Index No.: AGR010
Contract No.: CSP900113
Eff. Date: 07/31/13

STATE OF OHIO
DEPARTMENT OF ADMINISTRATIVE SERVICES
GENERAL SERVICES DIVISION
OFFICE OF PROCUREMENT SERVICES
4200 SURFACE ROAD, COLUMBUS, OH 43228-1395

AMENDMENT FOR CHANGE
AMENDMENT NO. 5

TO: OHIO DEPARTMENT OF AGRICULTURE

FROM: ROBERT BLAIR, DIRECTOR, DEPARTMENT OF ADMINISTRATIVE SERVICES

SUBJECT: CONTRACT FOR OHIO GRAPE INDUSTRIES EXTENSION AND RESEARCH PROGRAM

Attached are pages 4 through 12 to this contract. Remove these pages from the existing contract and replace with the attached pages on the effective and/or revision date.

This amendment is issued to add new projects, update the budget amounts for FY14 funding and, to re-paginate the document.

All other prices, terms and conditions remain unchanged.

Questions regarding this Amendment and/or the Requirements Contract may be directed to:

Therese Gallego, CPPB
therese.gallego@das.ohio.gov

This Amendment, the main Requirements Contract and any additional amendments thereto are available from the DAS Web site at the following address:

http://www.ohio.gov/procure

Affected Contractor(s):

678 (*address 48)
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Office of Sponsored Programs
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Columbus, OH 43210-1063
finch.24@osu.edu

MUTUALLY AGREED-UPON NEW PROJECTS FOR FY14

1. Expansion of Spotted Wing Drosophila (SWD) Monitoring and Management:
SWD has a very high probability of turning into a major threat to the grape industry in Ohio. A systematic monitoring of SWD in Ohio vineyards is needed. Traps need to be placed in many vineyards throughout Ohio. These traps need to be monitored on a weekly basis. Dave Scurlock and Dr. Gary Gao will be trained in 2013 in identifying SWDs, especially the females SWDs. Contractor will purchase additional traps, sample vials, and other supplies and recruit grape growers to help the Contractor monitor SWDs. A SWD distribution map in Ohio vineyards will be developed in cooperation with Dr. Celeste Welty. Management strategies will be developed with the help of Dr. Welty and consultation of entomologists from neighboring states.

2. Optimization of mobile detector deployment strategies for 2,4-D and dicamba drift
Goal and Objectives of Research:
To optimize a low-cost 2,4-D/dicamba detection system for use in vineyards. The intent is to have this system deployable by the time 2,4-D and dicamba tolerant crops are available to farmers.

Scope of Project:
The release of 2,4-D and dicamba tolerant corn, soybean, and cotton is imminent, beginning with 2,4-D tolerant corn in 2014. Grain farmers will embrace these crops because they provide a new tool for controlling glyphosate-resistant weeds. Currently Roundup Ready crops are planted on nearly 90% of Ohio's soybean and corn fields. Agronomists predict that once 2,4- D and dicamba tolerant crops are available their adoption will be similar. This means that the use of 2,4-D and dicamba in the state is likely to increase by a factor of 20 compared to present. 2,4-D and dicamba are 400- and 75-fold more toxic than glyphosate to broadleaf crop plants. OGIC funded research conducted at OARDC over the past three years demonstrated that simulated-drift of 2,4-D with concentrations equivalent to 1/300th of the dose (1X-dose) to be used in a single application to corn or soybean severely injured grapes with maximum damage occurring when drift coincides with bloom. A concentration of 1/30th of the 1X dose killed vines. Even with advanced drift reduction technology in place, the increased use of these herbicides adjacent to sensitive crops and wild areas will be such that plant injury resulting from off-site movement is inevitable and almost certainly will exceed current levels (estimated at approximately 300 incidents per year in Ohio).

Drift incidents often lead to financial loss and the need for compensation. An inability to detect drift compounds in damaged crops is one factor that complicates settlement in such cases. 2,4-D and dicamba are hormonal herbicides of the auxin mimic class, and it is very difficult to reproducibly and accurately detect residues of these herbicides from above ground plant tissues if they are not collected within three days (72 hours) of the drift event. Contractor's goal is to solve this problem and allow for longer-term residue detection through deployment of a proprietary, low-cost (OSU-University of Maryland, College Park joint Patent Application) detection system that grape- and other sensitive crop-growers can deploy in their fields. The specific objectives of this proposal are:

A. to calibrate performance of the detector unit in field conditions and correlate measured herbicide levels with herbicide-induced injury;
B. optimize mobile detector deployment strategies to maximize accuracy of 2,4-D/dicamba drift detection;
C. inform grape growers about the detector technology and make the detector available on a cost-recovery basis; and
D. develop and publish protocols and fact sheets allowing grape growers to deploy mobile sensor technology in areas at high risk of 2,4-D/dicamba drift events.

This detector consists of a fiber matrix stretched across a support frame. Multiple units are easily constructed and deployable in a field setting. The experiments in this study will not be conventional herbicide drift studies. Instead the work is designed to identify the optimal configuration for mobile sensor deployment to maximize 2,4-D/dicamba detection, and will also continue our ongoing research to correlate levels of herbicide quantified from detectors with herbicide-induced damage on sensitive crops. To minimize the cost of the research tomato will be used as a surrogate for grape. Tomato and grape have similar sensitivity to 2,4-D and dicamba. Briefly, a field on OARDC campus will be planted with winter wheat to provide ground cover. Staked tomato (extremely sensitive to 2,4-D) will be propagated as potted plants in the greenhouse in advance of the field experiment and will be placed strategically throughout the field as living sentinel collectors of herbicide drift. There will be five replications of tomato across the field, and tomatoes will be deployed in a grid pattern at 0, 10, 20, 30, 40, 50, and 100 feet from the edge of the sprayed area (a 100-foot swath immediately downwind of the field and perpendicular to the direction of wheat seeding). The sprayer will be operated in both directions (back and forth) to increase the drift load downwind, and this procedure will be repeated three times with new tomato plants and detectors placed in the field each run. Herbicide deposition detectors will be placed in each tomato pot at the tomato canopy height mounted at 45° from horizontal, facing the prevailing wind. From previous research we know that fiber detector measurements at plant canopy height match initial dislodgeable residues present on plant materials (A. Murphy, unpublished data). Therefore, they will accurately reflect the amount of drift that causes specific levels of damage on the respective tomato plants. Unsprayed control plants at the same stage of growth will be used for all comparisons described. In order to correlate observed levels of herbicide present in/on plant tissues/sensors with observed drift, non-potted sensors ("sentinel sensors") will also be placed in line with the potted sensors in the vector of the prevailing wind. These sensors will allow more precise determination of the total range of herbicide drift. For efficiency, a hierarchical methodology will be utilized to quantitate herbicide levels present on deployed sensors starting

with sensors closest to the application site. Based on results from the initial studies we will determine the number and placement of sensors, in a grid pattern, needed to provide reliable results.

Detectors deployed in drift experiments will be harvested and shipped to the Blakeslee laboratory at OSU, stored and analyzed for herbicide concentration as the plants with which they were deployed begin to show herbicide damage. Measurements will begin with detectors/plants closest to the site of application, and will move outward. 2,4-D and dicamba residues will be solvent-extracted from mobile detectors and quantified using current state of the art liquid chromatography dual mass spectrometry methods developed in the Murphy lab (Kubes et al., 2011) and currently deployed in the Blakeslee laboratory. These methods have been extensively tested for the ability to detect auxinic herbicides, and have limits of detection as low as 100 ng/mL (0.001 ppm) for 2,4-D and 1 pg/mL (0.000001 ppm) for MCPP. Preliminary testing indicates that these methodologies allow quantification of herbicide depositions in the 100 pmol/cm2 range from mobile detectors. Finally, to support data from the above studies on the efficacy of the mobile detection system, select samples will be subjected to multiple additional forms of confirmatory analysis in the Blakeslee laboratory, including gas chromatography-mass spectroscopy, and capillary electrophoresis/diode array detection.

Potential outcomes and significance of outcomes:
The above studies will result in the development of a clear, easy-to-follow protocol for the deployment of mobile sensors designed to detect 2,4-D and dicamba drift. This system will provide grape growers the means to collect hard data on drift events which may result in crop damage. Once deployed by growers the hard data generated by this system will provide will be instrumental in achieving favorable settlements. Additionally, knowledge that this system is generally deployed in fields of sensitive crops could be a potential deterrent to applicators who would consider applying pesticides during weather conditions conducive to drift or applying drift/volatilization prone formulations of herbicides.

Length of Project: April-December 2014.

3. Effect of tannin addition on Cabernet Franc and Chambourcin wine quality

4. Effect of hyperoxidation on Riesling and Pinot Gris wine quality.

5. The Effects of Oxygen Management on Terpene and Ester Levels in White Wines
Objective:
The proposed research aims to critically evaluate the effects of oxygen introduction (intentional or unintentional) at various stages of white wine production on color, volatile flavor constituents and to determine these effects on the sensory characteristics of finished wines. By conducting both laboratory-scale and cellar research-scale experiments, we hope to identify specific practices/parameters like hyperoxidation that minimize oxidative degradation, increase storage life and improve product quality.

The program will include, but not be limited to distinguishing chemical differences in control and hyperoxidated musts. Oxygen levels will be measured throughout the entire winemaking process by the use of the NomaSense Trace Unit recently purchased by OGIC for the OARDC Enology Program. This device works on Oxo-Luminescence NomaSense® technology which allows for the nondestructive analysis of oxygen in bottled wine. The manipulation of SO2 and O2 levels will also be explored before the bottling of the wine. Along with hyperoxidative treatments, the effects of storage temperatures are also of interest for white wines. The chemical compositions of the three wines will be studied after treatment of three different temperatures (50oF, 70oF, and 90oF). The volatile compounds will be analyzed on the GC-MS purchased from OGIC. The second year of research will incorporate quantitative descriptive analysis of wine quality by a trained sensory evaluation panel.

Deliverables:
A. Laboratory-Scale Research (FY14): Information characterizing the effects of hyperoxidation treatment variables (e.g., time of exposure, duration of exposure, oxygen levels, temperature) on the color and volatile profiles of Riesling wines.
B. Cellar-Scale Research (FY14): Information characterizing the effects of a standard hyperoxidation treatment on the color and volatile profiles of Riesling wines at critical stages of production and after storage at three temperatures (50oF, 70oF, and 90oF).

C. Laboratory-Scale Research (FY15): Information characterizing the effects of SO2 addition at vinification steps prior to bottling and the effects of O2 addition pre- and post-bottling (representing unintended O2 exposure) on the color and volatile profiles of Riesling wines

D. Cellar-Scale Research (FY15): Information relating the effects of an optimized hyperoxidation/storage treatment combination on the color and volatile profiles of Riesling, Vidal, and Traminette wines and the effects of these characteristics on wine quality as perceived by a trained sensory panel.

6. Varietal wine production for extension presentations and functions.

COST SUMMARY

Ohio Grape Industries Extension and Research Program
CSP900113
UNSPSC CATEGORY CODE: 93141905, 70141705

OAKS ITEM NUMBER: 11942

Description	Year 1 Cost	Year 2 Cost
1. Extension Services		
Extension Services	$ 172,716.00	$ *189,593.00
Category Total	**$ 172,716.00**	**$ *189,593**
2. Viticulture Research		
1. Viticulture	**Year 1 Cost**	**Year 2 Cost**
a. Evaluation of Crown Gall-Free grapevines	$ 9,012.00	$ *9,192.00
b. Evaluation of training systems for Cabernet Franc	$ 10,014.00	$ *10,215.00
c. Winegrape variety evaluation – Ne 1020 Project	$ 10,000.00	$ *12,700.00
d. Winegrape variety selection evaluation with improved cold hardiness	$ 7,010.00	$ *0.00
e. Clonal evaluation of Cabernet Franc.	$ 9,012.00	$ *9,192.00
f. Rootstock Evaluation for Traminette and Chardonel	$ 0.00	$ 0.00
g. Winter protection of grapes using ABA	$ 15,000.00	$ *15,300.00
*h. Implementing Best Viticulture Practices		$ *15,000.00
Viticulture Total	$ 60,048.00	$ *71,599.00
2. Plant Pathology	**Year 1 Cost**	**Year 2 Cost**
a. Evaluation of currently available and experimental fungicides	$ 3,023.80	$ 3,106.60
b. Collect infected grape canes and document pycnidia formation and sporulation	$ 3,023.80	$ 3,106.60
c. Determine the conditions required for sporulation of P.viticola on infected grape canes and develop a predictive model.	$ 3,023.80	$ 3,106.60

*Indicates change 07/26/13.

Plant Pathology (continued)	**Year 1 Cost**	**Year 2 Cost**
d. Determine the effects of dormant applications of a potential substitute for Liquid Lime Sulfur (Sulforix) on the development of Phomopsis cane and leaf spot and other grape diseases in Ohio, and the effects of dormant applications of phosphorous acid on control of grape diseases.	$ 3,023.80	$ 3,106.60
e. Determine the efficacy of a new biological control agent and soil amendments of compost for control of grape crown gall.	$ 3,023.80	$ 3,106.60
Plant Pathology Total	$ 15,119.00	$ 15,533.00
3. Entomology Section to be awarded after 08/01/12.	**Year 1 Cost**	**Year 2 Cost**
a. Develop more effective scouting protocols and pest management strategies to control invasive pests in Ohio vineyards, including but not limited to Multi-Colored Lady Asian Beetle, Marmorated Stink Bug, Spotted Wing Drisophila and European Berry Moth.	$ 14,608.00	$ *20,214.00
b. Evaluate Movento for control of grape scale.	$ 4,804.00	$ *2,000.00
c. Evaluate Movento and leverage for annual and long term control of grape phylloxera.	$ 4,804.00	$ *2,000.00
*d. Statewide systematic monitoring of Spotted Wing Drosophila (SWD), comprehensive training of growers in SED monitoring and identification, and insecticide efficacy studies of SWD.	$ 0.00	$ *5,000.00
Entomology Total	$ 24,216.00	$ *29,214.00
4. Weed Science	**Year 1 Cost**	**Year 2 Cost**
a. Continue development of new and improved herbicides, alternative weed control techniques and weed management systems that will provide more efficient, cost effective and environmentally sound weed control in Ohio vineyards.	$ 5,700.00	$ *5,700.00
*b. Optimization of mobile detector deployment strategies for 2,4-D and dicamba drift.	$ 0.00	$ 6,500.00
Weed Science Total	$ 5,700.00	$ *12,200.00
Category Total	**$ 105,083.00**	**$ *128,546.00**

*Indicates change 07/31/13.

3. Enology Research		
1. Enology research focused on producing premium quality wine in Ohio:	**Year 1 Cost**	**Year 2 Cost**
a. Identify vinification practices in determining optimum procedures of enhancing varietal character.	$ 13,037.00	$ *9,567.40
b. Investigation of new yeast and bacteria strains in producing higher quality and more complex wines.	$ 6,520.00	$ *7,653.40
c. Emphasis on aromatic volatile research by optimizing the GC/MS.	$ **	$ **
d. Investigation of new techniques of controlling both chemical and microbial wine stability.	$ 8,691.00	$ *0.00
*e. Effect of tannin addition on Cabernet Franc and Chambourcin wine quality		$ *13,085.40
*f. Effect of hyperoxidation on Riesling and Pinot Gris wine quality.		$ *4,894.40
*g. Effect of oxygen management on terpene and ester levels in white wines		$ *15,810.00
*h. Best Viticultural Practices		$ *5,930.00
Enology Research for Premium Quality Wine	$ 28,248.00	$ *48,874.00
2. Collaborative Enology research focused on enhancing both grape and wine quality for Ohio:	**Year 1 Cost**	**Year 2 Cost**
a. Evaluate cultural practices in the vineyard that optimize vine performance and fruit quality for wine quality enhancement.	$ *	$ *
b. Evaluate clones and rootstocks of existing and newly introduced varieties for enhancing wine quality (e.g. Cabernet franc, Riesling, Gamay noir, etc.)	$ *	$ *
c. Evaluate newly released varieties and advanced selections for grape and wine quality in Ohio. Varietal wine production for extension presentations and functions.	$ 6,519.00	$ *7,653.40
d. Develop standards of fruit maturity for varietals in Ohio in the production of premium wine.	$ 4,345.00	$ *0.00
e. Work with other disciplines involving Entomology, Plant Pathology and Weed Ecology on possible studies effecting wine quality	$ ***	$ ***

*Indicates change 07/19/13.

** Items 1c, 2a and 2b will receive data from the Viticulture Research Program.

*** Item 2e will be addressed as a collaboration within the Contractor's group should any significant pest issues of concern affecting wine quality are identified.

Enology Research to Enhance Grape and Wine Quality	$ 10,864.00	$ *0.00
Category Total	**$ 39,112.00**	**$ *64,594.00**
Grand Total	**$ 316,911.00**	**$ *382,733.00**

CONTRACTOR INDEX

CONTRACTOR AND TERMS:

BID CONTRACT NO.: CSP900113-1

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SUMMARY OF AMENDMENTS

Amendment Number	Effective Date	Description
5	07/31/13	To add new projects, update the budget amounts with FY14 funding and to re-paginate the document.
4	08/24/12	To correct the FY13 totals for Viticulture Research and Grand Total and to correct the OAKS vendor address code.
3	08/08/12	To add the Entomology costs and include these costs in the Grand Total amounts.
2	07/13/12	To correct Weed Science and Grand Total amounts for Years 1 and 2.
1	07/06/12	To correct Grand Total amount in Year 1 and Plant Pathology Total, Viticulture Research Category Total and Grand Total amounts in Year 2.