# APPENDIX A. Supporting tables on NE9 crop importance and the PGRU conservation and distribution activities.

Table 1. Importance of the PGRU's vegetables and fruits to the U.S. Based on US Production Data from National Agricultural Statistics Service (2022).

|  |  |
| --- | --- |
| **Crops** | **Average U.S. Production Value from 2016-2021 in millions of dollars** |
| Artichokes | $67.01 |
| Asparagus | $87.66 |
| Broccoli | $825.92 |
| Cabbage | $451.25 |
| Cauliflower | $403.35 |
| Celery | $381.01 |
| Onions | $997.69 |
| Squash | $218.12 |
| Tomatoes | $1,713.47 |
| **Total vegetables** | **$5,145.48** |
| Apples | $3,129.97 |
| Grapes | $5,908.48 |
| Tart Cherries | $62.20 |
| **Total fruits** | **$9,100.66** |

Table 2. Number of **samples** distributed from PGRU **seed** collections from 2018-2022 by cooperator type.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cooperator Type** | **2018** | **2019** | **2020** | **2021** | **2022** | **Total** |
| Foreign, Commercial Companies | 5872 | 3908 | 366 | 6851 | 592 | **17589** |
| Foreign genebank/genetic resource units | 6 | 30 | - | 64 | 123 | **223** |
| Foreign Individuals | 771 | 47 | 170 | 6 | 27 | **1021** |
| Foreign Public Organizations (gov) | 2190 | 1259 | 965 | 1227 | 2056 | **7697** |
| US State Agencies & All Universities | 1713 | 2131 | 2000 | 2756 | 1069 | **9669** |
| USDA, ARS | 32 | 439 | 185 | 91 | 17 | **764** |
| USA Commercial Companies | 1988 | 1193 | 813 | 2219 | 790 | **7003** |
| Other USA Federal Agencies | 169 | 480 | 7 | 3 | 37 | **696** |
| USA Individuals | 263 | 693 | 380 | 167 | 164 | **1667** |
| US Non-profit Organizations | 614 | 61 | 102 | 7 | 27 | **811** |
| **Total** | **13618** | **10241** | **4988** | **13391** | **4902** | **47140** |

Table 3. Number of **unique accessions** distributed from PGRU **seed** collections from 2018-2022 by cooperator type.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Cooperator Type** | **2018** | **2019** | **2020** | **2021** | **2022** |
| Foreign, Commercial Companies | 4890 | 3493 | 343 | 6546 | 584 |
| Foreign genebank/genetic resource units | 6 | 29 | - | 64 | 123 |
| Foreign Individuals | 770 | 46 | 170 | 6 | 27 |
| Foreign Public Organizations (gov) | 1661 | 1185 | 790 | 1047 | 1524 |
| US State Agencies & All Universities | 1297 | 1510 | 1561 | 1902 | 942 |
| USDA, ARS | 32 | 398 | 125 | 76 | 17 |
| USA Commercial Companies | 1485 | 1059 | 686 | 1977 | 668 |
| Other USA Federal Agencies | 169 | 463 | 7 | 3 | 36 |
| USA Individuals | 255 | 647 | 359 | 163 | 149 |
| US Non-profit Organizations | 611 | 60 | 102 | 6 | 27 |

Table 4. Number of **samples** distributed from PGRU **clonal** collections from 2018-2022 by cooperator type.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Cooperator Type** | **2018** | **2019** | **2020** | **2021** | **2022** | **Total** |
| Foreign, Commercial Companies | 7 | - | - | 4 | - | **11** |
| Foreign genebank/genetic resource units | 1 | 123 | - | - | - | **124** |
| Foreign Individuals | 132 | 68 | 102 | 54 | 80 | **436** |
| Foreign Public Organizations (gov) | 16 | 34 | 1 | - | 8 | **59** |
| US State Agencies & All Universities | 1911 | 1314 | 395 | 161 | 274 | **4055** |
| USDA, ARS | 331 | 1265 | 664 | 9 | 446 | **2715** |
| USA Commercial Companies | 684 | 412 | 240 | 80 | 136 | **1552** |
| Other USA Federal Agencies | 9 | 3 | 8 | 14 | 10 | **44** |
| USA Individuals | 4737 | 4558 | 2557 | 274 | 354 | **12480** |
| US Non-profit Organizations | 255 | 204 | 147 | 1 | 14 | **621** |
| **Total** | **8083** | **7981** | **4114** | **597** | **1322** | **22097** |

Table 5. Number of **unique accessions** distributed from PGRU **clonal** collections from 2018-2022 by cooperator type.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Cooperator Type** | **2018** | **2019** | **2020** | **2021** | **2022** |
| Foreign, Commercial Companies | 7 | - | - | 4 | - |
| Foreign genebank/genetic resource units | 1 | 117 | - | - | - |
| Foreign Individuals | 71 | 28 | 36 | 22 | 28 |
| Foreign Public Organizations (gov) | 15 | 29 | 1 |  | 8 |
| US State Agencies & All Universities | 1028 | 426 | 371 | 154 | 264 |
| USDA, ARS | 315 | 1184 | 664 | 9 | 437 |
| USA Commercial Companies | 457 | 335 | 211 | 72 | 128 |
| Other USA Federal Agencies | 6 | 3 | 8 | 14 | 10 |
| USA Individuals | 1586 | 1671 | 1209 | 184 | 304 |
| US Non-profit Organizations | 167 | 170 | 133 | 1 | 14 |

Table 6. Number of samples and unique accessions distributed to NE9 states from 2018-2022.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **State** | **Clonal** | | **Seeds** | |
| **Samples** | **Accessions** | **Samples** | **Accessions** |
| Connecticut | 77 | 70 | 18 | 18 |
| Delaware | 35 | 35 | 2 | 2 |
| Maine | 639 | 484 | 62 | 60 |
| Maryland | 748 | 667 | 99 | 90 |
| Massachusetts | 263 | 201 | 102 | 98 |
| New Hampshire | 95 | 88 | 106 | 106 |
| New Jersey | 85 | 83 | 187 | 177 |
| New York | 5065 | 2074 | 3992 | 3253 |
| Pennsylvania | 895 | 583 | 318 | 296 |
| Rhode Island | 27 | 27 | 1 | 1 |
| Vermont | 268 | 230 | 15 | 9 |
| West Virginia | 581 | 450 | 28 | 27 |
| **Total to NE9** | **8778** | **2823** | **4930** | **3788** |

**Appendix B:** PGRU References from 2018 to 2022

**2018**

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**Appendix C:** Facilities and Equipment

Facilities

1. PGRU is divided between three buildings located on the campus of the New York State Agriculture Experiment Station, Cornell University, Geneva, New York.
   1. USDA Building (592 m² or 6,372 sq ft) houses the laboratory, administration, components as well as facilities for clonal crops
      1. Five offices (114 m² or 1,227 sq ft), including Research Leader, Computer Specialist, Molecular Biologist, Computer support staff and Administrative Support Staff.
      2. Laboratory Space (157 m2 or 1,690 sq ft )
      3. Three Clonal Greenhouses (160 m2 or 1,722 sq ft)
      4. Headhouse (92 m² or 990 sq ft)
      5. Characterization room (30 m² or 323 sq ft)
      6. Cold Storage (26 m² or 280 sq ft)
   2. Clonal Office Building was finished in July 2001 with 4 scientist offices at 100 sq ft each. Technician room with 10 cubicle workstations for the clonal program technicians and breeding program technicians at 400 sq ft. One unisex bathroom and open storage area.
   3. The Seed Processing Building houses the NERPIS office, seed processing and storage facilities
      1. Office space (858 sq ft), contains three enclosed offices for Vegetable Curator/Horticulturist, Statistician and the Operations Manager. Desk space for Greenhouse Manager, three Agricultural Science Technicians and a Biological Science Aid.
      2. Vernalization chamber (291 sq ft) held at 20 °C and ambient humidity.
      3. Seed cold storage room (47 m2 or 529 sq ft) held at 0° C and 20% relative humidity.
      4. Cold storage anteroom (27 m2 or 330 sq ft) held at 4° C and 30% relative humidity.
      5. Restrooms (47 m2 or 506 sq ft) handicap equipped, separate for male and female.
2. Crop and seed production facilities include approximately 24.1 ha of land and 0.10 ha of greenhouses.
   1. Wellington farm (14 ha or 34.58 acres), is located 1.2 km (about 1 mile) north of the Cornell Agritech campus. The PGRU has a lease-to-own contract with Cornell University. The following site improvements have been made:
      1. Comprehensive field drainage system was installed in 1988.
      2. 1105 m2 (11,895 sq ft) field laboratory which includes a 277 m2 (2,982 sq ft) rodent proof storage area for pollination cages and bee keeping equipment, an 483 m2 (5,200 sq ft) farm equipment storage and workshop area and a 350 m2 (3,768 sq ft) heated field lab for planting, harvesting and seed cleaning operations was built in 1989.
      3. Twenty-five hive apiary on a gravel pad was established in 1992.
      4. Trickle irrigation was installed in 1992. The farm was divided into 8 irrigation zones which can be individually scheduled using electronic timers. The system includes a 18,920 liter (4,000 gallon) water storage tank and an injection fertigation system.
      5. Electrified deer fence was installed in 1992. A deer fence now encloses both the Wellington Farm and the adjacent McCarthy Farm which is used by the NCGR.
      6. 3-sided equipment shed
   2. McCarthy Farm (Approximately 20 ha or 50 acres) is located 1.3 km (about 1 mile) North of the NYSAES Campus. The PGRU maintains a long-term lease with Cornell University for this property.
      1. Comprehensive field drainage system was installed in 1984-85.
      2. Trickle irrigation was installed in 1984-85. There are 9 risers from the system which are normally controlled.
      3. Electrified deer fenced was installed in 1984-85. The fence was modified/extended in

1992 to encompass the Wellington Farm.

* + 1. 4.05 ha (10 acres) are leased from Cornell University on the Station Nursery Farm which is located 0.4 km (0.2 mile) north of the Wellington farm. Site improvements include trickle irrigation and field tile drainage.
  1. Greenhouse Facilities
     1. Construction was completed on two permanent USDA, ARS greenhouses (450 m2 or 5,000 sq ft) in 1992. One house (PGH-1) is equipped with aluminum-framed rolling benches, the other (PGH-2), has sand bed floors to accommodate pollination cages. Both greenhouses contain computerized environmental controls, automated drip irrigation systems, ratio:feeder fertilizer injector, hot water bottom heat for benches and ground beds and 1,000 watt sodium lights and are heated with steam. Approximate capacity is 5,000 1-gallon pots.
     2. Construction was complete in 2002 on a permanent USDA, ARS greenhouse (2,000 sq ft). The house (PGH-3) is equipped with sand bed floors and computerized environmental controls.
     3. Adjoining headhouse (148 m2 or 1,600 sq ft) contains 12.43 m2 (134 sq ft) potting bench space, 11 soil bins (4.5 hl), 2 walk-in vernalization coolers (92 m2 or 990 sq ft), steel shelving (30 m2 or 323 sq ft) for storage, and vented steel chemical storage cabinet for pesticide storage and was completed in 2004.

Information Management

Computer resources include a Dell server [PowerEdge R510 (4TB and 8TB HD, 64GB RAM, 1GB Network)] and Red Barn server [Supermicro SYS-8027R-TRF+ (20TB HD, 512GB RAM, 10GB Network)] housed by the Cornell University Computational Biology Service Unit for bioinformatics. Cloud storage solutions are available, allowing for the maximization of research and information security. An onsite USDA IT specialist is at the location, which helps to bridge the gap between university and USDA IT systems. Cornell University supplies high-speed Internet2 rated traffic. Our collaboration tools use voice over internet protocol (VoIP), Microsoft Teams, and Zoom.

Field Equipment

Equipment used for field maintenance and distribution of seed and clonal collections are listed below:

|  |  |  |
| --- | --- | --- |
| * 3 pt. hitch Spinner Spreader | * Debarder | * Rotary mower |
| * 4 Bottom Plow | * Disk | * Rotovator |
| * Air blast sprayer | * Drill | * Seed Counter |
| * Air Column (5) | * Flatbed trucks (5) | * Snowmobile |
| * ATV (4) | * Forklift | * Sprayer |
| * Auger | * Generator | * Straw Mulcher |
| * Boom Sprayer 110 gallon | * Gravity Separator | * Thresher (3) |
| * Brush Chopper, 5’ | * Herbicide Sprayer (2) | * Tiller, 42” Rotovator |
| * Brush Machine | * Mower (2) | * Tiller, 68" Rotovator |
| * Cargo van | * Mower Walk Behind | * Tractor (14) |
| * Cleaner & Tester Mill Seed | * Mulch Layer | * Tractor Wagon |
| * Clipper (2) | * Mulch Transplantor | * Trailer (2) |
| * Crop care Mulch lifter | * Mulcher Pulvi/Teeth Notched | * Vegetable Seed Separator (2) |
| * Cultivator | * Multi-Crop Shredder | * Ventilation bin controller |
| * Cultivator - Vineyard | * Plow Coulter-Chisels SL |  |
| * Cutter Mower – Sickle-bar | * Power Pruners |  |

Laboratory and Characterization Equipment

Equipment used for characterization and research of seed and clonal collections are listed below:

|  |  |  |
| --- | --- | --- |
| * Autoclave | * HPLC Systems (3) | * Refractometer (2) |
| * Balance (3) | * Hybridization oven (2) | * Repeater Thin/Thin |
| * Calculator, DNA/RNA | * Ice machine | * Rotor (8) |
| * Centrifuge (7) | * Incubator (2) | * Shaker, Environmental (2) |
| * Centrifuge (refrigerated) | * Laminar Flow Hood (2) | * Shaker, Junior Orbital (2) |
| * Cold Chamber (2) | * Liquid nitrogen tank | * Speedvac (2) |
| * Digital imager/Analysis | * Lyophilizer system | * Still |
| * Dishwasher | * Microplate Reader | * Titrator, automated |
| * DJI Phantom Drone | * Oven (2) | * Transfer lamp |
| * Fotosystem 1000 | * PCR Machine (8) | * Tristimulus Colorimeter (3) |
| * Freezer, -20℃ (2) | * Penetrometer, digital | * Uninterrupted Power Supply (2) |
| * Freezer, -80℃ (9) | * pH meter (2) | * Vacuum Centrifuge |
| * Genetic Analyzer | * Plate reader | * Vacuum Manifold |
| * GenoGrinder (2) | * Printer | * Water Filtration System |

# APPENDIX D: Project participants for the NE-9 Regional Research Project

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**APPENDIX E:** Projected participation, allocation of resources of state and federal participants for Regional Research Project NE9: Plant Genetic Resources Conservation and Utilization.

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Participant Name, Email Address and Phone Number** | **Institution and Department** | **Research** | | | | | | **Objectives** | | | |
| CRIS Codes | | | Personnel | | |
| RPA | SOI | FOS | SY | PY | TY | 1 | 2 | 3 | 4 | |
| Gan-Yuan Zhong  [GanYuan.zhong@usda.gov](mailto:GanYuan.zhong@ars.usda.gov) 315-787-2482 | PGRU, USDA, ARS | 202-1110-1080; 202-1112-1080  202-1130-1080; 202-1131-1080  202-1132-1080; 202-1139-1080 | | | 0.25 | - | 1.25 |  | X | X | X | |
| Benjamin Gutierrez  [ben.gutierrez@usda.gov](mailto:ben.gutierrez@usda.gov)  315-787-2439 | PGRU, USDA, ARS | 202-1110-1080; 202-1112-1080  202-1130-1080; 202-1131-1080  202-1132-1080; 202-1139-1080 | | | 1.00 | - | 2.00 | X | X | X | X | |
| Zachary Stansell [zachary](mailto:c.thomas.chao@ars.usda.gov).stansell@usda.gov  315-787-2454 | PGRU, USDA, ARS | 202-1110-1080; 202-1112-1080  202-1130-1080; 202-1131-1080  202-1132-1080; 202-1139-1080 | | | 1.00 | - | 2.60 | X | X | X | X | |
| Erin Galarneau [erin.galarneau@usda.gov](mailto:%20%20%20%20%20%20%20%20%20%20%20%20erin.galarneau@usda.gov)  315-787-2438 | PGRU, USDA, ARS | 202-1429-1080; 202-1430-1080  202-1451-1080; 202-1460-1080  202-1469-1080 | | | 1.00 | - | 6.60 |  | X | X | X | |
| Peter Bretting [peter.bretting@usda.gov](mailto:peter.bretting@ars.usda.gov) 301-504-5541 | NPS, USDA, ARS,  National Program  Leader NP301 | 202-1110-1080; 202-1112-1080  202-1130-1080; 202-1131-1080  202-1132-1080; 202-1139-1080  202-1429-1080; 202-1430-1080  202-1451-1080; 202-1460-1080  202-1469-1080 | | | 0.10 | - | - | X | X | X | X | |
| Gary Kinard [gary.kinard@usda.gov](mailto:gary.kinard@ars.usda.gov) 301-504-5951 | National Germplasm Resources Laboratory USDA, ARS | 202-1110-1080; 202-1112-1080  202-1130-1080; 202-1131-1080  202-1132-1080; 202-1139-1080  202-1429-1080; 202-1430-1080  202-1451-1080; 202-1460-1080  202-1469-1080 | | | 0.15 | 1.00 | - | X |  | X |  | |

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| **Participant Name, Email Address and Phone Number** | **Institution and Department** | **Research** | | | | | | **Objectives** | | | |
| CRIS Codes | | | Personnel | | |
| RPA | SOI | FOS | SY | PY | TY | 1 | 2 | 3 | 4 | |
| Karen Williams karen.williams@ usda.gov 301-504-5421 | National Germplasm Resources Laboratory USDA, ARS | 202-1110-1080; 202-1112-1080  202-1130-1080; 202-1131-1080  202-1132-1080; 202-1139-1080  202-1429-1080; 202-1430-1080  202-1451-1080; 202-1460-1080  202-1469-1080 | | | 0.15 | - | 0.15 | X |  |  |  | |
| Christina Walters christina.walters@ usda.gov 970-495-3202 | National Center for Genetic Resources Preservation;  USDA, ARS | 202-1110-1080; 202-1112-1080  202-1130-1080; 202-1131-1080  202-1132-1080; 202-1139-1080  202-1429-1080; 202-1430-1080  202-1451-1080; 202-1460-1080  202-1469-1080 | | | 0.10 | 0.10 | 0.05 | X |  |  |  | |
| Gayle Volk  [gayle.volk@usda.gov](mailto:gayle.volk@ars.usda.gov)  970-492-7607 | National Center for Genetic Resources Preservation;  USDA, ARS | 202-1110-1080; 202-1112-1080  202-1130-1080; 202-1131-1080  202-1132-1080; 202-1139-1080  202-1429-1080; 202-1430-1080  202-1451-1080; 202-1460-1080  202-1469-1080 | | | 0.10 | 0.10 | 0.05 | X |  |  |  | |
| Christopher Richards christopher.richards@ usda.gov 970-495-3201 | National Center for Genetic Resources Preservation;  USDA, ARS | 202-1110-1080; 202-1112-1080  202-1130-1080; 202-1131-1080  202-1132-1080; 202-1139-1080  202-1429-1080; 202-1430-1080  202-1451-1080; 202-1460-1080  202-1469-1080 | | | 0.10 | 0.05 | X | X |  |  | X | |
| Total SY, PY, TY and FTE | X | X | | |  |  |  | X | X | X | X | |

1 Research Problem Area(s) (RPA), Subject(s) of Investigation (SOI), and Field(s) of Science (FOS) 2 SY = scientist years, PY = professional years, TY = technician years