Introduction

This report contains information gathered from research trials conducted at the Southern Agricultural Research Center (SARC) and in the surrounding counties during 2002 (Fig. 1). The purpose of this document is to summarize and disseminate the work accomplished by the annual activities of the Southern Agricultural Research Center’s faculty and staff.

Approximately 44 agronomic field experiments and 32 weed management experiments were conducted by the Southern Agricultural Research Center personnel during the 2001-2002 cropping season. The experiments cover variety and germplasm testing, cropping systems, alternative crop evaluations and weed management. These studies are condensed into 54 progress reports presented in this document. Most experiments are continuing projects and the interpretation of this information may change with the collection of additional data. The accumulation of this agronomic and weed research information is the beginning of what will eventually become several individual and more substantial publications.

Funding and Support

The Southern Agricultural Research Center is an administered unit of the Montana Agricultural Experiment Station (MAES), and as such, is allocated a portion of the funds dispersed to the MAES by the Montana State Legislature on a biennium basis. Allocations of state funds to SARC for the current and past fiscal years (FY) are presented in Table 1.

Table 1. State-funded MAES allocations to SARC for FY2002 and FY2003.

<table>
<thead>
<tr>
<th>Budget Item</th>
<th>FY2002</th>
<th>FY2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>$223,983</td>
<td>$224,618</td>
</tr>
<tr>
<td>Labor</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Operations</td>
<td>42,200</td>
<td>42,200</td>
</tr>
<tr>
<td>Capital Equipment</td>
<td>54,470</td>
<td>12,000</td>
</tr>
<tr>
<td>Total Allocation</td>
<td>$320,653</td>
<td>$278,818</td>
</tr>
</tbody>
</table>

1/ Fiscal years begin July 1st and terminate on June 30th the following calendar year.

In 2002, the Agronomy and Weed Science programs at SARC received $157,749 in extramural funding of research through grants and contracts. Organizations and private companies that contributed grant or contract funds and/or other gifted resources include:

- Aventis CropScience Inc.
- BASF
- Bayer AG
- Beta Seed Company
- Coors Brewing Company
- Dow AgroSciences LLC
- E.I. du Pont de Nemours and Company
- Forage Genetics Inc.
- Garst Seed Company
- Integra Seed Ltd.
- Kussmaul Seed Company
- Monsanto Company
- Montana Alfalfa Seed Committee
- Montana Board of Research and Commercialization Technology
- Montana Wheat and Barley Committee
- Saskatchewan Wheat Pool
- Seedex Inc.
- Syngenta Crop Protection Inc.
- Syngenta Seed Inc.
- United Agri Products Inc.
- Urbana Laboratories Inc.
- Valent USA Corporation
- Wensman Seed Company
- Western Plant Breeders
SARC Faculty and Staff

Current staff includes two tenure-track faculty positions; three support scientists; a farm foreman; and one part-time administrative assistant. The following individuals are the current faculty and staff at the station:

Dr. Kenneth D. Kephart (February 1, 1998)
Associate Professor of Agronomy and Superintendent
kephart@montana.edu

Dr. James A. “Mick” Mickelson (September 1, 1999)
Assistant Professor of Weed Science
jmickelson@montana.edu

Ms. Nicole D. Flowers (April 17, 2001)
Research Associate - Weed Science
nflowers@montana.edu

Dr. Qasim A. Khan (May 1, 2002)
Post Doctoral Fellow in Plant Breeding
qkhan@montana.edu

Dr. Geraldine B. Opena (December 1, 2002)
Research Associate - Agronomy
gopena@montana.edu

Mr. Tom A. Fischer (February 1, 1998)
Research Specialist and Farm Foreman
tfischer@montana.edu

Mrs. Tammy L. Balzer (May 15, 2000)
Administrative Assistant	
	
tbalzer@montana.edu

Ms. Peggy Lamb, former Agronomy Research Associate, resigned February 28, 2002 to accept a similar position at the Northern Agricultural Research Center near Havre, Montana. Dr. Geraldine Opena, a recent graduate of Kansas State University, was hired in December, 2002 to assume the duties and responsibilities previously held by Ms. Lamb. Mr. Mike Particka, former Weed Science Research Associate, resigned May 31, 2002 to accept a Research Associate position in the Department of Horticulture at Michigan State University. State-funded support for this vacated position was terminated by the MAES in August, 2002.

Capital Equipment Acquisitions

The capital equipment allocation provided in FY2002 was used to purchase a new John Deere Model 6420 row crop tractor, a new John Deere Model 790 plot tractor, a new John Deere Model 960 field cultivator and a used John Deere Model 825 row crop cultivator. The capital equipment allocation provided for FY2003 has been dedicated towards the purchase of an experimental plot drill possessing no-till planting capability. In December, 2002, Mr. Ron Balzer of Worden, Montana donated a John Model 630T row crop cultivator in excellent condition to support research activities on irrigated crops.

Physical Plant Improvement

No major building projects were initiated at SARC during 2002. During the summer of 2002, most buildings were repainted on their north- and west-facing sides as the result of an insurance settlement related to hail damage experienced in July, 1998. Some buildings, particularly the houses and garages in the residential area, also received new roofing. The septic line serving a restroom in the shop building partially collapsed and was replaced with 4” schedule 40 PVC pipe. The buried galvanized water line which serves the center’s lawn irrigation system was excavated in two locations to repair leaks resulting from corrosion. To accommodate employees hired by the Weed Science program as part of a Montana Board of Research and Commercialization Technology grant, a second office trailer was leased for two years and moved on site in June. A small temporary shed was purchased to relocate storage of research equipment that had previously been stored among pesticides in the weed science lab building.

2002 Weather Conditions

Weather conditions experienced at SARC during the cropping season from September, 2001 to August, 2002 are summarized in Table 2. Extremely dry conditions prevailed as this region of the state entered it’s fourth consecutive year of drought, combined with unusual fluctuations in temperature during the growing the season. Total annual precipitation was 4.3 inches below the expected average. Average temperature for the year was 1.1 °F warmer than normal. Month to month variation in temperature from normal values were more extreme. Much warmer than normal temperatures occurred from September, 2001 to February, 2002, averaging 4.3 °F above normal during this 6 month period. Spring temperatures, particularly those occurring in March, were unusually cold which delayed planting and slowed crop growth. Above average temperatures were again experienced from late June throughout the month of July. August temperatures were abnormally cool. The frost-free period during the summer of 2002 was 121 days, 4 days shorter than normal and more than 3 weeks shorter than the frost-free period experienced the previous season. Accumulated heat units (GDD50,
Precipitation on land fallowed during the summer of 2001 did not recharge soil moisture levels sufficient for uniform establishment of fall planted crops. Dryland winter wheat studies planted in September, 2001, either failed to germinate and establish a stand, or suffered substantial stand losses over winter as a result of the drought stress. Seven dryland winter wheat and winter triticale trials on the station were subsequently abandoned and not harvested. Dryland alfalfa trials planted in the spring of 2000, 2001 and 2002, also failed to produce sufficient growth to warrant harvesting in 2002. Surface soil moisture conditions in the spring of 2002 were more favorable for spring crop germination and emergence compared to conditions that existed the previous fall, but little moisture existed in the soil profile below the 6 to 12 inch depth at planting. Soil temperatures in March, April and May were much cooler than normal which delayed emergence and slowed early crop development. Most dryland trials received less than 5 inches of rainfall during crop development. The extremely hot, dry conditions that occurred in late June and continued throughout the month of July, hastened maturity of most dryland crops, severely depressing yields and reducing crop quality.

The excellent cooperation and support provided by the SARC personnel. Special recognition also goes to the individuals who serve on the Southern Agricultural Research Center Advisory Committee (Table 2).

The authors would like to extend their appreciation to the following individuals, most of whom are area students, for their hard work towards the planting, weeding, harvesting and processing many of the research trials in this report; Terra Balzer, Tanner Bennion, Ed Dvorak, Justen Ewen, Lee Fischer, Johanna Hedman, Brad Hofmann, Tamsen Nelson and Treva Tesky.

**Electronic Availability of SARC Information**

The Southern Agricultural Research Center web site is continuously being improved and updated. Past, current and future reports are, or will be, available over the world wide web. Home page for the research center is “http://www.sarc.montana.edu/”. Simply select the menu listing for “Annual Reports” to locate this information.

The electronic weather station that was put into operation during 1999 continues to provide real time weather information by using radio telemetry to broadcast data to a receiving computer. This information is accessible over the world wide web at:

“http://www.sarc.montana.edu/wx/”

Additional weather-related information can be accessed from the research center’s home page by selecting the menu listing for “Weather Information”.

**Disclaimer**

Montana State University and the Montana Agricultural Experiment Station are equal opportunity, affirmative action institutions. The information contained in this report is supplied with the understanding that no discrimination is intended and no endorsement by the Montana Agricultural Experiment Station is implied. Results of research trials reported are considered preliminary, and may not be duplicated or reprinted without permission of the authors or project leaders involved. Use of commercial trade names, commercial services and/or registered trademarks do not imply endorsement or exclusion of these or similar items by Montana State University or the Montana Agricultural Experiment Station.

**Acknowledgements**

Special recognition goes to the following individuals who provided their time, land and additional resources in support of this program:

Mr. Gary Ballensky, Farmer Cooperator, Ft. Smith
Mr. Gary Broyles, Farmer Cooperator, Rapelje
Mr. Bret Conover, Farmer Cooperator, Broadview
Mr. Frank Deveny, Farmer Cooperator, Hysham
Mr. Mike Hammond, Farmer Cooperator, Huntley
Mr. Jeff Heyd, Farmer Cooperator, Worden
Mr. Don Holland, Farmer Cooperator, Forsyth
Mr. Dave Kelsey, Farmer Cooperator, Molt
Mr. Greg Lackman, Farmer Cooperator, Hysham
Mr. Bill Linger, Farmer Cooperator, Molt
Mr. Mark Majerus, Cooperator, USDA Plant Material Center, Bridger
Mr. John MeHling, Farmer Cooperator, Hardin
Mr. Carter Miklovich, Farmer Cooperator, Lodge Grass
Mr. Tony Zinne, Farmer Cooperator, Ryegate

Mr. Mike Hammond, Farmer Cooperator, Huntley
Mr. Jeff Heyd, Farmer Cooperator, Worden
Mr. Don Holland, Farmer Cooperator, Forsyth
Mr. Dave Kelsey, Farmer Cooperator, Molt
Mr. Greg Lackman, Farmer Cooperator, Hysham
Mr. Bill Linger, Farmer Cooperator, Molt
Mr. Mark Majerus, Cooperator, USDA Plant Material Center, Bridger
Mr. John MeHling, Farmer Cooperator, Hardin
Mr. Carter Miklovich, Farmer Cooperator, Lodge Grass
Mr. Tony Zinne, Farmer Cooperator, Ryegate

The excellent cooperation and support provided by these individuals has been invaluable to projects conducted by SARC personnel. Special recognition also goes to the individuals who serve on the Southern Agricultural Research Center Advisory Committee (Table 2).

The authors would like to extend their appreciation to the following individuals, most of whom are area students, for their hard work towards the planting, weeding, harvesting and processing many of the research trials in this report; Terra Balzer, Tanner Bennion, Ed Dvorak, Justen Ewen, Lee Fischer, Johanna Hedman, Brad Hofmann, Tamsen Nelson and Treva Tesky.

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Table 2. Summary of climatic data by months for the 2001-2002 cropping year (September-August) compared to averages for the period of record from 1911 to 2000 at the Southern Agricultural Research Center near Huntley, Montana.

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sep</td>
<td>Oct</td>
<td>Nov</td>
</tr>
<tr>
<td>Precipitation (inches)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Year (2001-2002)</td>
<td>0.74</td>
<td>0.84</td>
<td>0.54</td>
</tr>
<tr>
<td>Average (1911-2000)</td>
<td>1.31</td>
<td>1.01</td>
<td>0.63</td>
</tr>
<tr>
<td>Difference</td>
<td>-0.57</td>
<td>-0.17</td>
<td>-0.09</td>
</tr>
<tr>
<td>Mean Temperature (°F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Year (2001-2002)</td>
<td>62.3</td>
<td>46.5</td>
<td>39.1</td>
</tr>
<tr>
<td>Average (1911-2000)</td>
<td>57.7</td>
<td>46.9</td>
<td>33.3</td>
</tr>
<tr>
<td>Difference</td>
<td>+4.6</td>
<td>-0.4</td>
<td>+5.8</td>
</tr>
</tbody>
</table>

**Last Killing Frost in Spring**

- **2001-2002:** May 23 (31 °F)
- **Average (1911-2000):** May 16

**First Killing Frost in the Fall**

- **2001-2002:** September 22 (27 °F)
- **Average (1911-2000):** September 19

**Frost-free period**

- **2001-2002:** 121 days
- **Average (1911-2000):** 125 days

**Growing Degree Days (Base 50)**

- **2001-2002:** 2,048 GDD (°F)
- **Average (1911-2000):** 2,056 GDD (°F)

**Growing Degree Days (Corn)**

- **2001-2002:** 2,033 GDD (°F)
- **Average (1911-2000):** 2,021 GDD (°F)

**Maximum Summer Temperature**

- 109 °F on July 13 and July 15, 2002

**Minimum Winter Temperature**

- -15 °F on March 2, 2002

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1/ In this summary, 32 °F is considered a killing frost. Average last and first killing frost dates are calculated on a 50% probability of a minimum temperature occurring below a threshold temperature of 32.5 °F based on observations from 1911 to 2000.

2/ Growing degree days calculated from temperatures observed during the frost free period from May 23 through September 22 for 2002, and from May 16 through September 19 for temperatures averaged from the period of record of 1911 to 2000.
Table 3. Southern Agricultural Research Center Advisory Committee Membership, January 1, 2003.

<table>
<thead>
<tr>
<th>Member</th>
<th>County</th>
<th>First Appointed</th>
<th>Current Term Expires</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Farmer/Ag. Industry Members</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mike Greytak</td>
<td>Big Horn</td>
<td>1998</td>
<td>2004</td>
</tr>
<tr>
<td>Rodney Jabs</td>
<td>Big Horn</td>
<td>1998</td>
<td>2004</td>
</tr>
<tr>
<td>Carter Miklovich</td>
<td>Big Horn</td>
<td>1996</td>
<td>2005</td>
</tr>
<tr>
<td>Dennis Newton</td>
<td>Carbon</td>
<td>1996</td>
<td>2005</td>
</tr>
<tr>
<td>Ervin Schlemmer</td>
<td>Carbon</td>
<td>2002</td>
<td>2005</td>
</tr>
<tr>
<td>Bill Griffin</td>
<td>Custer</td>
<td>2001</td>
<td>2004</td>
</tr>
<tr>
<td>Mark Helland</td>
<td>Custer</td>
<td>2001</td>
<td>2004</td>
</tr>
<tr>
<td>(vacant)</td>
<td>Musselshell/Golden Valley</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tony Zinne</td>
<td>Musselshell/Golden Valley</td>
<td>1995</td>
<td>2004</td>
</tr>
<tr>
<td>Greg Lackman</td>
<td>Rosebud/Treasure</td>
<td>1996</td>
<td>2005</td>
</tr>
<tr>
<td>Glen Leonhardt</td>
<td>Rosebud/Treasure</td>
<td>1998</td>
<td>2004</td>
</tr>
<tr>
<td>Kim Nile</td>
<td>Rosebud/Treasure</td>
<td>1998</td>
<td>2004</td>
</tr>
<tr>
<td>Mike Bernhardt</td>
<td>Stillwater</td>
<td>1996</td>
<td>2002</td>
</tr>
<tr>
<td>David Kelsey (Chair)</td>
<td>Stillwater</td>
<td>1996</td>
<td>2005</td>
</tr>
<tr>
<td>Terral Balzer (Vice Chair)</td>
<td>Yellowstone</td>
<td>1995</td>
<td>2004</td>
</tr>
<tr>
<td>(vacant)</td>
<td>Yellowstone</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Walter Hudyma</td>
<td>Yellowstone</td>
<td>1998</td>
<td>2004</td>
</tr>
<tr>
<td><strong>Montana Cooperative Extension County Agent (Ex Officio) Members</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kirk Barnette</td>
<td>Big Horn</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Darrel Krum</td>
<td>Carbon</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kent Williams</td>
<td>Custer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>John Pfister</td>
<td>Musselshell/Golden Valley</td>
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<td></td>
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<tr>
<td>(Vacant)</td>
<td>Rosebud/Treasure</td>
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<td></td>
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<tr>
<td>Lee Schmelzer</td>
<td>Stillwater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paul Dixon</td>
<td>Yellowstone</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1/ Term limits are 3 years. Advisory committee members may serve no more than 3 consecutive terms.
2/ Serves as the SARC delegate on the MAES/College of Agriculture State Advisory Committee.
3/ Serves as a SARC alternate on the MAES/College of Agriculture State Advisory Committee.