APPENDIX D
SAES-422

Project/Activity Number: NE1231
Project/Activity Title: Collaborative Potato Breeding and Variety Development Activities to Enhance Farm Sustainability in the Eastern US
Period Covered: Oct 2012 to Sept 2013
Date of This Report: 12 December 2014
Annual Meeting Date(s): 3-4 February 2014

Project Participants:
De Jong, Walter (wsd2@cornell.edu) – Cornell
Halseth, Don (deh3@cornell.edu) – Cornell
Menash, Sandra (srm45@cornell.edu - Cornell
Porter, Greg (porter@maine.edu) – University of Maine
Alyokhin, Andrei (Andrei_Alyokhin@umit.maine.edu) – University of Maine
Camire, Mary Ellen (Mary.Camire@umit.maine.edu) – University of Maine
Perkins, Lewis (Bperkins@maine.edu) – University of Maine
Kleinhenz, Matt (Kleinhenz.1@osu.edu) - Ohio State
Haynes, Kathy (Kathleen.Haynes@ars.usda.gov) – USDA-ARS Beltsville
Richard Veilleux (potato@vt.edu) – Virginia Tech
Mathew, Sudeep (samathew@umd.edu) – University of Maryland
Qu, Xinshun (xsq1@psu.edu) – Penn State
Peck, Mike (mxp30@psu.edu) – Penn State
Zotarelli, Lincoln (lzota@ufl.edu) – University of Florida
Clough, Mark (meclough@ncsu.edu) – North Carolina State University
Yencho, Craig (yencho@ncsu.edu) - North Carolina State University
Stafford, Kirby (Kirby.Stafford@ct.gov) – Connecticut Ag Expt Station

Brief summary of minutes of annual meeting:
Attendees at the February 2014 annual NE1231 meeting were Sudeep Mathew (UMD), Lincoln Zotarelli (UF), Mike Peck and Xinshun Xu (PSU), Richard Veilleux (VATech), Matt Kleinhenz (OSU), Craig Yencho & Mark Clough (NCSU), Chris Hopkins (Black Gold. Regional Manager, East Coast), Inclement weather in the north limited travel for Greg Porter (UM), Don Halseth and Walter DeJong (Cornell).

No administrative advisor report was presented because a new advisor has yet to be appointed. Ann Marie Thro provided a NIFA report via speaker phone. Maine points were that the potato breeding special grants was renewed for 2014 with a $1,350,000 RFA to be announced soon. Impact statements are very important and plant breeding is very high profile in Washington at this time due at least partially to stakeholder input and good impact statements. Variety develop is a good measurable outcome, but we need to convey that plant breeding takes a long time (especially for potato) – how do we educate legislators about this process? What are other relevant indicators of progress/impact (novelty, scientific excellence?)? The AFRI Plant Breeding Program was summarized (1 yrs worth of funding; 5-6 awards; additional information).

Greg Porter provided an update on the Eastern USDA-NIFA Grant for Potato Breeding Research via email. Funding was obtained from the 2013 RFA and subcontracts should now be in place. Our grant received positive reviews and our funding level was retained at the same level as the previous year despite federal budget difficulties. Appreciation was expressed to everyone for getting grant

material in on time. The RFA for the 2014 grant program should be expected sometime in the spring.

State and provincial reports were given describing production status, promising clones, and market needs. Industry input was that quality and solids are big issues and that AF0338-17 is looking very promising in FL, TX, MO, NC. Two loads of seed for NC. MD - solids are low for some reason, even in ATL. A good red in the east is still needed. Beacon Chipper is good for quality, but yield has been lower than ATL. Would like to have more cultivars that Frito-lay will accept (they are looking at Lamoka, a good step). Regarding funding and collaboration, we were advised to ask for what we need. Probably in the long-term we might need to look at more inter-regional collaboration, especially if you introduce a new variety. For example: AF0338-17 best line in 5 different trials in different regions.

Plant Pathology and breeding program reports were presented by participants. Emailed reports were distributed and discussed. The NE1231 seed nursery shopping list was distributed and each clone was discussed. No major changes were suggested for 2014.

Mark Clough provided an update on the project website: the process of including data is working well on his end and the database is growing. People are welcomed to provide input on improvements. Reports can be posted on the web site.

The next NE1231 meeting will be held in early 2015 in Orlando, FL after the NPC Potato EXPO.

Accomplishments:
This multidisciplinary, regional project is designed to take advantage of the existing strengths and resources of the potato breeding community in the eastern US, and it encourages the pooling of regional resources and promotes increased communication within the potato community located in the northeast, mid-Atlantic and southeast. The overarching goal of this specific project is to identify new potato varieties for use in the mid-Atlantic and southeast US, which will contribute to a more sustainable and profitable potato industry. Most major varieties, including Atlantic (the dominant out-ofofield chipping variety in the US) as well as two recent chip potato varieties that have resistance to internal heat necrosis, Harley Blackwell and Elkton, have passed through this system. As such, the NE-1231 Project (and its predecessors NE-1031, NE-1014, NE-184 and NE-107) have played a central role in eastern potato variety development for many years.

This regional project has: 1) allowed potato breeders to share breeding materials and test results; 2) along with the USDA NRSP6 Potato Germplasm Enhancement Project it has facilitated potato germplasm selection and evaluation under diverse environmental conditions by all the breeding programs in the eastern US; 3) given research and extension personnel the opportunity to evaluate new selections from several potato breeding programs; 4) facilitated regional germplasm screening for specific characteristics at a single location (e.g. early blight and powdery scab resistance in PA); 5) developed variety profiles and cultural recommendations for each selection put into commercial production; and 6) as noted above, resulted in the release and adoption of most, if not all, of the major potato cultivars currently produced in the eastern US.

Potato breeding for improved quality and pest resistance was conducted in ME, NY, NC, and USDA-ARS Beltsville, MD during 2013. These four programs focus on specific pest and marketing issues, so that regional resources are used efficiently. For example, ME is the only breeding program in the region which focuses on russets and long whites for processing (50% russets, 40% fresh and

chipping whites, 10% specialty). ME also emphasizes research on late blight, pink rot, potato virus Y, and scab resistance. During 2013, our programs generated 978 new tetraploid families (733,000 seeds) from crosses using parents with desirable quality, utilization, adaptation, and/or pest resistance traits. USDA-ARS also generated 83 2x crosses (209,000 seeds) for use in germplasm improvement. Progeny (106,900) from earlier crosses were field selected resulting in 3,437 clones that will be further selected under conditions with diverse abiotic and biotic stress in the eastern U.S. and beyond.

Advanced clones from our project were introduced to growers through field days, presentations, publications, web sites, and direct contact with stakeholders. Eight advanced clones were entered into tissue culture programs leading to commercial seed production. Several advanced clones and newly released varieties are currently being evaluated in commercial scale trials on-farm for their potential across the US. The most promising chipstock lines currently under evaluation include: Beacon Chipper, Elkton, Lamoka, Waneta AF0338-17, AF4157-6, BNC182-5, NC0349-3, and NY148. NY150 and AF4138-8 are being evaluated for the round-white fresh market. NY150 is a specialty white with very small, bright tubers. The most promising red-skinned tablestock clones are: Dark Red Chieftain, Red Maria, and NY136. AF4659-12, is a pinto-type, yellow-fleshed 'roasting' variety that is being evaluated by small-scale local foods markets. All of these will be evaluated under variable commercial production conditions extensively during 2014 and onward.

Each eastern breeding program submits its most promising advanced clones to the regional project's seed nursery in ME. During 2013, the project distributed seed potatoes for 15 regional potato variety trials conducted in eight states and two Canadian provinces. Eleven standard varieties and 27 numbered clones or newly released varieties were tested for yield, tuber quality, and pest resistance. NE1231 Regional potato variety trials were conducted at three ME locations during 2013. The regional trial sites (numbers of clones tested) were: Presque Isle (37), St Agatha (33), and Exeter (14). NE1231 variety trials were also conducted in FL, NC, VA, MD, PA, OH, NY, and Canada (NB, QC). Each regional trial site reports results to their local stakeholders and submits their data to the project website coordinator located in NC. The data are entered into a searchable database so that results are accessible to stakeholders and researchers anywhere in the world. Based on 2012-13 Maine results, AF0338-17, AF4157-6, and NY148 were the most outstanding chipping prospects. AF4138-8 and NY150 were promising round-white fresh market clones. Dakota Trailblazer, Teton Russet, AF3362-1, and AF3001-6 were the top performing russeted clones.

In terms of sharing information, our project web site and interactive searchable database, which is updated regularly, (see: http://potatoes.ncsu.edu/NE.html) continues to grow in importance and popularity. Evidence of its importance is the fact that it has been used as a model for other regional projects including the new USDA NIFA SCRI potato acrylamide mitigation project and the USPB chip trials. The web site provides current contact information for project cooperators and recent research reports, as well as access to our regional variety database and a dynamic summary generator for all released varieties. The interactive database has become popular as a tool used by researchers and stakeholders, and it can be viewed at < http://potatoes.ncsu.edu/nesrch.php>. The summary generator allows users to build a cultivar summary that contains the most up-to-date performance data in a concise one-page format <http://potatoes.ncsu.edu/nesummary.php>.

New varieties and descriptions.

This project seeks, through activities coordinated across many Northeastern States, to develop

potato varieties with improved agronomic, disease-resistance, and nutritional characteristics. It is anticipated that improved potato cultivars will help maintain the viability of rural economies, reduce dependence on pesticides, and contribute substantially toward maintaining a secure, safe and nutritious food supply.

Advanced Potato Clones Showing Particular Promise in 2013 include:

- **AF0338-17, to be named Sebec in early 2014** (AF303-5 x SA8211-6), a widely-adapted, mid-season, high yielding, round white for out-of-field chipping and fresh market. It has performed well in the S.E. and mid-Atlantic states with yields averaging near those of Atlantic. Specific gravity has averaged 4 points lower than Atlantic. AF0338-17 has chipped well from the field and has had much lower incidence of internal defects than Atlantic. It is moderately susceptible to scab, but has moderate verticillium resistance.
- **AF3001-6, to be named Easton in early 2014** (Silverton Russet x AF1668-60), a widely adapted, late maturing, long-white with netted skin, very good fry color, and high yields. AF3001-6 is very good baked, boiled, and mashed. U.S.#1 yields have averaged ~131% of standard russeted varieties (usually Russet Burbank) in Maine trials. Specific gravity is moderate (average of 1.081 in ME trials) and fry color from storage has been excellent. It has been an outstanding performer in the national fry processing trials (NFPT). It is moderately susceptible to scab, but has good verticillium resistance. Susceptibility to tuber decay (tuber blight in 2011, softrot in several research trials, fusarium in a 2013 commercial trial) has been the most serious concern so far for this variety.
- **AF3362-1** (Reeves Kingpin x Silverton Russet), a mid-season, long russet with good yields, processing potential, and fair to good appearance. AF3362-1 is very good baked and mashed. U.S.#1 yields have averaged ~132% of standard russeted varieties (usually Russet Burbank) in Maine trials. Specific gravity is moderate (average of 1.083 in ME trials) and fry color from storage has been mostly good. It may be a good alternative to Shepody for out-of-field and short-term storage processing use as well as useful for russet fresh market. It has moderate scab resistance and good bruise resistance. AF3362-1 is susceptible to internal heat necrosis and should not be grown in the S.E. states or other areas where this defect is frequently observed
- **AF4157-6** (Yankee Chipper x Dakota Pearl), an early to mid-season, round to oblong white with good yields, moderately-high gravity, very good chip color, and fair to good appearance. U.S.#1 yields have averaged 95% of Atlantic and 108% of Snowden in Maine trials. Specific gravity is moderate to high (average of 1.086 in ME trials) and chip color from storage has been very good. It has low sugars even from cool temperature storage. It is susceptible to scab, but has resistance to golden nematode, blackspot bruise, and pink rot. AF4157-6 has potential as a chipper in southern states and in northern states on fields where scab is not a concern
- **AF4138-8** (SA9707-6 x AF1953-4), a fresh market, early to mid-season, round to oblong white with bright skin. It has good yields, attractive tubers, low specific gravity, blackspot bruise tolerance, low hollow heart incidence, and good boiled quality. It is moderately resistant to scab and has golden nematode resistance. Seed Availability: University of Maine seed plus it is in virus clean up at Porter Farm, Maine Seed Potato Board.
- **AF4172-2** (A95523-12 x A92158-3), a medium maturing, russet with good fry quality, fair to good tuber appearance, and high yields. US#1 yields have averaged ~119% of standard russeted varieties (usually Russet Burbank) in Maine trials. Specific gravity is moderate (average of 1.083 in ME trials) and fry color from storage has been very good. It has been a good performer in the national fry processing trials (NFPT). It is susceptible to scab, but

has good bruise resistance. Tuber size tends toward the smaller size classes. Baked quality scores have been very good.

- **AF4296-3** (A0508-4 x A99081-8), a widely adapted, late maturing, russet with good fry quality, fair tuber appearance, and high yields. US#1 yields have averaged ~111% of standard russeted varieties (usually Russet Burbank) in Maine trials. Specific gravity is moderate (average of 1.079 in ME trials) and fry color from storage has been good. It has been an outstanding performer in the national fry processing trials (NFPT). It is moderately susceptible to scab, but has moderate verticillium resistance and good bruise resistance.
- **AF4648-2** (NY132 x Liberator), a mid-season, round to oblong white with good yields, moderately-high gravity, bruise resistance, very good chip color, and good appearance. It could go for chipping or fresh market. It has good scab resistance and is resistant to golden nematode and PVY.
- **AF4659-12** (A99331-2 x US147-96RY), a yellow-fleshed "pinto-type" specialty variety with a interesting red and yellow skin pattern. It produces small, fingerling-type tubers that are excellent roasted, boiled, or fried. Seed Availability: University of Maine seed plus it is in virus clean up at Porter Farm for tissue culture.
- **NY140** (NY121 x NY115), a late-season dual-purpose fresh market and chipping clone with large round to oblong tubers, high yields, moderate gravity, blackspot bruise resistance, good chip color, and good appearance. It is scab susceptible, but it is resistant to golden nematode (races Ro1 and R02) and has moderate late blight resistance.
- **NY148** (NY128 x Marcy), a late-season, high specific gravity, chip stock clone. It has round tubers with prominent skin netting. Yields have been very high in many trials. Chip color from storage is good, but not exceptional. It has good scab resistance, moderate early and late blight resistance, resistance to golden nematode (Ro1). It is susceptible to internal heat necrosis and is quite susceptible to bruising.
- **NY150** (NY121 x Jacqueline Lee), a niche market, early-season, round-white for fresh market use. It produces many small tubers with bright white skin. It has moderate scab resistance, moderate late blight resistance, resistance to golden nematode (Ro1), and is immune to PVY.

Project milestones for 2013, and progress related to each of these, follow:

Conduct breeding, germplasm enhancement, and selection studies to improve potato productivity and quality for important eastern U.S. markets.

Breeding: *During 2013, our programs generated 978 new tetraploid families (733,000 seeds) from crosses using parents with desirable quality, utilization, adaptation, and/or pest resistance traits. USDA-ARS also generated 83 2x crosses (209,000 seeds) for use in germplasm improvement. Progeny (106,900) from earlier crosses were field selected resulting in 3,437 clones that will be further selected under conditions with diverse abiotic and biotic stress in the eastern U.S. and beyond. Crosses conducted by the University of Maine continue to emphasize (50%) russets for processing and fresh; however, a significant component of the program is represented by round whites and chipping types (40%)and specialty types (10%). Cornell University and NC State University place strong emphasis on breeding for chip quality and utilization, but also include fresh market, colored-skin, and specialty types in their breeding goals.*

USDA-ARS potato breeding at the tetraploid level typically focuses on chipping types and clones with colored skin and/or flesh. The 4x-2x crosses in the USDA-ARS program partially focus on yellow-fleshed tetraploid S. tuberosum (tub) and orange-fleshed diploid S. phureja-S. stenotomum (phu-stn) to enhance the carotenoid content in tuberosum. The phu-stn combinations are also being used to

enhance tuber specific gravity. In addition, crosses were made between tub and hexaploid S. albicans or S. iopetulum to incorporate the nitrogen uptake efficiency of these hexaploid species into tuberosum Also, crosses were made between diploid phu-stn and S. chacoense (chc) to incorporate the nitrogen uptake efficiency of chc into long-day adapted phu-stn. In addition, 4x-2x or 2x-4x crosses were made between tub and cycle three late blight resistant phu-stn clones. Seed nurseries on Aroostook Farm for yellow-flesh and orange-flesh. Approximately 290,000 seed were collected from 44 open-pollinated orange-flesh phu-stn parents and 33,000 seed from 15 open-pollinated yellow-flesh phu-stn parents.

VA Tech continues to develop 4x-2x hybrid families representing unusual genomic combinations of Solanum tuberosum Group Tuberosum and S. tuberosum Group Phureja where much of the Phureja genome has passed through the "monoploid sieve" to eliminate lethal and severely deleterious genes. The question is whether this purified Phureja genome can serve as a building block for new cultivars or if it will introduce too many undesirable traits for potato breeding purposes. Seedlings representing eight 4x-2x hybrid families were planted during 2013 to generate seedling tubers for future selection studies. The families were generated from crosses between cultivars Atlantic, Katahdin and Desirée as female parents and male parents consisting of diploid hybrids derived from crosses between doubled monoploids and heterozygous diploid selections. The greenhouse tubers will be shipped to project cooperators in ME and NC for field selection.

Selection: *USDA-ARS and ME send seed from all clones in the second or third field generation (12-hill or 60-hill stage) to cooperators in FL, NC, PA, NY and ME for early generation evaluation and to select materials with broad regional adaptation. All of our programs send seed from more advanced field generations (third and higher) to regional cooperators (FL, NC, VA, MD, PA, OH, NY, ME) for continued phenotyping, selection, and advancement. Advanced clones from our project were introduced to growers through field days, presentations, publications, web sites, and direct contact with stakeholders. Eight advanced clones were entered into tissue culture programs leading to commercial seed production.*

Use of novel and highly improved potato germplasm to reduce the impact of economically important potato pests in the eastern U.S.

Wild or cultivated diploid germplasm that we are using to introduce novel traits for pest resistance or improved quality includes: S. phureja and S. stenotomum for resistance to early and late blight (USDA-ARS); S. bulbocastanum for late blight and insect resistant (ME), S. chacoense for insect resistance (USDA-ARS, NC); S. hougasii for late blight resistance (USDA-ARS); and S. berthaultii for insect resistance (NY, NC). In addition, 4x-2x or 2x-4x crosses were made between tub and cycle three late blight resistant phu-stn clones.

Golden nematode: *Breeding efforts in NY have emphasized resistance to golden nematode Ro1; however, resistance to race Ro2 is now also a priority. The NY program developed Ro2 resistance by selecting for adaptation within a collection of South American tetraploids, and work has begun to procure additional sources of resistance from Europe to broaden the genetic base of resistance and provide resistance to G. pallida. The USDA-ARS and ME programs also use parental materials with nematode resistance. Progeny from crosses using resistant parents are being evaluated for resistance to both races of the golden nematode (NY and USDA-ARS). NY's H1 PCR-based marker is also being also used to screen clones for Ro1 resistance (NY, ME). NY is also testing for resistance to G. pallida using in vitro techniques.*

Late blight: *Mini-tubers were produced for the cycle four diploid phu-stn late blight resistant population. Tubers from 20 seedlings from each of 72 families were paired, with one to be sent to Mexico for evaluation in 2013 and the other to be planted in Maine. Three segregating families,*

consisting of 41 clones total, involving a late blight resistant selection of S. hougasii (6x) obtained from Chuck Brown (ARS-WA) were evaluated for foliar late blight in PA in 2012. Twenty-one of these clones were significantly more resistant to late blight than Atlantic. Of the 105 clones selected from crosses between (Beltsville clones x CIP clones with horizontal late blight resistance to late blight) and (Beltsville clones x cold chipping tub-gryl hybrids from ARS-WI), 27 had specific gravity greater than 1.080 and chip color from Jan 50F storage less than 7.0. All clones were harvested and tubers sent to PA for late blight evaluations in 2013.

Scab: *ME, NY, PA, and USDA-ARS screen and select for resistance to scab in inoculated and/or naturally-infected field experiments. Lines are tested over multiple years because of environmental effects on disease incidence and severity. Scab resistant parents are used extensively in all four breeding programs. Clones showing resistance are being used as parents to improve the level of resistance in future germplasm. Clones from Per McCord's IHN mapping population have been evaluated for resistance to common scab in ME. The population appears to be segregating for resistance.*

Potato Virus Y (PVY) *As a result of the NY neotuberosum project, extreme resistance to PVX and PVY is present in many NY breeding lines. The variety Eva, for example, is immune to both PVX and PVY. All four breeding programs continue to include virus-resistant clones as parents. Marker-assisted selection for potato virus Y resistance (Whitworth et al. 2009; Ry_{adg}, RYSC3, Kasai et al, 2000; Ry_{sto}, YES3, Song and Schwarzfischer 2008) are being used to supplement traditional screening methods and provide earlier detection of resistant clones.*

Colorado Potato Beetle: *Horticultural evaluation of glandular-trichome- producing advanced lines continues within the Cornell NY breeding program. Crossing at the diploid level is also being undertaken to reinitiate the introgression of trichome traits from S. berthaultii into S. tuberosum. All current CPB-resistant lines are derived from a handful of crosses between tetraploid S. tuberosum and unreduced pollen from diploid S. berthaultii. A frequent association between insect resistance and unacceptable levels of tuber glycoalkaloids has been difficult to eliminate while selecting at the 4x level. Current tetraploid lines also lack the acyl-sugar secreting, type B trichomes present in S. berthaultii. In a complementary effort, NCSU has used the USDA-ARS-developed tetraploid S. chacoense (2n=4x=48) potatoes crossed with S. tuberosum (Sanford et al., 1997) to develop CPB resistant germplasm. During 2006-2013, NCSU has used several of the most promising advanced chc-based CPB-resistant lines in crosses with Cornell University's S. tuberosum X S. berthaltii derived materials. Field evaluation of these materials continued in 2013.*

Selection: Each of the breeding programs maintain plots for resistance screening (e.g. NC, CPB resistance; ME, scab, verticilliun, late blight, pink rot, fusarium, PVY and PLRV; NY late blight, scab, insect resistance, PVY; USDA-ARS late blight, scab; and/or or utilize regional collaborators (USDA-ARS NY for golden nematode resistance; Penn State for late blight, early blight, and powdery scab). Marker-assisted selection is being used to speed selection for PVY and golden nematode resistance.

Short-term Outcomes:

Eastern potato growers need new potato varieties which are highly productive and less susceptible to stress, diseases, and insects than current varieties. This regional potato breeding and trial network produces new potato varieties and evaluates their potential to serve fresh, processing, and specialty potato markets in the East. These new varieties will improve grower profitability by increasing yields, enhancing market quality, and/or decreasing costs associated with pests. Farm gate receipts for eastern potato production exceed 460 million dollars annually, therefore the impact of a successful new potato cultivar can mean many millions of dollars to the industry over time. Potatoes can cost more than $2500 per acre to produce and devastating diseases such as pink rot and/or late blight can totally destroy the crop. Resistant varieties greatly decrease the risk of losses and, in the case of late blight resistance, can reduce production costs by reducing the number

of chemical sprays applied to protect the crop from the pest. Several areas in NY could not produce potatoes without the golden nematode resistant varieties developed as part of this and other research projects. Over the years, the eastern regional project has resulted in the release of many commercially important potato varieties (e.g. Atlantic, Andover, Harley Blackwell, Kanona, Keuka Gold, MaineStay, Marcy, Monticello, Pike, and Sunrise). Peter Wilcox, a purple-skinned yellow-fleshed specialty variety from the USDA-ARS program, and Lehigh, a yellow-fleshed dual-purpose variety from NY, are two of the more recent releases from the eastern programs. Lamoka (NY139), Waneta (NY138), and Red Maria (NY129) are three 2010-2011 releases that are attracting commercial interest. Elkton (B1992-106) was released in 2012, while Sebec (AF0338-17) and Easton (AF3001-6) were released in early 2014. Potato seed multiplication and commercial adoption are slow processes, so it will take years to know the full impacts of these varieties on eastern potato production. To facilitate the adoption process, ME coordinated 16 commercial-scale trials representing 11 new potato varieties (2 chippers, 1 round-white, 3 russets, 3 reds, and 2 specialty market yellow fleshed) and 111 acres during 2013. Additional commercial trials were conducted in the other participating states. AF0338-17, AF3001-6, and AF3362-1 were among the clones in these commercial trials. Additional commercial trials were conducted in the other participating states. Recent variety releases from the eastern group or those introduced to the east by our trial network were produced on 2184 seed acres in NY and ME during 2013. The seed value of these acres is ~$4.0M and this seed has the potential to produce 12,100 acres of potatoes in 2014 with a value of ~$36M. If these varieties perform well their production will expand over time. Depending on the characteristics of the specific potato variety, the potential benefits of adoption include new marketing opportunities, more efficient processing, higher yields, better nutritional value, reduced pesticide costs, and less risk of losses to stress, diseases, and pests.

Outputs:

1. Cultivars released this year:

Elkton is a medium to medium-late maturing potato variety with netted-skinned, round-oblong tubers, and white-flesh. Average marketable yields ranged from 76% to 113% of Atlantic. Elkton was released by the USDA-Beltsville program in November 2012. Elkton has been extensively tested by the NE1231 network, chip color processed directly from the field in southern locations or from storage in the northern locations is about the same as 'Atlantic'. Elkton is resistant to internal heat necrosis. Overall baked, boiled and microwaved scores have been good. Elkton is moderately resistant to common scab, early blight, and Verticillium wilt; intermediate to moderately susceptible to late blight; moderately susceptible to powdery scab; and, susceptible to potato virus Y and potato virus S.

(Two other varieties Sebec (AF0338-17) and Easton (AF3001-6) were released in early January 2014, just outside the timeframe of this report and will be listed next year – see above for attributes of these two cultivars).

2. Publications:

Journal Papers

Haynes, K.G., X. Qu, and B.J. Christ. 2014. Two cycles of recurrent maternal half-sib selection reduce foliar late blight in a diploid hybrid *Solanum phureja – S. stenotomum* population by two-thirds. Amer. J. Potato Res. 91:254-259.

Haynes, K.G., D.M. Gergela, X.S. Qu, M.W. Peck, G.C. Yencho, M.E. Clough, M.R. Henninger, D.E. Halseth, G.A. Porter, P.C. Ocaya, L. Zotarelli, S.R. Menasha, B.J. Christ, L. Wanner, C.M. Hutchinson. 2014. Elkton: A new potato variety with resistance to internal heat necrosis and hollow heart and suitable for chipping directly from the field in the southern United States. Amer. J. Potato Res. 91:269-276.

Published Abstracts

Gergela, D.M., L. Zotarelli, K. Haynes, and G.A. Porter. 2013. B1992-106, a new potential chipping potato variety for Florida. Am J Potato Research 90: 131 (abstr.)

Porter, G.A., P. Ocaya, and T.Mills 2013. New varieties from the breeding and variety development program. Proceedings of the University of Maine Cooperative Extension Potato Conference, Caribou, ME. January 24, 2013 (abstr.).

Porter, G.A. and P.C. Ocaya 2013. National fry processing trial and USPB/SFA chipping potato trial. Proceedings of the University of Maine Cooperative Extension Potato Conference, Caribou, ME. January 24, 2013 (abstr.)

Technical Articles or Reports, not refereed

Halseth, D.E., Sandsted, E.R., Kelly, J.M., and Moriarty, S. 2014. 2013 Upstate New York potato variety trials and cultural practice experiments. Cornell University, Department of Horticulture Report No. 81, 54 pages

Kleinhenz, M.D., J.B. Moyseenko, S.D. Walker, and B. Williams. 2013. Ohio Potato Germplasm Evaluation Report, 2013. The Ohio State University, Horticulture and Crop Science Series No 810, 48 pp.

Porter, G.A., P. Ocaya, B. MacFarline, and B. Plummer. 2013. Potato variety trial results in Maine, 2012 growing season. PSE Departmental Mimeo 2013-01, 40 pp.

Porter, G.A., P. Ocaya, and T. Mills. 2013. Maine potato breeding program annual report, 2013 growing season. PSE Departmental Mimeo, 20 pp.

Qu, X. and B.J. Christ. 2014. Pensylvania Potato Research Report, 2013. Dept of Plant Pathology & Environmental Biology, The Pennsylvania State University, University Park, PA, 35 pp.

Yencho, G.C. and M.E. Clough. 2013. North Carolina Potato Variety Trial and Breeding Report, 2013. NC State University, Raleigh, NC. 44pp. < http://potatoes.ncsu.edu/Reports.html

L. Zotarelli. 2013. Florida Potato Variety Trial Report, 2013. University of Florida, Horticultural Sciences Department. Report. 231 pages.