ANNUAL REPORT OF COOPERATIVE REGIONAL PROJECTS
Supported by Allotments of the Regional Research Fund,
Hatch Act, as Amended August 11, 1955
January 1 to December 31, 1982

1. PROJECT: NORTH CENTRAL REGIONAL PROJECT NC-7
Introduction, Multiplication, Evaluation, Preservation< Cataloguing, and Utilization of Plant Germplasm

2. COOPERATING AGENCIES AND PRINCIPAL LEADERS:

Administrative Adviser	R. W. Hougas, Wisconsin
Regional Coordinator	W. H. Skrdla, Iowa

State Experiment Stations and Representatives

Alaska	*R. L. Taylor	Missouri	*L. E. Cavanah
Illinois	*T. Hymowitz, Chmn	Nebraska	*J. H. Williams
Indiana	*J. Janick	North Dakota	*J. D. Franckowiak
Iowa	*I. T. Carlson	Ohio	*S. Z. Berry, Secy
Kansas	*C. E. Wassom	South Dakota	*R. M. Peterson
Michigan	*A. Iezzoni	Wisconsin	*W. H. Gabelman
Minnesota	*H. Pellett		

U. S. Department of Agriculture

ARS Germplasm Resources Laboratory	*G. A. White
ARS Ass't to Deputy Administrator, Germplasm	Q. Jones
ARS Area, Director, Mid-Great Plains Area	C. W. Alexander
Cooperative State Research Service	C. 0. Grogan
Soil Conservation Service	*K. Blan
Northern Regional Research Center	*R. Kleiman

*Voting Members of NC-7 Technical Committee

North Central Regional Plant Introduction Station, Ames, Iowa

Regional Coordinator	W. H. Skrdla
Horticulturist	Vacant
Research Plant Pathologist	R. L. Clark
Research Entomologist	R. L. Wilson

3. PROGRESS OF WORK AND PRINCIPAL ACCOMPLISHMENTS

a. Introductions having Special Value

Described below are plant introductions reported by cooperators in 1982 that are considered to have made important contributions to plant breeding programs and to LJ. S. Agriculture.

(1) Grasses, legumes, field'crops

(a) Corn

1/ Corn PI 172326, 'Golden Mine Dent' from Australia, was used as a source of greater kernel depth in Inbred Corn Line A672 released by the Minnesota Agricultural Experiment Station in 1982. (Notice of Release of Corn Inbred Line A672, Univ. of MN, December, 1982.)

2/ Corn PI 209135, 'Mayorbela' from Puerto Rico, was used in H110 and Hlll maize inbred germplasm released by Purdue University in 1982. PI 209135 is a synthetic of tropical origin and was used in these germplasm for its resistance to several major diseases of corn. Inbred H110 was developed from the cross of Oh514 x PI 209135. Inbred Hlll was developed from the cross B37 x 209135. (Warren, H. L. 1982. Registration of H110 and Hlll maize germplasm. Crops Sci. 22(6):1270-1271)

(b) Orchardgrass

1/ In an evaluation test for persistence and compatibility with birdsfoot trefoil under frequent clipping, preliminary data indicate that certain PI's are showing good vigor and rust resistance. To date, PI 440278, USSR, appears most promising, followed by 440276 and 440277 (both from USSR) for rust resistance and 440270, 440272, 440274, and 440275 (all from USSR) for vigor. (I. T. Carlson, ISU, Iowa, 1982 APR).

(c) Sinapis alba

1/ Sinapis alba, 458960 from Germany shows excellent response to red and far red light in seedling stage, indicating phytochrome control of many structural and biochemical changes associated with seedling development. (P. Kaufman, Univ. of MI, 1982 APR).

(d) Sunflowers

1/ Sunflower male sterility. Genes for pollen restoration for Indiana-1L, a male sterile, are found in 'Hopi' (369359), 'Peredovik' (176576), "Seneca' (369360), 'Outlook', and 'Record', as well as in HA89 and the original wild type from which Indiana-l was developed. Indiana-l is tentatively designated as cms$_4$. (Heiser, Jr., C. B. 1982. Registration of Indiana-l cms sunflower germplasm. CropSci 22:1089).

2/ Sunflower PI 287230, var. 'Enisej' from USSR was used in breeding program for its earliness and fast dry down of heads. It was used in crosses with various germplasm pools from which inbred lines were derived and currently being used for production of IS 7117 and IS 7118. (M. Abdallah, Fargo, ND 1982 APR).

3/ Sunflower PI 430538, 'Novinka' from USSR was crossed to various adapted inbred lines to provide resistance to race 3 downy mildew. (D. Gedge, Pioneer Hi-Bred Intern., Moorhead, MN. 1982 APR).

4/ Sunflower PI's 195573, Ethiopia, 377530, 'Kenya White' from Kenya, and 430538, 'Novinka' from USSR were used in the South Dakota sunflower breeding program for their resistance to Race 3, Downy Mildew. (M. Carson, 1982 APR, South Dakota).

(2) Vegetables

(a) Cucumber

1/ 1982 evaluations of two cucumber introductions at Sun Prairie, WI provided the following information: 308916 USSR -- Vines: small, short internodes, Flowering: Monoecious, clusters of flowers at the nodes, Fruit:' pickle type, black spines, small size (8cm x 5cm) and blochy, rather large seed cavity, many fruit with severe carpel separation.

390244 Japan'Hyuga 2" -- Vines: large, vigorous, Flowering: monoecious, Fruit: slicer (fresh market) type, black spines,

20cm x 5cm, small fruit have nice dark color but color becomes lighter as fruit gets larger, slight to severe tapering at the blossom end.

Both accessions have desirable traits and will probably be used in breeding program, (1982 APR-letter 11/5/82 from L. Gautney, Ferry Morse Seed Co., Wisconsin to W. H. Skrdla).

2/ Cucumis sativus, PI 234517, SC-50 [(Ashley x PI 197087) x Ashley] from South Carolina, was reported to carry greater Verticillium tolerance than the two check varieties used. Two tolerant selections were made at the Campbell Institute for Research and Technology, Napoleon, Ohio. PI 234517 was previously reported to carry resistance to anthracnose and powdery mildew. (Ltr. from G. E. Tolla 12/7/82 and USDA Plant Inventory).

(b) Lettuce

1/ Lactuca sativa (lettuce) PI's 165063, 176579, 222253, 251790, 268405, and 288244 carry individual plants showing apparent resistance to aster yellows and crosses were made with 'Montello' and 'Green Lake'. PI 288244, from UAR, showed greater field resistance to aster yellows than commercial cultivars. (L. Sequeira, WI, 1982 APR).

(c) Pumpkin

1/ PI 302418, Cucurbita pepo, has resistance to the pickleworm. It is known as the 'Omaha Pumpkin' and is derived from the Omaha Indians. (Ltr. from B. G. Rhodes, Clemson University, 2/1/82).

(d) Tomato

1/ In Israel, plants of 19 wild tomato accessions were screened in the greenhouse for resistance to Pseudomonas tomato, which causes bacterial speck. The abstract states: "Plants of Lycopersicon pimpinellifolium, PI 126430 (Peru), L. peruvianum, PI 128643 (Peru), and 128650 (Chile), and L. hirsutum f. glabratum, PI 134417 and L34418, (both from Ecuador) remained symptomless. Individual plants of L. pimpinellifolium, PI 126433, 126925, and 126939 (all from Peru) and L. peruvianurn, PI 126946 (Peru) and 128652 (Chile) also showed a high level of resistance to the pathogen. Genetic studies indicated that resistance of L. pimpinellifolium in accession PI 126430 (Peru) to P. tomato was dominant and conditioned by a single gene." (Pilowsky, M. 1982. Screening wild tomatoes for resistance to Bacterial Speck pathogen (Pseudomonas tomato). Plant Disease 66(1):46-47)

2/ Recently, T. H. Barksdale and A. K. Stoner deomonstrated single dominant gene resistance in PI 422397, Lycopersicon pimpinellifolium from Maryland. Breeding lines deriving resistnace to Septoria leaf spot from this PI were used in a replicated field test to assess their performance during an artificially induced epidemic. "During the epidemic, disease increase for the resistant 422397 and for all

of its selected progeny lines was more gradual than for the susceptible lines. The level of resistance in these resistant lines was sufficient to maintain a foilage canopy over the fruit /until harvest". (T. H. Barksdale, 1982. Control of an epidemic /of Septoria leaf spot of tomato by resistance. Plant Disease 66(4):239-240)

3/ /Tomato PI's 289286, Hungary and 117563, Brazil, were used as K - efficient lines in K - utilization for physiological and inheritance studies at Wisconsin. PI 126452, Peru, was used as one of two K - inefficient lines in the study. The total dry wt of efficient lines /averaged 64% more than inefficient lines at the stress level (5 mg) /of K per plant. The four lines were comparable in top, root, and /total plant dry wt at the high (200 mg K) level. (A. Makmur, G. W. Gerloff, and W. H. Gabelman. 1978. Physiology and Inheritance of Efficiency in Potassium Utilization in Tomatoes Grown Under Potassium Stress. J. Amer. Soc. Hort. Sci. 103(4):545-549.)

4/ Tomato PI's 205040, 'Yellow Peach' from Ohio, and 129021, Ecuador, were found to be Ca-efficient in tests using low (16.5 mb/plant) ca nutrient solutions. Differences in efficiency were maintained where these selections were grown with higher ca concentrations. (J. E. English and D. N. Maynard. 1981. Calcium Efficiency Among Tomato Strains. J. Amer. Soc. Hort Sci. 106(5):5520-5527.)

(e) More than 16 publications including journal articles and state and federal bulletins are known to have reported evaluation information on plant introductions in 1982.

b. Accomplishment/s of the Regional Station and Regional Program

(1) Germplasm Collection and distribution activity:

New agronomic, horticultural, and industrial plant introductions received in 1982 totaled nearly 2000 accessions. This includes 760 accessions of Panicum and 470 of Setaria from India; 260 accessions of perennial Medicago, largely a collection made on a plant exploration trip to Turkey, and other accessions obtained through exchange and collections from domestic explorations made in previous years which reached us in 1982; 365 accessions of Brassica from Korea which were collected by Dr. P. P. Knowles, California, and shared with us.

(2) Plant Explorations from the North Central Region.

Three plant explorations took place from the NCR in 1982:

(a) Exploration for Rubus in Great Britain, by E. T. Denisen, ISU, in August.

(b) Exploration for Tuber Bearing Potatoes in Mexico, by R. W. Ross, Interregional Potato Introduction Station, Sturgeon Bay, WI, in September-October.

(c) Exploration in Northern Hokkaido, Japan, for Ornamentals of Potential Value to the NCR, by M. Kawase and 2 staff members from the National Arboretum in September and October, 1982. Over 420 entries were collected which represent 133 species.

(3) Seed Increase and Germplasm Maintenance Activity

(a) About 1400 accessions were planted in the field for seed increase plus nearly 2400 plots that were planted for disease and insect evaluations in the field, or for growing material to be evaluated under laboratory conditions.

(b) Field record notes were taken on all accessions according to a format con aining descriptors developed for each crop. This information is the entered into the Germplasm Resources Information Network (GRIN) as apart of the crop data base.

(c) Two seed storage rooms are maintained at 40°F temperature and 35 to 40% relative humidity, Equipment for both rooms performed well during the year and thus, provided good protection for the viability of seed stored in the rooms.

(d) 3300 germination tests were made by staff at the PI station on the following crops: Corn -- 1800 samples and Brassica -- 1500 samples.

In addition, tests were made by the Iowa State University Seed Science Laboratory on 1375 accessions of grasses, legumes and oil crops.

Beginning in FY 1983, the National Seed Storage Laboratory will provide assistance with making germination tests through cooperative agreement with ISU. The PI staff will continue to make tests on larger seeds, which are easier to manipulate and test.

(e) Seed sent to the National Seed Storage Laboratory (NSSL).

Reserve quantities of about 1160 accessions were sent to the NSSL in 1982. In previous years we sent 6011 accessions so now the new total is 7171 accessions.

The following seed was sent in 1982:

Bromus	3
Panicum	112
Setaria	27
Zea mays	295
Lathyrus	19
Lespedeza	15
Medicago (Per.)	140
Melilotus	7
Atriplex	5
Beta	1
Cucumis	65
Cucurbita	237
Daucus	8
Lycopersicon	109
Pastinaca	1
Petroselinum	9
Raphanus	17
Spinacea	3
Helianthus	51
Lepidium	36
TOTAL	1160

(4) Preserving Genetic Integrity of Plant Introductions

Of about 1400 accessions that were planted in the field for seed increase, pollination was controlled for nearly 700 accessions by making hand pollinations or growing the plants under cages and using bees and flies as pollinators.

(a) The genetic integrity of several cross-pollinated crops is protected by using special pollination methods. Generally, the species in our collections are naturally pollinated in one of three ways: (1) self-pollinated, (2) insect-pollinated, and (3) wind-pollinated. Techniques and resources for controlling pollination of some but not all crops are available and used for seed increases at Ames. The following methods of pollination are used at Ames for seed increases:

1/ Hand pollination: Corn, sunflowers, and pumpkins are hand pollinated and for this reason, are very labor-intensive crops for seed increase. /Corn is wind pollinated but sunflowers and pumpkins are insect pollinated. In 1982, the following crops and numbers of each were grown:

- Corn		307 accessions for seed increase
		10 check varieties
	Total	317
-Sunflowers		90 accessions for seed increase
		7 check varieties
	Total	97
-Pumpkins		70 accessions for seed increase
	Total	484

2/ Cage pollination: Seed increases are made under cages using bees for /pollinators. More than one species can be grown per cage. The following were grown under 150 cages in 1982:

- Cucumbers		103
- Carrots		75
- Parship		1
- Spinach		8
	Total	187

Total (1) and (2) = 671 accessions

3/ Self pollination: Some vegetables, like garden tomatoes and peas are highly self pollinated and no protection from outcrossing is needed.

4/ Open pollination: Many grasses and legumes and some vegetables are insect pollinated or wind pollinated. Except for those described /above, no protection from outcrossing is provided. In the short term, this may not be too serious a problem as long as plant breeders know how increases are made. For the long term, the genetic base of an accession may drift. However, no practical means of controlling wind pollinated accessions on a large scale has been developed.

(b) Research to find an effective method of pollinating wild species of sunflowers under cages was initiated in 1982 but no concrete results are available yet. Preliminary indications are that seed production under cages with bees looked promising. However, a problem developed with the leafcutter bee and more needs to be learned about its survival requirements in this area.

(c) Through cooperative agreement with the University of Nevada at Reno, original seed of alfalfa introductions is increased under cages to prevent outcrossing. In 1982, 200 accessions were increased under cages using leafcutter and some honeybees as pollinators. Leafcutter bees are more effective in making alfalfa pollinations than honeybees. Increase seed is returned to Ames for distribution. It was also found that seed production under amber Lumite screen was superior to gray fiberglass. Replacement cages will now be constructed of Lumite.

(d) Through cooperative agreement with South Dakota State University, seed of a native grass collection held at Brookings is being increased for deposit at the National Seed Storage Laboratory. About two-thirds of the work was completed in 1982.

(5) Seed Distribution and Cataloguing

(a) More than 12,250 seed packets and plants were distributed in response to 133 seed requests. Some of the largest distributions include:

Species	No. of Requests	No. of Packets
Bromus	10	750
Zea mays	80	2050
Medicago (per.)	22	1860
Cucumis	27	670
Lycopersicon	69	1550
Brassica	14	570
Helianthus	34	1620

(b) Two seed catalogues were produced and distributed in 1982. One was for Medicago. It was a highly imporved version of the last one, published in 1974. Very likely it will be the last one to reflect open pollinated seed. Hopefully, the next one will reflect seed increases made under control pollination conditions at Reno, NV.

The other was for Brassica which had previously been published only as a mimeographed list.

(c) Accession performance reports were distributed to cooperators who received seedl during the past 2 years. (1 year for annual, 2 years for perennial). More that 150 reports were distribured. The most valuable reports from these requests, as well as information appearing in published results are summarized in the next section.

(6) Seed Increase of Alfalfa Germplasm in Cages in Reno, Nevada

(a) In 1982, original seed of 160 accessions were sent to Reno for the 1983 planting. They still had 40 accessions on hand from prior shipments.

(b) Replacement of gray fiberglass screenwith amber lumite screen will begin as replacements need to be made. It was concluded that the lumite screen was more conducive to higher seed production than the gray fiberglass.

(c) There was a change in technicians in charge of the seed increase work. Larry Teuter, who helped establish the work left the University and Jim Berg was hired as his replacement and is now getting acquainted with the work to carry it forward.

(d) Seed increases of 195 accessions was sent to Ames for preservation and storage.

(e) Visual observations and cytological studies of a number of plant introductions being increased at Reno, NV have identified several variants. A virescent mutant was identified in PI 247789, a tetraploid germplasm from Peru. The virescent genotype is controlled by a single recessive gene.

(f) In PI 258752, from USSR, a male sterile mutant was identified. Male sterility is controlled by a single recessive gene.

(g) PI $44317 and PI 304525, both Medicago sativa ssp. sativa from Spain and Turkey, respectively are extremely sensitive to the pesticide dibrom. An inheritance study of dibrom sensitivity is underway.

(h) Screening 12 populations of M. sativa ssp. falcata and M. sativa ssp. coerulea has demonstrated that most populations have a few plants with a discernible level of 2n pollen. PI numbers screened were 179370, 251690, 258752, 314093, 315460, 315465, 315471, 315479, 315481, 325381, 325382, and 325407. Hybridization of the M. sativa ssp. falcata population with M. sativa ssp. coerulea populations results in progeny with a significant elevation of 2n pollen frequency.

(7) Seed Increase of Native Grasses at Brookings, S.D.

(a) Each year, for the duration of the cooperative agreement and until all existing germplasm in the South Dakota native grass collection has been increased and harvested, seed of these existing collections made in the wild will be collected, harvested, and threshed. The cleaned seed will be sent to the National Seed Storage Laboratory, Ft. Collins, Colorado for long term storage. It is estimated that seed stored under their conditions should remain viable for more than 40 years.

(b) The 1982 season was favorable for seed production but two heavy snowstorms in November essentially buried the nurseries. Most of the plants were broken down as a result+, and we were able to harvest only about 430 families of big bluestem. We are currently threshing those and I hope we can complete them by February 1.

(c) Computer printouts containing information on agronomic characters of individual plants within each of the nurseries are presently being developed. They will contain collection area descriptions for each ecotype, and basic statistics (i.e. agronomic characters means and variances) for ecotypes and families within ecotypes. These printouts will be much more efficient and readable than the field books in which the data have been kept.

(8) Seed Increase of Tomato Genetic Stocks at Davis, CA

(a) About 800 seed stocks of genetic material were received from E. A. Kerr, Canada, who recently retired. About 150 of these are single gene stocks and the rest are combinations. Whether or not the combinations will be increased depends on the amount of duplication of material now in the collection and seed viability. Perhaps 200 or more of the combinations will be increased.

(b) An interesting accession was received from Dr. Ochoa of Peru. It is a Solanum lycopersicoides collected in an extinct volcano crater at 3500 meters. It may have cold tolerance.

(c) About 800 accessions were increased in 1982.

(d) There are now a total of 2300 to 2400 accessions in the genetic stock collection.

(e) Total distribution of seed stocks in CY 1982 amounted to 2610 packets or items. This resulted from 183 requests from 130 scientists, indicating that some scientists sent more than one request -- as many as eight.

(9) New Crops Activities

(a) The following new crop accessions were grown in 1982 for seed increase:

Alyssum	1 acc.	Helianthus	90 acc.
Berteroa	1 acc.	Lobularia	1 acc.
Brassica	170 acc.	Ocimum	8 acc.
Camelina	1 acc.	Origanum	4 acc.
Crambe	2 acc.	Sinapis alba	9 acc.
Eruca	18 acc.	Thlaspi	1 acc.
		Total	306 acc.

(b) Techniques for increasing Brassica that would improve seed production and minimize outcrossing are being tested. Several accessions of B. napus were grown in cages in 1982 with encouraging results as to seed production. More work will be continued under cages in 1983.

(c) A large collection of Amaranthus, over 300 accessions, was received from Rodale Press in 1981 but the accessions were quite badly mixed as to species. It will be necessary to increase them in the field and greenhouse in order to separate the species before PI numbers can be assigned. This will require some additional resources for hiring temporary labor.

(10) Germplasm Enhancement (Pre-Breeding)

(a) Activity under this heading is beginning to emerge with ARS support under the title of "Germplasm Enhancement". Several crop advisory Committees have prepared, or are now preparing, proposals for enhancement work. This includes the NC-7 crops of maize, alfalfa, and tomatoes.

(11) GRIN -- Germplasm Resources Information Network

A computer assisted information project to serve the U. S. National Plant

Germplasm System. The work is cooperative between the USDA-ARS and the Laboratory for Inforation Sciences in Agriculture (LISA) at Colorado State University, Fort Collins. However, in 1983, LISA will be phased out and ARS will assume full responsibility and capability.

(a) Progress at the NC-7 Regional Station

1/ The Germplasm Resources Information Project is now in the process of becoming the Germplasm Resources Information Network.

2/ In June, Sharon Van De Voorde attended the first GRIN Training session at LISA in Ft. Collins, Colorado. A short time later the Perkin-Elmer terminal arrived making possible our first contact with the Prime 750 in Beltsville. A demonstration/training database was and is available for practice. A Direct Access Facility, DAF, was installed to insure noise free communication through Telenet with the Prime 750.

3/ 'The GRIP/GRIN staff at LISA began transferring data from the files at ISTJ to the computer at Beltsville by tapes, early in 1982. This work is nearing completion.

4/ A GRIN training session for the entire NC-7 staff was held in December, 1982 at which time the GRIN database was installed. We are preparing to add inventory data to information system data within the network.

5/ Equipment

'Currently, there is a terminal (VDU and printer) on hand at the PI campus headquarters, with a DAF line to the Prime 750 computer in Beltsville, MD. It was decided to schedule the same facility for the PI farm so that the Prime 750 could be easily accessed from both locations, and in view of the large number of PI staff that will be using the facility.

(12) Crop Advisory Committees (CAC's) for NC-7 Crops

The crop iadvisory committees were initially organized to help the GRIP program get underway by developing descriptor lists for various crops and to provide other advice on their respective crops as needed by GRIP. Their importance in serving the National Plant Germplasm System (NPGS) was recognized by the National Plant Genetic Resources Board (NPGRB) and the status of the CAC's was elevated to serve as advisorys to the various elements of the NPGS and the NPGRB. &is resulted in the organization of new CAC's which now total 18. Three new! committees relating to NC-7 priority crops were organized in 1982.

The CAC's are now involved with developing plans for germplasm evaluation and for germplasm enhancement. Certain committees are also looking into the adequacy of germplasm availability and adequacy. For example, the Maize CAC is concerned that corn germplasm from Latin American countries is adequately maintained and available in the U.S.

The Crop Advisory Committees that relate to NC-7 priority crops are listed as follows:

(a) Tomato CAC. W. H. Skrdla, Chairman; R. L. Clark, member.
(b) Maize CAC. M. M. Goodman, Chairman; W. H. Skrdla, member.
(c) Alfalfa CAC. W. H. Skrdla, Chairman; R. L. Clark, member.
(d) Sunflower CAC. Chairman not designated; W. H. Skrdla, member.
(e) Sugarbeet CAC. D. Doney, Chairman, W. H. Skrdla, member.
(f) Forage and Turf CAC. Chairman not designated; W. H. Skrdla, member.

(13) Regional, cooperative program

(a) The Nebraska Station continued its intensified evaluation on alfalfa introductions, which includes yield trials, replicated tests for insect resistance in addition to the single row field evaluation trials. However, in 1982, the USDA-ARS terminated the plant breeding project, so certain field evaluations will not be continued. The outlook for the insect resistance evaluation work is that it will continue in the foreseeable future.

(b) Other state agricultural experiment stationsin the region, as well as in other regions and foreign institutions, continue to evaluate plant introductions, as needed, in search of desired plant traits for inclusion in their breeding programs.

(14) Capital Improvements

Generally, capital improvements are considered to be in two categories for 1982: (1) plans for space in the new agronomy building and greenhouses, and (2) new equipment.

Plant Introduction is administratively in the Agronomy Department at Iowa State. Since the Department is making plans for a new building, which appears quite promising, as early as Spring, 1983, and our PI Research Unit is being included in this new building, much time and effort has been and will continue to be spent in drawing floor plans to accomodate space for laboratories, computer terminal room, mailing room, records center, clerical office, library/conference room, offices, etc., as well as identifying room controls,. Plans are to eventually raze the present Plant Introduction headhouse and greenhouse on campus but we do not know yet whether that will occur before the new building construction begins or after it is completed. This raises the possibility of the need for an interim move, which would be very disruptive to our program. Eventually, however, we will have new facilities on campus that will be integrated into the Departmental facilities instead of being, separate as we are now.

Items of new equipment items include the following:

(1) Research microscope with attachments
(2) Pick-up microscope
(3) Freeze-dry equipment
(4) Grinding mill for dry plant material
(5) Screen and frames for constructing 30 10x8x20 ft. cages for sunflower research
(6) Additional office and laboratory furniture for new building at PI farm
(7) New sign (under construction) for PI farm entrance
(8) Lockers for restrooms at PI farm

(9) Cube lockers for employees at farm to store miscellaneous personal items

(10) New computer terminals, visual display unit and printer and a Direct Access Facility (DAF) to the Prime 750 computer at the National Agricultural Library, Beltsville, MD where our data information will be stored

(15) Coordinate the Plant Introduction Program within the North Central Region and with similar programs in other Regions

(a) Coordination continues among the four regional stations with regard to seed collections, filling seed requests, and other matters.

(b) Over the years, a crop priority system evolved among the four regional plant introduction stations whereby each station became responsible for certain genera, with back-up supplies maintained at the NSSL. Prior to the NSSL, duplicate collections accumulated at the regional stations because they held back-up supplies for each other. At NC-7, we are now transferring these duplicate samples to the station having primary responsibility for the respective collections. The transfer of 1574 accessions to various stations in 1982 is summarized as follows:

2/18/82	Trifolium spp. to S-9	46 accessions
3/19/82	Dorycnium rectum to S-9	1 accession
3/22/82	Lespedeza spp. to S-9	4 accessions
3/24/82	Trifolium spp. to NE-9	423 accessions
4/7/82	Cucurbita spp. to NE-9	67 accessions
9/29/82	Allium oschaninii to W-6	1 accession
9/30/82	Allium cepa to NE-9	167 accessions
10/12/82	Astragalus spp. to W-6	50 accessions
11/22/82	Lotus to NE-9	185 accessions
11/22/82	Poa to W-6	115 accessions
11/29/82	Apium to NE-9	58 accessions
11/29/82	Alopecurus to W-6	42 accessions
11/30/82	Phleum to NE-9	49 accessions
12/7/82	Vicia to S-9	1 accession
12/10/82	Triticum monococcum to Dr. David H. Smith, Jr.	1 accession
12/20/82	Agropyron spp. to W-6	176 accessions
12/20/82	Aegilops spp. to Sm. Grains	176 accessions
12/20/82	Lasiagrostis caragans to W-6	1 accession
12/20/82	Stipa sp. to W-6	1 accession
12/30/82	Calamagrostis to W-6	10 accessions
	Total	1574

(c) Coordination of the program regionally and nationally is accomplished in several ways:

- Staff visits to the State Agricultural Experiment Stations in the region.

- Attending special meetings, workshops and professional society meetings.

- Participation in the work of crop commodity committees.

(d) In 1982, the coordinator and staff performed various functions and traveled to meetings as part of the plan to coordinate germplasm work

regionally and nationally, as follows:

(1) Wilson -- Jan. -- to Sunflower Forum, Fargo, ND

(2) Wilson -- Feb. -- to NCR-2 Corn Breeders Research Committee, Chicago.

(3) Clark -- Feb. -- NCR-25 Corn pathology meeting, Chicago.

(4) Skrdla -- June -- Beltsville, MD, Small Grains Site Assessment Committee.

(5) Wilson -- June -- Logan, Utah re: leafcutter bees for sunflower research at Ames.

(6) Skrdla
Wilson -- June -- NC-7 Meeting, Manhattan, KS.
Clark

(7) Skrdla -- July -- National Alfalfa Improvement Conference, Davis, CA.

(8) Skrdla -- July -- Ft. Collins, Co., Aberdeen, ID -- Small Grain Site Assessment Committee.

(9) Clark -- Aug.-- APS meeting, Salt Lake City, Utah.

(10) Skrdla -- Aug. -- ASHS meeting, Ames, IA.

(11) Skrdla -- Aug. -- Ft. Collins, Co., Workshop on Tissue Culture and Cryopreservation, NPGC, and Plant Germplasm Operating Committee organizational meeting.

(12) Skrdla -- Sept. -- Interview by Karen Beloyt for PI story in October issue of the Iowa Stater.

(13) Skrdla -- Sept. -- Staff visit to the Nebraska AES.

(14) Wilson -- Sept. -- Georgia, to develop cooperative work in corn insect evaluation work.

(15) Skrdla
Clark -- Alfalfa CAC, Ames, IA NC-83
Wilson

(16) Skrdla - Telephone interview by John Dugan for broaddast on WOI November 3.

(17) Skrdla -- Nov.-December.-- ASA Meeting, Anaheim, CA.

(18) Skrdla -- Dec. -- Maize CAC. Chicago.

(e) By attending meetings such as.those listed above, we try to maintain visibility among plant scientists and learn as much as possible of their needs. At the same time, they become better acquainted with our program and materials and services available through it.

(16) Personnel

(a) The Horticulturist position was not filled in 1982 but it is hoped that it will be filled in early 1983.

(b) The two half-time staff members in graduate school,. reported in the 1981 annual report are still on board. In addition, I have made arrangements to take on a third half-time graduate student to work on the collection of more than 300 amaranth now on hand. This collection requires clarification of nomenclature as well as separation of species within accessions, which are now mixed. They were sent to us without PI numbers, knowing that the mixtures existed, and with the agreement that we would do this clean-up work becuase one of our Research Associates is a specilist in amaranth.

(17) Ornamental Program

(a) 1982 distribution to NC-7 Regional Trial Cooperators. A total of 788 ornamental plants of 7 taxa were sent on request to regional cooperators for planting at 32 trial sites. These plants include Acer Ginnala, Elaeagnus augustifolia, Forsythia ovata, Juniperus squamata 'Blue Star', Populus x canascens 'Tower', Rhododendron 'Northern Lights', and Rosa rugosa (PI 384453).

(b) Ten-year ornamental testing and evaluation reports for twenty three species and cultivars were distributed in 1982.

(c) In September - October, 1982, an exploration for winter-hardy ornamentals in Japan was conducted by Dr. M. Kawase, Ohio State University, supported in part by ARS Plant Exploration funds. The exploration was cooperative with the U. S. National Arboretum with Drs. Frederich Meyer and Sylvester G. March participating for the Arboretum. The exploration was very successful, with 422 entries collected representing 133 species. These will be propagated and evaluated to determine their hardiness in cold climates and for other traits badly needed in landscape materials for the High Plains Region in order to broaden the base of landscape plantings available for that region.

(18) Disease screening:

(a) Tomato fruit rot (soil rot):

Only a few new tomato lines were received at the PI Station this year, so a field trial was not set up. Three of the soil rot resistance lines from previous years' tests (406756, 406776, and 406865) were corssed, in the field, with Rutgers and Floramerica, as well as themselves. Seed was harvested from 8 different crosses among these five lines. The F1 plants derived from these seeds are now growing in the greenhouse for production of an F2 generation. The F2 will be grown in the field in 1983 and tested for soil rot reaction so that we can determine the inheritance of this resistance.

(b) Tomato Septoria leafspot:

Over 4600 lines of tomato were inoculated with Septoria lycopersici in the greenhouse during the winter of 1982. All of the wild, green-fruited species tested (L. 'parviflorum, L. chmielewskii, L. peruvianurn, and L. hirsutum) were highly resistant (but not immune) to Septoria leafspot.

The greatest variability in reaction types occurred in L. pimpinellifolium, most of which were susceptible. A few lines, however, such as 126934, 127806, 144955, and 422397, were resistant. Even a few of the L. esculentum lines (111407, 129106, 129129, 372364, 372365, 372367, 372372, and 372377) were moderately resistant.

Crosses have been made between several of these resistant L. esculentum and L. pimpinellifolium lines and susceptible commercial types. Seed from these F1 crosses has been harvested and the F2 generation will-soon be planted in the greenhouse. This study to determine the nature of inheritance to Septoria is being done by a graduate student in Agronomy, Bryce Abel, for his Masters thesis.

(c) Belly rot of cucumber:

Of 170 lines in this year's test, six (PI 197085, 197086, 197087, 200815, 200818, and 250147) were highly resistant and will be tested again in 1981. PI 165509, shown to be highly resistant, or immune, last year, continued to show no rotting in this year's tests;

Crosses were made between 165509 and Black Diamond-and National Pickle during the 81-82 greenhouse season and F2 seed was produced under cages last summer. The F2 populations will be evaluated in the summer of 1983.

(d) Economic threshold level of stalk rot and European corn borer infestation;

Data are now being analyzed for this two-year long experiment. In addition, we isolated fungi from these plots, from the second internode of stalks from each treatment. The most commonly isolated fungus was Fusarium moniliforme. Since we inoculated with three species (F. moniliforme, F. graminearum, and Diplodia maydis) this gave an indication of the most aggressive colonizer among the three. Diplodia was not isolated from uninoculated plots in 1982, in contrast to 1981 when it was almost as common in unionoculated as inoculated plots.

(e) Fusarium stalk rot screening of corn:

Of 142 lines inoculated in a replicated field test, five lines (165457, 167987, 162700, 162928, and 126574) were at least as resistant to stalk rot as the resistant check, H533H. Evaluations were made by splitting, the stalks and counting the number of internodes rotted.

(19) Insect Resistance Screening

(a) Work was terminated on searching for 1st-instar black cutworm resistance in corn. Of 3038 corn germplasms screened, only PI 217462 was intermediate in resistance.

(b) In cooperation with Dr. Ray Clark, Plant Pathologist, we attempted to determine whether there would be an interaction between stalk rot infection and corn rootworm feeding. One year's data do not support evidence of interaction. The test will be re-run since the natural incidence of stalk rot was so high.

(c) A technique was developed to screen crown vetch for resistance to Aphis craccivora. Nine vetches were screened with PI 229968 producing 14.3 aphids for a 6.0 day reproductive period, compared to PI 238142 which produced 74.8 aphids during a 18.3 day reproductive period.

(d) Testing continued to determine the best pollination method for increasing seed of the wild types of sunflower. Data is still being analyzed. The test will be run again next summer.

(e) Work was begun to determine if Brassica napus (PI 171538) resistance to turnip aphids is also same gene(s) controlling resistance to powdery mildew.

(f) 100 corn genotypes were evaluated for silk feeding resistance to corn earworms. PI 340856 was the most resistant, next to PI 217413 (resistant check). Work will continue in 1983.

(g) Five selected plant introduction corns were planted (200 plants each) and evaluated on an individual plant basis for silk feeding resistance to corn earworms. Of the 1000 plants evaluated, ca. 20 were selected for progeny row testing next summer.

(h) Selected proso millets were evaluated for leaf feeding resistance to fall armyworms. Of the 19 millets tested, PI 380959 had the smallest larval weights. Retesting will be necessary to confirm resistance.

(i) Selected amaranths were evaluated for leaf feeding resistance to cabbage loopers. Three of the 28 tested produced smaller larvae and/or pupae. They will be retested in 1983 to confirm the resistance.

4. USEFULNESS OF FINDINGS

a. Plant Introductions continue to provide valuable germplasm for plant traits, disease and insect resistance, and other traits that are useful to plant breeders for developing and improving crop varieties, which benefits the general public by increased food production, improved food quality, energy conservation, and cleaner environment. The evaluation of plant introductions and the exchange for dissemination of information and seed through the NC-7 project, helps to better serve crops workers. The permanent maintenance and preservation of plant introductions assures a valuable germplasm pool for present and future use.

5. WORK PLANNED FOR NEXT YEAR

a. Continue (i) program of seed increase, storage, preliminary evaluation; (ii) pathology and entomology screening and evaluation work; (iii) check new plant introductions for abnormalities; (iv) local and regional testing of new crops and ornamentals, and (v) coordination of regional cooperative programs.

b. Implement computer assisted programs in cooperation with the Germplasm Resources Information Project.

c. Attend and participate in Annual Meetings of professional organizations, Regional Technical Committees, workshops, and crop commodity committees.

d. Visit stations in the region, and outside the region to conduct and coordinate plant germplasm work.

6. PUBLICATIONS ISSUED OR MANUSCRIPTS PREPARED DURING THE YEAR

Publications that concern information from the North Central Region on plant introductions are listed below. Publications from other regions on NC-7 primary maintenance crops are listed in Appendix A.

(a) Regional Station Publications. [Author(s) is a member of the Regional Station Staff:

(1) Clark, R. L., and Block, C. C. 1982. Septoria leaf spot resistance in Lycopersicon species. Phytopathology 72:1000 (abstr).

(2) Jarvis, J. L., Clark, R. L., and Guthrie, W. D. 1982. Effect of second-generation European corn borers on resistance of maize to Diplodia maydis, Phytopathology 72:1149-1152.

(3) Starks, K. J., Burton, R. L., Wilson, R. L. and Davis, F. M. 1982. Southwestern corn borer: Influence of planting dates and times of infestation on damage to corn, pearl millet, and sorghum. J. Econ. Entomol. 75:57-60.

(b) State Station Publications

None

(c) Journal articles

(1) Indiana

(a) Heiser, Charles B. Jr., 1982. Registration of Indiana-l CMS Sunflower Germplasm. Crop Sci. 22(5):1089.

(b) Warren, H. L. 1982. Registration of H110 and Hlll Maize Germplasm (Reg. Nos. GP 121 and GP 122). Crop Sci. 22(6):1270-1271.

(2) Wisconsin

(a) Edwards, M. D. and R. L. Lower. 1981. Investigations into the characteristics of seeds from compact cucumber plants. Cucurbit Genetics Cooperative 4:2-4.

(b) Edwards, M. D. and R. L. Lower. 1982. Variability for seed quality among fruit from individual compact cucumber plants. Cucurbit Genetics Cooperative 4:4-5.

(c) English, Jean E. and Donald N. Maynard. 1981. Calcium Efficiency among Tomato Strains. J. Amer. Soc. Hort. Sci. 106(5):552-557.

(d) Makmur, Amris, G. C. Gerloff and W. H. Gabelman. 1978, Physiology and Inheritance of Efficiency in Potassium Utilization in Tomatoes Grown under Potassium Stress. J.Amer.Soc.Hort.Sci. 103(4):545-549.

7. APPROVED:

3/8/83
Date

S. Z. Berry by [illegible]
Chairman, NC-7 Technical Committee
S. Z. Berry

Date

NC-7 Administrative Adviser
R. W. Hougas

(3) USDA

(a) Barksdale, T. H. 1982. Control of an Epidemic of Septoria Leaf Spot of Tomato by-Resistance. Plant Disease 66(3):239-240.

(b) Elgin, J. H., Jr. and S. A. Ostazeski. 1982. Evaluation of Selected Alfalfa Cultivars and Related Medicago Species for Resistance to Race 1 and Race 2 Anthracnose. Crop Sci. 22(1):39-42.

APPENDIX A

1. Publications

The publications listed below are from other regions, or foreign sources, but concern NC-7 primary crops.

(a) Sunflowers,

(1) Thompson, T. E., D. C. Zimmerman and C. E. Rogers. 1981. Wild Helianthus as a Genetic Resource. Field Crops Res. 4(1981)333-343. Texas

(b) Tomatoes

(1) Grattidge, R., and R. G. O'Brien. 1982. Occurrence of a third Race of Fusarium Wilt of Tomatoes in Queensland. Plant Path. 66(2):165. [illegible]-Australia

(2) Pilowsky, M. and D. Zutra. 1982. Screening Wild Tomatoes for Resistance to Bacterial Speck Pathogen (Pseudomonas tomato),. Plant Disease 66(1):46-47. Israel

ACHIEVEMENTS

1. Tangible Achievents

a. Plant Introductions Received in 1982

1) Grasses and Field crops

Genera	Nd. of accessions	
Agrostis	2	
Panicum	757	
Setaria	470	
Zea mays	26	
Total	1255	1255

2) Legumes

Coronilla	1	
Lathyrus	4	
Medicago (Per)	258	
Medicago (Ann)	18	
Melilotus	1	
Trigonella	10	
Total	292	292

3) Vegetables

Asparagus	3	
Beta	11	
Cucumis	5	
Cucurbita	10	
Daucus	7	
Lycopersicon	16	
Total	52	52

4) Oil and Special (New crops)

Brassica	365	
Chenopodium	4	
Eruca	1	
Helianthus	1	
Sinapis	19	
Total	390	390

5) Ornamental

Alcea	6	
Althaea	1	
Baptisia	1	
Cotoneaster	3	
Muretia	2	
Tulipa	1	
Total	14	14
TOTAL		2003

2. Other achievements

a. W. H. Skrdla

(1) Served as member of Small Grains Site Selection Review Committee to make recommendation on location of new facilities for the Small Grains Collection. Travelled to Beltsville, MD, Aberdeen, Idaho, and Ft. Collins, CO to review facilities at these locations.

b. R. L. Clark

(1) Presented a paper on the Septoria leafspot resistance work on tomato (see publications) at the 74th Annual Meeting of the American Phytopathological Society in Salt Lake City, August, 1982.

PRINCIPAL ACCOMPLISHMENTS AND SIGNIFICANCE

1. Plant Introduction germplasm continues to provide plant scientists with valuable genes.

In 1982, 12,200 packets of seed and plants were distributed as a result of 333 requests from plant scientists. This distribution is about average, or slightly under but it shows that considerable use is made of our collection, which eventually translates into reports on development of improved breeding lines, germplasm, cultivars and other uses which eventually benefits the public, Usually, many years pass between the distribution of an accession and a report on its contribution to the public. While it is impossible to locate and document all uses of PI's, sixteen reports are summarized in another part of this annual report. They state that PI material was used in: (1) corn for greater kernel depth and for disease resistance in two inbreds; (2) orchardgrass for good vigor and rust resistance; (3) Sinapus alba showing response to red and far red light, indicating value for use in Phytochrome control; (4) sunflowers for pollen restorer genes, earliness and fast dry down of heads, and resistance to downy mildew; (5) cucumbers for desirable vine and fruit traits, and resistance to anthracnose and powdery mildew; (6) lettuce for resistance to aster yellows: (7) pumpkin for its pickleworm resistance; and (8) tomato for single dominant gene resistance to bacterial speck, single dominant gene resistance to Septoria leafspot, K-efficiency, and ca-efficiency. If all such valuable reports were sent to the Regional Station and if all literature could be surveyed, there would be many more examples.

2. Plant Exploration to Japan for Hardy Ornamentals is Completed.

In September-October, 1982, an exploration for winter-hardy ornamentals in Japan was conducted by Dr. M. Kawase, Ohio State University, supported in part by ARS Plant Exploration Funds. The exploration was cooperative with the U. S. National Arboretum with Drs. Frederich Meyer and Sylvester G. March participating for the Arboretum. The exploration was very successful, with 422 entries collected representing 133 species. These will be propagated and evaluated to determine their hardiness in cold climate and for other traits badly needed in landscape materials for the High Plains Region in order to broaden the base of landscape plants available for that region.

3. Stalk rot resistance in corn affected by European Corn Borer Infestation.

Work done in conjunction with entomologists at the Corn Insects Lab, Ankeny, shows that corn breeders must include resistance to the second brood European corn borer in lines expected to withstand stalk rot infections. Lines resistant only to fungal stalk rots showed heavy stalk rot damage in the presence of large numbers of corn borers. Only where no borers were involved did stalk rot resistant lines fully show their resistance to this disease,

4. Belly rot resistance in cucumber found in PI 165509.

Work done at the PI station has shown a level of resistance to belly rot of cucumber in PI 165509, Cucumis sativus var. sikkinensis from India, that approaches immunity. This disease, caused by the soil inhabiting fungus Rhizoctonia solani, is the most serious disease of pickling cucumbers in the southern Mississippi Valley production area. Incorporation of the resistance found in PI 165509 into commercial type varieties will mean substantial increases in economic yields of pickles in the lower Mississippi

Valley, as well as other parts of the southeast, and will reduce the need for development and application of chemical control measures against this disease in these areas.

5. PI tomatoes show resistance to Septoria Leafspot.

High levels of resistance to Septoria leafspot have been located in wild species of tomatoes from South America. This disease causes extensive defoliation of tomatoes in the humid tomato production areas of the eastern U. S. Frequent applications of chemical fungicides are required, in these areas, to produce a marketable crop. The level of resistance found in tomato's wild relatives would effectively prevent epidemics of this disease, decrease costs of production, and eliminate the need for chemical controls of this serious leaf disease,

6. Fall armyworm resistance located in proso millet.

The current collection of proso millet, Panicum miliaceum L., was evaluated for fall armyworm, Spodoptera frugiperda (J. E. Smith), resistance. Two of the lines, PI 185037 and PI 176653, were consistantly the most resistant when comparing larval weights, pupal weights, and larval development times. If tansferred to commercial cultivars, insect control on this minor crop could be greatly reduced. With the advent of "genetic engineering", it may be possible to transfer fall armyworm resistance from millet to other crops of major importance, e.g. corn.