# 1997 PROJECT REVISION

NRSP-6
Inter-Regional Potato Introduction Project
(formerly IR-1)

PROJECT NUMBER: NRSP-6 (formerly IR-1)

**TITLE**: Introduction, preservation, classification, distribution and evaluation of *Solanum* species

**DURATION**: October 1, 1997 to September 30, 2002

**STATEMENT OF THE PROBLEM**: Perform functions stated in title as designated National Plant Germplasm System genebank for potato.

**JUSTIFICATION**: Potato is the most important vegetable in the US and the 4th most important world crop after rice, wheat and corn. About 1.4 million acres are grown annually in the US for a production of 45.9 billion pounds, worth $2.43 billion in farm receipts (SR=$206 M, WR=$1501 M, NCR=$491 M, NER=$229M) (National Potato Council, Potato Statistical Yearbook, 1995). Potato chips had retail sales of $4.82 billion in 1995 (Snack Food Association, 1996 State-of-the-Industry Report). Potato is an increasingly popular component of the US diet (Appendix). Only wheat flour exceeds potato in per capita consumption. There is a virtually exploding export market for processed forms (Appendix). Thus improvements in the potato crop have a major impact on society and contribute to an agricultural system which is highly competitive in the global economy.

NRSP-6 has an important role to play in the continued importance of potato in the US:

1. *Genetic improvement in new potato varieties*. Currently grown varieties are a relatively small and uniform group within a large and genetically diverse group of exotic potato species. Thus, NRSP-6 is needed to provide the "new blood" for future varieties with higher consumer acceptance qualities, less reliance on chemical inputs, greater resistance to stresses, and improved yields. This will contribute to a safe and secure food system resulting in healthy, well nourished children, youth, and families, greater harmony between agriculture and the environment, without sacrificing enhanced economic opportunities. Genes which confer resistances are a natural, biologically based pest management technology which contributes to a sustainable agriculture system. NRSP-6 stocks can provide value-added genes which may be incorporated through conventional breeding programs or molecular biology. The practical potential of the NRSP-6 genebank in this regard has expanded greatly with the increasing ease of characterizing and moving exotic genes through biotech.

2. *Quarantine issues*. Scientists who import potato germplasm must wait 1-2 years for the stocks to pass through quarantine. By preserving germplasm of interest at NRSP-6, the time and expense of quarantine testing is not duplicated, and US scientists can quickly obtain the materials needed for their research. Because potatoes can be easily contaminated with systemic and other pathogens, the US breeders and researchers need NRSP-6 to serve as a center for preservation and distribution of "clean" potato germplasm.

3. *Preservation of biodiversity*. Natural habitats in which potatoes grow are being increasingly disturbed, threatening the *in situ* genetic diversity. NRSP-6 is needed to set collection priorities and organize expeditions, preserving unique germplasm before it is lost. NRSP-6 also is needed to coordinate with foreign agencies and the US plant introduction and quarantine offices for acquisition of valuable stocks from other genebanks.

4. *Technology transfer*. Data related to the identification, characterization and evaluation of samples must be gathered, organized and made available to users if genetic resources are to be efficiently used. NRSP-6 provides this service. The NRSP-6 germplasm resource is the linchpin for a broad multidisciplinary, multifaceted national program for potato genetic evaluation and improvement. Basic germplasm handling and manipulation research is shared through technology transfer to potato researchers worldwide. The NRSP-6 genebank also serves as a

model for conservation of biodiversity, and staff regularly do educational outreach to schools and community groups.

**PREVIOUS WORK**: In 1947 the Potato Association of America documented the need for a genebank for tuber-bearing *Solanum* species. A cooperative North Central Regional Project was established at the University of Wisconsin Peninsular Agricultural Research Station near Sturgeon Bay, Wisconsin in 1948, and in 1950, this Project became the Inter-Regional Potato Introduction Project. In 1992 IR-1 became National Research Support Program - 6 (NRSP-6). NRSP-6 IS DESIGNATED AS THE OFFICIAL WORKING COLLECTION OF POTATO GENETIC RESOURCES FOR THE UNITED STATES. NO OTHER PROJECT IS RESPONSIBLE FOR MAINTAINING POTATO GERMPLASM.

Introduction: Germplasm has been acquired through donations from foreign genebanks or collectors, collecting expeditions organized by IR-1, and through sampling of introductions made by individual US scientists. The collection now contains 4,596 wild and cultivated tuber-bearing *Solanum* species represented by 4,356 true seed populations and 240 clonal stocks (varieties, breeding stocks, genetic stocks, etc.). The NRSP-6 *Solanum* wild potato species collection is the largest, most complete and most accessible in the world.

Classification: Internationally recognized *Solanum* taxonomists have actively cooperated in classification and description of species collected. Ten experts have provided NRSP-6 with taxonomic determinations and advice in a total of 41 working visits to Sturgeon Bay. In 1987, Dr. David Spooner joined the Project as taxonomist, collector, and administrator of the herbarium. He has made yearly collecting trips to Latin America.

Preservation: NRSP-6 maintains disease-tested propagules by state-of-the-art technology. Many seedlots have retained high germination rates for over 25 years, and in vitro clones can be stored for up to two years before repropagation. All germplasm has been backed up at the National Seed Storage Lab (NSSL), Ft. Collins, CO, or the University of Wisconsin, Madison.

Distribution: Since 1950, NRSP-6 has distributed over 198,000 samples of germplasm, but demand has increased so rapidly that orders within the last 10 years account for nearly half of this total. These materials have greatly facilitated the growth of basic knowledge of potato, as reflected in the 2,141 research papers and graduate theses documented in annual reports to date. Exotic germplasm is increasingly being used to breed modern cultivars. Wild or primitive cultivated species *Solanum andigena, acaule, chacoense, demissum, phureja, spegazzinnii,* and *raphanifolium* appear in the pedigrees of varieties released in Canada and the US 1992-95.

Evaluation: Extramural funding has allowed NRSP-6 to contract numerous systematic screening experiments on economically important traits. These data have been summarized and are available in printed or computer database form. Project staff have done research involving many aspects of breeding, genetics, physiology, disease and pest resistance, and germplasm technology. Crossing barriers have been overcome. New traits of potential use have been characterized. Easier methods of handling germplasm have been pioneered, and taxonomic research has helped to put germplasm in more useful groupings (for specifics see listed publications under section *Critical Review*).

**OBJECTIVES**:

1. Introduce additional germplasm to expand genetic diversity contained in the US *Solanum* germplasm collection.

2. Classify accessions with species names which will serve as stable identifiers, and promote efficient utilization.

3. Preserve all NRSP-6 germplasm in secure, disease free, and readily available form according to best current technology and conduct research pursuant to improving that technology.

4. Distribute potato germplasm, associated data and advice to all researchers and breeders in a timely, efficient, and impartial manner.

5. Evaluate the collection for as many important traits as possible.

6. Collaborate with foreign potato genebanks for global database development, exchange of materials and technology, and free access of germplasm.

**PROCEDURES**:

1. Introduction: *Solanum* species will be collected in Latin America each year according to priorities set by NRSP-6. Germplasm of interest will be requested from CIP, BGRC, and other potato genebanks based on the new global evaluation database. Foreign scientists with research materials of interest to US scientists will be asked to share these stocks. Potato germplasm imported by US scientists will be reviewed by the Technical Committee for possible addition to the collection. ARS releases will be incorporated into the NPGS collection. Documentation of all new introductions will be computerized and entered into the national germplasm database, the Germplasm Resources Information Network (GRIN), local databases, and the Intergenebank Potato Database.

2. Classification: Species names will be assigned to all new accessions. Taxonomic studies using both molecular and classical techniques will be employed to determine stable species boundaries. Especially relevant are "complexes" of species which are (questionably) synonymous like *brevicaule*. It will be very helpful to have the empirical evidence on which to assign stable species names. The herbarium will be updated to include new collections, labels will be printed and affixed where missing, and a catalog listing available herbarium specimens will be printed and distributed.

3. Preservation: Research to identify less expensive, easier, and more reliable ways to grow and increase potato germplasm will continue. We will research the potential of remote OP seed increases, straw mulch for weed control, improved potting media, treatments to improve uniformity of germination, pollination techniques. Samples of new germplasm will be transferred to NSSL and/or the University of Wisconsin for backup. Rigorous disease prevention and monitoring practices (mainly for viruses) will be continued. We will add bacterial ring rot screening to the health monitoring protocol for the in vitro collection, and will experiment with modified atmospheres to improve long term in vitro storage. What is the best genetic sample of diversity for each species, and how do we most efficiently collect and maintain it? With modern DNA based techniques, we can find precise answers to these questions. Thus, we also need a program on site to generate the basic data which will allow us to monitor the genetic diversity in the collection. Lab facilities and staff will be added for molecular marker analysis to quantify genetic relationships within species. This will provide empirical evidence for: 1) the effectiveness of current seed increase techniques, 2) the relationship of genetic diversity within the genebank and *in situ*, 3) ecogeographic factors correlated with genetic diversity, 4) collection techniques to maximize capture of genetic diversity, 5) synthesis of core collections, and, 6) actual identity of germplasm samples misidentified or presumed to be duplicated among world potato genebanks. Research into the *in situ* status of US germplasm will be done as groundwork, and an *in situ* preservation project will be started in the Southwest US.

4. Distribution: Quick and impartial distribution of germplasm will be maintained. An updated catalog of available stocks will be prepared, printed, and distributed to cooperators.

5. Evaluation: Unpublished screening data of experiments conducted by cooperators will be requested, and published reports will be reviewed to gather evaluation information. Extramural funds will be sought for high priority systematic screening related to taxonomy, genetics, physiology, and reproductive biology. Resulting data will be summarized, compiled with previous information, and made available in GRIN, local databases, published research papers and printed catalogs. Investments in germplasm maintenance pay dividends proportional to the known usefulness of the germplasm. Thus, we need to do more systematic screening for economic traits, their genetic characterization, and the identification of specific individuals and/or populations which are best candidates for enhancement. NRSP-6's efforts to evaluate germplasm should be expanded so that fully characterized materials (e.g., screened to the genotype level) can be provided to enhancement researchers who will adapt these materials for breeding. The diversity of exotic germplasm often provides a greater range of expression for economic traits than that found in the cultivar breeding pool. These extreme types need to be

identified and used as research models to help us better understand the genetics and physiology of desired traits (thus, how to most efficiently breed them into the crop). We also need to upscale our efforts to systematically adapt wild germplasm for tuberization in the long days of the North American growing season. This will allow more practical screening of tuber traits. Additional funding will be needed to accomplish this.

6. Collaboration: Intergenebank collaboration initiated in 1990 will be continued and expanded to aid NRSP-6 in meeting its goals: The joint database being produced will identify accessions desirable to introduce and add to the NRSP-6 collection. Cooperation with other genebanks will also allow more logical prioritizing and planning of future collection expeditions. Good relationships will be maintained/built with countries to which potato species are native, and countries in which the exceptional ability of the potato to produce food is needed. Exchange of germplasm and herbarium specimens will facilitate taxonomic comparisons needed for proper classification. Germplasm management techniques will be shared, such that NRSP-6 can incorporate preservation methods found to be effective at other genebanks. Requesters will benefit from a global perspective on the status of available potato germplasm, since this will make distribution as fast and efficient as possible. Similarly, worldwide pooling of evaluation data will arm NRSP-6 cooperators with more information with which to exploit potato germplasm. It is essential that the US continue active cooperation with other world genebanks for the most efficient collection and preservation of potato genetic resources, and for building international relations which will insure future access to native germplasm in Latin America.

**ORGANIZATION**:

Voting Membership:

1. One representative actively engaged in potato improvement from each Region of the US (appointed by the Agricultural Experiment Station Directors in each Region).

2. One representative actively engaged in potato improvement from USDA, ARS.

Nonvoting Membership:

3. The NRSP-6 Project Leader.

4. One representative of the National Program Staff, USDA, ARS.

5. One representative of the USDA, ARS administration from the Midwest Area.

6. One representative of the USDA, CSREES.

7. One technical representative from Agriculture Canada.

8. Administrative Advisors: One Director from each CSREES Region (selected by the Regional Association of Directors). The Lead Administrative Advisor is from the NC Region (in which NRSP-6 is located).

Meetings:

The Committee shall meet at least annually to report progress, plan future activities, and prepare budget requests. An Executive Committee consisting of the voting membership, Lead Administrative Advisor and Project Leader will function on matters which require attention between regular meetings.

**SIGNATURES**:

National Research Support Program - 6

Administrative Advisor date

Chair, Regional Association of Directors date

Chair, Committee of Nine date

Administrator, CSREES date

**RESOURCES**:

Project Leader: Dr. John Bamberg, USDA/ARS. 80% NRSP-6 Admin -- 20% Research. Potato Genetics, germplasm technology & evaluation.

Project Taxonomist: Dr. David Spooner, USDA/ARS 40% NRSP-6 Taxonomy -- 60% Research. Plant Systematics.

Administrative oversight: Dr. Phil Simon, USDA/ARS/RL. 10% NRSP-6 Administration.

**FY 1996 Sample of Resources[1]**

| PARTICIPANT/ITEM | SY | PY | TY | RRF FUNDS | STATE FUNDS |
|---|---|---|---|---|---|
| Project Leader[2] | 0.2 | 0.8 | | | |
| Taxonomist[2] | 0.6 | 0.4 | | | |
| ARS-RL[2] | | 0.1 | | | |
| Proj. Asst. | 0.2 | 0.8 | | 19,164 | 12,776 |
| Technician | | | 1.0 | 24,000 | |
| Technician | | | 1.0 | 19,386 | |
| Gardener | | | 1.0 | 4,784 | 19,136 |
| Research Asst. | 0.5 | | | 16,146 | |
| Fringe benefits | | | | 23,894 | |
| Temp. Labor | | | 1.5 | 20,000 | |
| Supp. & Serv. | | | | 20,124 | |
| Travel | | | | 6,000 | |
| Util. & etc. (est) | | | | | 56,250 |
| Totals | 1.5 | 2.1 | 4.5 | 153,498 | 88,162 |

---

[1]Only personnel with formal attachment to NRSP-6 are listed. An additional estimated 0.6 TY is provided as

University of Wisconsin secretarial and clerical assistance. Funding figures are rounded.
[2]ARS funded Curator, Taxonomist and Research Leader, respectively.

**CRITICAL REVIEW**:

*Accomplishments:*

Met the increasing demand for US and foreign germplasm distributions (see Appendix). Numerous seed increases, germination tests, virus assays, and in vitro transfers supported availability and quality of propagules.

Initiated a formal collection of genetic stocks.

Devised and implemented a scheme which allows quarantine testing concurrent with seed increase at the genebank. This greatly reduces time and resources for quarantine, and allows efficient release of small seedlots from the wild or from other genebanks.

Conducted yearly collecting expeditions to Latin America (Columbia, Venezuela, Bolivia, Mexico, Guatemala, Costa Rica, USA) resulting in over 400 new additions to the genebank.

Developed a worldwide association of potato genebank leaders. This project has produced a comprehensive passport and evaluation database, initiated a joint research project and exchanged germplasm and technology. Research project is providing the first empirical information on dynamics and partitioning of potato germplasm's genetic diversity. This will help us make better germplasm management decisions with finite resources.

Created a working herbarium with representative sheets for nearly all accessions in the genebank.

Published a comprehensive evaluation data summary booklet, two revisions of the inventory of germplasm available for distribution, a popular brochure highlighting the genebank, and revised the genebank's Procedures Manual.

Characterized the collection for relative field vigor, flowering, pollen fertility.

Accomplished virtual complete data entry into the Germplasm Resources Information Network (GRIN) and backup of samples at National Seed Storage Lab (NSSL). Produced comprehensive inventory database.

Computerized order processing.

Implemented long term -18C storage of reserve inventory of seed collection.

Conducted or contracted screening for species relationships, frost tolerance, tuber calcium accumulation, fertility in heat stress, glycoalkaloids, rooting vigor, gibberellin hormone mutants, nitrogen use efficiency, resistance to Colorado potato beetle, Rhizoctonia and Late blight (see list of publications for details).

Hosted visits by 49 germplasm scientists

*Work Undone:*

Work has been started on all specific goals set forth in the last project revision. However, much more research still needs to be done on collecting and other aspects of improving germplasm acquisition, methods to improve germplasm preservation technology, basic evaluation for sources of disease and stress resistance and quality traits. All of these needs can be more efficiently pursued through cooperative projects with other potato genebanks, so intergenebank collaboration should also be strengthened in the future.

*Publications:*

Ehlenfeldt, M.K. and R.E. Hanneman, Jr. 1992. Endosperm dosage relationships among Lycopersicon. Theor. Appl. Genet. 83(3):367-372.

Hosaka, K. and D.M. Spooner. 1992. RFLP analysis of the wild potato species, *Solanum* acaule Bitter (*Solanum* sect. Petota). Theor. Appl. Genet. 84:851-858.

Spooner, D.M. and J.B. Bamberg. 1991. The Inter-Regional Potato Introduction Project (IR-1), U.S. center for potato germplasm. Diversity 7(4):32-35.

Spooner, D.M., R. Castillo T., and L. Lopez J. 1992. Ecuador, 1991 potato germplasm collecting expedition: taxonomy and new germplasm resources. Euphytica 60:159-169.

Spooner, D.M. and D. Douches. 1991. Allozyme variation in *Solanum* sect. Petota ser. Etuberosa (Solanaceae). Amer. J. Bot. 79:467-471.

Spooner, D.M. and K.J. Sytsma. 1992. Reexamination of series relationships of Mexican and Central American wild potatoes (*Solanum* sect. Petota): evidence from chloroplast DNA restriction site variation. Syst. Bot. 17:432-448.

Spooner, D.M., K.J. Sytsma, and E. Conti. 1991. Chloroplast DNA evidence for genome differentiation in wild potatoes (*Solanum* sect. Petota). Amer. J. Bot. 78:1354-1366.

Spooner, D.M. and R.G. van den Berg. 1992. Species limits of *Solanum berthaultii* Hawkes and *S. tarijense* Hawkes: morphological data. Taxon 41:685-700.

Spooner, D.M. and R.G. van den Berg. 1992. An analysis of recent taxonomic concepts in wild potatoes (*Solanum* sect. Petota). Gen. Res. Crop Evol. 39:23-37.

Van den Berg, R.G. and D.M. Spooner. 1992. A reexamination of infraspecific taxa of a wild potato, *Solanum microdontum* Bitter (*Solanum* sect. Petota: Solanaceae). Pl. Syst. Evol. 182:239-252.

Bamberg, J. B. and Max W. Martin. Inventory of Tuber-bearing *Solanum* species - catalog of potato germplasm, 1993. Potato Introduction Station, 4312 Hwy 42, Sturgeon Bay, WI 54235. University Publishing. 104 pp.

Bamberg, J. B., J. P. Palta, L. A. Peterson, Max Martin, and A. R. Krueger. 1993. Screening tuber-bearing *Solanum* (Potato) germplasm for efficient accumulation of tuber calcium. Am. Potato J. 70:219-226.

Bamberg, J. B. and R. E. Hanneman, Jr. 1993. The transmission and yield effects of a gibberellin mutant allele in potato (*Solanum* tuberosum L.). Potato Research 36:365-373.

Bamberg, J. B. 1993. A planting aid for potato seedling transplants. Am. Potato J. 70:677-681.

Bamberg. J. B. (ed.). 1993. IR-1: The Inter-Regional Potato Program--the United States Potato Genebank. Palmer Publications. 6 pp.

Stone, J. M., J. P. Palta, J. B. Bamberg, L. S. Weiss, and J. F. Harbage. 1993. Inheritance of freezing resistance in tuber-bearing *Solanum* species: Evidence for independent genetic control of nonacclimated freezing tolerance and cold acclimation. Proc. Natl. Acad. Sci. 90:7869-7873.

Bamberg J. B. 1994. Allelism of endosperm balance number (EBN) in *Solanum acaule* and other wild potato species. Theor. Appl. Genet. 89:682-686.

Bamberg, J. B. and D. M. Spooner. 1994. The United States Potato Introduction Station herbarium. Taxon 43:489-496.

Bamberg, J. B., Max W. Martin and J. J. Schartner. 1994. Elite selections of tuber-bearing *Solanum* species germplasm. Univ. Wisc. Press. 67 pp.

Bamberg, J. B., R. E. Hanneman, Jr., J. P. Palta, and J. F. Harbage. 1994. Using disomic 4x(2EBN) potato species' germplasm via bridge species *Solanum commersonii*. Genome 37:866-870.

Contreras-M., A., L. Ciampi, S. Padulosi, and D. M. Spooner. 1994. Potato germplasm collecting expedition to the Guaitecas and Chonos Archipelagos, Chile, 1990. Potato Res. 36:309-316.

Giannattasio, R. and D. M. Spooner. 1994. A reexamination of species boundaries between *Solanum* megistacrolobum and S. toralapanum (*Solanum* sect. Petota, series Megistacroloba): morphological data. Syst. Bot. 19:89-105.

Giannattasio, R. and D. M. Spooner. 1994. A reexamination of species boundaries and hypotheses of hybridization concerning *Solanum megistacrolobum* and *S. toralapanum* (*Solanum* sect. Petota, series Megistacroloba): molecular data. Syst. Bot. 19-106-115.

Spooner, D. M. and J. B. Bamberg. 1994. Potato genetic resources: Sources of resistance and systematics. Proc. of the Symp. "Potato Production: Can we break the chemical dependency?". Am. Potato J. 71:325-337.

Bamberg, J. B., Z. Huaman, and R. Hoekstra. 1995. International Cooperation in Potato Germplasm. Crop Sci Soc Am 23:177-182.

Bamberg, John B. 1995. Screening potato (*Solanum*) species for male fertility under heat stress. Am Potato J 72(1):23-33.

Contreras-M., A. and D. M. Spooner. 1995. Revision of *Solanum* section Etuberosum. In: M. Nee, D. E. Symon, J. P. Jessop (eds.). Solanaceae IV: taxonomy, chemistry, evolution, Royal Botanic Gardens, Kew.

Kleinhenz, Matthew D., John B. Bamberg, and Jiwan P. Palta. 1995. Use of stomatal index as a marker to screen backcross populations of two wild potato species segregating for freezing tolerance. Am Potato J 72(4):243-250.

Palta, J. P., L. S. Weiss, J. F. Harbage, J. B. Bamberg, and J. M. Stone. 1993. Molecular mechanisms of freeze-thaw injury and cold acclimation in herbacious plants: merging physiological and genetic approaches. In: Interacting stresses on plants in a changing climate (M. B. Jackson and C. R. Black, Eds.). Berlin, Germany; Springer- Verlag 659-680.

Rodriguez, A., O. Vargas, E. Villegas, and D. M. Spooner. 1995. Wild

potato (*Solanum* sect. Petota) germplasm collecting expedition to Mexico in 1993, with special reference to *Solanum bulbocastanum* Dunal and *S. cardiophyllum* Lindley. Potato Res 38:47-52.

Spooner, David M., J. Tivang, J. Nienhuis, J. T. Miller, D. S. Douches, and A. Contreras-M. 1995. Comparison of four molecular markers in measuring relationships among the wild potato relatives *Solanum* section Etuberosum (subgenus Potatoe). Theor Appl Genet 92:532-540.

Spooner, David M., R. Castillo T., L. Lopez J., R. Pineda, R. Leon P., A. Vargas, M. L. Garcia, and J. B. Bamberg. 1995. Colombia and Venezuela 1992 wild potato (*Solanum* sect. Petota) germplasm collecting expedition: taxonomy and new germplasm resources. Euphytica 81:45-56.

Spooner, David M., R. G. van den Berg, and J. B. Bamberg. 1995. Examination of species boundaries of *Solanum* series Demissa and potentially related species in ser. Acaulia and series Tuberosa (sect. Petota). Syst Bot 20:293-314.

Spooner, David M., R. G. van den Berg, W. Garcia, and M. L. Ugarte. 1994. Bolivia potato germplasm collecting expeditions 1993, 1994: taxonomy and new germplasm resources. Euphytica 79:137-148.

Vega, S. E. and J. B. Bamberg. 1995. Screening the U.S. potato collection for frost hardiness. Am Potato J 72(1):13-21.

Watanabe, K. N., M. Orrillo, S. Vega, J. P. T. Valkonen, E. Pehu, A. Hurtado, and S. D. Tanksley. 1995. Overcoming crossing barriers between nontuber-bearing and tuber-bearing *Solanum* species: towards potato germplasm enhancement with a broad spectrum of solanaceous genetic resources. Genome 38(1):27-35.

Bamberg, J. B., Martin, M. W., Schartner, J. S., and Spooner, David M. 1996. Inventory of tuber-bearing *Solanum* species - catalog of potato germplasm. NRSP-6 publication, 4312 Hwy 42, Sturgeon Bay, WI 54235.

Vega-Semorile, S.E., Bamberg, J.B. and Palta, J.P. 1996. Potential for improving freezing stress tolerance of wild potato germplasm by supplemental calcium fertilization. Am. Potato J. 73:397-409.

Bamberg, J. B. and Martin, Max. 1996. Interregional Potato Introduction Project, NRSP-6. National Potato Evaluation and Enhancement Report, 1995.

Bamberg, J.B., Longtine, C. and Radcliffe, E. B. 1996. Fine screening Solanum (potato) accessions for resistance to Colorado potato beetle. Am Potato J. 73:211-223.

**APPENDIX**

Source: National Potato Council Potato Statistics Yearbook, 1995

Increasing importance of the US potato industry.
---

Per capita consumption (1994 vs. 1989)
---
Fresh..... - 3.3%
Processed.....+16.5%
Total..... + 8.8%

Exports (1994 vs. 1989)
---
Fresh.....+ 33%
Frozen.....+ 76%
Flakes.....+ 77%
Chips.....+651%
Dried.....+ 4%

**Volume of Stocks Distributed**

**and Numbers of Resulting Publications**

| Years | NRSP-6 Stocks | ARS-WI Co-op Stocks | Total | Publications |
|---|---|---|---|---|
| 1950-1953 | 2,705 | 0 | 2,705 | 3 |
| 1954-1957 | 4,597 | 0 | 4,597 | 21 |
| 1958-1961 | 4,723 | 1,347 | 6,070 | 65 |

| | | | | |
|---|---|---|---|---|
| 1962-1965 | 6,206 | 3,739 | 9,945 | 85 |
| 1966-1969 | 12,531 | 2,215 | 14,746 | 107 |
| 1970-1973 | 12,041 | 4,332 | 16,373 | 126 |
| 1974-1977 | 15,628 | 2,522 | 18,150 | 164 |
| 1978-1981 | 17,322 | 1,129 | 18,451 | 206 |
| 1982-1985 | 18,117 | 1,053 | 19,170 | 271 |
| 1986-1989 | 31,154 | 3,401 | 34,555 | 404 |
| 1990-1993 | 34,912 | 139 | 35,051 | 431 |
| 1994-1995 | 18,446 | 0 | 18,446 | 258 |

WR interim review of NRSP-6

Comments:

NRSP-006 was established in 1950 and can claim many accomplishments during its existence. In 1995 alone, 78 new accessions were collected, 19 papers were published by NRSP personnel and NRSP stock was used in 113 other published studies. Moreover, NRSP-006 collaborates internationally by distributing germplasm and participating in the Association of Potato Inter-genebank Collaborators (APIC). An important question to ask is, have these activities affected the improvement of varieties? Apparently, the answer is "yes." In 1995, six varietal releases published in the American Potato Journal have wild species' introductions in their pedigrees. Resources from 1993-1995 remained about level from RRF and increased significantly from non-federal sources. NRSP is functioning very well.