm)	Straightness	Cross-sectional shape[y]	Smoothness	Color[x]	Sweetness	Astringency	Perfuminess	Notes[w]
RR 3006	61										Becoming pithy in 6 sv, somewhat variable in dev in 6 sv.
RR 3006	63										3 sv becoming junky.
RR 3009	61	5	15	5	r-cb	5	5	9	9	1	BBL type, becoming seedy without pods sizing up.
RR 3009	63										quite seedy but not pithy.
RR 3009	65										Seedy but not pithy.
1720	58	5	13	8	r	8	5	7	9	1	BBL type, some battering in the grader.
1720	62										Some pods, particularly in 6 sv heavily battered in grader.
1720	64										
1729	57	5	12	7	r	9	5	7	7	1	Some battering in grader; long primary branch w/pods above the canopy; 1s & 2s good quality & useable.
1729	59										Would be prime in one more day.
1729	61										Getting seedy but still good quality.
1733	58	5	14.5	7	r	5	2	7	5	3	Good quality overall, but too light for OR production.
1733	61										Concentrated set.
1733	63										Mixed seed dev in 3 & 4 sv; some polywogs in 4 sv.
1737	56	6	13	7	r	7	4	7	5	3	Produces large pods w/o becoming seedy; much battering in grader; mixed 3-7 seed dev in 6 sv.
1737	59										TEST PICK - no change in 24 hrs - p & s sat.

Entry	Harvest (DAP)	Sieve size	Length (cm)	Straightness	Cross-sectional shape[y]	Smoothness	Color[x]	Sweetness	Astringency	Perfuminess	Notes[w]
1737	61										Flat pod OT in 3 sv & smaller.
B17	58	5	14	6	r	9	3	7	5	3	A few polywogs; too light to blend w/ 5630.
B17	62										Polywogs in 3 sv; 6 sv becoming pithy.
B17	64										
B59	61	4-5	12	5	r-cb	7	3	7	7	5	Relatively short bean, pods with RC.
B59	63										
B59	65										Little change in seed development, but grade is quite low - still good quality.
Star2006	58	3-4	13	7	r	9	4	5	7	3	Many blossoms sticking to 1 sv pods;polywogs & blanks in 4 sv, 2 & 3 sv ok.
Star2006	61										Some oval & stringy off types, prime at this date.
Star2006	63										~75% pods retain pedicels; becoming pithy in 5 sv.
Star2007	57	3-4	13.5	9	r	9	4	5	7	1	Wide range of sv sizes perhaps due to a split set; ace pods.
Star2007	61										Becoming pithy in 5 sv, occasionally in 4 sv; a few ovals encountered while picking.
Star2007	63										Pithy 5 & 6 sv, ez pick - ~80% pods retain pedicels.
Star2007/11	61	3-4	13	4	r	7	4	9	7	3	5 sv becoming seedy & pithy, mixed seed dev in 4 sv.

Entry	Harvest (DAP)	Sieve size	Length (cm)	Straightness	Cross-sectional shape[y]	Smoothness	Color[x]	Sweetness	Astringency	Perfuminess	Notes[w]
Star2007/11	62										Mixed pithy pods in 4 &n 5 sv; 5 sv v seedy. Line has ez pick trait & produces a high proportion of pods w/ pedicels retained.
Star2007/11	64										Pithy 6 sv a few in 5 sv.
Star2007/5	57	4-5	13	7	r	9	5	7	9	1	Split in 2 sv, more seed dev than Star2007; ace pods.
Star2007/5	59										No change in sv sz although weights have shifted. Plot 61 is on edge w/ early weed pressure; $ EZ pick trait; line is rather indeterminate & very heavy foliage; some polywogs mainly in 4 sv. 4 sv has greatest seed dev suggesting mix of sv sizes.
Star2007/5	61										5 sv becoming quite seedy but other sv sizes less developed.
Star2008	58	4-5	13	7	h-r-o	9	6	9	5	3	Mix of pod cross section shape - few ovals, mostly heart & few oval.
Star2008	61										Hard picking, ace pods, mix of round & ovals so not grading accurately.
Star2008	63										~70% pods retain pedicels.
Black Diamond	62	4	14	9	r-cb	9	7	7	7	3	Very slender dk green straight attractive pods.
Black Diamond	64										Still very high quality.
Black Diamond	66										pithy 5 sv & mixed pithy pods in 4 sv.
Emotion	58	2	12	7	r	9	4	3	7	7	Very different flavor profile; long slender attractive pods.

Entry	Harvest (DAP)	Sieve size	Length (cm)	Straightness	Cross-sectional shape[y]	Smoothness	Color[x]	Sweetness	Astringency	Perfuminess	Notes[w]
Emotion	61										Prime at this date.
Emotion	63										
SB4829	59	4	14	9	r	9	7	5	5	5	Long straight attractive bean.
SB4829	62										Partial string in some pods.
SB4829	64										Becoming pithy in 5 & 6 sv.

[z]Scale of 1 - 9 where 1 is least or worst and 9 is most or best. [y]r = round, cb = creaseback, h = heart, and o =oval. [x]Scores based on a 1 - 9 scale with 9 darkest. Standard BBL color is rated as 5. [w]Abbreviations: sv = sieve, dev = development, RC = reverse curve, v = very, sl = slight, grn = green, upr = upright, sz=size, dk=dark, OT=off type, ace = shiny pod gene, pc=persistent color, ez=easy.

Table 9. Seed development in different sieve sizes on day of harvest for experimental and check snap bean lines grown in a trial of commercial entries planted June 15 at the OSU Vegetable Research Farm in 2023.

		Sieve size[z]					
Entry	**Harvest (DAP)**	**6**	**5**	**4**	**3**	**2**	**1**
5630	58	6	5	3	2		
5630	62	9	7	7	3		
5630	64	9	8	6	3		
7066	58	4	3	2	1		
7066	61	8	6	3	2		
7066	63	8	6	3	2		
7318	61		7	5	3		
7318	63	9	8	5	2		
7318	65	9	9	7	3		
Sahara	59			3	2	1	
Sahara	62		5	3	2	1	
Sahara	64		7	3	2		
BEX098	59		6	4	2		
BEX098	62		7	5	3	2	
BEX098	64		7	6	2		
BEX100	61		7	3	2	2	
BEX100	63			5	3	1	
BEX100	65		9	8	5	3	
BEX162	63		7	4	2	1	
BEX162	65		7	5	2	1	
BEX162	68		9	8	5	3	
BEX174	61		3	2	1	1	
BEX174	63	8	5	3	2		
BEX174	65	9	7	5	3		
BEX175	62						
BEX175	68						
BEX175	70						
Hudson	61		3	2	1		
Hudson	63	7	5	3	2		
Hudson	65	7	5	3	2		
F-26	58	5	3	2	1		
F-26	59	5	3	2	1		
F-26	61	5	4	3	2		
PL 0005	58			3	2	1	
PL 0005	61			7	5	3	
PL 0005	63			9	7	2	
PL 0008	58		4	3	2	1	
PL 0008	62		4	3	2		
PL 0008	64		7	6	3		
PL 0062	62				2	1	
PL 0062	64			5	3	2	

Entry	Harvest (DAP)	Sieve size[z]					
		6	5	4	3	2	1
PL 0062	66			9	7	5	
RR 3006	58	6	5	3	2		
RR 3006	61	7	5	3	1		
RR 3006	63	9	7	5	3		
RR 3009	61	8	7	5	3		
RR 3009	63	9	9	7	3		
RR 3009	65	9	9	7	5		
1720	58	6	5	3	2	1	
1720	62	7	6	5	3		
1720	64	9	8	6	2		
1729	57	5	3	2	1		
1729	59	5	4	2	1		
1729	61	7	6	4	2		
1733	58		5	3	2		
1733	61		7	4	2		
1733	63	9	8	7	5		
1737	56	6	3	2	1		
1737	59	5	3	2			
1737	61	5	3	2	1		
B17	58		4	3	2	1	
B17	62	9	7	4	2		
B17	64	9	6	3	2		
B59	61		3	2	1		
B59	63	7	5	3	2		
B59	65	5	5	3	2		
Star2006	58		5	3	1	1	
Star2006	61		8	5	4	2	
Star2006	63		9	7	3		
Star2007	57		3	2	1	1	
Star2007	61		7	6	3	1	
Star2007	63		9	8	7	5	
Star2007/11	61		9	5	2	1	
Star2007/11	62		9	5	2	2	
Star2007/11	64		9	6	5	2	
Star2007/5	57		5	3	2	1	
Star2007/5	59		5	7	2	1	
Star2007/5	61		8	4	2	1	
Star2008	58	5	3	2	1		
Star2008	61	7	4	3	2	1	
Star2008	63	7	7	3	2		
Black Diamond	62		7	4	3	1	
Black Diamond	64		5	3	5	2	
Black Diamond	66		9	6	4	2	
Emotion	58					2	1
Emotion	61					2	1

Entry	Harvest (DAP)	Sieve size[z]					
		6	5	4	3	2	1
Emotion	63				9	5	3
SB4829	59		3	2	2	1	
SB4829	62		5	2	2	1	
SB4829	64	9	7	7	3		

[z]Scale of 1 - 9 for seed development where 1 = none, 3 = beginning, 5 = moderate, 7 = becoming seedy & 9 = very seedy.

Table 10. Quality evaluation of blanched and frozen snap bean samples from a yield and quality trial grown at the Vegetable research Farm in 2023. Average scores are based on a scale of 1 – 5 where 5 = highest/best, except for toughness, where a low score indicates a more tender sample. Values are color coded where blue is best/highest. N indicates the number of individuals who evaluated samples and % Count shows the percent of individuals assigning a particular overall rating to cultivars.

	Average Score						% Count (Overall)				
Line	Color	Flavor	Sweet-ness	Tough-ness	Over-all	N	% 1 (Worst)	% 2	% 3	% 4	% 5 (Best)
1720	3.5	2.9	3.1	2.9	3.0	9	11	22	33	22	11
1729	3.8	3.2	2.7	3.1	3.2	9	0	22	44	22	11
1733	3.2	2.5	2.3	2.9	2.3	10	30	20	40	10	0
1737	4.4	3.3	2.7	2.9	3.4	9	0	11	33	56	0
B17	4.8	3.8	2.3	3.4	3.3	8	0	13	50	38	0
B59	3.5	2.6	2.3	2.8	2.3	10	30	20	40	10	0
BEX098	3.5	3.0	2.5	2.7	3.5	11	0	0	55	45	0
BEX100	4.2	3.1	3.0	3.2	3.3	11	9	18	27	27	18
BEX162	3.6	3.4	2.5	3.1	3.3	11	0	9	64	18	9
BEX174	3.8	3.1	2.9	2.8	3.5	10	0	10	40	40	10
BEX175	3.4	3.2	3.6	4.0	3.4	5	0	20	40	20	20
Black Diamond	3.7	3.0	3.2	3.0	3.0	10	10	10	50	30	0
Emotion	3.4	3.8	3.2	3.0	3.5	11	0	0	45	55	0
F-26	3.2	2.0	1.2	3.0	1.9	9	33	44	22	0	0
Hudson	3.6	2.9	2.2	3.0	2.9	10	0	30	50	20	0
OR5630	3.9	3.0	2.3	3.3	2.7	7	0	57	14	29	0
OSU7066	2.2	2.4	2.0	3.2	2.0	9	44	22	22	11	0
OSU7318	4.1	2.7	2.1	2.8	2.5	10	30	10	40	20	0
OSU7562*	3.5	3.3	3.5	3.0	3.3	4	0	25	25	50	0
OSU7567*	2.3	2.5	2.0	3.8	1.8	4	50	25	25	0	0
PL 0005	3.9	3.4	3.6	3.5	3.4	11	0	18	36	36	9
PL 0008	4.4	3.4	3.0	3.4	3.4	9	0	11	44	33	11
PL 0062	3.7	2.8	3.2	3.1	3.0	10	0	30	50	10	10
RR 3006	4.2	3.2	3.8	3.1	3.5	10	0	10	30	60	0
RR 3009	2.7	2.7	3.4	3.2	3.0	11	9	18	36	36	0
Sahara	4.3	2.7	2.2	3.1	3.1	11	9	18	27	45	0
SB4829	4.4	3.6	3.2	3.6	3.3	9	0	11	44	44	0
STAR2006	3.9	3.6	4.1	2.7	3.6	11	0	9	27	55	9
STAR2007	3.9	3.5	2.9	3.5	3.7	11	0	0	36	55	9
STAR2007/11	4.4	3.4	3.5	3.3	3.4	10	0	20	30	40	10
STAR2007/5	3.9	3.4	3.5	3.5	3.5	11	0	27	18	36	18
STAR2008	3.8	3.2	3.3	3.3	3.1	11	0	27	45	18	9
Tapia*	4.3	3.3	2.5	3.5	3.0	4	0	25	50	25	0

* OSU Yield Trial Beans (Romano only)

Research/Extension Progress Report for 2023-2024 Funded Projects
Progress Report for the Agricultural Research Foundation Oregon Processed Vegetable Commission

Title: Nitrogen fertility requirements of new sweet corn hybrids

Project Leader(s): Identify project leader(s) and their location(s).

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Cooperator(s): N/A

Funding History: $14,051 (1 year)

Abstract: Cost of inputs for sweet corn production have risen dramatically in recent years, making the crop unattractive to growers for production for processing. One input for which prices have been especially high is nitrogen fertilizer. If nitrogen use could be reduced without loss of yield, then sweet corn contracts for processing would be more competitive with other crop options. Newer hybrids currently in use by processors have not been evaluated for nitrogen use efficiency. We conducted a trial of contemporary hybrids using different nitrogen fertilizer side dress treatments to determine if existing recommendations still apply or if these might be adjusted to increase profitability for growers. The objective of this research was to evaluate nitrogen sidedress requirements for supersweet corn hybrids currently used in processing in the Willamette Valley and Columbia Basin. A yield and quality trial was established at the OSU Vegetable Research Farm in 2023 with seven hybrids grown at five levels (0, 50, 100, 150 and 200 lb/A) of sidedress nitrogen. A preplant soil test revealed that residual N was low, so 40 lb/A N as 16-16-16 was broadcast prior to planting. At V5, sidedress N treatments were applied in the form of liquid N. Silking date was used to estimate time of harvest, which was refined using moisture testing as harvest neared. Data was recorded on yield and yield parameters. Hybrids showed a linear to curvilinear response for net T/A yield to increasing levels of N. 'Coronado', 'Mint' and 'Kopa' all showed highest yield at 100 lb/A N whereas '007R', 'Driver', 'GSS1477' and 'HMC302' produced highest yield at 200 lb/A N. The data suggests that some hybrids could be grown at lower N rates of 100 lb/A whereas others were responsive to N and no threshold for maximum was identified even when rates were 200 lb/A. Type of response did not necessarily correlate with overall yield; the highest yield was achieved by Coronado with 100 lb/A sidedress N. While results is suggestive of trends, the study should be repeated to validate these results.

Key Words: Sweet corn, fertility trial, ammonium, nitrate, yield response

Objective: Determine nitrogen (N) requirements for new supersweet corn hybrids grown for processing.

Procedures:

The trial was conducted at the OSU Vegetable Research Farm. The field selected for this study had been fallowed the previous winter, with dry farmed sunflowers and winter wheat being the two previous crops. A preplant soil test was conducted that revealed that N levels were low (Table 1). Prior to planting, 40 lb/A N was broadcast using 16-16-16 (N-P-K) applied at the rate of 250 lb/A. The field was irrigated on a weekly basis with approximately an inch of water applied through solid-set sprinklers.

Seven supersweet corn hybrids representing those currently being grown in the Willamette Valley and Columbia Basin were planted 15-16 June. The hybrids included in the trial, their area of production and processing traits are shown in table 2. These were seeded with a hand-propelled belt planter into 30-foot rows spaced at 30 inches between rows. Initial population was about 60 seeds/plot, which was thinned to a 9 inch within row spacing to achieve a population density of 33,000 plants/A. Experiments were arranged as a split plot with fertilizer treatments as whole strips through the field and hybrids as subplots within strips. Subplots consisted of three rows where the center row was harvested for yield and quality evaluation. The trial was replicated 4 times and had border rows top and bottom in the field. The center 20 feet of each subplot was harvested by hand harvest and brought to the grading room for husking and yield and quality measurements.

Sidedress fertilizer treatments were applied on 20 July at the V4-V5 stage Using urea ammonium nitrate solution UAN 32 (Simplot) between rows figures 1 & 2). Sidedress treatments consisted of 0, 50, 100, 150, 200 lb N/A applied to the field. The tractor moved at a constant speed through the field and adjustments in rate of flow were used to achieve the desired amount. Fertilizer was injected into the soil on both sides of the center data row. Seeds were treated with fungicide/insecticide mix as supplied by the seed company. Weeds were controlled with 1.6 pints Atrazine 4l mixed with Impact 0.75 oz and applied on 17-July.

Data was collected on 50% silking date during the growing season. At harvest, total ear number and weight, net ear number and weight and cull ear number and weight were recorded. Individual ear measurements included length and diameter, row number, tip fill and kernel depth and weight per ear. Hybrids were harvested at about 28-32 days after 50% silking. Samples were moisture testing (target of 75-77% for supersweet hybrids) to identify the optimum harvest time and a final moisture was taken on harvested ears (table 3). A soil test of residual ammonium and nitrate N was obtained after harvest for each hybrid-treatment combination (combined across replicates) to determine if any plant-available N remained (table 4).

Accomplishments:

Hybrids showed a similar range in 50% silking date (table 5) and maturities (tables 3 and 5). Fertilizer treatment did not significantly affect growth rates as individual hybrids matured a similar rate across treatments (table 5). Except for 007R, percent kernel moistures were within the desired range of 75-77%. The hybrid 007R was earlier maturing than the rest and had a final moisture of 74.1% (table 3). Husked weight of sweet corn hybrids ranged from 10.7 to 16.6 T/A but was reduced by 30 to 40% when husks and culls were removed (table 5). Overall yields were lower than expected, but may have been impacted by temperatures during the growing season. Hybrids produced economic yields (net T/A) in the range of seven to 10 T/A (table 5). In terms of overall ranking, Driver had highest average yield across all treatment, followed by HMC302, Coronado, Kopa, Mint, 007R and GSS1477.

Lowest yields were observed with the zero sidedress rate, and increased by 1.1 to 2.7 T/A for the higher fertilizer rates. Two linear patterns of response to N were observed with the various hybrids (figure 3). Three (Coronado, Mint and Kopa) showed increases in yield up to the 100 lb/A N sidedress treatment, after which yields plateaued or even decreased at higher N treatments. The other four hybrids showed a continuous linear response across treatments, with highest yields achieved at highest rates of N. Weight and number of cull ears was generally low and while differences were observed among hybrids, there did not appear to be an increase in culls in response to N treatment. Weight per ear varied among hybrids with Driver and HMC302 producing the heaviest and 007R the lightest ears. Ear parameters also varied among hybrids, with heaviest ears having the greatest length and diameter, row number and kernel depth. However, Ear parameters were not correlated with yield did not show linear responses to fertilizer treatment.

Soils at the end of the study appeared to have little residual plant-available N (table 4). In many cases, nitrate N was below detectable levels except at the highest N treatments. While ammonium N was detectable, levels were generally low except at 150-200 lb/A treatment.

Impacts:

These data suggest that some contemporary supersweet corn hybrids may produce optimum yields at lower sidedress N rates than others. For the conditions observed in this current study (8 ppm NO3-N preplant, 30 lb/A starter N) historical sidedress recommendations would have been to apply 145 lb/A N. In our study, three hybrids produced high yields at about 70% of this rate, which could translate into a significant savings in N fertilizer costs. This study should be repeated in 2024 to verify these results.

Relation to Other Research:

Some of the same hybrids were included in our commercial supersweet corn yield and quality trial. This trial is supported entirely by fees from commercial companies and data are provided to companies and processors as well as conducting a sample display of frozen ears and kernels at the PNVA meetings held in Kennewick WA in November, 2023.

Table 1. Preplant nutrient status of a field used for a supersweet sweet corn nitrogen fertility trial grown at the OSU Vegetable Research Farm in 2023.

	Percent			pH units		mg nutrient/kg soil					
Soil sample	C	N	OM	pH	BpH	PO_4-P	Ca	Mg	K	NO_3-N	NH_4-N
1	1.66	0.15	3.32	6.46	6.53	83	4423	1051	206	8.44	0.36
2	1.7	0.14	3.4	6.43	6.52	79	4415	1054	195	8.42	0.27

Table 2. Supersweet corn hybrids, source and production information grown in a sidedress N fertility trial at the OSU Vegetable Research Farm in 2023.

Hybrid	**Source**	**Kernel color**	**Area of production**
Driver	HM Clause	yellow	Willamette Valley
Kopa	HM Clause	yellow	Willamette Valley
Mint	HM Clause	yellow	Willamette Valley
Coronado	HM Clause	white	Columbia Basin
HMC302	HM Clause	yellow	Columbia Basin
GSS1477	Syngenta	yellow	Willamette Valley
007R	Syngenta	yellow	Willamette Valley

Table 3. Supersweet corn kernel moisture percentages at harvest of a nitrogen fertility trial grown at the OSU Vegetable Research Farm in 2023.

Hybrid	1st Moisture date	1st Moisture (%)	Harvest date	Days to harvest	Final Moisture (%)
007R	9/11	74.8	9/13	89	74.1
Coronado	9/13	77.0	9/15	91	75.2
Driver	9/13	79.6	9/15	91	76.1
GSS1477	9/14	77.5	9/15	91	75.5
HMC302	9/11	79.5	9/15	91	76.8
Kopa	9/14	78.3	9/18	94	76.0
Mint	9/13	78.7	9/18	94	76.2

Table 4. Residual nitrogen following a supersweet corn trial of seven hybrids grown with five sidedress N treatments at the OSU Vegetable Research Farm in 2023.

		Lb/A sidedress N treatment				
Hybrid	**N test**	**0**	**50**	**100**	**150**	**200**
		ppm (mg/kg)				
007R	NO_3-N	BQL*	BQL	BQL	BQL	0.36
	NH_4-N	1.00	0.67	0.76	3.18	1.24
Coronado	NO_3-N	BQL	BQL	1.34	BQL	BQL
	NH_4-N	0.62	0.81	0.78	0.95	1.37
Driver	NO_3-N	BQL	BQL	BQL	BQL	0.77
	NH_4-N	0.94	0.87	0.78	0.83	1.82
GSS1477	NO_3-N	0.83	BQL	BQL	BQL	2.17
	NH_4-N	0.92	0.85	0.80	1.03	4.36
HMC302	NO_3-N	BQL	BQL	BQL	BQL	0.23
	NH_4-N	0.81	0.86	1.12	1.29	1.29
Kopa	NO_3-N	BQL	BQL	BQL	BQL	BQL
	NH_4-N	0.82	0.90	1.37	0.94	0.75
Mint	NO_3-N	BQL	0.23	BQL	8.23	BQL
	NH_4-N	0.91	1.07	0.98	6.14	1.33

*BQL = Below quantifiable limits. < 0.2 ppm NO_3-N detected in 2M KCl soil extract.

Table 5. Yield, yield components and days to silking and maturity of supersweet corn hybrids grown in a fertility trial at the OSU Vegetable Research Farm in 2023.

Hybrid	**Sidedress N (lb/A)**	**Total T/A**	**Husked T/A**	**Net T/A**	**Cull T/A**	**Net ears/A**	**Cull ears/A**	**Wt/ear (lb)**	**50% silking (days)**	**Harvest (days)**	**Ear ln. (in)**	**Ear dia. (in)**	**Ear row no.**	**Ear tip fill**	**Kernel depth (mm)**
007R	0	10.7	7.4	7.0	0.4	21,199	1,742	0.66	61	89	8.5	2.1	19.5	7.8	12.3
	50	10.8	7.7	7.1	0.5	22,942	1,742	0.62	61	89	8.7	2.0	18.5	8.0	11.8
	100	10.9	7.7	7.2	0.5	21,780	2,614	0.66	62	89	8.6	2.0	19.0	8.0	12.5
	150	11.2	8.0	7.8	0.1	23,813	581	0.66	61	89	8.6	2.0	19.5	8.3	12.5
	200	12.2	8.7	8.4	0.3	25,555	290	0.66	60	89	8.6	2.1	18.0	7.8	12.0
Coronado	0	10.8	7.0	6.8	0.3	20,618	1,162	0.65	62	91	8.2	2.1	19.3	8.5	11.8
	50	12.6	8.0	7.8	0.2	23,522	871	0.66	62	91	8.0	2.1	19.0	7.5	11.3
	100	15.0	9.9	8.8	1.1	27,007	5,518	0.65	62	91	8.0	2.1	20.3	8.3	11.5
	150	14.5	9.4	8.7	0.7	26,426	2,614	0.66	62	91	7.9	2.1	19.3	8.0	11.5
	200	15.2	9.7	8.9	0.8	26,136	3,775	0.68	62	91	8.0	2.2	19.8	8.3	11.8
Driver	0	12.5	8.3	7.4	0.9	19,747	3,775	0.75	63	91	9.3	2.0	18.5	7.3	13.5
	50	12.9	8.8	8.2	0.6	21,490	2,323	0.76	62	91	9.3	2.0	19.0	6.3	13.3
	100	13.4	9.1	8.8	0.3	22,651	1,162	0.78	62	91	9.4	2.1	19.0	6.8	13.3
	150	13.1	8.9	8.8	0.1	22,651	290	0.78	63	91	9.3	2.1	19.5	7.0	13.5
	200	16.6	11.0	10.1	1.0	27,007	4,646	0.75	63	91	9.2	2.1	19.0	6.5	13.5
GSS1477	0	11.4	7.7	7.2	0.6	22,651	2,323	0.63	62	91	8.5	1.9	16.0	6.0	12.8
	50	11.9	7.3	7.1	0.2	20,328	871	0.70	63	91	8.6	2.0	17.5	7.3	13.3
	100	11.4	7.7	6.9	0.8	20,909	3,194	0.67	62	91	8.6	2.0	17.0	6.5	13.5
	150	12.0	8.3	7.1	1.2	21,199	4,937	0.67	63	91	8.6	2.0	16.5	5.8	13.5
	200	13.6	9.4	8.4	1.0	24,974	4,066	0.67	63	91	8.5	2.0	16.5	6.0	13.3
HMC302	0	11.9	8.0	7.6	0.4	20,618	1,162	0.74	60	91	9.3	2.1	18.0	7.8	13.3
	50	13.0	8.7	8.2	0.6	21,780	2,033	0.75	60	91	9.2	2.1	19.0	7.3	13.3
	100	11.9	7.7	7.4	0.3	19,747	1,162	0.75	60	91	9.0	2.1	19.0	7.8	13.8
	150	13.5	9.1	8.5	0.6	22,651	2,323	0.75	61	91	9.2	2.1	19.0	7.3	13.8
	200	16.1	10.4	9.8	0.6	26,136	2,033	0.75	61	91	9.2	2.1	18.5	7.5	13.3

Hybrid	Sidedress N (lb/A)	Total T/A	Husked T/A	Net T/A	Cull T/A	Net ears/A	Cull ears/A	Wt/ear (lb)	50% silking (days)	Harvest (days)	Ear ln. (in)	Ear dia. (in)	Ear row no.	Ear tip fill	Kernel depth (mm)
Kopa	0	11.8	7.6	7.4	0.1	19,457	581	0.76	63	94	8.9	2.1	17.0	7.0	13.8
	50	12.4	7.9	7.9	0.0	20,618	0	0.77	62	94	8.8	2.1	18.5	8.3	13.5
	100	13.4	8.6	8.4	0.2	21,490	871	0.78	63	94	8.8	2.1	18.5	7.8	13.5
	150	13.1	8.2	8.0	0.2	20,328	871	0.78	62	94	8.7	2.1	18.0	8.5	13.3
	200	13.6	8.7	8.5	0.1	22,070	581	0.77	62	94	8.7	2.1	17.5	6.8	13.5
Mint	0	11.6	7.6	7.2	0.4	21,199	2,033	0.68	63	94	8.1	2.0	17.5	7.3	13.3
	50	11.8	7.9	7.6	0.3	21,780	1,452	0.69	62	94	8.1	2.1	18.0	7.5	13.5
	100	13.2	8.7	8.3	0.4	24,684	2,033	0.67	62	94	8.0	2.0	20.5	7.0	13.5
	150	12.7	8.5	7.8	0.7	22,651	3,194	0.68	62	94	8.0	2.0	19.0	6.5	13.5
	200	13.3	8.4	8.2	0.3	23,522	1,452	0.69	62	94	8.0	2.1	19.5	7.3	13.5
LSD0.05*		1.0	0.7	0.6	0.3	1,711	1,308	0.02	1	0	0.1	0.03	0.9	0.4	0.4

*If difference in a pair of means in a column is less than the LSD value, they are not significantly different at P ≤ 0.05 by Fisher's Least Significant Difference test.

Figure 1. Tractor and equipment used for liquid N sidedress application for a supersweet corn fertility trial grown at the OSU Vegetable Research Farm in 2023.

Figure 2. Supersweet corn fertility trial at V5-V6 following liquid N application grown at the OSU Vegetable Research Farm in 2023.

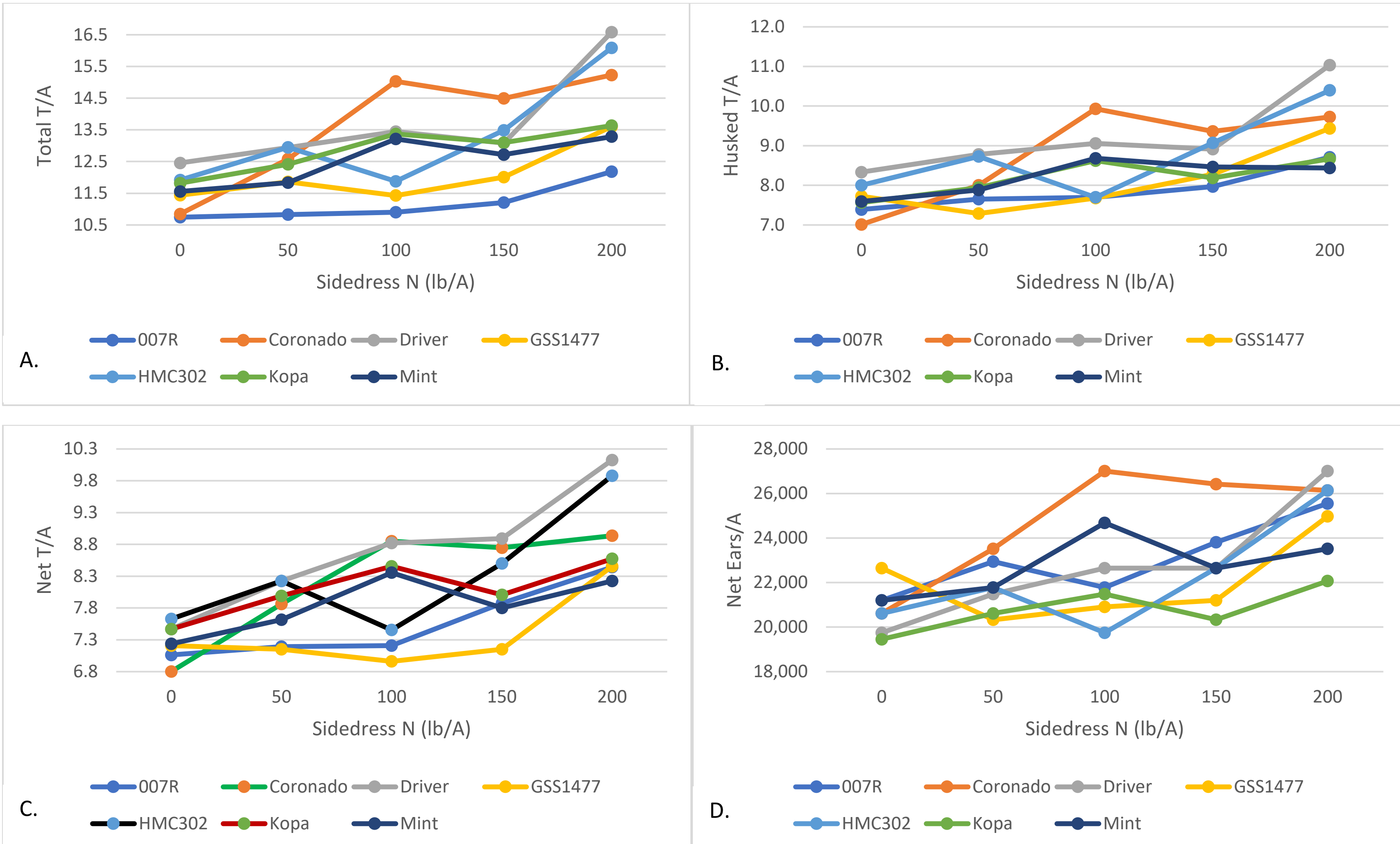

Figure 3. Yield response for seven supersweet corn hybrids grown at five sidedress N levels at the OSU Vegetable Research Farm in 2023. A. Total T/A yield (husk + ear weight), B. Husked T/A, C. Net T/A and D. Net ears/A.

Research/Extension Progress Report for 2023-2024 Funded Projects Progress Report for the Agricultural Research Foundation Oregon Processed Vegetable Commission

<u>Title</u>
Expanding on the Oregon Green Bean awareness campaign

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<u>Funding History</u>
$16,326 (for 2023-24)
$24,657 (for 2022-23)

<u>Abstract</u>
The overall objective of the “Expanding on the Oregon Green Bean awareness campaign” project is to educate regional consumers, culinary professionals, retailers and distributors about the history and sensory quality of Oregon green beans and their value and use as a local frozen vegetable. This project will expand on the previously OPVC funded “Creating an Oregon Green Bean awareness campaign” to roll out and promote the campaign in person at an *Oregon Green Bean Fest* event and through social media. The impacts will include increased knowledge on how to use frozen green beans and interest in home cooking with frozen green beans, as well as increased awareness of the history and culinary value of green beans in Oregon.

<u>Key Words</u>
Green beans, Oregon, Agriculture, History, Willamette Valley, frozen, vegetables, local

<u>Objectives</u>
Objective 1: Organize an Oregon Green Bean Fest – a public event for education, engagement, and distribution of marketing materials to consumers
Objective 2: Promote the story, history, and culinary value of Oregon green beans
Objective 3: Distribute frozen green beans to consumers along with cooking tips and recipes
Objective 4: Promote Oregon green beans through social media channels during the holiday season

<u>Procedures</u>
<u>Objective 1: Organize an Oregon Green Bean Fest – a public event for education, engagement, and distribution of marketing materials to consumers</u>

CBN has been organizing Fests (short for “festival”) with Wellspent Market in Portland for several years to promote various vegetables and grains including the annual Tomato Fest in September 2021 and 2022 which attracted over 350 attendees each year. These fests are celebrations of local food, home cooking, eating, and community. They are free public events where people can taste, connect, interact, and learn.

The Oregon Green Bean Fest will be a free, four-hour event open to the public and organized in collaboration with host Wellspent Market in July or August 2023. The Fest will include 6-8 community participants with booths for education, tasting and sales. Educational booths will feature green beans, both fresh and frozen. The fresh booth will be managed by OSU bean breeder Jim Myers who will bring 4-6 fresh green bean lines from his breeding program for consumer tasting. During the Tomato Fest (Sept '21 and '22) the OSU Dry-Farm Collaborative used the opportunity to send attendees home with to-go tasting bags using QR codes which resulted in over 200 tasting results from consumers blind tasting irrigated vs non-irrigated and grafted vs non-grafted tomatoes for a research project. Oregon Green Bean Fest attendees will have the unique experience to taste new and in-development cultivars and engage in conversation and share opinions with the breeder (Myers). Myers will use this consumer input to guide his bean breeding work.

At the event, OPVC will have the opportunity to manage a booth to educate consumers on commission goals and products. Frozen green bean sample packets can be distributed to attendees along with the frozen green bean recipe cards to encourage consumers to try cooking with frozen beans at home. OPVC can also use this venue to distribute the Eat Oregon Green Beans! posters and Green Bean Zines to promote the Oregon Green Bean story, recipes and cooking tips.

A couple local food vendors will be invited to sell dishes featuring green beans. Jim Dixon, Wellspent Market owner, and/or other local culinary educators will provide demonstrations (and tasting samples) on how to use green beans (fresh and frozen) in home recipes. Other community partners that share goals in educating and promoting Oregon green beans will be invited to participate if space is available.

Objective 2: Promote the story, history and culinary value of Oregon green beans
The 1500-word article by journalist Margarett Waterbury will soon be published online at Medium. Promotion of this piece will occur during the Oregon Green Bean Festa in the summer, and again during the holiday months of November and December through social media. It will be also sent to journalists and businesses that may be interested in sharing this historical and cultural story with their audience.

Objective 3: Distribute frozen green beans to consumers along with cooking tips and recipes
As described under Objective 1, during the Festa, frozen Flav R Pac green bean sample packets and/or Flav R Pac coupons will be distributed to attendees along with the frozen green bean recipe cards to encourage consumers to try cooking with frozen beans at home. The Green Bean Zines which include recipes and cooking tips will also be distributed during the Festa. Local culinary educators will provide demonstrations (with tasting samples) on how to use green beans (fresh and frozen) in home recipes.

Objective 4: Promote Oregon green beans through social media channels during the holiday season
Considering the popularity of green bean casserole and similar dishes during the holiday months of November and December, cooking tips, recipes and content developed in the first year of this project will be used for frozen green bean promotion.

Accomplishments

Objective 1: Organize an Oregon Green Bean Fest – a public event for education, engagement, and distribution of marketing materials to consumers
A Green Bean Fest took place on August 5, 2023 at Wellspent Market which attracted 250-300 attendees to learn about the history of green beans in Oregon and taste green beans in new ways. Some photos can be seen here. During the event, Matthew Cook and Tony Shepard from the OPVC had a booth where they distributed the Green Bean Zine, Oregon Green Bean posters and free coupons for frozen green beans. OSU bean breeder Jim Myers had a display to educate attendees on the history of Oregon green beans and has samples from his green bean breeding lines for people to taste and provide feedback. Another booth featured demonstrations of cooking with frozen green beans by trusted local culinary favorites Jim Dixon of Wellspent Market and Heather Arndt-Anderson of OPB Superabundant. Attendees were able to taste the dishes and take home the recipes. Attendees also had the opportunity to taste green bean sandwiches and soft serve ice cream.

Objective 2: Promote the story, history and culinary value of Oregon green beans
Two articles by journalist Margarett Waterbury have been published online at Medium. Titles are "From South America to Midwest Canning Jars" and "Blue Lake: How a Bean with Roots in California Conquered the Willamette Valley". These articles have been shared and promoted through the Culinary Breeding Network Instagram account (27.5k followers), through the CBN newsletter (2k subscribers) and through the CBN YouTube channel (1850 subscribers).

The Oregon Green Bean Zine is published with open access on the CBN website and had 450 views in 2023. In addition to being distributed at the Green Bean Fest and to 200 members of the People's Coop in SE Portland.

Heather Arndt Anderson, a Portland-based culinary historian and ecologist who writes the OPB Superabundant weekly newsletter, published an article "Oregon's legume legacy amounts to more than a hill of beans" in September 2023 to the OPB website.

Objective 3: Distribute frozen green beans to consumers along with cooking tips and recipes
During the Green Bean Fest, free coupons for Stahlbush and Flav R Pac frozen green beans were distributed to attendees along with the frozen green bean recipe cards to encourage consumers to try cooking with frozen beans at home. The Green Bean Zines which include recipes and cooking tips were also distributed during the Fest and to 200 People's Coop members. During the Green Bean Fest, two local culinary educators provided cooking demonstrations (with tasting samples) on how to use frozen green beans in home recipes. Jim Dixon's "Green Beans Agrodolce" recipe was included in the Willamette Week "What we are cooking this week" column and provided some history of beans in Oregon for the article.

Objective 4: Promote Oregon green beans through social media channels during the holiday season
The Oregon Green Bean articles, zine, and recipes were shared through the CBN Instagram account (>27.5k) and distributed in a CBN newsletter (2k). The content reached more than 12,500 people.

Impacts
Increased interest in home cooking with frozen green beans.
Increased knowledge on how to use frozen green beans.
Increased awareness of the history and culinary value of green beans in Oregon.

Relation to Other Research
This extension effort compliments the breeding work of Jim Myers.

Research/Extension Progress Report for 2023-2024 Funded Projects Progress Report for the Agricultural Research Foundation / Oregon Processed Vegetable Commission

Title: The Corn Earworm Conundrum: using VegNet data and resources to reassess activity patterns of an important pest

Project leaders: Jessica Green, Silvia Rondon, and Len Coop; Oregon IPM Center 4574 SW Research Way, Corvallis, OR 97331-7304
Cooperators: Kyleah Rabe, Emma Slone, Thomas Barnett, Jessica Blakley, Mike Christensen, Matt Cook, Peter Kenagy, OSU Vegetable Research Farm

Funding history:
2020-21: $18,364
2022-23: none requested
2023-24: $14,781

ABSTRACT

VegNet is a regional pest monitoring, detection, and alert service designed to benefit the Oregon processed vegetable industry. It has been operational for 25 years and is now an integral resource for many people. The program provides activity data, based on passive and active sampling, of 10+ species of common insect pests. Crops monitored include broccoli, cauliflower, sweet corn, and snap beans. Each week between May and September, subscribers receive a summary of data trends at each site, potential impacts, and other items of interest regarding vegetable crop production. Cooperating growers and ag industry representatives then use the data to make informed IPM decisions. The program is free and utilized by home gardeners, OSU Extension personnel, state agencies, and the general public. Many of the species we track have wide host ranges (grasses, small fruits, nursery stock, etc.) and because monitoring occurs throughout the mid-Willamette Valley, subscribers often 'tune in' to become informed of possible outbreaks that might affect them. Comparative analyses between sites and years can reveal trends that directly inform pest management priorities. Counts are reported on an interactive dashboard, and a research blog is maintained to provide more information about pest biology and activity trends.

KEYWORDS: insect, monitoring, sweet corn, IPM, pest, corn earworm, broccoli, cauliflower

OBJECTIVES

1. Conduct an intensive review of factors affecting variance in date of first catch, relation to environmental factors, and latitudinal arrival patterns of corn earworm adult moths.

2. Document sweet corn development at each monitoring site, input data into existing crop phenology calculator and mapping program for reporting. Sample for corn earworm larvae in cooperator fields and document planting date and pesticide use as possible indicators of pressure, both at silk and just before harvest.

PROCEDURES

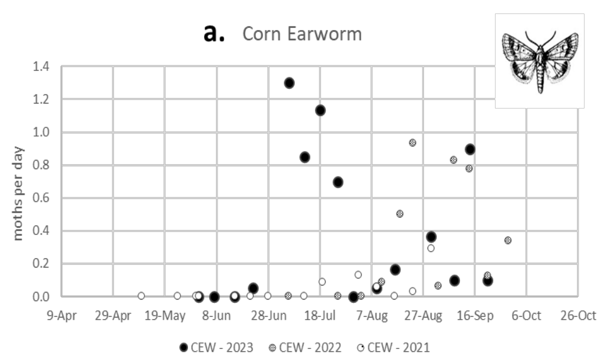
Field sites were selected based on target crop, relative geographical location, and grower cooperation. At each location, 'Texas cone' wire mesh traps were placed at field edges and baited with pheromone lures. These traps are considered the industry standard for non-light emitting passive sampling of target moth species within Lepidoptera:Noctuidae. Plastic bucket traps are another viable option, and were used at some of the brassica sites. Other passive sampling efforts included yellow sticky cards and delta wing traps. Sticky traps were used to monitor cucumber beetles, Hemipteran pests, and smaller moths. Monitoring was conducted from 1 June to 21 September 2023. Lures were changed every 4 weeks. New this year, we utilized a mobile app to input trap data into an Arc-GIS system. Data then populates the interactive dashboard of the [Oregon Pest Monitoring Network](). Direct sampling was conducted periodically and included sweep nets, leaf pulls, and root examination. An oral presentation overview of VegNet was given in the general vegetable session of the [Pacific Northwest Vegetable Association's Annual Conference and Trade Show]() on 15 November 2023, Kennewick, WA.

ACCOMPLISHMENTS

OBJ. 1 - *Regional pest monitoring and reporting.*

Corn earworm (CEW) activity in a region varies each year, and differences can be substantial. Corn earworm moths were detected on 25 July. The regional average was about 1 moth/day during July, which is higher than normal (FIG. 1a), but the average was greatly influenced by a fresh market sweet corn field in Albany. This grower had successional plantings in a small area, and trap counts were between 23 and 35 moths per week, versus 0 to 5 per week at all other locations.

Data comparisons of corn earworm activity between years is ongoing. Oregon IPM Center's phenology expert, Dr. Len Coop, is now retired, but has agreed to assist with analysis for this project. The current USPest.org model considers first silk as a biofix for corn earworm, with a default of 1 August, which places a treatment window between 5-17 August. As seen in figure 1a, that would have been appropriate for most locations, but did not account for the early hatch (and silking) at the Albany site.



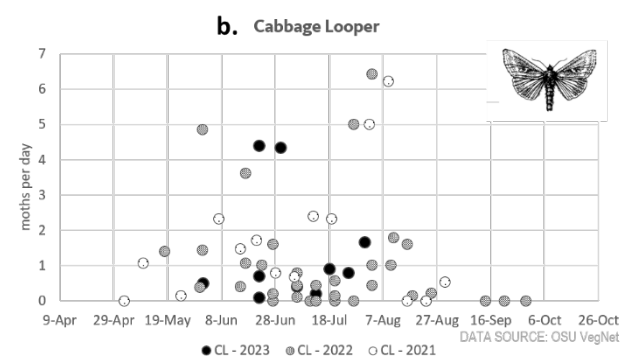
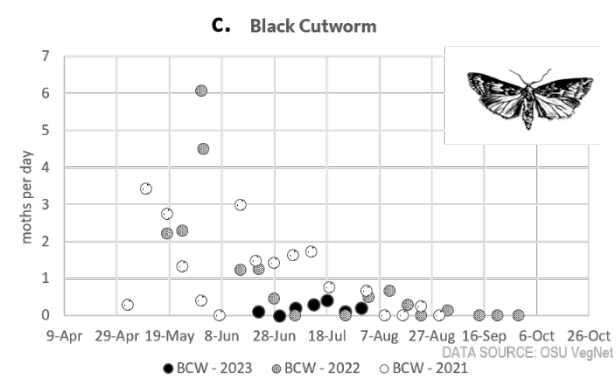


FIGURE 1. Activity trends for corn earworm (a) were abnormal, but greatly influenced by one fresh market field. The regional average of looper moths (b) was within historical norms, and black cutworm (c) was notably low.



Black cutworm activity (FIG 1c) remained very low throughout June and July, but it is likely that we missed a spring flight that is commonly detected in prior years. Again, logistical issues prevented data collection from late April to mid-June. Looper levels (FIG. 1b) were within normal limits, with some fields experiencing higher pressure than others.

OBJ. 2 – *Sweet corn development*

Direct comparison between sweet corn phenology and larvae earworm pressure was not able to be performed this year. Reasons include: limited availability of student workers to visit field sites (one did not drive, and another chose to pursue a lab-based cutworm study), a late start in identifying field sites, and other factors. If this is still of interest, to pursue, I could continue this objective next year. but it will require more coordinated communication, and should be done on a grower cooperator field, rather than the vegetable research farm, where planting dates and plot sizes may not be representative of commercial production.

IMPACTS

Being an invited speaker at PNVA was a highlight of the year. It provided more visibility for the program, and resulted in some good networking opportunities. Of about 150 attendees at the session, only 10 or so had heard of VegNet. We decided to apply for some research funding from PNVA this year, and it has been awarded for the 2024-5 season, in hopes that a match can come from OPVC.

One of the benefits of having data automatically upload into a digital hub is that it can be easily retrieved, and statistically analyzed. An example of output is shown in the Appendix. This format will help in the future, so that we can compare between years or even compare trap counts of a certain pest between one commodity and another (black cutworm in vegetables vs. grass seed, for instance).

RELATION TO OTHER RESEARCH / EXTENSION / PERSONAL NOTE

A concurrent project monitoring *Diabrotica* beetles was conducted this year, in collaboration with a National Corn Rootworm IPM Working Group. This work was presented at the Pacific Northwest Insect Management Conference in Portland, OR on 9 January 2024. Proceedings from the conference are available (pg. 41).

The recent transition of Ms. Green's employment from OSU Dept. of Horticulture to a split appointment between Oregon IPM Center and the Pesticide Safety Education Program has had mixed consequences. While both roles have brought opportunity to partner with other faculty and stakeholders (e.g. Dr. Seth Dorman and the Oregon Pest Monitoring Network, training pesticide applicators), additional responsibilities have, at times, contributed to overload and diluted effort. Both programs now have new faculty, however, so some of the work Ms. Green was doing has been transferred to them.

APPENDIX – DATA

Color-coded data summaries were offered to subscribers during the peak activity months, and all data were retained on a server operated by our USDA-ARS collaborator. This will help with future analyses and data sharing if that ever becomes of interest.

site_ID	Date	Target Pest	Average Count/Day	Raw Count	County	Crop Type	Vegetables
ALBN.2	7/18/2023	Alfalfa Looper	**1.0**	5	Linn	Vegetables	Spinach
ALBN.2	7/18/2023	Beet Armyworm	**1.8**	9	Linn	Vegetables	Spinach
HWY34	7/25/2023	Beet Armyworm	**0.0**	0	Linn	Vegetables	Broccoli
LKSD	7/25/2023	Beet Armyworm	**0.1**	1	Benton	Vegetables	Snap Beans
AURO	7/19/2023	Bertha Armyworm	**1.0**	6	Marion	Vegetables	Broccoli
LKSD	7/13/2023	Black Cutworm	**0.3**	2	Benton	Vegetables	Sweet Corn
LKSD	7/18/2023	Black Cutworm	**0.4**	2	Benton	Vegetables	Sweet Corn
DVRC	7/20/2023	Black Cutworm	**0.0**	0	Benton	Vegetables	Snap Beans
LKSD	7/25/2023	Black Cutworm	**0.1**	1	Benton	Vegetables	Sweet Corn
LKSD	7/13/2023	Cabbage Looper	**0.2**	1	Benton	Vegetables	Snap Beans
ALBN.2	7/18/2023	Cabbage Looper	**0.2**	1	Linn	Vegetables	Spinach
LKSD	7/18/2023	Cabbage Looper	**1.6**	8	Benton	Vegetables	Snap Beans
HWY34	7/25/2023	Cabbage Looper	**1.2**	12	Linn	Vegetables	Broccoli
LKSD	7/25/2023	Cabbage Looper	**0.4**	3	Benton	Vegetables	Snap Beans
ALBN.1	7/11/2023	Corn Earworm	**1.7**	12	Linn	Vegetables	Sweet Corn
AURO	7/11/2023	Corn Earworm	**0.0**	0	Marion	Vegetables	Sweet Corn
ALBN.1	7/18/2023	Corn Earworm	**3.4**	17	Linn	Vegetables	Sweet Corn
LKSD	7/18/2023	Corn Earworm	**0.0**	0	Benton	Vegetables	Sweet Corn
AURO	7/19/2023	Corn Earworm	**0.0**	0	Marion	Vegetables	Sweet Corn
LKSD	7/25/2023	Corn Earworm	**0.7**	5	Benton	Vegetables	Sweet Corn
AURO	7/11/2023	Diabrotica	**0.2**	2	Marion	Vegetables	Sweet Corn
CRVO 2.5	7/13/2023	Diabrotica	**0.4**	3	Linn	Research C	Sweet Corn
LKSD	7/18/2023	Diabrotica	**1.6**	8	Benton	Vegetables	Sweet Corn
AURO	7/19/2023	Diabrotica	**0.3**	2	Marion	Vegetables	Sweet Corn
DVRC	7/20/2023	Diabrotica	**0.5**	1	Benton	Vegetables	Snap Beans
LKSD	7/25/2023	Diabrotica	**1.9**	13	Benton	Vegetables	Sweet Corn
HWY34	7/25/2023	Diamondback Moth	**2.0**	20	Linn	Vegetables	Broccoli
ALBN.2	7/18/2023	W. Yellowstriped Armyworm	**0.6**	3	Linn	Vegetables	Spinach
LKSD	7/18/2023	W. Yellowstriped Armyworm	**0.6**	3	Benton	Vegetables	Sweet Corn
LKSD	7/25/2023	W. Yellowstriped Armyworm	**0.1**	1	Benton	Vegetables	Sweet Corn

Average Count/Day	July 13th-20th	
	LTAVE	2023AVE
Alfalfa Looper	0.8	1.0
Beet Armyworm	n/a	1.8
Bertha Armyworm	0.1	1.0
Black Cutworm	0.8	0.2
Cabbage Looper	15.3	0.7
Corn Earworm	0.3	1.1
Diabrotica	1.3	0.7
Diamondback Moth	11.2	n/a
W. Yellowstriped Armyworm	n/a	0.6

unique_ID	site_ID	date	time	target_pest	nontarget_	nontarget_	notes	crop_devel	collector_ir	beneficial_	beneficial_	days_betw	pest_count	pest_count	pest_count	county	sample_m	pheromone
3498	CRVO 4	6/1/2023	8:10:10	Cabbage Looper	NA	NA	NA	NA	ES	NA	NA	2	0.5	1	3.5	Linn	Pheromone	Bucket Trap
3494	CRVO 2	6/1/2023	8:03:24	Corn Earworm	NA	NA	NA	NA	ES	NA	NA	2	0	0	0	Linn	Pheromone	Bucket Trap
3496	CRVO 2.5	6/1/2023	8:03:46	Diabrotica	NA	NA	Card not changed	NA	ES	NA	NA	2	0	0	0	Linn	Passive Sam	NA
3497	CRVO 3	6/1/2023	8:09:54	Diamondback Moth	NA	NA	NA	NA	ES	NA	NA	2	0	0	0	Linn	Pheromone	Delta Trap
3556	VF	6/6/2023	5:25:06	Corn Earworm	Possible BA	1	NA	NA	Jg	NA	NA	5	0	0	0	Benton	Pheromone	Bucket Trap
3557	VF	6/6/2023	5:25:34	Diabrotica	NA	NA	NA	Not up yet	Jg	NA	NA	5	0	0	0	Benton	Passive Sam	NA
3579	CRVO 2	6/8/2023	9:08:48	Corn Earworm	NA	NA	NA	NA	ES	NA	NA	7	0	0	0	Linn	Pheromone	Bucket Trap
3580	CRVO 2.5	6/8/2023	9:09:33	Diabrotica	NA	NA	NA	NA	ES	Coleoptera	2	7	0	0	0	Linn	Passive Sam	NA
3666	VF	6/15/2023	8:37:58	Corn Earworm	NA	NA	NA	NA	ES	NA	NA	7	0	0	0	Benton	Pheromone	Bucket Trap
3667	VF	6/15/2023	8:38:27	Diabrotica	NA	NA	2 neuroptera Card changed today	NA	ES	Coleoptera	2	5	0.2	1	1.4	Benton	Passive Sam	NA
3784	ALBN_1	6/22/2023	8:01:22	Bertha Cutworm	NA	NA	Beet, not Bertha, need a new option e	NA	ES	NA	NA	7	0.4	3	3	Linn	Pheromone	Bucket Trap
3782	HW34	6/22/2023	7:32:50	Bertha Cutworm	NA	NA	Beet not Bertha - add exigua	NA	ES	NA	NA	7	2.7	19	19	Linn	Pheromone	Bucket Trap
3772	LKSD_1	6/22/2023	5:47:06	Black Cutworm	Glassy Cutw	1	NA	NA	ES	NA	NA	7	0.1	1	1	Benton	Pheromone	Hartstack T
3786	ALBN_1	6/22/2023	8:03:57	Cabbage Looper	NA	NA	NA	NA	ES	NA	NA	7	4.4	31	31	Linn	Pheromone	Bucket Trap
3780	HW34	6/22/2023	7:29:11	Cabbage Looper	NA	NA	NA	NA	ES	NA	NA	7	0.1	1	1	Linn	Pheromone	Hartstack T
4085	HW34	6/22/2023	7:29:11	Cabbage Looper	NA	NA	NA	NA	ES	NA	NA	7	0.7	5	5	Linn	Pheromone	Hartstack T
3774	LKSD_1	6/22/2023	5:54:33	Corn Earworm	NA	NA	First CEW of the year!	NA	ES	NA	NA	7	0.1	1	1	Benton	Pheromone	Hartstack T
3765	VF	6/22/2023	4:48:44	Corn Earworm	NA	NA	NA	NA	ES	NA	NA	7	0	0	0	Benton	Pheromone	Bucket Trap
3773	LKSD_1	6/22/2023	5:49:38	Diabrotica	NA	NA	NA	NA	ES	NA	NA	7	1	7	7	Benton	Passive Sam	NA
3766	VF	6/22/2023	4:49:16	Diabrotica	NA	NA	NA	NA	ES	Neuroptera	1	7	0	0	0	Benton	Passive Sam	NA
3781	HW34	6/22/2023	7:31:02	Diamondback Moth	NA	NA	NA	NA	ES	NA	NA	7	0.3	2	2	Linn	Pheromone	Delta Trap
3902	HWY34	6/29/2023	9:32:15	Bertha Cutworm	Crambid m	9	Also WAW, faded and smaller though,	NA	Jg	NA	NA	7	0	0	0	Linn	Pheromone	Bucket Trap
3908	HWY34	6/29/2023	9:42:53	Cabbage Looper	Raspberry l	2	Tons of lacewings also lady beetles an	NA	Jg	Neuroptera	50	7	3.9	27	27	Linn	Pheromone	Hartstack T
3901	HWY34	6/29/2023	9:22:06	Diamondback Moth	NA	NA	Flea beetles starting but damage not l	NA	Jg	NA	NA	7	1.7	12	12	Linn	Pheromone	Delta Trap
3929	LKSD	6/30/2023	4:49:47	Black Cutworm	NA	NA	NA	NA	Jg	NA	NA	8	0	0	0	Benton	Pheromone	Hartstack T
3928	LKSD	6/30/2023	4:44:17	Cabbage Looper	NA	NA	NA	Cotyledon	Jg	NA	NA	8	4.8	38	33.3	Benton	Pheromone	Bucket Trap
3931	LKSD	6/30/2023	4:58:20	Diabrotica	NA	NA	NA	NA	Jg	NA	NA	8	1	8	7	Benton	Passive Sam	NA
3930	LKSD	6/30/2023	4:56:40	Western Yellowstrip	NA	NA	In CEW, (t wds south) no CEw	NA	Jg	NA	NA	8	1	8	7	Benton	Pheromone	Hartstack T
4004	ALBN_1	7/6/2023	6:37:29	Bertha Cutworm	NA	NA	Beet, not Bertha, need a new option entered =S.exigua thanks 1 glassy cutworm	NA	ES	NA	NA	10	1	10	7	Linn	Pheromone	Bucket Trap
4034	ALBN_1	7/6/2023	6:37:29	Bertha Cutworm	WYS	5	Beet, not Bertha, need a new option entered =S.exigua thanks 2 glassy cutworm	NA	ES	NA	NA	5	0.8	4	5.6	Linn	Pheromone	Bucket Trap
4007	HW34	7/6/2023	7:30:55	Bertha Cutworm	NA	NA	Beet not Bertha - add exigua	NA	ES	NA	NA	6	0.5	3	3.5	Linn	Pheromone	Bucket Trap
4081	HW34	7/6/2023	7:30:55	Bertha Cutworm	WYS	2	Beet not Bertha - add exigua	NA	ES	NA	NA	6	0	0	0	Linn	Pheromone	Bucket Trap
4010	LKSD	7/6/2023	7:51:50	Black Cutworm	Saved	3	3 smaller could be faw plus 1 WAW er	NA	Jg	NA	NA	6	0.2	1	1.2	Benton	Pheromone	Hartstack T
4005	ALBN_1	7/6/2023	6:41:36	Cabbage Looper	NA	NA	NA	NA	ES	NA	NA	10	0.9	9	6.3	Linn	Pheromone	Bucket Trap
4033	ALBN_1	7/6/2023	6:41:36	Cabbage Looper	NA	NA	1 glassy cutworm	NA	ES	NA	NA	5	0.2	1	1.4	Linn	Pheromone	Bucket Trap
4006	HWY34	7/6/2023	7:28:15	Cabbage Looper	Raspberry l	2	Tons of lacewings also lady beetles an	NA	ES	NA	NA	6	0	0	0	Linn	Pheromone	Hartstack T
4014	LKSD	7/6/2023	8:06:15	Cabbage Looper	Same, save	3	Water on, sand looks good so far but l	NA	Jg	NA	NA	6	0.5	3	3.5	Benton	Pheromone	Bucket Trap
4003	ALBN.1	7/6/2023	5:34:28	Corn Earworm	NA	NA	Other beneficial: 3 neuroptera 1 Hymenoptera	NA	ES	Coleoptera	1	9	3.9	35	27.2	Linn	Pheromone	Bucket Trap
4013	LKSD	7/6/2023	7:58:37	Corn Earworm	NA	NA	Still 0? No CEW here yet?	NA	Jg	NA	NA	6	0	0	0	Benton	Pheromone	Hartstack T
4074	LKSD	7/6/2023	7:58:37	Corn Earworm	False CEW	1	Still 0? No CEW here yet?	NA	Jg	NA	NA	6	0	0	0	Benton	Pheromone	Hartstack T
4012	LKSD	7/6/2023	7:54:53	Diabrotica	NA	NA	NA	NA	Jg	Neuroptera	1	6	1.5	9	10.5	Benton	Passive Sam	NA
4008	HWY34	7/6/2023	7:31:43	Diamondback Moth	NA	NA	Flea beetles starting but damage not l	NA	ES	NA	NA	6	0.7	4	4.7	Linn	Pheromone	Delta Trap
4082	HWY34	7/6/2023	7:31:43	Diamondback Moth	NA	NA	Change next week	NA	ES	NA	NA	6	0.8	5	5.8	Linn	Pheromone	Delta Trap
4032	ALBN.1	7/11/2023	8:22:41	Corn Earworm	NA	NA	2 false CEW with present underwing s	NA	ES	NA	NA	7	1.7	12	12	Linn	Pheromone	Bucket Trap
4030	AURO	7/11/2023	6:44:41	Corn Earworm	NA	NA	1 false CEW	NA	ES	NA	NA	10	0	0	0	Marion	Pheromone	Hartstack T
4031	AURO	7/11/2023	6:47:00	Diabrotica	NA	NA	Card changed	NA	ES	Coleoptera	5	10	0.2	2	1.4	Marion	Passive Sam	NA
4075	LKSD	7/13/2023	4:54:06	Black Cutworm	WYS	2	3 smaller could be faw plus 1 WAW er	NA	ES	NA	NA	6	0.3	2	2.3	Benton	Pheromone	Hartstack T
4073	LKSD	7/13/2023	4:47:19	Cabbage Looper	WYS	3	Water on, sand looks good so far but l	NA	ES	NA	NA	6	0.2	1	1.2	Benton	Pheromone	Bucket Trap
4099	CRVO 2.5	7/13/2023	6:01:43	Diabrotica	NA	NA	Card not changed	NA	ES	NA	NA	7	0.4	3	3	Linn	Passive Sam	NA
4148	ALBN.2	7/18/2023	5:35:20	Bertha Cutworm	Waw	3	Not Bertha but BEET= exigua; new lu	NA	Jg	Coleoptera	8	5	1.8	9	12.6	Linn	Pheromone	Bucket Trap
4155	LKSD	7/18/2023	9:57:54	Black Cutworm	NA	NA	Also 3WAW but entering separately	NA	Jg	Neuroptera	20	5	0.4	2	2.8	Benton	Pheromone	Hartstack T
4149	ALBN.2	7/18/2023	5:47:09	Cabbage Looper	Alfalfa loo	5	New lure - five nice alfalfa bloopers sa	NA	Jg	NA	NA	5	0.2	1	1.4	Linn	Pheromone	Bucket Trap
4154	LKSD	7/18/2023	9:40:42	Cabbage Looper	Waw	1	New lure	3rd trifolia	Jg	NA	NA	5	1.6	8	11.2	Benton	Pheromone	Bucket Trap
4150	ALBN.1	7/18/2023	6:44:03	Corn Earworm	NA	NA	First planting silks drying second plant	NA	Jg	Neuroptera	12	5	3.4	17	23.8	Linn	Pheromone	Bucket Trap
4157	LKSD	7/18/2023	10:12:27	Corn Earworm	Beet exigua	3	look back - have ever caught CEW her	NA	Jg	NA	NA	5	0	0	0	Benton	Pheromone	Hartstack T
4156	LKSD	7/18/2023	10:06:42	Diabrotica	NA	NA	Also snaps right here too	NA	Jg	Neuroptera	12	5	1.6	8	11.2	Benton	Passive Sam	NA
4196	AURO	7/19/2023	8:12:03	Bertha Cutworm	NA	NA	Too many to count! Will edit later a lo	NA	Jg	NA	NA	6	0	NA	0	Marion	Pheromone	Bucket Trap
4194	AURO	7/19/2023	7:57:27	Corn Earworm	Not sure	1	NA	V6	Jg	NA	NA	6	0	0	0	Marion	Pheromone	Hartstack T
4193	AURO	7/19/2023	7:55:49	Diabrotica	Scmaggot	4	NA	NA	Jg	Neuroptera	8	6	0.3	2	2.3	Marion	Passive Sam	NA
4276	HWY34	7/25/2023	5:53:34	Bertha Cutworm	NA	NA	Not Bertha; beet exigua - new lure to	NA	Jg	NA	NA	10	0	0	0	Linn	Pheromone	Bucket Trap
4280	LKSD	7/25/2023	10:10:04	Black Cutworm	Beet	1	Corn is very weedy also had 1 Waw er	NA	Jg	Neuroptera	10	7	0.1	1	1	Benton	Pheromone	Hartstack T
4279	HWY34	7/25/2023	6:16:59	Cabbage Looper	Rasp looper	1	New lure lots of beneficials lady beetl	NA	Jg	Neuroptera	32	10	1.2	12	8.4	Linn	Pheromone	Hartstack T
4284	LKSD	7/25/2023	10:35:14	Cabbage Looper	NA	NA	NA	3rd trifolia	Jg	NA	NA	7	0.4	3	3	Benton	Pheromone	Bucket Trap
4283	LKSD	7/25/2023	10:25:46	Corn Earworm	NA	NA	*timing	V7	Jg	Neuroptera	18	7	0.7	5	5	Benton	Pheromone	Hartstack T
4282	LKSD	7/25/2023	10:14:56	Diabrotica	NA	NA	Going to move from here and place at	NA	Jg	Neuroptera	10	7	1.9	13	13	Benton	Passive Sam	NA
4277	HWY34	7/25/2023	6:00:51	Diamondback Moth	Scm	4	She looks rough, very patchy big gaps	NA	Jg	NA	NA	10	2	20	14	Linn	Pheromone	Delta Trap
4281	LKSD	7/25/2023	10:13:11	Western Yellowstrip	NA	NA	As an NTO in BCW	NA	Jg	NA	NA	7	0.1	1	1	Benton	Pheromone	Hartstack T
4405	ALBN.2	7/31/2023	4:59:40	Alfalfa Looper	NA	NA	NA	NA	Jg	NA	NA	5	0.8	4	5.6	Linn	Pheromone	Bucket Trap
4414	LKSD	7/31/2023	6:39:35	Alfalfa Looper	NA	NA	Start recording AL as it's own	NA	Jg	NA	NA	6	0	0	0	Benton	Pheromone	Bucket Trap
4407	ALBN.2	7/31/2023	5:04:01	Bertha Cutworm	Glassy	2	Not Bertha but BEET= exigua	NA	Jg	NA	NA	5	3	15	21	Linn	Pheromone	Bucket Trap
4418	HWY34	7/31/2023	8:50:26	Bertha Cutworm	NA	NA	Beet not Bertha need exigua added	NA	KR	NA	NA	6	0.3	2	2.3	Linn	Pheromone	Bucket Trap
4415	LKSD	7/31/2023	6:43:57	Black Cutworm	Waw	1	Waw very small though, ragged	NA	Jg	Neuroptera	25	6	0.2	1	1.2	Benton	Pheromone	Hartstack T
4406	ALBN.2	7/31/2023	5:00:55	Cabbage Looper	NA	NA	NA	NA	Jg	NA	NA	5	1.2	6	8.4	Linn	Pheromone	Bucket Trap
4419	HWY34	7/31/2023	9:01:48	Cabbage Looper	AL	0	No AL	NA	Jg	Neuroptera	7	6	2.5	15	17.5	Linn	Pheromone	Hartstack T
4413	LKSD	7/31/2023	6:38:01	Cabbage Looper	NA	NA	Pulled bucket & lure for water - reset	NA	Jg	NA	NA	6	1.3	8	9.3	Benton	Pheromone	Bucket Trap
4420	HWY34	7/31/2023	9:13:11	Cabbage White Butt	NA	NA	Need visual scan added, this is not a s	NA	KR	NA	NA	1	2	2	14	Linn	Passive Sam	NA
4416	LKSD	7/31/2023	6:48:50	Corn Earworm	NA	NA	NA	V8	Jg	Neuroptera	15	6	0	0	0	Benton	Pheromone	Hartstack T
4412	LKSD	7/31/2023	6:35:02	Diabrotica	NA	NA	Pulled / moved the bucket and this be	NA	Jg	Neuroptera	8	6	2.3	14	16.3	Benton	Passive Sam	NA
4417	HWY34	7/31/2023	8:55:04	Diamondback Moth	NA	NA	NA	NA	ELFUM	NA	NA	6	0	0	0	Linn	Pheromone	Delta Trap
4569	AURO	8/8/2023	9:00:41	Bertha Cutworm	NA	NA	See pic on phone.. field is gone	Gone! Tille	Jg	NA	NA	20	0	NA	0	Marion	Pheromone	Bucket Trap
4568	AURO	8/8/2023	8:50:10	Black Cutworm	NA	NA	Really?	NA	Jg	NA	NA	20	0	0	0	Marion	Pheromone	Bucket Trap
4571	DVCR	8/8/2023	10:25:43	Black Cutworm	NA	NA	But n/a full of water & fallen	NA	Jg	NA	NA	14	0	0	0	Linn	Pheromone	Bucket Trap
4553	ALBN.1	8/8/2023	6:23:08	Corn Earworm	Not sure, s	2	Putting new hercon strip	NA	Jg	Neuroptera	6	10	1	10	7	Linn	Pheromone	Bucket Trap
4567	AURO	8/8/2023	8:48:24	Corn Earworm	NA	NA	Wing fragments bur really n/a becau	V10	Jg	NA	NA	20	0.1	2	0.7	Marion	Pheromone	Hartstack T
4566	AURO	8/8/2023	8:42:45	Diabrotica	NA	NA	... couldn't find WCR... look for pics	V10	Jg	Neuroptera	6	20	1.3	25	8.8	Marion	Passive Sam	NA
4570	DVCR	8/8/2023	10:24:54	Diabrotica	NA	NA	NA	NA	KR	NA	NA	14	0.9	13	6.5	Benton	Passive Sam	NA
4708	ALBN.2	8/15/2023	3:02:16	Alfalfa Looper	NA	NA	1 WYS	NA	ES	NA	NA	15	0.5	8	3.7	Linn	Pheromone	Bucket Trap
4702	ALBN.2	8/15/2023	3:00:12	Bertha Cutworm	Glassy	2	lots of other insects in trap. No benef	NA	ES	NA	NA	15	0	0	0	Linn	Pheromone	Bucket Trap
4707	AURO	8/15/2023	5:07:17	Black Cutworm	NA	NA	Really?	NA	ES	NA	NA	6	0.2	1	1.2	Marion	Pheromone	Bucket Trap
4704	ALBN.1	8/15/2023	4:07:22	Corn Earworm	NA	NA	First planting silks drying second plant	NA	Jg	NA	NA	25	0.5	13	3.6	Linn	Pheromone	Bucket Trap
4705	AURO	8/15/2023	5:05:29	Corn Earworm	NA	NA	NA	NA	ES	NA	NA	25	0	0	0	Marion	Pheromone	Hartstack T
4716	LKSD	8/17/2023	6:21:22	Alfalfa Looper	NA	NA	Start recording AL as it's own	NA	ES	NA	NA	18	0	0	0	Benton	Pheromone	Bucket Trap
4715	LKSD	8/17/2023	6:20:47	Corn Earworm	Beet exigua	3	look back - have ever caught CEW her	NA	ES	NA	NA	29	0	0	0	Benton	Pheromone	Hartstack T
4756	ALBN.2	8/21/2023	7:51:34	Beet Armyworm	NA	NA	Done... pulling	Harvest ra	Jg	NA	NA	12	1.5	18	10.5	Linn	Pheromone	Bucket Trap
4757	HWY34	8/21/2023	9:25:30	Beet Armyworm	NA	NA	NA	Harvest	Kr	NA	NA	7	0.7	5	5	Linn	Pheromone	Bucket Trap
4755	ALBN.2	8/21/2023	7:45:41	Cabbage Looper	NA	NA	NA	Harvest	Jg	Hymenopte	Yellowjack	12	0.4	5	2.9	Linn	Pheromone	Bucket Trap
4758	HWY34	8/21/2023	9:32:17	Cabbage Looper	NA	NA	Pic on phone - yay for beneficials!	Harvest	Kr	Hymenopte	80	7	10	70	70	Linn	Pheromone	Bucket Trap
4770	AURO	8/22/2023	7:26:33	Black Cutworm	NA	NA	1 GCW	NA	ES	NA	NA	7	0.3	2	2	Marion	Pheromone	Bucket Trap
4768	LKSD	8/22/2023	6:20:56	Black Cutworm	WYA aka w	5	But entering separately TONS of bene	NA	Jg	Coleoptera	40	9	0	0	0	Benton	Pheromone	Hartstack T
4767	LKSD	8/22/2023	6:18:17	Cabbage Looper	NA	NA	Pulling bucket ... issues w trap recover	NA	Jg	NA	NA	9	0.6	5	3.9	Benton	Pheromone	Bucket Trap
4766	ALBN.1	8/22/2023	5:06:25	Corn Earworm	NA	NA	First planting silks drying second plant	NA	ES	NA	NA	7	1	7	7	Linn	Pheromone	Bucket Trap
4771	AURO	8/22/2023	7:28:55	Corn Earworm	NA	NA	NA	NA	ES	NA	NA	7	0	0	0	Marion	Pheromone	Hartstack T
4769	LKSD	8/22/2023	6:27:14	Corn Earworm	Beet armyw	1	SO many beneficial!	Ear develop	Jg	Neuroptera	75	9	0.1	1	0.8	Benton	Pheromone	Hartstack T
4926	AURO	8/29/2023	6:24:32	Black Cutworm	NA	NA	1 GCW	NA	ES	NA	NA	7	0.1	1	1	Marion	Pheromone	Bucket Trap
4930	LKSD	8/29/2023	9:56:39	Black Cutworm	NA	NA	But entering separately TONS of bene	NA	ES	NA	NA	9	0	0	0	Benton	Pheromone	Hartstack T
4928	ALBN.1	8/29/2023	8:41:35	Corn Earworm	NA	NA	First planting silks drying second plant	NA	ES	NA	NA	7	1.1	8	8	Linn	Pheromone	Bucket Trap
4925	AURO	8/29/2023	6:22:49	Corn Earworm	NA	NA	NA	NA	ES	NA	NA	7	0	0	0	Marion	Pheromone	Hartstack T
4929	LKSD	8/29/2023	9:53:12	Corn Earworm	NA	NA	SO many beneficial!	NA	ES	NA	NA	9	0.1	1	0.8	Benton	Pheromone	Hartstack T
5087	AURO	9/7/2023	6:34:39	Black Cutworm	NA	NA	lure changed	NA	ES	NA	NA	10	0	0	0	Marion	Pheromone	Bucket Trap
5077	LKSD	9/7/2023	5:32:56	Black Cutworm	NA	NA	Also many lacewings	Harvesting	Jg	Hymenopte	45	7	0	0	0	Benton	Pheromone	Hartstack T
5092	ALBN.1	9/7/2023	8:28:50	Corn Earworm	NA	NA	lure changed + trap moved to younge	NA	ES	NA	NA	10	0.2	2	1.4	Linn	Pheromone	Bucket Trap
5094	ALBN.1	9/7/2023	8:28:50	Corn Earworm	NA	NA	lure changed + trap moved to younge	NA	ES	NA	NA	10	0.2	2	1.4	Linn	Pheromone	Bucket Trap
5086	AURO	9/7/2023	6:33:17	Corn Earworm	NA	NA	lure changed, crop development phot	NA	ES	NA	NA	10	0	0	0	Marion	Pheromone	Hartstack T
5079	LKSD	9/7/2023	5:42:09	Corn Earworm	NA	NA	But also n/a because top was off... pull	Harvest	Jg	NA	NA	7	0	0	0	Benton	Pheromone	Hartstack T
5078	LKSD	9/7/2023	5:34:04	Western Yellowstrip	NA	NA	NA	NA	Jg	NA	NA	7	0.1	1	1	Benton	Pheromone	Hartstack T
5117	AURO	9/11/2023	5:10:04	Black Cutworm	NA	NA	lure changed	NA	ES	NA	NA	3	0	0	0	Marion	Pheromone	Bucket Trap
5116	AURO	9/11/2023	5:09:10	Corn Earworm	NA	NA	lure changed, crop development phot	NA	ES	NA	NA	3	0	0	0	Marion	Pheromone	Hartstack T
5205	ALBN.1	9/14/2023	5:35:39	Corn Earworm	NA	NA	lure changed + trap moved to younge	NA	ES	NA	NA	7	0.9	6	6	Linn	Pheromone	Bucket Trap
5338	ALBN.1	9/21/2023	5:05:18	Corn Earworm	NA	NA	lure changed + trap moved to younge	NA	ES	NA	NA	7	0.1	1	1	Linn	Pheromone	Bucket Trap