2017 WASHINGTON RED RASPBERRY COMMISSION RESEARCH PROPOSAL

Project number: 3455-6640 **Proposed Duration:** 6 years

Project Title: Comparison of Alternate- and Every-Year Production in Summer-Bearing Red Raspberry

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Cooperators/Co-PI: Jonathan Maberry, Maberry Packing LLC

Year Initiated 2015 Current Year 2016 Terminating Year 2020

Total Project Request: Year 1 $8,958 **Year 2** $8,277 **Year 3** $6,635 **Year 4** $6,848
Year 5 $9,050 **Year 6** $16,030

Other funding sources: *None at this time.*

Description:
Increasing costs and decreasing availability of labor are compromising the economic viability of commercial red raspberry production in western Washington. The grower community is in need of alternative production systems that minimize labor needs, maintain productivity, and are economically viable. This project addresses that need by evaluating the economic viability of alternate-year production relative to traditional every-year production systems. Specific sub-objectives of this projects are to: 1) Evaluate differences in plant productivity and yield between alternate- and every-year production systems; and 2) Complete a benefit-cost analysis to assess the on-farm net benefits of alternate-year production relative to traditional every-year production systems. Results of this project will be disseminated at conferences, field days, and through a Washington State University extension publication. Overall, this long-term project will provide valuable information regarding potential labor savings and the economic feasibility of this alternative system of red raspberry production.

Justification and Background:
The increasing cost of labor has become prohibitive for many growers of horticultural crops, including red raspberry (*Rubus idaeus*). Summer-bearing raspberry is particularly labor intensive, with annual pruning and tying of canes representing approximately 10% of total annual costs during established bearing years (personal communication with grower). Access to labor is also extremely challenging for growers. These issues demonstrate a need to investigate alternative production systems that reduce growers' dependency on labor. Alternate-year

production, which entails removal of spent floricanes and producing fruit on an every-other-year cropping cycle, represents one potential system that reduces labor associated with pruning and tying.

In Oregon, alternate-year production is practiced in 20-55% of 'Marion' blackberry fields (Strik, 1996). Average two-year yields are reduced by 10-30% relative to every-year production, but several advantages contribute to its adoption (Bullock, 1963; Martin and Nelson, 1979). Decreased labor costs, primary due to reduced pruning and training needs, as well as reduced pesticide usage and improved cold hardiness, are several of the advantages that contribute to the persistence of alternate-year production in blackberry (Bell et al., 1992). Minimal research on alternate-year production systems have been completed in red raspberry. Furthermore, no published research has been conducted in Whatcom County, which contributes approximately 93% of total production in Washington State (WRRC, 2014). In a six-year study performed in Vancouver, Washington, with 'Meeker' and 'Willamette', investigators found yield was reduced by 60% in an alternate-year system (Barney and Miles, 2007). However, it was not articulated if primocane suppression occurred during the course of the study, which can impact yield potential. Studies in New York have found yield reductions of only 30% over the long-term and these reductions can be partially offset through suppression of the first flushes of primocanes during fruiting years (Pritts, 2009).

Despite potential yield reductions, these systems may be economically viable given the current scenario of high labor costs and reduced labor availability. The increasing problems related to costs and availability of labor need to be addressed and this project proposes to address this need by systematically evaluating the costs, potential savings, and yield of summer-bearing raspberries produced using an alternate-year production system.

Relationship to WRRC Research Priority(s):
This project directly addresses the priority labor saving cultural practices, including A/Y systems and mechanical pruning.

Objectives:
The overall objective of this project is to evaluate the economic viability of alternate-year production for summer-bearing red raspberries growers in western Washington. Specific sub-objectives include: 1) Evaluate differences in plant productivity and yield between alternate- and every-year production systems; and 2) Complete a benefit-cost analysis to assess the on-farm net benefits of alternate-year production relative to traditional every-year production systems.

Procedures:
Treatment plots of 'Meeker' red raspberry were established in the spring of 2015 with Mr. Jon Maberry in Whatcom County, Washington. The experimental design is a randomized complete block, with two treatments (alternate- and every-year production) replicated three times. Experimental units will be two rows randomized within a block (**Fig. 1**). In 2015, primocanes were suppressed in the alternate-year treatment plots and an initial crop was harvested from all treatments. In Winter 2015/2016, all canes will be removed from the alternate-year treatment plots, while the every-year treatment plots will be pruned and caned per industry standard. Fruit production in alternate-year treatment plots will be prevented in 2016, but primocanes will be

grown for fruit production in 2017. Fall mowing of spent floricanes in the alternate-year treatment plots will be repeated in 2017 and 2019, preceded by three-to-four spring applications of primocane suppressive herbicides during bearing years. Every-year treatment plots will be managed according to commercial standards throughout the duration of the project, which will entail annual pruning and tying.

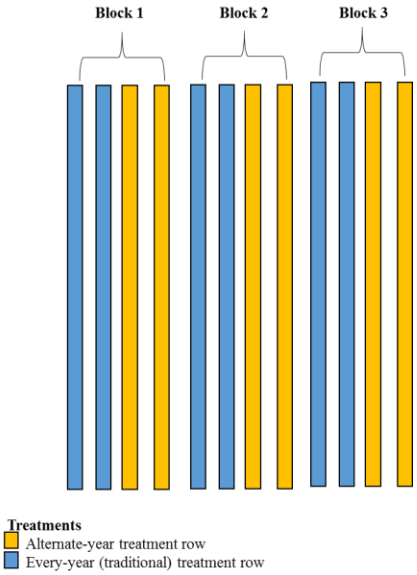

Figure 1. Experimental design comparing alternate- and every-year production systems in summer-bearing red raspberry. Two rows per experimental unit within a block are required for equipment operation.

Data collection began in 2015, in which a baseline enterprise budget was developed through a focus group with growers. These data will be used to update the raspberry production cost study completed by MacConnell and Kangiser (2007). This budget will be used as benchmark for assessing and estimating changes in net profit due to alternate-year production. Supplementary information, such as differences in number of pesticide and fertilizer applications between the two treatments, labor requirements, as well as yield and productivity, will be incorporated in these budgets. Plant growth and productivity will be measured from ten plants randomly selected within each treatment plot. Cane numbers and height will be measured to assess establishment and growth between the two treatments. Yield (both estimated and actual) and average berry size will also be determined in order to assess how the treatments impact fruit production. Foliar tissue samples will also be collected to evaluate treatment impact on plant nutrient status. Overall, these data will be utilized to evaluate the economic viability of alternate year-production, as well as impacts on plant growth and yields.

Given the proposed objectives, this will be a long-term project that will collect harvest data from alternate-year treatment plots for three cropping seasons. This translates into a six-year project, with alternate-year production occurring in 2015, 2017, and 2019, and years of strictly primocane production in 2016, 2018, and 2020. Six years of data collection is warranted to study the impacts of these treatments on a perennial plant like raspberry. A table describing the timeline of the project is provided in **Table 1** (revised from 2014 because we collected production data in 2015).

Table 1. Timeline of crop production for project comparing alternate- and every-year production of red raspberry.

Treatments	2015	2016	2017	2018	2019	2020
Alternate-year production	Initial harvest (First crop)	No crop	Second crop	No crop	Third crop	No crop
Every-year production	Initial harvest (First crop)	Second crop	Third crop	Fourth crop	Fifth crop	Sixth crop

Anticipated Benefits and Information Transfer:

Completion of this project will provide growers relevant information about the potential cost savings of alternate-year production relative to traditional every-year production. This project will also provide baseline information about implementation of this system in summer-bearing red raspberry grown in Washington. Both information derived from the benefit-cost analysis and evaluations of plant growth and productivity will be shared at grower conferences and through

two WSU Extension Publication (Fact Sheet and Excel Workbook). Results will also be available on the WSU Small Fruits Horticulture website (http://smallfruits.cahnrs. wsu.edu/) and be published in a peer-reviewed research publication.

References:

Barney, D.L. and C. Miles (eds.). 2007. Commercial Red Raspberry Production in the Pacific Northwest. PNW 598.

Bell, N., E. Nelson, B. Strik, and L. Martin. 1992. Assessment of winter injury to berry crops in Oregon, 1991. Oregon State University Agricultural Experiment Station, Special Report 902, July, 1992. 23 pp.

Bullock, R.M. 1963. Spacing and time of training blackberries. Oregon Hort. Soc. Proc. 55:59-60.

MacConnell, C. and M. Kangiser. 2007. Washington Machine Harvested Red Raspberry Cost of Production Study for Field Re-establishment. Washington State University Whatcom County Extension.

Martin, L.W. and E.H. Nelson. 1979. Establishment and management of 'Boysenberries' in Western Oregon. Oregon State University Agr. Expt. Sta. Circ. 677.

Pritts, M., 2009. Pruning Raspberries and Blackberries. New York Berry News. 8(4): 7 pp. Accessed 5 Nov. 2014 at: < http://www.fruit.cornell.edu/berry/production/pdfs/ raspprunning.pdf>.

Strik, B. 1996. Blackberry Production in Oregon. 11th Annual Conference of the North American Bramble Growers Association. Accessed 5 Nov. 2014 at: < http:// berrygrape.org/blackberry-production-in-oregon/>.

Washington Red Raspberry Commission (WRRC). 2014. 2014 Pacific Northwest Raspberry Assessment Report. WWRC. Accessed Dec. 5 2015 at: <http://www.red-raspberry.org/>.

Budget and Justification:

	2017	2018	2019	2020
Salaries[1/]	$3,932	$4,089	$5,743	$9,070
Time-Slip[2/]	$800	$800	$800	$800
Operations (goods & services)[3/]	$50	$50	$50	$1,050
Travel[4/]	$380	$380	$380	$1,935
Meetings	$	$	$	$
Other	$	$	$	$
Equipment[4/]	$	$	$	$
Benefits[5/]	$1,473	$1,529	$2,077	$3,175
Total	**$6,635**	**$6,848**	**$9,050**	**$16,030**

[1/] Research Associate (co-PI Mrs. Suzette Galinato) at the WSU School of Economic Sciences [4.17% FTE in 2016 (0.5 month at $2,648); 2.08% FTE in 2019 (0.25 month at $1,490); and 6.25% FTE in 2020 (0.75 month at $4,647)]; Scientific assistant in Small Fruit Horticulture program (Mr. Sean Watkinson) at 5% FTE per year from 2016 to 2020 ($2,318 in 2016; $3,932 in 2017; $4,089 in 2018; $4,253 in 2019, and $4,423 in 2020); yearly salaries include 4% inflation.

[2/]Timeslip in 2017-2020 for plant growth and fruit quality data collection: 40 hr/week x 2 weeks = 80 hours @ $800.

[3/]General office supplies (2015); incentives to participants who will help develop and review the enterprise budgets (2016); field supplies (e.g, sample bags, flagging tape, etc.) for 2016 to 2020; journal publication charge (2020).

[4/] Research Associate will meet with growers in order to collect and validate data for the every-year raspberry enterprise budget (2015 and 2016) and the alternate-year raspberry enterprise budget (2020). Research associate will also co-present with PI key results of the study at a grower conference in 2020 (e.g., Washington Small Fruit Conference); travel for PI to commute from Mount Vernon, WA, to field site in Lynden, WA approximately three times in 2015 and eight times per year from 2016-2020 (88 mi/roundtrip at 0.54 cents/mi) .

[5/]No equipment funding requests.

[6/]Benefits are calculated at 32.86% of monthly salary for Research Associate ($870 in 2016; $490 in 2019; and $1,527 in 2020); Benefits for Scientific Assistant is 35.44% ($1,393 in 2017; $1,449 in 2018; $1,507 in 2019, and $1,568 in 2020). Benefits for timeslip at 10%.

Budget reviewed and approved by: Jeanne Burritt 12/5/2016 .

Washington Red Raspberry Commission
Progress Report for 2015 Projects

Project number: 3455-6640

Title: Comparison of Alternate- and Every-Year Production in Summer-Bearing Red Raspberry

Personnel:

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Cooperators/Co-PI: Jonathan Maberry, Maberry Packing LLC
Reporting Period: This report presents data from 2016, one year after the project was initiated.
Accomplishments:

- Treatments were established in Mr. Jon Maberry's field in Lynden, WA in 2015 (please see the proposal for more details); 2016 was an "off production year" for the AY treatment, so only yield from EY treatments were collected.
- A focus-group led by Dr. DeVetter and Mrs. Galinato was held in Lynden, WA, in Sept. 2015. Red raspberry growers and crop consultants attended the meeting and provided cost of production data for the revision of the red raspberry enterprise budget initially published by MacConnell and Kangiser in 2007. A revision of this enterprise budget was published in 2016. These data will be used as a benchmark for the alternate-year production study.
- Data collected in 2016 include: primocane height, primocane number, primocane diameter, estimated yield (EY plots only), berry size (EY plots only), and foliar leaf nutrients (tissue collected July 21, 2016).

Results:

- Plots were harvested 19 times between June 11 and July 19, 2016. Estimated and actual yields and berry weight were compared across blocks, showing no difference due to block.
- There were no treatment effects for primocane number, height, nor diameter, although there was numerically more primocanes in the EY treatment (17.8 versus 15 primocanes/hill in EY versus AY treatments, respectively; *P*-value = 0.06)
- Tissue nutrient concentrations were not different across treatments except for iron and aluminum, with concentrations being greater and above sufficiency for iron in EY treated plots (*P*-values = 0.02 and 0.01 for iron and aluminum, respectively).

Publications:

Galinato, S.P. and L.W. DeVetter. 2016. 2015 Cost Estimates for Establishing and Producing Red Raspberries in Washington State. WSU Enterprise Budget. TB21. <http://pubs.wpdev.cahnrs.wsu.edu/pubs/tb21/>.

Acknowledgements: Many thanks to the WRRC and red raspberry grower cooperators. We look forward to continuing this project. We'd be happy to provide additional data upon request.