

BIOAg Planning Grant Final Report

TITLE: Increasing local dry bean production and markets through on-farm variety trials and nutrition education.

PRINCIPAL INVESTIGATORS:

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KEY WORDS

Heirloom, dry beans, variety trials, on-farm selection, nutrition education.

ABSTRACT

The goal of the planning grant was to gather baseline data regarding local dry bean production and farmgate sales, as well as for local market demand in Whatcom County. We developed a production and marketing survey for dry beans, and due to high interest from stakeholders in the region, we distributed a survey to approximately 700 people in a 12-county region. Of the 119 survey respondents, 108 indicated they are growing or would like to grow dry beans. Next we developed and distributed a follow-up questionnaire for the 22 respondents who indicated they have grown dry beans in the area for more than 20 years, and we collected seed of 20 heirloom dry bean varieties that have been grown locally (and seed saved) for 20 or more years. In our preliminary dry bean variety trial at WSU Mount Vernon NWREC in 2012, we found that a dry bean variety that has been in production in the region for more than 50 years matured 3 weeks earlier than the commercial varieties in the trial. On May 22 2013 we planted a new variety trial that includes the 20 local heirloom varieties plus 16 commercial standard varieties. In addition, in response to questions we received regarding differences among dry bean varieties in cooking time and protein content, we: 1) developed one assay to measure water absorption and bean hardness during soaking and a second assay to measure cooking time, with the goal of determining if there is a relationship between water absorption during soaking and cooking time; and 2) determined that it was not possible to use existing grain protein analysis equipment to measure bean protein and it is more cost effective to send samples out for analysis than to purchase new equipment for this purpose. New information generated from the planning grant supported the development of new and pending research grant projects to investigate productivity of heirloom dry bean varieties as well as other grain legumes in the area and a human nutrition education curriculum for K-12 schools in Whatcom County. The long term goal of our program is to increase local

dry bean production, marketing and consumption, which will positively impact human and farm health.

PROJECT DESCRIPTION

Consumer demand for regionally produced staple crops has opened a market opportunity for dry bean production in western Washington (WA). Strong informal seed saving and seed exchange networks have helped maintain and develop a wide diversity of dry bean types throughout North America and including western WA. The diversity of beans are particularly well suited to niche marketing in western WA. In order to support the development of dry beans as a specialty crop in western WA this project seeks to quantify answers to the following questions:

1. What are the primary challenges limiting dry bean production in western WA?
2. How does productivity of western WA heirloom dry beans compare to market standards?
3. What are key cultural factors and dry bean traits that contribute to the selection and development of heirloom dry beans in western WA?

To address these questions we conducted a survey of western WA growers and collected seed of their heirloom dry bean varieties. We are conducting field trials at WSU Mount Vernon to compare agronomic qualities of heirloom dry beans and market standards. We will record interviews with dry bean growers to document the 'story' behind each heirloom dry bean variety.

Dry beans are relatively easy to grow, they are a biological source of nitrogen for the soil, the harvested crop has a long shelf life with minimal input, and many varieties are well suited to production in western Washington (Miles, 2006). Dry beans are also an excellent source of human nutrition and can help prevent heart disease which is the leading cause of death in the U.S. today. However, many Americans regard dry beans as an unattractive food source. Extensive literature has shown that both youth and adult consumers who observe and participate in growing and tasting demonstrations are more likely to regularly consume the targeted food (Blair et al., 1991; Sommerfeld et al., 2010).

In 2012, we conducted a small variety trial at WSU Mount Vernon NWREC to evaluate productivity of 5 dry bean varieties, including 1 variety from a local grower who has been growing and saving seed of this variety for more than 50 years. In addition, we provided seed of 4 of these varieties to 4H and community garden projects. While no publishable information was gathered from distributed seed, awareness has been raised regarding the potential to grow dry beans in the area.

In 2013, we developed and distributed an on-line survey to growers throughout the 12 counties of northwest Washington to establish current dry bean production and marketing trends. We followed up with respondents who are growing dry beans and collected seed of 20 heirloom dry beans that have been grown in the area for more than 20 years. We also developed an assay to measure dry bean hardness and water absorption during pre-cooking soaking, and we developed an assay to measure dry

bean cooking time. Our goal is to determine if there is a correlation between water absorption and cooking time.

The project team met face-to-face and carried out proposal writing activities via email to develop and refine the research protocols, develop collaborative relationships with community partners, and write and submit American Pulse Association (APA), WSDA-SCRI block grant, CAHNRS Emerging Issues research, and WSARE grant proposals.

OUTPUTS

Work Completed:

Objective 1 of this project was to measure current dry bean production and farmgate sales in northwest Washington to establish baseline data that will enable the project team to measure project impact for new research grants. A survey (see Appendix) was distributed February 25, 2013 to primary contacts at Washington State University County Extension including small farm personnel and Master Gardener coordinators in 12 counties (Whatcom, Skagit, San Juan, Island, Snohomish, King, Pierce, Thurston, Mason, Kitsap, Jefferson, Clallam). We requested that primary contacts distribute our survey to regional growers via their established email lists, and it was sent to approximately 700 people including: 147 Master Gardeners in Skagit County and 85 in Jefferson County, 200+ Whatcom Farmers list-serve members, 60-100 Snohomish County Growers Alliance members, 60-100 Sno-Valley Tilth members, and 60-100 Growing Groceries mentors. In addition, an unknown number of producers were reached through San Juan County Farm and Food list-serve, WA Young Farmers Coalition list-serve, Thurston County Farm Bureau, Thurston Food System Council, Thurston Agriculture Advisory Committee, Thurston Conservation District's internal list, Lewis Conservation District's internal list, and Mason Conservation District's internal list. A link to the survey was included in Grow Northwest March 2013 Issue <http://www.grownorthwest.com/wp-content/uploads/2013/03/Grow-March-2013-WEB.pdf>.

Of the 119 survey respondents, 108 indicated they are growing or would like to grow dry beans. Respondents were located in Clallam, Grays Harbor, Island, Jefferson, King, Kitsap, Lewis, Mason, Pierce, San Juan, Skagit, Snohomish, Thurston, and Whatcom Counties. The average dry bean production area was 0.20 acres (N=76). Personal use was ranked as the most important reason for growing dry beans, followed by crop diversity (N=74) (Figure 1). Being unable to dry the beans in the field was ranked as the main challenge limiting dry bean production, followed by high labor demand and lack of access to suitable machinery (N=63) (Figure 2). Currently black beans are the most commonly grown dry bean type, followed by black and white patterned beans. Of the 76 respondents who grew dry beans, 45 indicated that they grow alternative varieties not mentioned in the survey (Figure 3). Additionally, 22 respondents indicated they grow dry beans that have been cultivated in western WA for more than 20 years. The primary market outlets

identified by respondents who grow dry beans are CSA, Farmer's Market and Farm Stand (N=30) (Figure 4).

To develop a better understanding of the factors which lead to the selection and preservation of heirloom dry bean varieties by growers in Western WA, we are developing a follow-up survey for respondents who provided us with seed. We will audio record each survey response, and we have an exemption from WSU Internal Review Board (IRB) for this.

Objective 2 was to survey local buyers to establish local market demand for dry beans in northwest Washington. We did not address this objective in the planning grant.

Objective 3 was to hold monthly meetings of the project team to develop and refine research protocols, develop collaborative relationships with community partners, and write research grant proposals. The team met several times, and under the leadership of Miles and Jones, grant proposals have been submitted. Under the leadership of Betz, new community partnerships have been formed with the Bellingham School District. In 2012, Miles submitted two preliminary proposals, one to WSARE and one to WSDA, however neither of these reached the full proposal stage. Miles also collaborated with a grower to submit a WSARE Producer grant to investigate small-scale dry bean production and threshing in Whatcom County, however this proposal also was not funded. Jones submitted a CAHNRS Emerging Issues research proposal which was not funded. Miles did receive funding from the American Pulse Association, and Miles and Jones received funding from the Northwest Agriculture Research Foundation. Details of funded project are provided below.

Objective 4 (new) was added in response to requests from potential growers to provide production information based on trials in the area. In 2012 we conducted a replicated variety trial at WSU Mount Vernon NWREC with 4 commercial varieties and 1 heirloom variety collected from a local farm. The heirloom variety was ready for harvest 3 weeks earlier than the commercial varieties (Table 1). Through our grower survey, we collected a total of 20 heirloom dry bean varieties, and along with 16 commercial dry bean standard varieties, and we have planted these in a replicated trial at WSU Mount Vernon NWREC (Table 2). We have also developed a laboratory assay to measure dry bean water absorption and bean hardness during pre-cooking soaking. We have also developed a laboratory assay to measure cooking time. Our goal is to determine if there is a relationship between water absorption, bean hardness and cooking time. We also investigated the potential to analyze protein in bean varieties as this information is frequently requested by potential growers and consumers. We partnered with the small grain program at WSU NWREC to assay dry bean protein using their equipment that is utilized to analyze grain protein. Unfortunately the analyses programs do not exist for this equipment for dry beans and in order for us to do these assays we would need to purchase new equipment at the cost of approximately \$60,000 plus pay annual

calibration fees. We then conducted a search for laboratories that can analyze protein in dry beans and found options with costs ranging from \$20 to \$60 per sample. Thus it is more cost effective to send dry bean samples out for protein analysis than to develop a laboratory for this purpose.

Publications, Handouts, Other Text & Web Products:

1. Brower, B., H. Gonzalez and C. Miles. 2013. Western Washington Dry Bean Grower Survey.
2. Field trial and cooking experiment data will contribute to the MS thesis of Kelly Atterberry, Horticulture, and will be submitted for publication in 2015, either collectively or separately.
3. Grower survey and follow-up interviews will contribute to the PhD dissertation of Brook Brower, Crop Science, and will be submitted for publication in the *Journal of Agriculture and Human Values* or a similar peer-reviewed journal, by 2015.
4. Whatcom County Extension: the Bean Project. <http://whatcom.wsu.edu/beans/index.html>.

Outreach and Education:

1. Brower, B. 2012. WSU Mount Vernon Small Grain Field Day, June 28. 100+ attendees.
2. Miles, C, and B. Brower. 2012. WSU Mount Vernon NWREC field day, July 12. 180 attendees.
3. Miles, C. 2013. Growing dry beans in western WA. Padilla Bay Gardening Club. March 14. 20 attendees.
4. Atterberry, K., and C. Miles. 2013. Stanwood Rotary Club with 2 agricultural specialists from New Zealand, WSU Mount Vernon NWREC, May 21. 6 attendees.
5. Brower, B., K. Atterberry, and C. Miles. 2013. Evergreen College undergraduate student tour at WSU Mount Vernon NWREC, May 24. 28 attendees.
6. The survey has also been an intrinsic outreach tool. 700 people received the survey.

IMPACTS

Short-Term: Growers in western Washington have gained awareness about the potential to grow dry beans in the region. One new grower utilized our dry bean thresher and seed cleaner in winter 2012. Dry bean production in the region will be at least 10 acres by 2016.

Intermediate-Term: Americans will regard dry beans as a healthy and attractive food source. As a result, marketers will seek local producers for dry beans. School food programs will connect with local growers to supply dry beans. Local growers will experience increased sales of dry beans, and dry bean production will increase in the region to 100 acres by 2020.

Long-Term: Dry bean consumption will increase through school food programs, and growers will increase sales through farm-to-school programs. School food program directors and Extension nutrition professionals will develop recipes suitable for school lunch programs. Human health and nutrition will improve due to increased dry bean consumption by 2025.

ADDITIONAL FUNDING APPLIED FOR / SECURED

WSARE preproposal (Miles et al.) submitted in 2012, full proposal was not requested. Submitting a new revised preproposal (Jones et al.) in 2013.
WSDA Specialty Crop Block Grant preproposal (Miles et al.) submitted in 2012, full proposal was not requested. Submitted a new revised preproposal (Jones et al.) in 2013 and a full proposal was requested and has been submitted, 'Early Maturing Dry Beans for Specialty Markets in Western Washington' \$ 268,190.
CAHNRS Emerging Issues research proposal (Jones et al.) submitted in 2012, but was not funded.
American Pulse Association proposal (Miles et al.) was funded in 2013, \$42,759.
Northwest Agriculture Research Foundation proposal (Miles and Jones) was funded in 2013, \$14,750.

GRADUATE STUDENTS FUNDED

Research projects of Brook Brouwer, PhD candidate, Crop Science, and Kelly Atterberry, MS candidate, Horticulture, were supported by this grant.

RECOMMENDATIONS FOR FUTURE RESEARCH

1. Evaluate local heirloom dry bean varieties in on-station and on-farm replicated field trials and determine maturity dates and yield in comparison with standard varieties in the same market class.
2. Develop scale-appropriate and affordable equipment for dry bean threshing and seed cleaning.
3. Evaluate nutritional education for youth and adults to determine impacts on dry bean consumption.
4. Test cooking time for dry beans and run correlations between cooking time, water absorption and bean hardness during pre-cooking soaking to see if measurements are correlated and if water absorption and/or bean hardness during soaking can be used to estimate cooking time.

Table 1. Plant height (cm), number of days after seeding to harvest, plant stand at harvest (per A), and bean yield (pounds per acre) at WSU Mount Vernon NWREC in 2012.

Variety	Plant Height @ 100% Flower (cm)	Days after seeding	Harvested No. Plants/Acre	Bean Yield/Acre (lbs)
Eclipse - Black bean	53.3 a	133	40,512	1628.5 a
Lariat - Pinto bean	53.1 a	138	40,076	1678.5 a
Orca - Black and white	33.5 b	145	33,542	721.2 b
Rockwell - White and brown	24.5 c	119	26,790	800.1 b
Silver Cloud - Kidney bean	35.7 b	145	22,216	799.6 b
Significance	<0.0001		0.2674	0.0002

Table 2. Heirloom dry bean varieties collected from growers in western WA.

Entry	Variety	Market Class	Type	County Origin
1	Kring's Cranberry	Cranberry	bush	San Juan
2	Wally's Soldier	Soldier	bush	Clallam
3	Black Coco	Black	bush	Skagit
4	Skyriver Black	Black	bush	San Juan
5	Bale's Cranberry	Cranberry	bush	Skagit
6	Price's Soldier	Soldier	bush	Skagit
7	Youngquist's Swedish Brown Bean	Brown Bean	bush	Skagit
8	Rockwell	Colored-Patterned	bush	Island
9	Decker	Cranberry	bush	Skagit
10	Hutterite	Yellow	bush	Skagit
11	Ireland Creek Annie	Yellow	bush	Skagit
12	Calypso	Black and White	bush	Skagit
13	Montezuma Red	Mexican Red	bush	San Juan
14	Cannellini	White Kidney	bush	San Juan
15	Kring's Lima	Lima	pole	San Juan
16	Lopez Snow Cap	Colored-Patterned	pole	San Juan
17	Henderson Bean	Colored-Patterned	pole	Snohomish
18	Tarheel	Greasy Cut-Short	pole	Skagit
19	Monachine	Colored-Patterned	pole	Pierce
20	Lois' Small White Navy	Navy	pole	Skagit

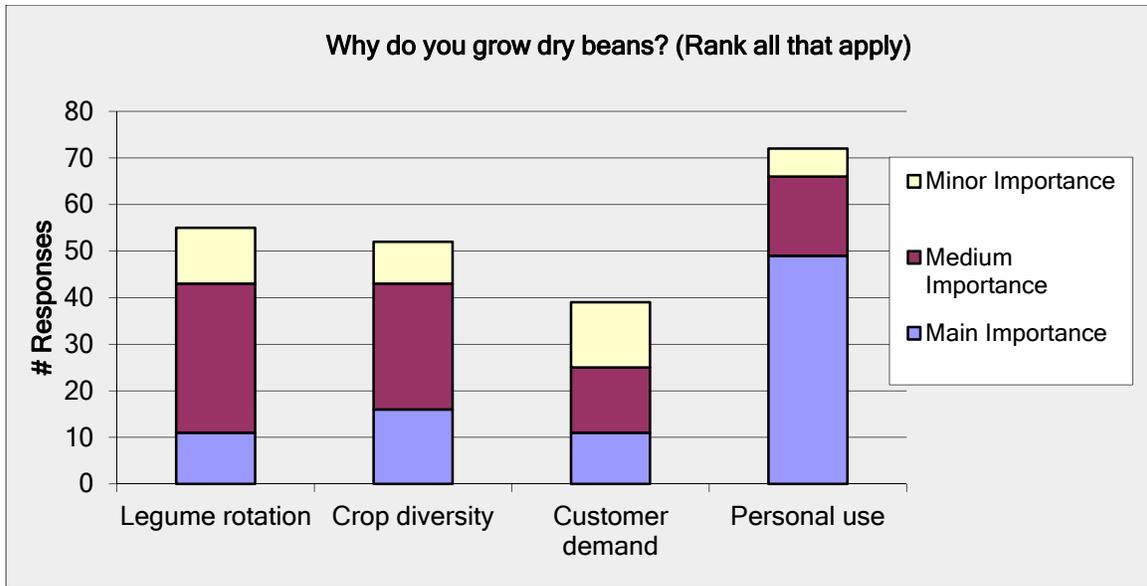


Figure 1. Responses to question “Why do you grow dry beans?”

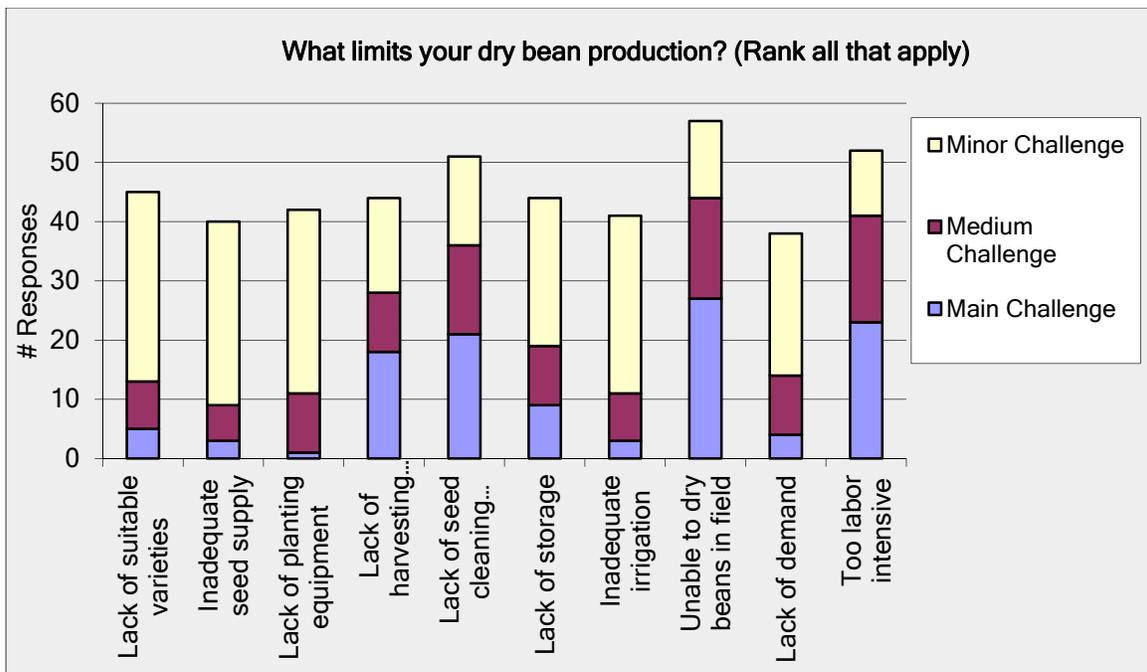


Figure 2. Responses to question “What limits your dry bean production?”

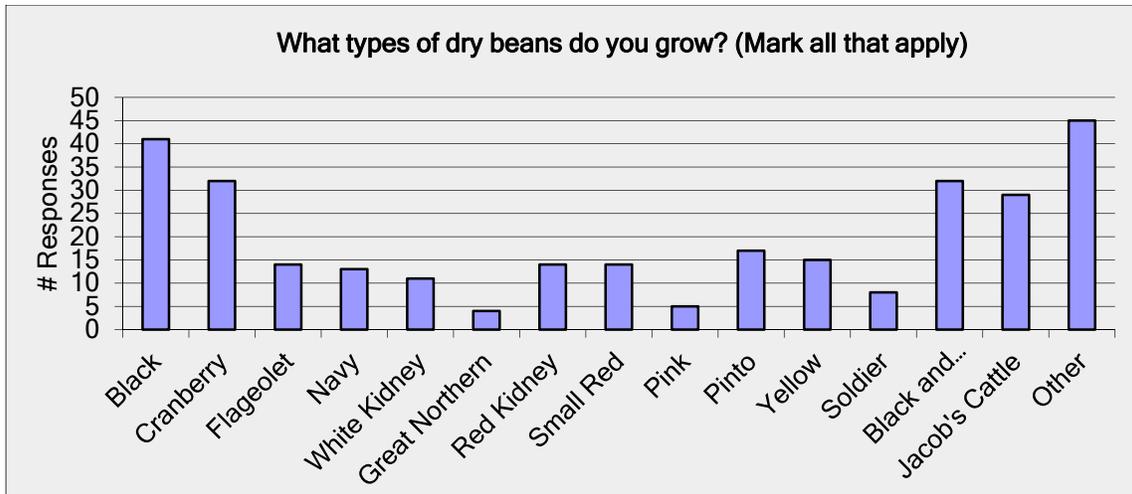


Figure 3. Responses to question, “What types of dry beans do you grow?”

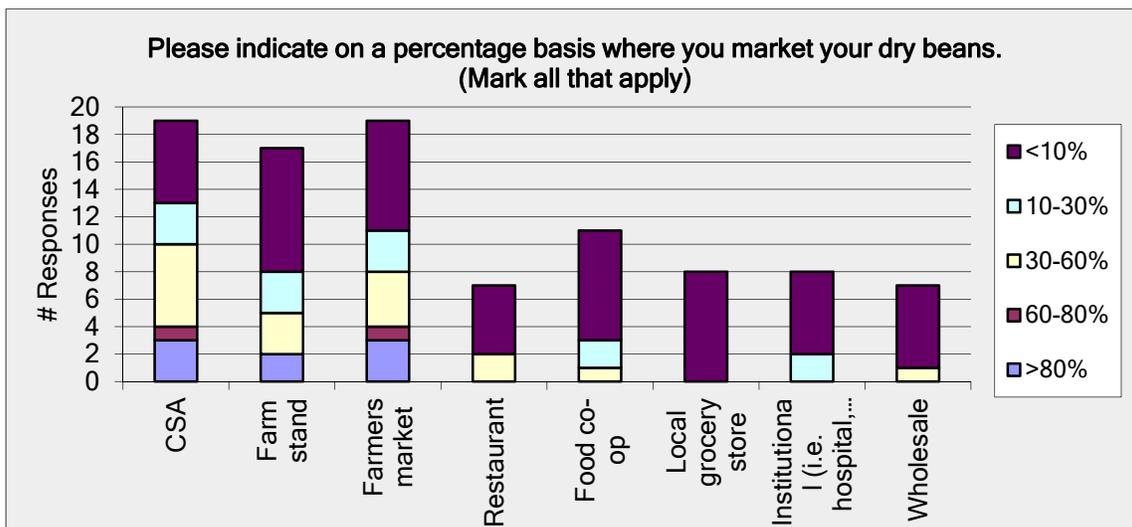


Figure 4. Responses to request “Please indicate on a percentage basis where you market your dry beans.”



Figure 5. Sample of heirloom dry bean varieties collected in western WA.