

The 1st
ANNUAL REPORT

of the

WESTERN TRIANGLE AGRICULTURAL RESEARCH CENTER
Montana Agricultural Experiment Station
Conrad, Montana

1978

Submitted by

Gregory D. Kushnak, Superintendent

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HISTORY AND BACKGROUND

Authorization for Montana Agricultural Experiment Station's Western Triangle Agricultural Research Center came from the 1977 Legislature, which appropriated \$206,000 for the biennium ending June 30, 1979. An additional \$14,000 was contributed by the Montana Wheat Research and Marketing Committee. The Research Center (first called a satellite station) was charged with serving the agriculture of the western half of Montana's Golden Triangle, which encompasses the following counties: Glacier, Pondera, Teton, Toole, and western portions of Liberty, Chouteau, and Cascade. Impetus for the new center came primarily from farmers and ranchers of the Western Triangle, who organized their efforts through the Soil Conservation Districts.

A 12-man Advisory Board, representing the counties involved, was established during the fall of 1977. The Board met in early October to establish guidelines pertaining to site location, and to develop the role and scope of the Research Center.

Jim Krall of the Montana Agricultural Experiment Station, Bozeman, was appointed Coordinator, and summoned the assistance of personnel from Montana State University, the Soil Conservation Service, and other agencies to provide the Advisory Board with technical information on soils, climate, and other disciplines pertinent to site selection.

In January 1978, Dr. Greg Kushnak was hired as the first Superintendent of the Western Triangle Research Center; and the following April, Ronald Thaut joined the staff as the first Research Technician. Temporary headquarters were set up in Conrad.

Research Center Location: The Advisory Board members and the Montana Agricultural Experiment Station were in general agreement that the Research Center should be strategically located in order to expedite service to all counties involved. It was felt that the Conrad area would best satisfy this need because of its central location; proximity to Interstate 15, and the availability of both irrigated and dryland facilities.

Selection of a location on soil typical of the Western Triangle was given high priority. This narrowed the site selection to a Scobey/Kevin glacial till soil, which was by far the most prevalent of the region.

Other factors considered were: good accessibility to the public; availability of utilities; within 10 miles of a service center; landowner's willingness to sell; and price. It was felt that 40 to 80 acres would be sufficient to accommodate the on-station research activities, since off-station research in the various counties was held with equal importance.

Members of the Advisory Board provided over 30 names of landowners to be contacted. The Advisory Board and MSU staff, assisted by the SCS Soil Survey Team from Choteau, examined each of the prospective sites for suitability and availability. In March 1978, the Advisory Board selected the Denzer land nine miles north of Conrad. The Board of Regents authorized purchase of this land on May 31, 1978; but Title complications delayed the transfer, and closing was not anticipated until sometime in December 1978.

The land consisted of 75 acres of land with irrigation canal and pump; and met all of the selection criteria.

Building Acquisition: The Advisory Board approached the Tiber County Water District regarding the possibility of transferring a 60 X 100' steel government building from the Water District to the Research Center. The Water District agreed to release possession of the building and received authorization for the transfer from the U. S. Department of Health, Education and Welfare.

Authorization for transfer however was contingent upon the land purchase.

Advisory Board: The Advisory Board for the Western Triangle Agricultural Research Center was formed during the fall of 1977 and consists of farmers and ranchers from each of the seven counties in the western half of Montana's Golden Triangle Area. Additional plans call for the addition of businessmen to the Board. Board members are appointed by the County Commissioners and/or Soil Conservation Districts in the respective counties. Appointments are for three years and limited to two terms.

The Advisory Board has played an essential role in the development of the Western Triangle Research Center. Many days of their valuable time were spent seeking information on buildings, site selection, available utilities, etc. A hearty vote of thanks to these members for their excellent service! Special thanks to Joe DeStaffany for leading the group as chairman, and for helping with soil sampling. Also to Dick Page and Paul Kronebusch for serving as vice-chairman and secretary.

Following is a list of the Advisory Board members:

Appointed through 1979

- Richard Page, Bynum, Teton County
- Dave Shane, Floweree, Cascade County
- Gary Iverson, Sunburst, Toole County
- Vade Hamma, Brady, Chouteau County

Appointed through 1980

- Henry Wilson Hodgskiss, Choteau, Teton County
- Don Buffington, Ledger, Liberty County
- Jerry Swenson, Cut Bank, Glacier County

Appointed through 1981

- Karl Ratzburg, Ledger, Toole County
- Paul Kronebusch, Conrad, Pondera County
- Joe DeStaffany, Conrad, Pondera County
- Dale Vermullan, Cut Bank, Glacier County
- Jack Baringer, Conrad, Extension Service Representative (ex-officio)

Committee Officers during 1978

Chairman: Joe DeStaffany
Vice-Chairman: Richard Page
Secretary: Paul Kronebusch

Following are the Minutes to the Advisory Board meetings during the first year and some earlier Soil Conservation District meetings pertaining to the establishment of the Western Triangle Research Center.

See Pages 4-15.

PONDERA COUNTY CONSERVATION DISTRICT

December 28, 1976

A special meeting of the Conservation District Supervisors for the purpose of establishing a list of needs for the satellite research station was called to order by Chairman Verstraete at 7:00 p.m. Those present were Tony Verstraete, LaVern Keil, Joe Broesder, Kenneth VandenBos, Jack Baringer, CEA, and Bev Walker, Secretary.

After discussion it was decided a 40 or more acre site with off site plots was the size best suited to our needs. Locations were discussed also. It was decided uniformity of land was most important.

Justification for the station are as follows:

- Interest of people in the area
- Distance from existing stations
- Producers needs not satisfied by existing stations
- Climatic differences
- Not getting fair share of research effort
- Glacial till soil
- Irrigation with above variations differ from existing research areas
- Saline seep situation
- Monoculture economics
- Area would support effort if information put out

It was also decided a local board of producers would be required.

List of principal needs:

- Cereal grains - dryland
 - Protein control - fertilizers
 - Weed Control
 - Malting barley varieties
 - Soil compaction
 - Minimum tillage
 - Saline seep if present program phased out
 - Variety comparisons with special emphasis on new releases
 - Rate of seeding versus date of seeding

Cereal grains - irrigated

- Malting barley - protein control
- Malting barley varieties
- Disease control in continuous cropping
- Fertilizer - time of application
- Green manure management
- Irrigation at proper states of plant growth and use of moisture meter for proper amount of water

Notices of a meeting of Triangle Area supervisors will be sent to all

supervisors in the Area to be held at the SCS office in Conrad on Thursday, January 6, 1977 for the purpose of establishing a statement of needs, and estimate of cost and preparing a proposal to present to the legislature.

Meeting adjourned at 9:45 P.M.

Beverly Walker,
Secretary

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SOIL CONSERVATION DISTRICT
SATELLITE EXPERIMENT STATION MEETING

January 6, 1977

The meeting was called to order by Pondera County Conservation District Chairman Tony Verstraete. Liberty, Toole, Teton, Glacier, Chouteau and Pondera Counties were represented at the meeting. The list of those attending is attached.

DeStaffany, Pondera County, gave a presentation showing need for the station.

Martin Burris, Associate Director, Agricultural Experiment Station, prepared a statement of need and an estimate of cost. The presentation was read and discussed.

A list of justifications that Pondera County Conservation District developed was discussed and added to. They are as follows:

- Interest of people in the area
- Over 100 miles distance from existing stations
- Climatic difference-growing season variation
- Not getting fair share of research effort
- Soil conditions vary from existing stations
- Saline seep situation
- Irrigation data needed under our area conditions
- Area economics limited to cereal grains
- Havre Station no longer conducts out-of-county off station plots

Available information not compatible with our conditions.

Area needs to know the results of research much quicker than what they are not getting it.

An advisory board consisting of representation from each of the involved counties would be required.

List of principal needs.

- Cereal Grains - Dryland
- Protein control - fertilizers
- Weed control
- Malting barley varieties
- Soil compaction
- Minimum tillage
- Saline seep research if present program phased out
- Disease control in continuous cropping
- Variety comparisons with special emphasis on new releases

Rate of seeding versus date of seeding.

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Cereal Grains - Irrigated

Malting barley - protein control

Malting barley varieties

Disease control in continuous cropping

Fertilizer - time of application

Green manure management

Irrigation at proper stages of plant growth and use of moisture
meter for proper amount of water

Variety comparisons with special emphasis on new releases

Legumes and grass - Irrigated

Legumes and their use in rotation

Wet feet syndrome in legumes

Dry and Irrigated

New crop experiments - such as, oil seeds, mint, corn, rape, etc.

Alternative cropping systems

Dryland alfalfa

It was decided that primary concern should also be given off station plots.

Those on the committee are Herb Karst, Toole County; Richard Page, Teton County; Tony Verstraete, Pondera County; Wade Hamma, Chouteau County; LaVern Keil, Pondera County; and Ralph Briggs, Cascade. Marty Malone will be contacted for Glacier County representative. Verstraete will contact Walt Dion and set up procedures for getting this proposal to the legislators.

Information will be sent to Dana Fitzgerald, Power, Wheat Research and Marketing Committee; and to Jim Stephens, Dutton, Farmers Union.

Articles will be placed in local papers.

Briggs, Cascade County, brought up the proposed change in the method of electing supervisors that is coming before the legislature.

Meeting adjourned.

Beverly Walker
Pondera County Conservation District,
Secretary

SATELLITE RESEARCH CENTER
ADVISORY COMMITTEE MEETING

October 13, 1977

Present at the first meeting of the Committee were Jack Gunderson, Rex Manuel, Joe Asleson, Jim Krall, Gene Sharp, Kurt Feltner, Martin Burris, Karl Ratzburg, Paul Kronebusch, Richard Page, Wilson Hodgskiss, Jerry Swenson, Dave Shane, Joe DeStaffany, Jack Baringer, Don Buffington and Don Bradley substituting for Dale Vermullan.

Joe Asleson recommended the Advisory Committee elect a chairman, vice-chairman and secretary and that they serve as the executive committee. Those elected were: Joe DeStaffany, chairman; Dick Page, vice-chairman; Paul Kronebusch, secretary.

Joe Asleson reported that the staff of the Satellite Research Center would probably consist of one professional, a number of technicians and maybe a half-time secretary.

It was discussed and decided that we should begin looking for 40 acres of irrigated land and 80 acres of dryland. Don Buffington moved that we try to acquire 40 acres of irrigated land and 80 acres of dryland preferably together and within a 10 mile radius of Conrad. Jerry Swenson seconded, motion carried.

Land and building purchase or lease was discussed. Also discussed was the need for local support and backing.

The possibility of advertising for land along the irrigation canal and also using advertising as a means of public information was discussed.

We drew lots for terms on the Advisory Committee and discussed the length of those terms. Karl Ratzburg made and Dick Page seconded a motion to have the County Commissioners or the Conservation Districts appoint or reappoint members at the end of one term which is three years and that members are limited to two terms. If members miss two regular meetings without an excuse they will be replaced on the committee. Motion carried.

Joe DeStaffany made and Wilson Hodgskiss seconded a motion that the chairman of the Advisory Committee serve one year term. Motion carried.

Jim Krall stated that he will send out to each committee member a list of possible areas for research and each member should indicate their order of importance for their area. This will be used to help set up a program at the center.

It was noted that Jim Krall will be heading up the Satellite Research Center until a permanent selection of personnel is made.

We discussed the possibility of taking over the Alkali Association building for supplies at \$55.00 a month.

Dave Shane moved and Don Buffington seconded that the Satellite Research Center Advisory Committee empower the executive committee to work with Jim Krall to get the Satellite Research Center started and to report back to the full committee at the next regular meeting. Motion carried.

The next regular meeting is planned for December 8, 1977 at 1:30 P.M. at the Conrad Community Center.

It was noted that the Satellite Research Center is not a part of the MSU Center research budget so the Triangle Area people will have to play a big role in seeing that the legislature continues to fund it.

Meeting adjourned at 4:30 P.M.

Paul Kronebusch,
Secretary

SATELLITE RESEARCH CENTER
EXECUTIVE COMMITTEE MEETING

November 1, 1977

Present at the meeting were Jim Krall, Jerry Nielsen, Jack Baringer, Joe DeStaffany, Dick Page and Paul Kronebusch. They met in Conrad at the County Extension Office and from there they toured areas north, west and south of Conrad. All areas were within 10 miles of Conrad.

They looked at these areas in relation to the window on the compiled map. They looked at the general topography, dug soil sample holes to view the profile, examined the depth of the soils and took soil samples.

Two possible sites were excluded because of distance and unfavorable soil characteristics.

After the site survey, they met at the SCS office to discuss their findings.

Jim Krall stated that the title of the person in charge of the SATELLITE RESEARCH CENTER would be that of Chief Agronomist. Jim also indicated that there is a push to get another staff member since there is the need of two personnel.

It was discussed that Rex Manuel should be kept informed of any progress made. Also discussed was the idea and need to get businessmen from the area towns as members of the advisory board. It was suggested that we consider a banker, lawyer, and an implement dealer from Choteau, Conrad, Cut Bank and Shelby.

Jim Krall indicated that the next step would be to try to set priorities in regard to the possible sites that were toured.

Both Jim Krall and Jerry Nielsen indicated that they would like to consider the Acheson place nine miles north of Conrad as the first site possibility. If that location isn't available then they would consider any of the other sites.

The other possible sites in no particular order are as follows: Elliot, Bokma, Brownell, Salansky and McFarland.

Meeting adjourned at 3:30 P.M.

Paul Kronebusch,
Secretary

SATELLITE RESEARCH CENTER
COMMITTEE MEETING

December 14, 1977

Present at the meeting were Jim Krall, Joe DeStaffany, Richard Page, Paul Kronebusch, Karl Ratzburg and Wilson Hodgskiss.

The meeting was held at 9:00 A.M. in the Pondera County Extension Office. The first item of business was to talk to Ronald Denzer, the owner of a possible site 11 miles north of Conrad. Jim Krall discussed with him what was needed and the possibility of purchasing or leasing approximately 75 acres of irrigated land above the main canal. Mr. Denzer indicated that he was interested in dealing with us on the 75 acres or on a 40 acre block of dryland that he owned one mile north.

The 40 acre piece is bordered to the west by 40 acres of state land that he has leased and bordered to the east by Kluth's irrigated land.

The committee then left the office to view a 100 acre field just north of Conrad. The owners of it are Smedrud and Lightner.

From there the committee traveled north to see land owned by McKee, Denzer, Kluth, Huyghe, Wipperman, Lonnevik and Ries.

The committee also talked to Arthur Huyghe and to Don Elings about possible sites. The Elings land was too distant and was poorly drained.

After dinner the committee met at the SCS office to further discuss the mornings findings.

Jim Krall stated that irrigated land that had been intensively irrigated could not accurately be used for dryland research. This ruled out the Huyghe and Lonnevik land. Jim further stated that soil surveys also showed that the McKee and Smedsrud-Lightner land was unsuitable.

The Wipperman land was rejected because of excess wasteland and roughness.

We then discussed what buildings would be needed. Jim Krall explained what size and what interior designs he thought were necessary.

Several members of the committee said they would check with local construction firms to see what it would cost to have these two buildings erected.

Chairman Joe DeStaffany then announced that the next meeting would be on January 5, 1978 at 1:15 in the Conrad Community Center. The meeting was then adjourned.

Paul Kronebusch,
Secretary

SATELLITE RESEARCH CENTER
Advisory Committee Meeting

January 5, 1978

Present at the meeting were: Jim Krall, Martin Burris, Greg Kushnak, Joe DeStaffany, Richard Page, Paul Kronebusch, Don Buffington, Karl Ratzburg, Jerry Swenson, Wilson Hodgskiss, Gary Iverson, Dale Vermullan, Vade Hamma, Jack Baringer and Ted Newman representing Dave Shane. Present as guests were: Donatus Kronebusch, representing the Pondera Canal and Reservoir Company and Ronald Denzer, a local landowner.

The minutes of the previous meeting were read. The minutes for the October 13th and the November 1st meetings were approved. The December 14th minutes were approved as corrected to include Jack Baringer on the advisory board.

Chairman DeStaffany asked Martin Burris to explain the present financial status. Mr. Burris stated that 2/3 of the money was to be spent this year with the remainder spent next year. He explained that if a contract for purchase is made then the money will be put in a fund for the desired number of years. Mr. Burris said that the only bills have been those for Jim Krall's salary and for the rent on the saline seep building. He said that the next major expense would be that of equipment purchases. He added that a full financial report could be given at the next meeting.

Martin Burris next explained the process of selecting a chief agronomist for the research center. He explained Greg Kushnak's background and that he had a Ph.D. in barley breeding. He went on to explain some of the research that will be done.

Jim Krall then explained the factors which are involved in the site selection. He mentioned that the Scobey-Kevin soil type was best and that the Eth-bridge type was not quite as satisfactory. Other factors he considered important are utilities available, accessibility to the Interstate and to Conrad, availability of irrigation water and the accessibility to the public. Mr. Krall stated that approximately 23 sites were considered.

Chairman DeStaffany then asked Donatus Kronebusch to explain the possibility of obtaining water stock for the irrigated land. Mr. Kronebusch said that the State presently held 40 shares of stock and that it was possible to obtain it.

The next item to be discussed was that of site selection. The Denzer, Acheson and Kronebusch lands were explained and pointed out on the map.

Martin Burris then held a private meeting with Ronald Denzer to discuss buying some of his land.

Chairman DeStaffany discussed the Brownell land west of town by the airport. He said it was dryland but could be irrigated. He also said that someone else had first chance to buy it.

DeStaffany also mentioned there was some State land south of Conrad by Phillips and some McFarland land southwest of Conrad. The McFarland land is 1/2 mile from water.

Jim Krall discussed the possibility of buying irrigated land now and leasing dryland. This would allow the dryland tests to be moved to different sites.

Greg Kushnak explained his plans for research involving yield capability aspects in different environments and areas.

Jim Krall then told the committee just what equipment was now available for the center. He listed the following: a 4-row no-till drill, plot sprayer, nursery thrasher, scales, test weight apparatus, a head thrasher, a 2030 John Deere tractor and a 5th-wheel trailer. Mr. Krall also discussed leasing equipment from implement dealers.

Chairman DeStaffany asked the committee members if they had any cost estimates on the 40 X 60 and the 30 X 80 buildings for the research center. Don Buffington and Karl Ratsburg both read their estimates and submitted them to Jim Krall.

Don Kronebusch suggested the committee look into the possibility of getting the building at the PAR site. Wilson Hodgskiss moved and Vade Hama seconded the motion to check into acquiring the building at the PAR missile site. Motion carried.

Jim Krall explained the questionnaire on research. He discussed each part and said that it should be reviewed annually.

Jim Krall talked to the SCS soil team in Choteau about the Brownell land west of Conrad. They said it would be good enough but not the best. It would be all right for irrigated research but not for dryland.

Martin Burris reported on the 38 acres of Denzers and the 33 acres of leased State land that Denzer farms. He said that Denzer wanted \$50,000 for it. The committee discussed this price and felt it was too high and no action was taken.

Adding more members to the advisory committee was discussed. Dick Page moved and Don Buffington seconded the motion to add a business from Choteau, Conrad, Cut Bank and Shelby. Motion carried.

There being no further business, the meeting was adjourned at 4:30 P.M.

Paul Kronebusch,
Secretary

SATELLITE RESEARCH CENTER
Advisory Board Meeting

March 30, 1978

Present at the meeting were: Jim Krall, Greg Kushnak, Grant Jackson, Joe DeStaffany, Richard Page, Paul Kronebusch, Jerry Swenson, Wilson Hodgskiss, Dave Shane, Vade Hamma, Dale Vermullan and Darrel Crum representing Karl Ratzburg.

The meeting was called to order by Chairman DeStaffany.

The minutes of the previous meeting were read and approved as corrected.

Chairman DeStaffany asked Jim Krall to give a financial report. He listed the items that had been purchased and the expenses that had been paid so far. Mr. Krall listed \$41,833 that had been spent with \$164,000 left in the fund.

DeStaffany then asked Greg Kushnak to explain the equipment on hand and that had been ordered. Kushnak listed them as follows: 2240 John Deere row crop, 3/4 ton Ford pickup with one ton rating, 5th wheel trailer 24 feet long and tandem axle, 2-row harvester, sprayer, back-pack plot sprayer, lister and rodweeder, Morris drill, 4-row no-till drill from saline seep, small tools, 12-foot Barber fertilizer spreader, office equipment, 35mm camera from saline seep and 1,000 stakes for plots.

Greg Kushnak stated that he and Jim Krall cut the equipment list down to the bare minimum.

Greg Kushnak explained that no research will be done on the experiment center land this year. The land will probably be cultivated by area farmers this year to free the equipment for the plots and to control the weeds.

Chairman DeStaffany stated that there was a possibility of getting surplus equipment at Helena from the Government Surplus Agency.

The PAR Site building was discussed next. It is 60 X 100' with 16 foot side walls.

Greg Kushnak explained that the Department of HEW still has control of it after the Tiber County Water District releases it. It was explained that it wouldn't be released until we had a definite place to put it.

Site selection was the next item of business. Greg said that 39 sites had been looked at and that seven bids were received at Bozeman. He went on to explain aspects of the two final sites; one at Brady and one at Conrad. He showed charts to the committee explaining the advantages and disadvantages of each of the two sites.

Jim Krall then discussed the procedure for purchasing land.

Chairman DeStaffany then recessed the meeting for a tour of the Kauk land at Brady and the Denzer land north of Conrad. After viewing both sites, with their advantages and disadvantages explained at each site, we met back at the Community Center to further discuss a selection of one site. The discussion included the availability of utilities, access and more about the PAR site building.

Greg Kushnak talked about the plots he plans to put out this summer. The plots will be located from Sunburst on the north to Power on the south. The plots will be along the Interstate on land volunteered by farmers.

Wilson Hodgskiss moved and Vade Hamma seconded the motion to have a secret ballot on deciding which site to select for the Center. The committee voted to try to buy the land up north first and if Denzers wasn't available, then buy Kauk's to the south.

Jim Krall indicated that he had the authority to try and purchase some land once a site was decided upon.

Greg Kushnak stated that Ronald Thaut, who has a B.S. degree in soils, was hired to work with him on the research plots.

A possible tour to the Moccasin Research Center was discussed for sometime this summer. The tour would be to view the station's facilities and research techniques. The committee thought mid-June would be the best time.

Joe DeStaffany asked for more ideas on adding more businessmen to the Advisory Board. Members suggested that each area get one or two names and present them at the next meeting. The board would then pick one man from each area.

There being no further business, Vade Hamma moved and Wilson Hodgskiss seconded the motion to adjourn at 4:50 P.M.

Paul Kronebusch,
Secretary

45th Legislature

LC 0937/01

 H Bill No. 282

INTRODUCED BY Manuel, Johnston, Kinnerly, Gunderson,
Underdahl.

A bill for an act entitled: "An act appropriating funds
for the establishment of a satellite agricultural experi-
ment station to serve the general area of Glacier, Toole,
Pondera, and Teton Counties."

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF MONTANA:

Section 1. There is appropriated the sum of \$206,000
for the biennium ending June 30, 1979, from the general
fund to the Montana Agricultural Experiment Station for
the purpose of establishing a satellite agricultural
experiment station serving Glacier, Toole, Pondera, and
Teton counties and surrounding areas.

-End-

Resume of HOUSE BILL 282
AGRICULTURAL RESEARCH CENTER FOR TRIANGLE AREA

The Pondera, Toole, Glacier and Teton Soil Conservation Districts have initiated a proposal for the establishment of a satellite experimental research station in these counties. The Montana Soil Conservation District's Convention favorably adopted the resolution for research for the west side of the Grain Triangle. The western Triangle finds itself in the situation of being equal in distance (over 100 miles) from Havre, Moccasin and Creston Experiment Stations, as well as Lethbridge. The information from these stations does not always fit the needs of farmers and ranchers of the four counties, as well as portions of Cascade, Chouteau and Liberty Counties.

December 22, 1976, representatives of the above mentioned counties met with Joe Asleson, Director of Montana Agricultural Experiment Stations, and head personnel from Havre, Moccasin and Montana State University Experiment Stations. They accepted the idea and would support our effort fully. In fact, they helped prepare a tentative budget for the biennium for establishment and operation of a satellite agricultural research station.

On January 6, representatives of the seven counties established a list of justifications: interest of people in the area; climatic difference; growing season variation; Chinook zone; existing experiment stations to limit research to nearer their centers; soil conditions; irrigation data needed; malt barley study and alternate crops. One of the essentials would be an advisory board consisting of representation from each of the involved counties.

A FEW FACTS

The existing stations at Havre and Moccasin are the same distance apart themselves as Havre is to Conrad or Moccasin is to Dutton.

The following figures that will be used as reference came out of the December 1976 book of Montana Agricultural Statistics, Volume XVI (County Statistics 1975 and 1976) prepared by the Montana Department of Agriculture and Statistical Reporting Service - USDA.

The counties of Pondera, Toole, Teton and Glacier in the 1974 drought year had 1,060,680 harvested acres which amounted to 69 million dollars or 9% of the state total crop receipts. In 1975, which was a good year, there were 1,184,090 acres in the four counties for 86 million dollars or 13% of Montana's total crop receipts.

Chart of 1975 numerical ranking of counties as to crop production as compared to 56 counties.

	Wheat	Wheat	Spring Wheat exclude Durum	Durum	Barley	Hay
PONDERA	5	3	17	2	1	27
TETON	10	6	19	6	4	5
TOOLE	6	13	4	3	3	51
GLACIER	20	16	9	16	2	29

Barley note: Four counties in 1975 ranked 1, 2, 3 and 4 of 56 counties. 378,600 acres of land (29% of total state barley acres); gross \$36,672,600 or (33.6% of state barley dollars.)

Planned is the possibility of a 40 acre main plot on irrigated and dryland satellite (small) experimental research site to be located in Pondera, Toole, Glacier or Teton county. Also planned are six to eight off station plots of about five acres, hopefully two in each county. The sites will be selected on availability of researchers and by an advisory board. The plan is to purchase the main site and obtain 10 year leases on the five acre plots.

Attached is the budget (two sheets) which Martin J. Burris with cooperation of Charles Rust and Dean Joe Asleson, Director of Montana Experiment Stations. The sheets are totaled individually for a total of \$280,182 but in writing the bill the amount became \$206,000.

Machinery and Equipment: Many items of machinery and equipment were purchased or acquired from other departments during 1978 in order to get the research program underway. Following is a list of those items:

1. Tractor, John Deere Model 2240, 50 HP diesel	\$9,500.00
2. Pickup Truck, 1978 Ford Model F-250, 400 cu. in. 3/4 ton, 4-wheel drive	6,925.00
3. Fifth-wheel Flatbed Trailer, Western brand, tandem- axle, 24' deck	4,508.00
4. Fertilizer spreader, Barber brand, 14' folding model, pull-type	1,812.00
5. Grain Harvester/Binder, Suzue model B600D, 2-row assembly, gasoline operated	2,145.63
6. Sickle Mower, Jari "Chief" model, 24" cutter bar, 3 HP gasoline operated	380.00
7. Herbicide sprayer, Big Butch model EB 300-74R, pull-type, 300 gallon tank, 27' boom, roller pump	1,440.00
8. Unit planter, John Deere, 4 double disk openers, 8 seed cones, 4 seed hopper cans, no-till coulter attachment	Loaned from Saline Seep Program
9. Thresher, Vogel portable, gasoline operated	Loaned from Saline Seep Program
10. Pickup truck, 1975 Dodge 100, 1/2 ton, 2-wheel drive	Granted from Director's Office
11. Forty Hand Sickles, Cumberland Model 0525, serrated cutting edge	169.56
12. Electronic Balance Scale, Mettler Model P10N, 10,000 gram capacity	1,431.25
13. Cereal Processor, Peterson cleaner, seed deawner and blower	1,141.23
14. Sieve shaker, Gamet brand, 5/64, 5 1/2/64, and 6/64 sieves, bottom pan	479.00
15. Bushel test weight apparatus, Ohaus brand, filling hopper, pint and quart test buckets	130.00
16. Vacuum cleaner, Sears Home-N-Shop model	200.00
17. Tool Set, Sears 635 piece mechanic's, 12-drawer chest and 12-drawer cabinet	1,418.60

18.	Electric arc welder, Lincoln K-1170 dual range, accessories and electrodes	293.18
19.	Electric drill, Wen model 952-PR 52, 1/2" variable speed	46.70
20.	Portable Electric Circular Saw, Skill Model 13-3368, 2 HP, 7 1/4" blade	85.20
21.	Two chain tighteners	39.52
22.	Two chains, 3/8" X 20'	70.68
23.	Hydraulic Jack, 12-ton	33.26
24.	Miscellaneous tools and accessories	175.97
25.	Electronic calculator, Sharp EL-1108, desktop model	50.00
26.	Four file cabinets, 4-drawer	444.60
27.	Small plot herbicide sprayer, 6' boom, backpack	Granted from Velsicol Corp.
28.	Camera, Yashica, 35mm	Loaned from Saline Seep Program
29.	Crop Science Journals, Vols. 1-18	Donated from Dr. Clee S. Cooper
30.	Agronomy Journals, Vols. 43-70	Donated from Dr. Clee S. Cooper

1978

RESEARCH ACTIVITIES

Acknowledgements: Research trials during 1978 were conducted with the assistance of many individuals from the USDA, Plant and Soil Science and Plant Pathology Departments at MSU, the County Extension Service, and the Saline Seep Project. Without the help of these people, most of the test plots would not have been possible. Special credit goes to Dr. Grant Jackson of the Saline Seep Project, for seeding the oilseed and fababean trials; to Dr. Pete Fay of Plant & Soil Science, MSU, for establishing weed control trials; and to the County Agents and Saline Seep Project for seeding winter wheat plots during the fall of 1977. The County Agents also assisted in lining up cooperators for test plot sites, and in the seeding and harvest of spring grain plots. Special thanks also to the following: the landowners who provided land for test plots; Eisenman Seed Company for cooperating with some of the malting barley variety tests; Cargill, Inc. - Conrad; Choteau Feed and Seed; Taylor Soil Service, Shelby; Big Sky Seeds, Inc. - Shelby, for providing fertilizer and seed for the experiments; and Peavey Co. - Shelby for help with protein determinations, Ron Thaut, Research Technician, and Sharon Black, secretary for Saline Seep, for their invaluable assistance in conducting the research, compiling the data, typing and assembling the contents of this report.

1978 Test Plot Locations: An attempt was made to test crop species and varieties under many different climatic conditions across the Western Triangle to estimate which crops or varieties would be most stable under varying conditions, or which ones would be suited only to specific conditions. The information would also establish a data base for the area. Unfortunately, a broad spectrum of environments was not sampled due to the loss of many experiments to hail.

A list of the 1978 test plots is presented in Table 1.

Table 1. Research plots grown in the Western Triangle during 1978.

Crop	Experiment	County	Cooperator + Location	Yield Data	
Winter wheat	Intrastate Varieties - Recrop	Pondera	Ron Bokma, Conrad	Yes	
	Intrastate Varieties - Fallow	Pondera	Ron Bokma, Conrad	Yes	
	Preliminary Varieties - Fallow	Pondera	Ron Bokma, Conrad	No (hail)	
	Nitrogen Rates - Recrop	Pondera	Ron Bokma, Conrad	Yes	
	Nitrogen Rates - Fallow	Pondera	Ron Bokma, Conrad	Yes	
	Varieties - Recrop	Toole	Karl Ratzburg, Ledger	No (hail)	
	Varieties - Fallow	Toole	Karl Ratzburg, Ledger	Yes	
	Varieties - Recrop	Teton	Albert Carlson, Choteau	Yes	
	Varieties - Fallow	Teton	Albert Carlson, Choteau	No (hail)	
	Nitrogen Rates - Fallow	Teton	Albert Carlson, Choteau	Yes	
	Spring wheat	Advanced Yield Varieties	Pondera	Ron Bokma, Conrad	Yes
		Varieties	Teton	Bert Corey, Choteau	Yes
Varieties		Cascade	Arnold Gettel, Power	Yes	
Varieties		Toole	Bob Aschim, Sunburst	Yes	
Varieties		Toole	Art Adamson, Devon	No (hail)	
Nitrogen Rates - Fallow		Toole	Art Adamson, Devon	No (hail)	
Seed Treatment		Toole	Art Adamson, Devon	No (hail)	
Nitrogen Rates - Fallow		Toole	Bob Aschim, Sunburst	Yes	
Nitrogen Rates - Recrop		Toole	Bob Aschim, Sunburst	No	
Barley		Intrastate Varieties - Dry	Pondera	Ron Bokma, Conrad	No (hail)
		Intrastate Varieties - Irr.	Teton	Ron Ostberg, Fairfield	Yes
		Hector/Klages Lines	Pondera	Ron Bokma, Conrad	No (hail)
	Varieties	Teton	Bert Corey, Choteau	Yes	
	Varieties	Cascade	Arnold Gettel, Power	Yes	
	Varieties	Toole	Bob Aschim, Sunburst	No (hail)	
	Varieties	Toole	Art Adamson, Devon	No (hail)	
	Varieties - Irrigated	Teton	Al Meyer, Fairfield	Yes	
	Disease Control - Irrigated	Teton	Gideon Schmidt, Fairfield	Yes	
	Nitrogen Rates - Fallow	Teton	Fulk, Fairfield	Yes	
	Nitrogen Rates - Fallow	Toole	Bob Aschim, Sunburst	Yes	
	Nitrogen Rates - Recrop	Toole	Bob Aschim, Sunburst	No	
Nitrogen Rates - Fallow	Toole	Art Adamson, Devon	No (hail)		
Ammon. Phos. vs. Planters	Teton	Art Adamson, Devon	Yes		

Table 1 (continued)

Crop	Experiment	County	Cooperator + Location	Yield Data
Fababeans	Varieties	Pondera	Ron Bokma, Conrad	Yes
	Varieties	Teton	Gene Schultz, Dutton	Yes
	Varieties	Liberty	Dale Lyders, Chester	Yes
Oilseeds	Mustard & Rape	Glacier	Fred Berkram, Cut Bank	Yes
	Sunflower Varieties	Glacier	Fred Berkram, Cut Bank	Yes
	Mustard & Rape	Toole	Herb Karst, Sunburst	Yes
	Sunflower Varieties	Toole	Herb Karst, Sunburst	Yes
	Mustard & Rape	Pondera	Ron Bokma, Conrad	Yes
	Sunflower Varieties	Pondera	Ron Bokma, Conrad	Yes
	Safflower	Pondera	Ron Bokma, Conrad	No
	Mustard & Rape	Teton	Gene Schultz, Dutton	Yes
	Sunflower Varieties	Teton	Gene Schultz, Dutton	Yes
	Safflower	Teton	Gene Schultz, Dutton	Yes
	Mustard & Rape	Liberty	Dale Lyders, Chester	Yes
	Sunflower Varieties	Liberty	Dale Lyders, Chester	Yes
	Corn Silage	Varieties - Dryland	Pondera	Ron Bokma, Conrad
Woods	Chemical Summerfallow	Pondera	Ron Bokma, Conrad	Yes

TITLE: Winter Wheat Investigations

YEAR: 1978

LOCATION: Western Triangle Agricultural Research Center, Conrad, Montana

PERSONNEL: Gregory D. Kushnak and Ron Thaut, Research Center, Conrad;
Allan Taylor and Grant Jackson, MSU, Bozeman; Bill Richter,
Jack Baringer, and Darrel Krum, Cooperative Extension Service

RESULTS: Seven of the ten winter wheat experiments escaped hail damage and were harvested for yield. Growing season precipitation and soil moisture was unusually high for all locations. No winterkill was observed at any of the test plots. Seeding dates, fertilizer rates, etc. are presented in the footnotes of the data tables. Following are some comments on each test plot.

Conrad Varieties (Tables 2 & 3): Two intrastate variety nurseries were grown, one on fallow and one on recrop, two miles west of Conrad. In comparing the two nurseries, Centurk ranked high in yield on fallow, but very low on recrop; while NAPB-1289, Rocky, and Lancer ranked high in both nurseries. This suggested that Centurk is very susceptible to a disease or some other factor associated with recropping on winter wheat stubble, while the latter varieties are more resistant.

On the average, the recrop nursery yielded nine bu/a less than the fallow nursery. Moisture should not have been that much of a limiting factor during the unusually wet year. Most likely, a combination of nitrogen deficiency and diseases reduced recrop yields.

It should be noted that recropping winter wheat on winter wheat stubble is not recommended because Cephalosporium root rot disease and cheatgrass can increase rapidly under such a rotation. When winter wheat is recropped, it should be grown on barley or spring wheat stubble in a 3-year rotation.

Three-year Variety Summaries: Three-year yield, test weight, plant height, and protein summaries for winter wheat varieties grown in Pondera County are presented in Tables 4, 5, 6, and 7, respectively. The previous years variety tests were conducted by Jack Baringer, Pondera County Extension Agent. Since not all of the varieties were tested in each of the three years, comparable averages were used. The comparable average is an adjusted average which allows comparison of varieties grown in unequal numbers of years. Over the three-year period, Centurk was the highest producer.

Conrad Nitrogen Rates-Recrop vs. Fallow (Table 8): The highest nitrogen rate on recrop (94#) failed to produce Centurk yields as high as the 14# nitrogen rate on fallow. This was contrary to expectation in light of the high rainfall conditions of this season, and was possibly due to diseases. The contention that Centurk is susceptible to diseases when grown under recrop conditions on winter wheat stubble is strengthened here. It is likely that the high nitrogen rates on recrop would have produced yields equal to the low and medium nitrogen rates on fallow if the recrop treatments were grown on the stubble of a crop other than winter wheat.

Ledger Varieties (Table 9): Located 14 miles northeast of Ledger in Toole County, this nursery produced the highest yields of all the winter wheat test plot locations. Snow cover remained deep throughout the winter, and soil moisture above normal. Centurk was the highest yielding winter wheat entry, with 70.6 bu/a. Bohl's selection, a beardless wheat, ranked second, and performed fairly well across other locations. Crest, a variety adapted to deep snow conditions, produced high yields; but this performance may not repeat itself in a year when winterkill conditions prevail. The Alpine winter barley yielded exceptionally high in two replications, but killed out in the third rep. Alpine barley is very winter-tender compared to winter wheat, and its performance in 1978 is not likely to be consistent.

A variety nursery on recrop was grown one mile from the fallow nursery, but was hailed out. It appeared that this nursery would have yielded very well.

Teton County Varieties (Table 10): Varieties were grown on both recrop and fallow nine miles northeast of Choteau. The recrop nursery, grown on winter wheat stubble, matured about five days earlier; and was harvested one day before a hailstorm destroyed the fallow nursery. Cheyenne yielded three bu/a more than Centurk, indicating that Centurk may have been slightly affected by diseases under the winter wheat stubble-recrop conditions. This was consistent with the recrop-fallow comparison at the Conrad location. On fallow conditions, Centurk usually shows a slight yield advantage over Cheyenne. As noted earlier, winter wheat recropped on winter wheat stubble produces a high risk of Cephalosporium root rot and cheatgrass problems.

Choteau Nitrogen Rates (Table 11): This experiment was grown three miles east of Choteau on a shallow, gravelly soil - a condition which prevents any great amount of soil moisture storage regardless of cropping system or pre-growing season precipitation. Under such conditions, the limited soil moisture supply could limit large responses to nitrogen, which appears to be the case in this experiment. Only 9.5 bu/a were gained by increasing the nitrogen rate from 14 to 90#/a. However, the effect of residual nitrogen in the soil was not known, as we were unable to obtain soil samples.

Table 2. Intrastate winter wheat variety trial grown on dryland fallow at Conrad, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety		Yield bu/a	Test weight #/bu	Plant height	% protein
15075	Centurk	63.2	63.2	31	8.7
NA 1289	NAPB 1289	57.2	63.1	34	9.0
NA 1316	Rocky	57.1	63.3	32	8.5
13547	Lancer	57.1	63.5	36	8.7
13844	Wanser	55.7	63.1	35	8.3
13880	Crest	54.7	62.8	33	9.2
17262	Hiplains	54.3	62.9	32	8.7
8885	Cheyenne	53.6	63.3	36	8.1
MT 7244		53.6	64.1	33	9.6
15327	Sundance	53.2	61.7	37	8.7
MT 7431		52.5	63.1	35	9.6
B 7802	Bohl's Sln.	51.5	63.8	32	9.6
13670	Winalta	51.3	64.1	35	9.1
13999	Trapper	50.5	63.1	34	8.7
13872	Froid	50.4	63.5	39	10.1
MT 6928		49.9	63.2	30	9.7
17439	Roughrider	49.8	64.1	36	10.1
14000	Winoka	49.2	64.8	35	9.0
13190	Warrior	48.7	63.1	34	9.0
13968	Nugaines	47.9	63.4	27	7.7
MT 7801		47.2	62.9	33	8.3
MT 7420		46.5	64.2	37	9.6
MT 7216		44.3	64.1	32	9.8
Experimental Means:		52.1	63.4	33.8	9.0

Cooperator: Ron Bokma, Conrad; Pondera Co., T28N, R3W, Sec. 17
 Seed Date: September 1977
 Harvest Date: 7 August 78
 Previous Crop: Fallow
 Fertilizer V:18-46-0 with seed + 30 AN topdress
 (actual #/a)

Table 3. Intrastate winter wheat variety trial grown on dryland recrop at Conrad, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety		Yield bu/a	Test weight #/bu	Plant height	% protein
MT 7431		46.7	63.1	32	11.7
NA 1289	NAPB 1289	46.3	63.4	28	10.4
13547	Lancer	46.3	64.0	28	11.0
13999	Trapper	45.8	63.7	31	11.7
NA 1316	Rocky	45.5	63.6	27	9.9
MT 7801		45.5	63.8	28	9.6
13872	Froid	45.2	63.1	35	11.4
MT 7244		44.6	63.9	30	9.9
15327	Sundance	44.3	61.0	33	10.8
B 7802	Bohl's Sln.	43.6	63.6	29	10.2
14000	Winoka	43.4	64.8	29	10.8
17439	Roughrider	42.6	63.8	28	11.3
8885	Cheyenne	42.2	63.8	28	10.5
MT 6928		42.2	62.9	26	11.3
13844	Wanser	42.1	64.1	29	9.7
13880	Crest	41.6	62.0	26	12.0
17262	Hiplains	41.4	63.4	28	10.8
13968	Nugaines	41.0	62.2	26	9.6
13670	Winalta	40.8	64.7	30	10.4
MT 7216		40.4	63.5	28	13.4
MT 7420		39.9	63.5	29	11.7
15075	Centurk	39.5	62.9	29	12.1
13190	Warrior	39.2	62.9	27	9.7
Experimental Means:		43.1	63.4	28.9	10.9

Cooperator: Ron Bokma, Conrad; Pondera Co., T28N, R3W, Sec. 17
 Seed Date: September 1977
 Harvest Date: 2 August 78
 Previous Crop: Winter wheat
 Fertilizer: V:18-46-0 with seed + 55 AN topdress
 (actual #/a)

Table 4. Three-year yield summary for winter wheat varieties grown in Pondera County, 1976-1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Yield (bu/a) 1/			Comparable Average
	1976	1977	1978	
Centurk	42.5	54.1	63.2	53.3
Sundance	56.1	48.9	53.2	52.7
Hiplains	-	51.8	54.3	51.9
NA 1289	-	-	57.2	51.1
Rocky	-	-	57.1	51.0
MT 7801	41.3	49.4	47.2	50.0
Wanser	-	-	55.7	49.8
Lancer	39.7	50.5	57.1	49.1
Cheyenne	46.9	46.6	53.6	49.0
Trapper	43.8	49.7	50.5	48.0
Winoka	44.4	48.4	49.2	47.3
MT 7216	-	50.9	44.3	46.6
MT 6928	38.1	50.0	49.9	46.0
Bohl's	-	-	51.5	46.0
Froid	43.1	43.3	50.4	45.6
Crest	34.5	46.6	54.7	45.3
Roughrider	-	42.6	49.8	45.2
Winalta	42.7	40.1	51.3	44.7
Nugaines	-	-	47.9	42.8
Warrior	35.2	43.5	48.7	42.5
Minter	38.8	40.6	-	42.2

1/ 1976 & 1977 - Joe DeStaffany, 9 mi. east of Conrad
 1978 - Ron Bokma, 2 mi. west of Conrad
 Checks for comparable average; Cheyenne & Winalta

Table 5. Three-year test weight summary for winter wheat varieties grown in Pondera County, 1976-1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Test weight (lbs/bu)			Comparable Average
	1976	1977	1978	
Centurk	63.3	62.1	63.2	63.2
Sundance	61.8	60.4	61.7	61.3
Hiplains	-	61.4	62.9	62.5
NA 1289	-	-	63.1	62.6
Rocky	-	-	63.3	62.8
MT 7801	63.4	62.4	62.9	62.9
Wanser	-	-	63.1	62.6
Lancer	63.6	62.4	63.5	63.2
Cheyenne	63.6	61.8	63.3	62.9
Trapper	62.9	61.4	63.1	62.5
Winoka	64.4	63.1	64.8	64.1
MT 7216	-	62.8	64.1	63.8
MT 6928	63.3	61.4	63.2	62.6
Bohl's	-	-	63.8	63.3
Froid	62.3	60.4	63.5	62.1
Crest	62.2	60.8	62.8	61.9
Roughrider	-	61.4	64.1	63.1
Winalta	64.0	62.1	64.1	63.4
Nugaines	-	-	63.4	62.9
Warrior	63.2	61.8	63.1	62.7
Minter	62.6	61.1	-	62.1

Table 6. Three-year plant height summary for winter wheat varieties grown in Pondera County, 1976-1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Plant height (inches)			Comparable Average
	1976	1977	1978	
Centurk	31	31	31	31
Sundance	38	36	37	37
Hiplains	-	31	32	32
NA 1289	-	-	34	34
Rocky	-	-	32	32
MT 7801	35	32	33	33
Wanser	-	-	35	35
Lancer	34	32	36	34
Cheyenne	37	34	36	36
Trapper	36	35	34	35
Winoka	37	34	35	35
MT 7216	-	32	32	33
MT 6928	30	29	30	30
Bohl's	-	-	32	32
Froid	39	36	39	38
Crest	28	29	33	30
Roughrider	-	33	36	35
Winalta	36	34	35	35
Nugaines	-	-	27	27
Warrior	33	32	34	33
Minter	38	36	-	37

Table 7. Three-year protein summary for winter wheat varieties grown in Pondera County, 1976-78. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	% Protein			Comparable Average
	1976	1977	1978	
Centurk	15.1	13.6	8.7	12.5
Sundance	12.8	13.7	8.7	11.7
Hiplains	-	13.7	8.7	12.8
NA 1289	-	-	9.0	12.9
Rocky	-	-	8.5	12.2
MT 7801	15.8	13.3	8.3	12.5
Wanser	-	-	8.3	11.9
Lancer	15.0	13.4	8.7	12.4
Cheyenne	15.4	12.8	8.1	12.1
Trapper	15.4	14.2	8.7	12.8
Winoka	14.2	13.8	9.0	12.3
MT 7216	-	13.7	9.8	13.4
MT 6928	15.6	14.1	9.7	13.1
Bohl's	-	-	9.6	13.7
Froid	15.6	13.8	10.1	13.2
Crest	15.3	13.3	9.2	12.6
Roughrider	-	14.6	10.1	14.1
Winalta	15.2	13.2	9.1	12.5
Nugaines	-	-	7.7	11.0
Warrior	16.1	14.0	9.0	13.0
Minter	15.9	14.6	-	13.3

Table 8. Effect of nitrogen rates on Centurk winter wheat grown on dryland recrop and summerfallow at Conrad, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

#/a Actual *	Yield (bu/a)		Test weight		Plant height		% protein	
	Recrop	Fallow	Recrop	Fallow	Recrop	Fallow	Recrop	Fallow
14-37-0	25.1	54.5	62.5	62.2	25	32	8.9	9.2
34-37-0	38.8	54.2	63.1	62.2	28	32	9.4	8.3
49-37-0	38.8	61.2	63.1	62.9	27	32	10.2	9.2
64-37-0	42.2	59.3	62.9	63.2	28	33	9.4	10.1
94-37-0	43.7	61.1	62.5	62.9	27	33	12.2	11.6
Experimental Means:	37.7	58.1	62.8	62.7	27.0	32.4	10.0	9.7

Cooperator & plot location: Ron Bokma, Conrad; Pondera Co. T28N, R3W, Sec. 17
 Seed Date: September 1977

Harvest Date: 2 August 78 recrop; 7 August 78 Fallow

Previous Crop: winter wheat for recrop plots

*Fertilizer: 80# 18-46-0 (14-37-0 actual) with seed for all treatments; balance of N topdressed on April 10 for respective treatments

Table 9. Winter wheat variety trial grown on dryland fallow northeast of Ledger, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

No.	Variety	Yield	Test weight #/bu	Plant height	% Protein
15075	Centurk	70.6	64.1	39	9.9
87802	Bohl's Sln.	65.4	64.0	34	11.4
13880	Crest	64.6	63.8	34	10.7
MT 7431		64.3	63.9	36	9.7
15327	Sundance	63.9	62.2	42	9.9
MT 7801		63.9	63.8	36	9.4
13190	Warrior	63.4	63.6	40	9.6
MT 6928		62.7	63.2	32	9.6
17262	Hiplains	62.0	63.4	36	9.6
MT 7244		61.6	64.6	36	10.7
13990	Trapper	60.2	63.8	41	9.6
MT 7216		59.8	64.2	36	10.6
8885	Cheyenne	59.1	64.4	40	9.6
13872	Froid	58.8	63.9	44	11.3
14000	Winoka	58.7	65.1	42	9.7
13670	Winalta	54.9	64.9	42	9.7
17439	Roughrider	50.4	64.1	37	11.1
(Alpine winter barley)		80.3*	48.7	-	9.4
Experimental Means:		61.4	63.9	38.1	10.1

Cooperator & plot location: Karl Ratzburg, Ledger; Toole Co. T29N, R1E, Sec. 11

Seed Date: September 1977

Harvest Date: 7 August 1978

Previous Crop: Fallow

Fertilizer : 18-46-0 with seed + 34 AN topdress
(actual #/a)

*Alpine barley: average of 2 reps; 3rd rep winter killed

Table 10. Winter wheat variety trial grown on dryland recrop northeast of Choteau, 1978 Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety		Yield bu/a	Test weight #/bu	% Protein
13990	Trapper	42.6	59.7	9.7
8885	Cheyenne	42.4	59.9	11.1
15075	Centurk	39.5	59.9	11.0
MT 6928		39.2	60.7	10.4
B 7802	Bohl's Sln.	38.1	60.7	10.7
17262	Hiplains	38.0	58.5	10.1
13880	Crest	37.3	58.6	11.1
MT 7216		37.1	60.8	11.6
15327	Sundance	37.1	59.5	10.8
13872	Froid	37.1	59.2	11.3
MT 7801		36.5	59.5	10.4
MT 7244		36.4	59.6	10.8
13190	Warrior	35.2	58.7	10.2
13670	Winalta	35.1	60.5	10.4
MT 7431		35.1	58.5	10.4
14000	Winoka	32.6	60.7	10.7
17439	Roughrider	30.7	59.6	11.7
Experimental Means:		37.1	59.7	10.7

Cooperator & plot location: Albert Carlson, Choteau; Teton Co. T25N, R3W,
Sec. 29

Seed Date: September 1977

Harvest Date: 27 July 1978

Previous Crop: Winter wheat

Fertilizer :18-46-0 with seed + 60 AN topdress
(actual #/a)

Table 11. Effect of nitrogen rates on dryland Cheyenne winter wheat grown on shallow, gravelly soil east of Choteau, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

#/a Actual * N-P ₂ O ₅ -K ₂ O	Yield bu/a	Test weight	% Protein
14-69-10	33.1	63.1	8.4
34-69-10	34.7	63.5	9.0
49-69-10	34.8	63.9	9.5
64-69-10	40.1	64.2	10.0
94-69-10	42.6	64.1	12.5
Experimental Means:	37.1	63.8	9.9

Cooperator & plot location: Albert Carlson, Choteau; Teton Co. T24N, R4W, Sec. 27

Seed Date: 2 October 77

Harvest Date: 26 July 78

Previous Crop: Summerfallow

*Fertilizer: 125# 11-55-0 (14-69-0 actual) + 10# K₂O with seed for all treatments; balance of N topdressed on April 10 for respective treatments

Precipitation	
Period	Amount (Inches)
Apr 20-27	1.00
Apr 30-May 7	1.60
May 15-18	0.80
May 31-June 1	1.30
June 18-19	0.55
June 24	0.32
June 28	0.70
June 30	0.32
July 10	0.50
July 16	0.60
July 17-18	0.62

TITLE: Spring Wheat Investigations

YEAR: 1978

LOCATION: Western Triangle Agricultural Research Center, Conrad, Montana

PERSONNEL: Gregory D. Kushnak and Ron Thaut, Research Center, Conrad;
F. H. McNeal, SEA, Bozeman; Bill Richter, Jack Baringer and
Darrel Krum, Cooperative Extension Service

RESULTS: Five experiments were harvested for yield, with the remaining four lost to hail. Varieties were not consistent in their yield ranking from one location to another. One contributing factor was the occurrence of differential sawfly damage at two of the locations, where solid stem varieties were at the advantage. All locations received above average amounts of rainfall. Seeding dates, fertilizer rates, etc. are presented in the footnotes to the data tables. Following are some comments on each test plot:

Conrad Varieties (Table 12): This nursery was grown on dryland fallow, two miles west of Conrad. Olaf, Fortuna, and Angus (from Minnesota) were among the top ranking hard red varieties; with Ward and Crosby durums yielding equally well. The experimental line, MT 7746, showed the highest yield potential, and will be given further evaluation. Butte, a North Dakota variety, ranked high in trials at other Research Centers across the state, and yielded fairly high at this location.

Pondera Co. Three-year Variety Summaries: Three-year yield, test weight, plant height, and protein summaries for spring wheat varieties grown in Pondera County are presented in Tables 13, 14, 15, and 16 respectively. The previous year's variety tests were conducted by Jack Baringer, Pondera County Extension Agent. Comparable averages are used to adjust for varieties grown in unequal numbers of years. Varieties grown only one year should be evaluated with caution.

Over the three-year period, Wared and Borah were the highest producers; but have also shown questionable milling and baking qualities. Newana and Olaf averaged very well over the period, and possess acceptable quality. Crosby durum showed good potential during its first year of evaluation.

Power Varieties (Table 17): This nursery was grown 10 miles southeast of Power, in Cascade county. There was slight sawfly damage at this location, and the solid stem varieties Tioga, Lew, and Fortuna tended to rank higher in yield. The semidwarfs Norana and Prodax were the top yielders, even though they are not regarded as sawfly resistant.

Choteau Varieties (Table 18): This nursery was grown halfway between Choteau and Dutton in Teton County. Sawfly damage at this location was moderate to high, and yields were closely associated with degree of damage. The solid stem varieties Lew, Fortuna, and Tioga were the top yielding entries. Ward durum, a hollow stem variety, appeared to escape damage by its later maturity or some other means.

Sunburst Varieties (Table 19): This nursery was grown 12 miles northeast of Sunburst in Toole County, and received heavy amounts of precipitation during the season. Hail caused some seed loss, and the data should be viewed in light of

this. Under these conditions, Newana and Prodax were the highest producers; which is consistent with a variety trial grown at this location the previous year. Note that Prodax had the lowest test weight.

Sunburst Two-year Variety Summary (Tables 20 and 21): Two-year spring wheat summaries for yield and test weight are presented in Table 20, and for plant height and protein in Table 21. The previous year test was conducted by Darrel Krum, Toole County Extension Agent. Comparable averages were used to adjust for varieties grown only one year. Over the two-year period, Newana averaged the highest yield. Wared and Borah also ranked high, but their milling and baking quality has been questionable.

Recommended Spring Wheat Varieties (Table 22): The current Montana Agr. Expt. Station variety recommendations which apply to the Triangle area are summarized in Table 22.

Sunburst Spring Wheat Nitrogen Rates (Table 23): This experiment was grown on fallow 12 miles northeast of Sunburst, and received heavy amounts of precipitation during the season. Hail caused some seed loss, but since the experiment involved only one variety (Newana), differential loss amount fertilizer treatments was minimal. Yields increased from 46 to 65 bu/a as the nitrogen rates were increased from 0 to 90 #/a. One exception was a levelling off between the 45 and 60 #/a rates, but the yield increase resumed sharply between the 60 and 90# rates.

Table 12. Advanced yield spring wheat variety trial grown on dryland fallow at Conrad, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety		Yield bu/a	Test weight #/bu	Plant height	Head date	% Protein
MT 7746	Kronstad S-Gallo	40.4	58.7	28	193	15.9
15930	Olaf	39.8	60.3	28	196	13.3
17282	Crosby (Durum)	37.9	60.5	34	192	15.8
15892	Ward (Durum)	37.9	60.4	36	193	15.3
13596	Fortuna	37.7	60.0	34	192	17.1
MT 7643		37.6	60.8	29	195	15.4
MT 766		37.3	58.3	34	196	13.5
17744	Angus (mn 6427)	37.3	61.2	29	194	13.6
MT 7720		37.1	57.1	31	193	15.3
MT 7416		36.1	59.3	29	192	14.1
MT 7732		36.1	57.8	28	193	15.4
17681	Butte	35.0	61.0	32	192	14.4
MT 7620		35.0	58.8	32	195	12.3
17286	Tioga	34.4	59.8	35	194	15.1
17430	Newana	34.4	61.7	27	196	12.0
MT 749		34.3	61.2	28	193	13.6
17749	Coteau	34.0	60.1	35	196	14.3
15326	Rolette (Durum)	33.6	61.9	33	192	15.0
15927	Norana	33.4	60.9	28	196	12.1
17429	Lew	33.4	59.5	33	195	14.4
MT 7718	Rescue/Bonanza	33.3	56.6	36	194	15.7
13333	Wells (Durum)	33.3	60.3	37	194	14.6
MT 7648		33.1	60.2	28	196	13.3
17738	Eureka	32.6	57.6	36	193	16.0
MT 7554		31.9	54.7	30	197	14.9
MT 7747	Kronstad S-No 66	31.8	60.6	26	193	14.5
MT 7710	CI 11490/Fortuna	31.8	57.8	37	194	14.2
10003	Thatcher	30.9	59.4	36	192	13.7
MT 7635		29.1	58.3	29	193	15.8
MT 7632		27.5	60.0	28	194	14.4
Experimental Means:		34.6	59.5	31.5	194.1	14.5
F-test:		3.76**	723.3**			
C.V. 1:		8.95	0.21			
LSD (.10):		3.64	0.14			

Table 12 continued.

Cooperator: Ron Bokma, Conrad; Pondera Co. T28N, R3W, Sec. 17

Seed Date: 15 April 78

Harvest Date: 4 September 78

Previous Crop: Fallow

Fertilizer (actual #/a): 11-48-0 with seed + 34 AN topdress

Sawfly Damage: None

Table 13. Three-year yield summary for spring wheat varieties grown in Pondera County, 1976-1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Yield (bu/a)				Comparable Average
	1976 1/	1977 2/	1977 3/	1978 4/	
Wared	41.7	31.2	38.8	-	38.0
Borah	41.6	27.4	37.1	-	36.1
Crosby durum	-	-	-	37.9	35.6
Newana	41.3	28.7	37.7	34.4	35.5
Olaf	43.3	23.7	34.9	39.8	35.4
Angus	-	-	-	37.3	35.1
Norana	36.0	29.9	38.7	33.4	34.5
Prodax	38.6	28.9	33.7	-	34.4
Lew	43.7	22.8	35.7	33.4	33.9
Ward durum	37.0	25.3	34.3	37.9	33.6
Butte	-	-	-	35.0	32.9
Tioga	40.1	23.6	33.2	34.4	32.8
Fortuna	30.0	23.2	38.4	37.7	32.3
Coteau	-	-	-	34.0	32.0
Rolette durum	40.0	21.8	29.5	33.6	31.2
Eureka	-	-	-	32.6	31.0
Thatcher	37.7	24.9	29.9	30.9	30.9

- 1/ Charles Skorupa, 11 mi. east of Conrad
 2/ Jim Sheble, 5 mi. northwest of Valier
 3/ Phil Broesder, 13 mi. west of Conrad
 4/ Ron Bokma, 2 mi. west of Conrad
 Checks for comparable average: Newana & Fortuna

Table 14. Three-year test weight summary for spring wheat varieties grown in Pondera County, 1976-1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Test weight (lbs/bu)				Comparable Average
	1976	1977	1977	1978	
Wared	58.7	63.1	62.7	-	61.3
Borah	-	61.4	61.3	-	60.6
Crosby durum	-	-	-	60.5	61.0
Newana	60.3	62.7	62.3	61.7	61.8
Olaf	58.0	61.7	62.0	60.3	60.5
Angus	-	-	-	61.2	61.7
Norana	58.7	62.4	62.0	60.9	61.0
Prodax	55.5	61.1	60.7	-	58.9
Lew	59.2	62.7	63.3	59.5	61.2
Ward durum	59.0	61.7	62.7	60.4	61.0
Butte	-	-	-	61.0	61.5
Tioga	59.7	61.4	61.7	59.8	60.7
Fortuna	60.3	61.4	62.3	60.0	61.0
Coteau	-	-	-	60.1	60.6
Rolette durum	61.9	62.1	63.3	61.9	62.3
Eureka	-	-	-	57.6	58.1
Thatcher	58.6	60.2	60.7	59.4	59.7

Table 15. Two-year plant height summary for spring wheat varieties grown in Pondera County, 1977-1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Plant height (inches)		
	1977 1/	1978 2/	Comparable Average
Wared	29	-	29
Borah	27	-	27
Crosby durum	-	34	34
Newana	27	27	27
Olaf	30	28	29
Angus	-	29	29
Norana	28	28	28
Prodax	28	-	28
Lew	32	33	33
Ward durum	33	36	35
Butte	-	32	32
Tioga	32	35	34
Fortuna	33	34	34
Coteau	-	35	35
Rolette durum	32	33	33
Eureka	-	36	36
Thatcher	33	36	35

1/ Phil Broesder, 13 mi. west of Conrad

2/ Ron Bokma, 2 mi. west of Conrad

Table 16. Three-year protein summary for spring wheat varieties grown in Pondera County, 1976-1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Percent protein				Comparable Average
	1976 1/	1977 2/	1977 3/	1978 4/	
Wared	15.5	11.7	13.0	-	13.5
Borah	15.9	11.9	13.4	-	13.8
Crosby durum	-	-	-	15.8	15.5
Newana	15.9	13.9	13.2	12.0	13.8
Olaf	16.6	13.5	14.1	13.3	14.4
Angus	-	-	-	13.6	13.3
Norana	16.0	13.2	13.2	12.1	13.6
Prodax	17.6	13.5	13.7	-	15.0
Lew	16.2	11.7	13.8	14.4	14.0
Ward durum	17.2	14.3	14.8	15.3	15.4
Butte	-	-	-	14.4	14.1
Tioga	16.9	12.0	14.2	15.1	14.6
Fortuna	15.6	12.2	14.2	17.1	14.8
Coteau	-	-	-	14.3	14.0
Rolette	17.4	14.8	15.1	15.0	15.6
Eureka	-	-	-	16.0	15.7
Thatcher	16.6	12.9	14.6	13.7	14.5

1/ Charles Skorupa, 11 mi. east of Conrad

2/ Jim Sheble, 5 mi. northwest of Valier

3/ Phil Broesder, 13 mi. west of Conrad

4/ Ron Bokma, 2 mi. west of Conrad

Table 17. Spring wheat variety trial grown on dryland fallow southeast of Power, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety		Yield Bu/a	Test weight	Plant height	Sawfly damage 0-9 1/	% protein
15927	Norana	51.6	61.4	31	3	10.4
MT 34	Prodax	51.0	59.7	32	2	10.7
17286	Tioga	47.3	61.7	37	1	12.2
17429	Lew	46.3	63.4	36	1	11.6
15892	Ward Durum	45.0	62.8	36	3	11.0
WS3	WS-3	44.7	61.3	27	1	11.6
13596	Fortuna	43.7	61.9	36	1	11.3
17430	Newana	43.2	61.4	31	2	10.6
15326	Rolette Durum	43.0	63.8	34	1	11.8
15930	Olaf	41.9	61.7	30	5	11.4
10003	Thatcher	41.0	61.7	38	5	11.8
17267	Borah	40.2	60.6	27	4	11.2
Experimental Mean:		44.9	61.8	32.9	2.4	11.3
F-test:		3.00*				
C.V. 1		8.06				
LSD (.10)		5.08				

Cooperator & plot location: Arnold Gettel, Power; Cascade County
 Seed Date: 11 May 78
 Harvest Date: 1 September 78
 Previous Crop: Summerfallow 1977
 Fertilizer (actual #/a): 11-48-0 with seed + 34 AN topdress
 1/ Sawfly damage: 0-none; 9-severe

Table 18. Spring wheat variety trial grown on dryland fallow east of Choteau, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety		Yield Bu/a	Test weight	Plant height	Sawfly damage 0-9 1/	Solid stem	% protein
17429	Lew	46.0	63.1	32	1	Yes	13.3
WS 3	WS-3	41.2	61.2	26	1	?	13.7
13596	Fortuna	40.4	62.2	33	1	Yes	13.7
17286	Tioga	39.9	62.2	32	1	Yes	13.8
15892	Ward	36.8	62.7	33	1	No	14.5
15927	Norana	35.8	60.3	25	6	No	12.7
15930	Olaf	34.2	60.1	25	7	No	14.1
MT 34	Prodax	33.8	59.5	27	7	No	13.3
17430	Newana	33.0	60.7	26	7	No	12.9
15326	Rolette	32.4	63.3	32	5	No	14.5
17267	Borah	32.1	60.0	25	7	No	13.2
10003	Thatcher	31.2	60.8	32	7	No	13.9
Experimental Means:		36.4	61.3	29.0	4.3		13.6
F-test:		7.73**					
C.V. 1:		7.81					
LSD (.10)		3.98					

Cooperator & plot location: Bert Corey, Choteau; Teton Co. T25N, R3W, Sec. 25
 Seed Date: 26 April 78
 Harvest Date: 28 August 78
 Previous Crop: Summerfallow 1977
 Fertilizer (actual #/a): 11-48-0 with seed + 34 AN topdress
 1/ Sawfly Damage: 0-none; 9-severe

Table 19. Spring wheat variety trial grown on dryland fallow east of Sunburst, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety		Yield Bu/A	Test Weight	% Protein
17430	Newana	56.4	60.4	12.3
MT 34	Prodax	56.2	58.8	10.9
17267	Borah	53.0	61.7	12.1
17429	Lew	50.7	62.8	12.0
15927	Norana	50.6	60.4	11.8
15892	Ward durum	46.3	62.3	13.1
13596	Fortuna	46.1	62.8	13.2
10003	Thatcher	44.0	60.8	13.1
17286	Tioga	43.0	61.7	13.1
15326	Rolette durum	42.8	62.4	14.0
WS-3	WS-3	41.9	60.0	11.8
15930	Olaf	41.9	59.8	12.1
Experimental Means		47.7	61.2	12.5
F-test		4.53**		
C.V. 1		9.26		
LSD (.10)		6.20		
Cooperator & plot location: Bob Aschim, Sunburst, Toole County., T37N, R1E, Sec. 35				

Seed Date: 18 May 1978

Harvest Date: 25 September 1978

Previous Crop: Summerfallow 1977

Fertilizer (actual #/a): 11-48-0 with seed + 34 AN topdress

Table 20. Two-year yield and test weight summary for spring wheat varieties grown in North Toole County, 1977-1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Yield (bu/a)			Test weight (lbs/bu)		
	1977 1/	1978 2/	Comparable Average	1977	1978	Comparable Average
Newana	61.7	56.4	59.1	63.0	60.4	61.7
Wared	61.8	-	58.7	62.7	-	62.3
Borah	59.8	53.0	56.0	62.0	61.7	61.9
Prodax	54.7	56.2	55.5	62.0	58.8	60.4
Norana	56.2	50.6	53.4	61.3	60.4	60.9
Lew	50.1	50.7	50.4	62.7	62.8	62.8
Fortuna	52.1	46.1	49.1	61.7	62.8	62.3
Ward durum	51.9	46.3	49.1	61.7	62.3	62.0
Rolette durum	51.3	42.8	47.1	62.3	62.4	62.4
Tioga	47.4	43.0	45.2	62.0	61.7	61.9
Olaf	48.1	41.9	45.0	62.7	59.8	61.3
WS-3	-	41.9	44.2	-	59.8	60.2
Thatcher	44.0	44.0	44.0	61.7	60.8	61.3

1/ Herb Karst, 12 mi. northeast of Sunburst
 2/ Bob Aschim, 12 mi. northeast of Sunburst
 Checks for comparable average: Newana & Fortuna

Table 21. Two-year plant height and protein summary for spring wheat varieties grown in north Toole County, 1977-78. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Plt. Height 1977	Percent Protein		
		1977	1978	Comparable Average
Newana	30	13.0	12.3	12.7
Wared	31	12.0	-	12.0
Borah	29	12.8	12.1	12.5
Prodax	31	13.4	10.9	12.2
Norana	31	13.4	11.8	12.6
Lew	37	13.1	12.0	12.6
Fortuna	38	12.7	13.2	13.0
Ward durum	36	14.0	13.1	13.6
Rolette durum	34	14.0	14.0	14.0
Tioga	37	14.0	13.1	13.6
Olaf	30	14.3	12.1	13.2
WS-3	-	-	11.8	11.9
Thatcher	37	13.8	13.1	13.5

Table 22. Recommended spring wheat varieties for district 5 of Montana. ^{1/}

Variety	Plant Type ^{2/}	Year	Recommended Use
Fortuna	ST	1966	Dryland in sawfly areas
Newana	SD	1976	Dryland or irrigated
Olaf	SD	1974	Dryland or irrigated
Thatcher	ST	1934	Dryland or irrigated
Rolette durum	ST	1976	Dryland or irrigated
Ward durum	ST	1974	Dryland
Wells durum	ST	1960	Dryland or irrigated

^{1/} District 5 includes the Triangle area

^{2/} ST - standard height; SD - semidwarf

Table 23. Effect of nitrogen rates on Newana spring wheat grown on dryland fallow in north Toole County, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

#/a Actual * N-P ₂ O ₅ -K ₂ O	Yield (bu/a)	Test Weight (#/bu)	% Protein
0-0-0	45.8	59.3	11.8
11-48-0	48.7	60.3	11.5
30-48-0	52.6	60.4	11.5
45-48-0	57.4	59.6	11.9
60-48-0	57.2	58.9	12.1
90-48-0	65.3	58.3	12.3

Experimental Means: 54.5 59.5 11.9

Cooperator: Bob Aschim, Sunburst, Toole Co. T37N, R1E, Sec. 35

Seed Date: 22 May 78

Harvest Date: 25 September 78

*Fertilizer: 100# 11-48-0 with seed (except check) for all treatments;
balance of N topdressed on June 6 for respective treatments;
N source - 34-0-0

TITLE: Barley Investigations

YEAR: 1978

LOCATION: Western Triangle Research Center, Conrad, Montana

PERSONNEL: Gregory D. Kushnak and Ron Thaut, Research Center, Conrad;
E. A. Hockett, SEA, and R. F. Eslick, MSU, Bozeman;
Dave Sands, MSU, Bozeman; Hank Olsen, Bill Richter,
Jack Baringer, and Darrel Krum, Cooperative Extension Service;
Don Becker, Eisenman Seed Co.

RESULTS: Eight experiments were harvested for yield, with the remaining six lost to hail. Summit and Steptoe yielded consistently high under both dryland and irrigated conditions at the various locations, while Hector, Dekap, and Kimberly ranked high at the dryland locations. Yields at the dryland locations were in the 70 bushel range due to above average precipitation, and it is not certain if the late maturing Kimberly will repeat superior performance on dryland in normal years. In general, percent kernel plump was higher, and percent thin lower, on dryland than on irrigated. Following are some comments on each test plot:

Fairfield Irrigated Varieties (Tables 24 and 26): The Intrastate nursery (Table 24) was grown on recrop land (previous crop barley) six miles east of Fairfield at Ron Ostbergs, and fertilized for a 100 bu/a yield level. A combination of irrigation and heavy rains caused severe lodging for most varieties, which tended to favor the more lodging resistant types. Klages outyielded Kimberly by 13 bu/a under these severe lodging conditions, which was likely due to the better lodging resistance of Klages. Normally, Kimberly would be expected to outyield Klages.

The other irrigated variety nursery was seeded by the Eisenman Seed Company on Al Meyer's place four miles north of Fairfield (Table 25). The Meyer nursery averaged 101 bu/a, and experienced no lodging. Although the malt varieties yielded less than the feed types, improvements in yield potential of malt varieties is indicated by the superior performance of Kimberly over Klages.

Five of the varieties grown at the Meyer location were also present in the Intrastate nursery at Ostbergs. Data for the five varieties are presented again in Table 26 to obtain a more direct comparison of their performance under severe lodging conditions vs. no-lodging conditions. Several interactions are apparent. Klages yielded higher than Kimberly under lodging conditions, while the reverse was true under no-lodging conditions; and the yield ranking of RPB-268-70, Summit, and NA-461-76 was reversed from one growing condition to the other. These comparisons indicate that the data in Table 24, for the severely lodged nursery at Ostbergs, should be used to project variety performance for severe lodging conditions only, and not for conditions where lodging is not severe.

Power Varieties (Table 27): This nursery was grown on dryland fallow 10 miles southeast of Power, in Cascade county. Steptoe, Dekap, and Summit were the top producers at greater than 80 bu/a.

Choteau Varieties (Table 28): This nursery was grown on dryland fallow, half-way between Choteau and Dutton in Teton county. Although Kimberly was the top

yielding entry, it is very late maturing and its superior performance may not continue in drier years.

Choteau Two-year Variety Summary (Tables 29 and 30): Two-year barley variety summaries for yield and test weight are presented in Table 29, and for plant height and protein in Table 30. The previous year test was conducted by the Saline Seep Project and Bill Richter, Teton County Extension Agent. Comparable averages were used to adjust for varieties grown only one year.

Pondera County Three-year Variety Summaries (Tables 31-33): The barley variety nurseries grown in Pondera county were not harvested in 1978 because of hail damage. To provide a barley variety data base for the county, variety trials grown near Conrad during the previous three years are summarized in Tables 31-33. These trials were conducted by Jack Baringer, Pondera County Extension Agent. Comparable averages were used to adjust for varieties not grown in all of the three years. Over the three year period, Steptoe, Unitan, and Hector averaged the highest yields (Table 31). Steptoe averaged the lowest test weight (Table 32), and the lowest percent protein (Table 33).

Recommended Barley Varieties (Table 34): The current Montana Agr. Expt. Station barley variety recommendations are summarized in Table 34.

Sunburst Barley Nitrogen Rates (Table 35): This experiment was grown on dryland fallow 12 miles northeast of Sunburst, and received heavy amounts of precipitation during the season. Hail caused moderate seed shattering, but since the experiment involved one variety (Klages), differential loss among fertilizer treatments was minimal. Yields increased steadily from 45 to 63 bu/a as nitrogen rates were increased from 0 to 90 #/a. Percent kernel plump decreased and percent thins increased at the higher nitrogen rates.

Choteau Barley Nitrogen Rates (Table 36): These treatments were applied to a field of dryland barley by Bill Richter, Teton County Extension Agent, one mile northwest of Freezout Lake near Choteau. Nitrogen responses were not as great as anticipated, and may have been due to phosphorus deficiency, soil salinity, or other limiting factors. Percent kernel plump decreased and percent thins increased as nitrogen rates increased to 50 #/a. This trend reversed at 80 #N/a.

Ammonium Phosphate vs. "Planters" (Table 37): These replicated treatments were applied to a field of Piroline barley near Choteau by the grower. The 18-46-0 treatment yielded 8 bu/a more than the "Planters" treatment. Test weight and sieve size did not differ between the two treatments.

Fungicide Barley Disease Control (Table 38): Fungicide and soil fumigation disease control treatments were applied to irrigated Klages barley near Fairfield by Hank Olsen, Teton County Agent; Dave Sands, Plant Pathology Dept., MSU; and Ron Thaut, Western Triangle Agricultural Research Center. Leaf spray treatments were applied six times during the growing season. The 'Dow' soil fumigant appeared to be the most effective disease control treatment, as reflected by the higher yields. At present, the economics and feasibility of soil fumigation are not appealing. The combination of seed treatment and leaf spray produced some positive effect, but the six bu/a gained would not warrant the repeated spray applications.

Table 24: Intrastate barley variety trial grown under irrigation at Fairfield, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Yield bu/a	Test weight	% plump on 6/64	% thin thr. 5 1/2/64	Lodging 1/ % Sev.	2nd Growth 2/
VD 22872 VDH 228-72	102.1	49.5	84	7	10	6
WA 11312 6194-63/Blazer	97.8	41.6	69	13	80	7
VD 07272 VDH 072-72	96.5	45.1	68	16	20	7
VD 11874 VDH 118-74	96.0	45.6	78	9	90	8
MN 25 Morex	95.0	44.7	81	8	80	8
NA 46176 N25B 461-76	91.8	46.0	51	28	90	9
UT 1009	91.6	41.8	84	7	50	5
15229 Steptoe	90.5	40.8	79	11	95	8
MT 729 Summit	89.5	46.3	64	20	90	8
15230 Blazer	88.8	43.8	70	14	60	8
VD 5 Pirouette	87.4	47.6	70	13	90	8
AT 506 Fairfield	86.8	45.4	77	12	100	9
15478 Klages	85.5	47.5	75	13	15	6
VD 26170 VDH 261-70	85.3	44.8	76	12	10	6
MT 756 RPB 268-70	83.3	46.3	66	17	90	9
MB 323 Klondike	80.5	44.7	69	13	90	8
MT 755 Cornel	79.5	46.9	75	13	100	9
MT 726 Lud	79.3	45.6	81	8	90	9
VD 15472 VDH 154-72	78.5	44.9	57	20	10	6
15514 Hector	78.3	44.7	71	16	80	5
VD 3 Menuet	77.9	46.6	70	16	90	9
ID 702378 Steve	74.1	38.9	64	20	100	9
16181 Purcell	72.6	45.0	58	23	95	4
15687 Kimberly	72.3	45.7	64	19	80	8

Table 24 continued.

Variety	Yield bu/a	Test weight	% plump on 6/64	% thin 5 1/2/64	Lodging 1/ % Sev.	2nd Growth 2/
NA 61076 N25B 610-76	72.0	43.0	44	37	90	9
13827 Shabet	71.4	43.7	54	25	100	8
VD 26772 VDH 267-72	70.3	43.8	68	13	10	6
RP 45672 RPB 456-72	70.0	44.5	54	27	80	8
VD 04674 VDH 046-74	69.3	46.0	72	15	100	9
10083 Ingrid	67.0	47.0	64	21	100	8
15768 Park ND 231	66.8	44.4	70	12	60	8
15549 Manker	64.9	44.9	77	13	80	8
15769 Glenn, ND 718	61.0	42.6	69	19	90	8
5438 Compana	60.6	39.9	60	23	100	9
10421 Unitan	60.3	40.9	78	10	90	9
3351 Dekap	58.6	40.9	52	29	100	9
9558 Pirolino	57.9	41.9	46	34	100	9
MT 73518 Hypana/Unitan	57.6	42.0	82	9	90	9
MT 842148 Shonupana	56.5	40.8	57	23	100	9
MT 73331 Washonupana	56.5	39.7	56	22	100	9
ES 1 Waxy Titan	52.5	34.7	54	21	95	8
ES 2 Derived Titan	41.4	37.0	60	18	100	9
Experimental Means:	75.7	43.8	67.1	17.1	78.3	7.9
F-test	5.37					4.0
C.V. 1	16.4					
LSD (.10)	7.81					

Table 24 continued.

Cooperator & plot location: Ron Ostberg, Fairfield; Teton Co. T22N, R2W, Sec. 36

Seed Date: 14 April 78

Harvest Date: 30 August 78

Previous Crop: Barley 1977

Fertilizer (actual #/a): 10-43-0 with seed + 90 N (approx.) broadcast

1/ Lodging Severity: 0-erect; 9-horizontal

2/ Second Growth (late tillers after lodging): 0-none; 9-much regrowth

Table 25. Barley variety trial grown under irrigation at Fairfield, 1978.
Western Triangle Research Center, Conrad; and Eisenman Seed Co.,
Fairfield.

Variety	Yield bu/a	Test Weight	% Plump*	% Thin**	% Protein
RPB 268-70	114.7	53.0	85.2	4.8	11.7
Summit	113.9	52.5	73.2	9.6	12.1
NK 40123	107.4	41.5	56.8	5.2	10.6
RPB N25B 461-76-SFB	106.3	53.0	76.8	6.4	13.0
RPB 439-71	105.5	52.0	76.8	7.2	12.4
72Ab 3633	99.4	52.0	80.0	6.8	13.6
Karl	97.5	47.0	52.0	4.0	11.4
NK 40259	97.4	43.0	68.0	2.0	11.0
Kimberly	96.8	49.0	70.0	10.8	12.6
72Ab 3484	92.2	51.5	80.8	6.0	12.5
Klages	90.4	49.0	48.0	15.4	12.3
74Ab 4302	87.1	45.5	45.2	4.8	11.5
Experimental Means:	100.7	49.1	67.7	6.9	12.1

Cooperator & plot location: Al Meyer, Fairfield; Teton Co. T22N, R3W, Sec. 11
Seed Date: 22 May 1978

Harvest Date: 1 September 1978

Previous Crop: Barley

Fertilizer (actual #/a): 100-70-50

*2-row plump remaining on 6/64 sieve; 6-row plump remaining on 6 1/4/64

**2-row thins through 5 1/2/64 sieve; 6-row thins through 5/64

Lodging: none

Table 26. Comparison of irrigated barley varieties grown under severe lodging conditions and no-lodging conditions on the Fairfield bench, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Yield		Test Wt.		% Plump		% Thin	
	lodged	no ldg	lodged	no ldg	lodged	no ldg	lodged	no ldg
RPB-268-70	83.3	114.7	46.3	53.0	66	85	17	5
Summit	89.5	113.9	46.3	52.5	64	73	20	10
NA 461-76	91.8	106.3	46.0	53.0	51	77	28	6
Kimberly	72.3	96.8	45.7	49.0	64	70	19	11
Klages	85.5	90.4	47.5	49.0	75	48	13	15
Means:	84.5	104.4	46.4	51.3	64	71	19	9

See Footnotes to Tables 24 & 25 for location details.

Table 27. Barley variety trial grown on dryland fallow southeast of Power, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Yield bu/a	Test weight	Plant height	% plump on 6/64	% Thin thr. 5 1/2/64	% protein
15229 Steptoe	86.4	44.4	27	93	3	11.2
3351 Dekap	83.9	49.5	30	92	3	11.8
MT 729 Summit	82.8	51.8	29	83	5	11.4
13827 Shabet	76.1	51.6	34	92	3	11.5
15514 Hector	75.9	51.6	33	96	2	10.8
15687 Kimberly	75.1	51.1	30	84	5	11.2
15478 Klages	73.4	49.9	32	80	6	11.0
MB 323 Klondike	72.5	47.1	32	73	8	12.6
AT 506 Fairfield	71.9	51.1	31	96	2	10.8
9558 Pirolina	71.0	52.1	31	95	2	12.4
5438 Compana	70.7	48.5	27	94	3	12.6
10421 Unitan	70.0	45.4	30	91	4	11.1
Experimental Means:	75.8	49.5	30.5	89.1	3.8	11.5
F-test	2.41					
C.V. 1	8.17					
LSD (.10)	4.67					

Cooperator & plot location: Arnold Gettel, Power; Cascade Co.

Seed Date: 11 May 78

Harvest Date: 29 August 78

Previous Crop: Fallow 1977

Fertilizer (actual #/a): 11-48-0 with seed + 34 AN topdress

Table 28. Barley variety trial grown on dryland fallow east of Choteau, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Yield bu/a	Test weight	Plant height	plump on 6/64	% Thin thr. 5 1/2/64	% protein
15687 Kimberly	77.6	51.3	29	91	3	13.2
MT 729 Summit	77.3	50.7	28	77	9	14.4
15514 Hector	75.6	50.7	27	91	4	14.9
3351 Dekap	73.9	49.2	26	90	5	14.6
15229 Steptoe	71.5	43.0	28	92	4	13.1
13827 Shabet	69.9	47.5	29	88	5	14.0
15478 Klages	68.9	51.0	29	90	4	13.3
AT 506 Fairfield	66.9	50.5	27	93	3	14.5
10421 Unitan	66.5	43.2	30	88	5	14.1
5438 Compana	65.6	46.3	25	96	2	13.5
9558 Pirolina	64.1	49.7	28	83	8	14.4
MB 323 Klondike	62.0	46.4	26	80	9	15.4
Experimental Means:	70.0	48.3	27.7	88.3	5.1	14.1
F-test	1.80					
C. V. 1	9.64					
LSD (.10)	5.07					

Cooperator & plot location: Bert Corey, Choteau; Teton Co. T25N, R3W, Sec. 25
 Seed Date: 26 April 78
 Harvest Date: 28 August 78
 Previous Crop: Summerfallow 1977
 Fertilizer (actual #/a): 11-48-0 with seed + 34 AN topdress

Table 29. Two-year yield and test weight summary for barley varieties grown between Choteau & Dutton in Teton County, 1977-1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Yield (bu/a)			Test weight (lbs/bu)		
	1977	1978	Comparable Average	1977	1978	Comparable Average
Kimberly	-	77.6	75.0	-	51.3	54.1
Hector	64.4	75.6	70.0	55.0	50.7	52.9
Dekap	65.0	73.9	69.5	53.4	49.2	51.3
Steptoe	64.3	71.5	67.9	47.2	43.0	45.1
Unitan	68.1	66.5	67.3	49.1	43.2	46.2
Summit	56.7	77.3	67.0	53.7	50.7	52.2
Shabet	63.2	69.9	66.6	50.1	47.5	48.8
Compana	59.8	65.6	62.7	51.4	46.3	48.9
Fairfield	56.3	66.9	61.6	54.0	50.5	52.3
Klondike	-	62.0	59.9	-	46.4	48.9
Klages	50.1	68.9	59.6	51.7	51.0	51.4
Piroline	54.5	64.1	59.3	54.0	49.7	51.9
Ershabet	45.5	-	47.2	54.6	-	51.9

Both location years: Bert Corey, halfway between Choteau & Dutton

Checks for comparable average: Unitan & Hector

Table 30. Two-year plant height and protein summary for barley varieties grown between Choteau and Dutton in Teton County, 1977-78. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Plant height (inches)			Percent Protein		
	1977	1978	Comparable Average	1977	1978	Comparable Average
Kimberly	-	29	32	-	13.2	12.0
Hector	32	27	30	12.3	14.9	13.6
Dekap	29	26	28	12.6	14.6	13.6
Steptoe	31	28	30	10.8	13.1	12.0
Unitan	37	30	34	11.3	14.1	12.7
Summit	29	28	29	12.2	14.4	13.3
Shabet	30	29	30	13.1	14.0	13.6
Compana	28	25	27	12.8	13.5	13.2
Fairfield	30	27	29	12.6	14.5	13.6
Klondike	-	26	29	-	15.4	14.0
Klages	29	29	29	13.8	13.3	13.6
Piroline	31	28	30	13.1	14.4	13.8
Ershabet	31	-	28	13.5	-	15.0

Comparable average checks - Hector + Unitan

Table 31. Three-year yield summary for barley varieties grown in Pondera County, 1975-1977. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Yield (bu/a)			Comparable Average
	1975 1/	1976 2/	1977 3/	
Steptoe	53.6	74.4	59.3	62.4
Unitan	52.1	71.0	59.3	60.8
Hector	54.5	72.0	50.0	58.8
Piroline	54.1	71.6	47.4	57.7
Fairfield	-	69.8	50.1	56.9
Klages	-	-	51.8	56.7
Compana	53.4	65.2	50.5	56.4
Dekap	55.8	-	45.5	56.1
Summit	-	68.3	49.6	55.9
Shabet	50.4	66.2	46.5	54.4
Ershabet	-	61.9	44.4	50.4

1/ Joe DeStaffany, 9 mi. east of Conrad

2/ Charles Skorupa, 11 mi. east of Conrad

3/ Phil Broesder, 13 mi. west of Conrad

Checks for comparable average: Unitan & Hector

Table 32. Two-year test weight and plant height summary for barley varieties grown in Pondera County, 1975-1977. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	Test weight (lbs/bu)			Plant height (inches)		
	1975	1977	Comparable Average	1976	1977	Comparable Average
Steptoe	47.5	44.3	45.9	29	28	29
Unitan	48.7	45.9	47.3	30	33	32
Hector	52.4	50.1	51.3	28	28	28
Piroline	53.2	51.4	52.3	27	29	28
Fairfield	-	51.1	52.5	26	28	27
Klages	-	49.2	50.5	-	27	26
Compiana	50.8	50.4	50.6	25	27	26
Dekap	51.3	49.1	50.2	-	23	22
Summit	-	51.1	52.5	25	26	26
Shabet	51.3	48.8	50.1	26	27	27
Ershabet	-	50.7	52.1	27	28	28

Table 33. Sieve size and two-year protein summary for barley varieties grown in Pondera County, 1975-1977. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety	% Plump 1975	% Thin 1975	Percent protein		
			1976	1977	Comparable
Steptoe	91	3	12.4	11.0	11.7
Unitan	80	8	13.8	11.4	12.6
Hector	88	4	16.0	10.8	13.4
Piroline	88	3	16.1	13.4	14.8
Fairfield	-	-	16.0	12.0	14.0
Klages	-	-	-	12.0	14.1
Compana	94	2	17.3	11.6	14.5
Dekap	83	5	-	11.5	13.5
Summit	-	-	15.9	11.7	13.8
Shabet	80	6	16.1	11.8	14.0
Ershabet	-	-	16.9	13.0	15.0

Table 34. Recommended spring barley varieties for Montana.

Cultivar	Year	Areas and use recommended**
Compana	1941	Dryland in all districts except 1; feed
Unitan	1959	Irrigated and dryland in all districts; feed
Dekap	1962	Dryland in all districts except 1; feed
Ingrid	1963	Irrigated land in districts 1 and 3; feed
Piroline	1967	Irrigated land in all districts except 6; and dryland in all districts; feed and malting
Erbet	1971	Irrigated and dryland in all districts where early maturity is desirable; feed
Shabet	1971	Irrigated or dryland in higher rainfall areas in all districts; malting and feed
Steptoe	1973	Irrigated and dryland in all districts; feed
Hector	1974	Dryland in all districts except 1; feed
Vireo*	1974	Irrigated land or dryland in higher rainfall areas in all districts; feed
Georgie*	1974	Irrigated land or dryland in higher rainfall areas in all districts; feed
Lud*	1975	Irrigated land in all districts; feed
Summit*	1975	Irrigated and dryland in all districts; feed
Purcell	1976	Irrigated and dryland in District 1
Stepford*	1977	Irrigated and dryland in all districts; hay
Horsford		Dryland in all districts except 3; hay

Table 34 (continued). Recommended spring barley varieties for Montana.

- *Private variety and protected under the Plant Variety Protection Act
- **District 1 Northwestern Montana
- District 2 Southwestern Montana
- District 3 Southeastern Montana
- District 4 Central Montana, including Cascade County
- District 5 Northern Montana, including Triangle Area
- District 6 Northeastern Montana

Table 35. Effect of nitrogen rates on Klages barley grown on dryland fallow in north Toole County, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

#/a Actual * N-P ₂ O ₅ -K ₂ O	Yield (bu/a)	Test Weight #/bu	% Plump	% Thin
0-0-0	44.7	50.2	91	3
11-48-0	49.4	50.1	93	3
30-48-0	50.5	50.0	93	3
45-48-0	54.8	49.9	89	4
60-48-0	59.5	50.1	88	5
90-48-0	63.3	49.3	85	7

Experimental Means: 53.7 49.9 90 4
 Cooperator: Bob Aschim, Sunburst, Toole Co. T37N, R1E, Sec. 35
 Seed Date: 22 May 78

Harvest Date: 25 September 78

*Fertilizer: 100# 11-48-0 with seed (except check) on all treatments;
 balance of N topdressed on June 6 for respective treatments;
 N source 34-0-0

Table 36. Effect of nitrogen rates on dryland barley near Freezout Lake in Teton County, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

#/a Actual Nitrogen	Yield bu/a	Test Weight	% Plump	% Thin
0	29.8	48.5	94	1
20	32.1	48.3	91	2
35	34.0	47.5	77	7
50	27.3	47.0	63	15
80	36.2	47.0	87	4
Experimental Means:	31.9	47.7	82	6

Cooperator: Fulk farm west of Freezout Lake; treatments applied by Bill Richter, Teton County Extension Agent.

Nitrogen Source: 34-0-0

Table 37. Comparison of di-ammonium phosphate and 'Planters' on Piroline barley near Choteau, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Treatment	Yield bu/a	Test Weight	% Plump	% Thin
100# 18-46-0	47.2	51.4	94	2
110# Planters	38.9	52.2	93	2

Harvest samples obtained by Bill Richter, Teton County Extension Agent.

Table 38. Effect of disease control treatments on yield and quality of irrigated Klages barley near Fairfield in Teton County, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, and Cooperative Extension Service.

Seed	Treatment 1/		Yield bu/a	Test Weight	% Plump	% Thin
	Leaf Spray	Soil				
none	none	none	99.4	47.7	68	15
none	M+D+K	none	94.7	47.5	74	11
Kocide	none	none	82.4	46.4	58	22
K+V	none	none	94.2	47.4	77	10
K+V	M+D+K	none	105.5	49.3	77	10
K+V	Kocide	none	99.5	48.7	81	8
K+V	Manzate	none	94.0	48.3	78	10
K+V	M+D+K	Fumigation	110.8	48.3	78	10
K+V	none	Fumigation	117.8	47.6	77	10

1/ K=Kocide; V=Vitavax; M=Manzate; D=Diazinon;
Leaf spray rates were 1.5# active/acre for each component

Seeded: 26 May 1978

Dates Sprayed: 8 June, 2-3 leaf
20 June, 5 leaf
30 June, elongation
11 July, awn emergence
21 July, kernel elongation
31 July, kernel filling

Harvested: 5 September 1978

Cooperators: Gideon Schmidt, Fairfield area landowner;
Hank Olsen, County Extension Agent, Fairfield;
Western Triangle Research Center, Conrad

Project Leader: Dave Sands, Plant Pathology Dept, MSU, Bozeman

TITLE: Fababean Investigations

YEAR: 1978

LOCATION: Western Triangle Agricultural Research Center, Conrad, Montana

PERSONNEL: Grant Jackson, Saline Seep Project, Bozeman;
Greg Kushnak and Ron Thaut, Research Center, Conrad;
Jack Baringer, Bill Richter and Bruce McCallum,
Cooperative Extension Service

INTRODUCTION: Fababeans (Vicia faba L.) are small seeded relatives of the garden broad bean. These legumes grow erect and possess excellent straw strength. Each plant produces many flowers, but only a small proportion of the flowers produce pods. The pods are borne along the stem, each containing three to four seeds. The seeds are reported to contain 25 to 30 percent protein, and are used as cattle feed and human food in Africa and Japan. Preliminary studies indicate that fababeans may have good potential as a crop for Montana.

Fababeans are well adapted to high rainfall or irrigated conditions, but are reportedly susceptible to high temperatures and drought. Thus, early seeding is often necessary to allow flowering to occur during cooler parts of the season. Fababeans are reported to be very frost tolerant in the spring. When the seed is properly inoculated, the plants will fix nitrogen like many other legumes. Seed should be placed three to four inches deep to ensure good moisture conditions for germination. Recommendations for irrigated or high moisture conditions call for seeding rates of 120-160 lbs/acre (three to four seeds/sq. ft.). In drier growing conditions however, it may be necessary to plant one to two seeds/sq. ft. Phosphate should be applied at 20 to 30 lbs. P_2O_5 /acre or according to soil test results. Fababeans have shown no consistent response to nitrogen fertilization. Fababeans are susceptible to shattering, and should be swathed when the lower two pods show signs of blackening. Combine pickup speed should match ground speed to reduce shattering loss at the pickup.

The purpose of our investigation was to determine if fababeans could be produced under dryland conditions in the Triangle area, and what the minimum moisture requirements would be.

Results: Above normal precipitation was received in 1978 and fababean production on dryland was successful at each location. It is therefore difficult to project the potential of this crop for drier years. The Chester location produced marginal yields; and perhaps in a dry year, fababeans would be a failure in that area. All locations considered, Diana and Ackepearle appeared to be the most desirable agronomically.

Conrad Varieties (Table 39): Blister beetles began feeding on the flowers approximately 10 days after first bloom. Pods set prior to the beetle attack continued to develop and produce seed. Robinson and Petite flowered much earlier than the other varieties, and had most of their pods set prior to beetle infestation. This was likely the reason for the higher yields of these two varieties at Conrad. At the other locations, where blister beetles did not occur, Robinson and Petite were the lowest yielding entries.

Robinson and Petite were much shorter than the other entries, and were con-

sidered to be too short for mechanical harvest.

Dutton and Chester Varieties (Table 40): No insect problems were encountered at Dutton and moisture was sufficient to produce an average yield of 2507 lbs/a. In contrast, the drier Chester location averaged only 745 lbs/a.

Table 39. Fababean variety trial grown on dryland recrop at Conrad, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT., and Saline Seep Project, Bozeman.

Variety	Yield #/a	Test Weight #/bu	Height (inches)			Shatter resistance	% PROTEIN
			lowest pod	highest pod	plant tip		
Diana	1628	66.7	6	19	30	poor	33.7
Robinson 1/	1615	62.8	5	12	18	good	37.8
Petite 1/	1430	63.9	3	12	18	good	31.1
Maxime	1316	65.0	7	20	30	poor	29.3
Ackepearle	1250	65.9	6	22	31	poor	28.9
Foec Nevyje	1214	65.0	7	21	30	poor	30.1

Experimental

Means: 1408.8 64.9 5.7 17.7 26.2

Cooperator & plot location: Ron Bokma, Conrad; Pondera Co. T28N, R3W, Sec. 17

Herbicide: Treflan-preplant incorporated

Seed Treatment: Fababean Bacterial Inoculant

Seed Date: 14 April 78

Harvest Date: 21 August 78

Previous Crop: Winter wheat 1977

Seeding Rate: 1.5 seeds/sq. foot

1/ Too short for mechanical harvest

Table 40. Fababean variety trials grown on dryland at Dutton in Teton County, and Chester in Liberty County, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad; and Saline Seep Project, Bozeman.

Variety	Dutton		Chester	
	Yield #/a	% PROTEIN	Yield #/a	% PROTEIN
Ackepearle	2925	30.5	832	30.0
Foec Nevyje	2733	29.7	577	32.0
Diana	2675	29.3	778	33.1
Maxime	2390	32.3	776	33.0
Petite	2200	29.0	-	-
Robinson	2121	30.3	770	29.9

Experimental Means: 2507 745

Seed Date: 13 April 78

Herbicide: Treflan-preplant incorporated

Seed Treatment: Fababean Bacterial Inoculant

Cooperators: Gene Schultz - 9 mi. east of Dutton; Dale Lyders - east of airport, Chester

TITLE: Oilseed Investigations

YEAR: 1978

LOCATION: Western Triangle Agricultural Research Center, Conrad, Montana

PERSONNEL: Grant Jackson, Saline Seep Project, Bozeman; Greg Kushnak and Ron Thaut, Research Center, Conrad; Jack Baringer, Bill Richter, Darrel Krum, Martin Malone, and Bruce McCallum, Cooperative Extension Service

INTRODUCTION: Sunflowers rank second among the world's sources of vegetable oils, and may become the number one source within the next 10 years. The increasing popularity of sunflower oil is due mainly to its higher level of polyunsaturates. The world's population is increasing its per capita consumption of edible fats and oils, which may push demands for sunflower oil even higher.

Oil-type sunflowers were first grown in the USA in 1967 when high oil types were introduced. Prior to that, sunflower production was not economical.

Sunflowers are adapted to a wide variety of soils, and thrive in much drier areas than soybeans. Their drought tolerance is attributed to a deep tap root, and the ability to go dormant during very dry periods. They are relatively frost tolerant in the spring.

Special equipment is required for seeding and harvest; and harvested seed may have to be artificially dried in some years. The stalks are relished by cattle.

Rapeseed ranks fourth in the world's vegetable oil production. Rape requires cooler and moister conditions than mustard or wheat, and may not produce high yields or quality in many drier areas of the Triangle. Both mustard and rape require protection from flea beetles, especially during the young seedling stage.

RESULTS: Rapeseed yielded equal to or higher than mustard at the Cut Bank and Sunburst locations, but the reverse was true at the other locations to the south. This is likely a reflection of Rapeseed's higher requirement for cool, moist conditions. Both mustard and rape required spraying for flea beetles at all locations except Dutton. Rapeseed appeared more vulnerable to damage by these insects than mustard; and was also preferred by rodents.

Sunflowers produced high yields at all locations except Chester where herbicide injury from 2,4-D was suspected. Dutton was the highest producing location where Oilmaster - OM#1 yielded 2462 lbs/a. OM#1 was the top yielder at most locations. Bird damage was very slight at some locations. Heavy wind and rain caused lodging at Sunburst.

Oilseed yield data are presented in the following tables: Cut Bank - Table 41; Subjurst - Table 42; Conrad - Table 43; Dutton - Table 44; Chester - Table 45.

Table 41. Oilseed crops grown on dryland north of Cut Bank, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad; and Saline Seep Project, Bozeman.

Crop/Variety	Yield #/a	Test Weight #/bu
Mustard, Oriental	876	53.3
Mustard, Yellow-2	753	54.3
Mustard, Brown	942	50.4
Rape, Torch	850	47.8
Rape, Tower	900	45.0
Sunflower, OM#1	1285	24.0
Sunflower, IS-8944	1115	24.7
Sunflower, OMX#8	1079	25.0
Sunflower, IS-894	1005	24.9
Sunflower, OMX#2	905	24.2

Cooperator & location: Fred Berkram, 20 mi. north of Cut Bank
 Herbicide: Treflan-preplant incorporated
 Seed Date: 18 May 1978
 Harvest Dates: 31 August 1978 - Mustard & Rape; 10 October 1978 - Sunflowers
 Fertilizer (actual #/a): 18-46-0 with seed + 30 N topdress

Table 42. Oilseed crops grown on dryland east of Sunburst, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT. and Saline Seep Project, Bozeman.

Crop/Variety	Yield #/a	Test Weight #/bu
Mustard, Oriental	958	48.8
Mustard, Yellow-2	1078	52.1
Mustard, Brown	908	51.4
Rape, Torch	1006	44.9
Rape, Tower	1142	47.0
Sunflower, OM-1	1332	25.4
Sunflower, OMX#8	1176	23.4
Sunflower, IS-894	1081	23.6
Sunflower, IS-8944	1016	26.3
Sunflower, OMQ#1	963	25.5
Sunflower, OMX#7	772	23.0
Sunflower, OMX#2	702	24.5

Cooperator & location: Herb Karst, 12 mi. northeast of Sunburst
 Herbicide: Treflan-preplant incorporated
 Seed Date: 18 May 1978
 Harvest Date: 28 September 1978

Table 43. Oilseed crops grown on dryland recrop at Conrad, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT., and Saline Seep Project, Bozeman.

Crop/Variety	Yield #/a	Test Weight #/bu	Plant Height
Mustard, Oriental	576	55.3	36
Mustard, Yellow-2	546	56.3	30
Mustard, Brown	402	51.4	36
Argentine Rape, Tower	<u>1/</u>	47.4	31
Sunflower, IS-894	1259	31.9	-
Sunflower, OMX#7	1170	31.9	-
Sunflower, OMQ	1127	30.4	-
Sunflower, IS-8944	1109	32.2	-
Sunflower, OM#1	1046	28.9	-
Sunflower, OMX#2	807	28.9	-

Cooperator & plot location: Ron Bokma, Conrad; Pondera Co. T28N, R3W, Sec. 17

Herbicide: Treflan-pre-plant incorporated

Seed Dates: 14 April 78 - Safflower; 23 May 78 - Mustard, Rape & Sunflowers

Harvest Dates: 31 August 78 - Mustard & Rape; 2 October 78 - Sunflowers

Previous Crop: Winter wheat 1977

Fertilizer (actual #/a): 11-48-0 with seed 50 AN topdress

1/ Severe pod damage from flea beetles reduce Rape yield to 122 #/a

Table 44. Oilseed crops grown on dryland east of Dutton, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad; and Saline Seep Project, Bozeman.

Crop/Variety	Yield #/a	Test Weight #/bu
Mustard, Oriental	1918	52.3
Mustard, Yellow-2	1555	54.2
Mustard, Brown	1318	52.6
Rape, Candle	982	51.6
Rape, Tower	1172	49.1
Sunflower, OM#1	2462	27.9
Sunflower, OMQ	2382	29.1
Sunflower, IS-894	2046	29.2
Sunflower, OMX#2	1978	28.9
Sunflower, IS-8944	1897	29.8

Cooperator & location: Gene Schultz, 9 mi. east of Dutton

Herbicide: Treflan-preplant incorporated

Seed Dates: 5 June 78 - Mustard, Rape & Sunflowers

Harvest Dates: 29 September-Mustard & Rape: 3 October - Sunflowers

Fertilizer: 11-48-0 with seed + 30 N topdress

Table 45. Oilseed crops grown on dryland at Chester, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad; and Saline Seep Project, Bozeman.

Crop/Variety*	Yield #/a **	Test Weight #/bu
Mustard, Oriental	330	-
Mustard, Yellow-2	390	-
Mustard, Brown	330	
Sunflower, OM#1	574	28.4
Sunflower, IS-8944	507	28.7
Sunflower, IS-894	486	27.7

Cooperator & location: Dale Lyders, east of airport

Herbicide: Treflan-preplant incorporated

*Rapeseed crop destroyed by gophers

**Yields were reduced by broadleaf herbicides applied to adjacent grain crop

TITLE: Dryland Corn Forage Yield Test

YEAR: 1978

LOCATION: Western Triangle Agricultural Research Center, Conrad, Montana

PERSONNEL: Greg Kushnak and Ron Thaut, Research Center, Conrad

PROCEDURE: Four hybrid varieties representing maturity classes from 80 to 98 days were seeded in three foot row spacings, with plants spaced 12 inches within the row. Plants were harvested after the first killing frost in the fall.

RESULTS: Dry matter yield data for the four varieties are presented in Table 46. Yields increased as maturity class increased, with the exception of MF 80. The highest yielding entry MF 98 is claimed to be drought tolerant and durable to stress; and appears to be the best of these four varieties for dryland corn forage production in the Western Triangle area. It is not certain if dry matter yields of greater than two tons/acre can be repeated in years when moisture is not quite so favorable.

Table 46. Corn forage yields produced on dryland at Conrad, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Variety 1/	Forage yield (Tons/A-dry matter)	% Moisture at harvest
Master Farmer - MF 80	1.99	77
Master Farmer - MF 85	1.58	79
Master Farmer - MF 88	1.76	76
Master Farmer - MF 98	2.17	78
Experimental Mean:	1.88	77.5

Seed Date: 23 May 1978

Seed Rate: Three foot row spacing; plants 12" within the row

Fertilizer: 11-48-0 with seed, 34 N topdress

Harvest Date: September 7, 1978

Cooperator: Ron Bokma, two mi. west of Conrad

1/ MF 80 through 98 indicated maturity class

TITLE: Chemical Summerfallow - evaluation of herbicides

YEAR: 1978

LOCATION: Western Triangle Agricultural Research Center, Conrad, Montana

PERSONNEL: Pete Fay, Plant & Soil Science Dept., MSU; and Greg Kushnak, Agricultural Research Center, Conrad

OBJECTIVES: To screen residual herbicides for seasonal vegetation control in chemical summerfallow

RESULTS: Herbicides used in this experiment are listed in Table 47, and vegetation control data in Table 48. Treatments which provided excellent weed control throughout most of the fallow season were: Ingran + metribuzin; metribuzin; Velpar + metribuzin; and R-40244. Possible carryover problems with these treatments at this location are not yet known. The R-40244 however, did not control volunteer indicating that subsequent crop damage from carryover would not be a problem. If used for chemical fallow, R-40244 would require a combination with one of the other chemicals to control grassy weeds and volunteer. The atrazine would have produced acceptable results if the normal 0.5# rate had been used.

Table 47. Herbicides evaluated for chemical summerfallow at Conrad, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Common Name	Other Designation	Source
terbutryn	Igran	Ciba Geigy
metribuzin	Sencor or Lexone	Chemagro or DuPont
atrazine	AAtrex (80 W)	Ciba Geigy
cyanazine	Bladex (80 W)	Shell
-	VEL-5026 (80 W)	Velsicol
-	Velpar	DuPont
-	Lorox	
-	R-40244	Stauffer

Table 48. Vegetation control evaluations for residual herbicides spring applied to winter wheat stubble (pre-emergence) for chemical summerfallow, 1978. Montana Agr. Expt. Station, Western Triangle Research Center, Conrad, MT.

Treatment 1/	Rate a.i./acre (pounds)	Percent Control 2/		Percent bare ground 3/
		Kochia	Tansy	
Igran	2.0	60	75	70
Igran + metribuzin	2 + 0.5	100	95	80
Igran + metribuzin	1.5 + 0.25	95	95	85
metribuzin	0.375	99	99	95
atrazine	0.25	30	30	60
Bladex	1.5	10	5	40
Bladex	2.0	15	5	30
Bladex	2.4	40	30	70
Bladex	2.8	40	30	75
Bladex + atrazine	2 + 0.4	80	80	80
Bladex + atrazine	2 + 0.5	70	90	85
VEL-5026	0.125	10	10	30
VEL-5026	0.25	10	10	30
VEL-5026	0.375	20	15	50
VEL-5026	0.5	30	30	60
metribuzin	0.75	99	99	95
Velpar + metribuzin	0.375 + .5	99	100	98
Velpar	0.375	0	5	10
Velpar + Lorox	0.375 + 1	10	15	20
Lorox	1.0	0	5	10
R-40244	1.0	99	99	95
R-40244	2.0	99	100	98
R-40244	4.0	99	100	95
R-40244 + VEL-5026	1.0 + 0.5	99	90	85
Non-treated check	-	0	0	5

1/ See Table 47 for common and trade names and manufacturer

2/ Readings taken 14 July 1978

3/ Percent of ground not covered by weeds

Date of herbicide application: 17 May 1978

Cooperator & location: Ron Bokma, two mi. west of Conrad