Introduction

The Southern Agricultural Research Center (SARC) near Huntley, Montana, is one of seven facilities that make up the Montana Agricultural Experiment Station (MAES) Research Center System. Established by the Montana Legislature in 1893, the mission of the Montana Agricultural Experiment Station, as defined by state statute, is "to conduct and promote studies, scientific investigations and experiments relating to agriculture, natural resources and rural life and to diffuse information thereby acquired among the people of Montana". The Montana Agricultural Experiment Station fulfills this mission as the agricultural research component of Montana State University-Bozeman's Federal Land Grant responsibilities for teaching, research and extension. The mission of the Research Center System is to serve the specific needs of the clientele in local production areas, and the broader needs of Montana agriculture in general, through applied research directed to the problems and impacts of agricultural production.

To fulfill these missions, the Southern Agricultural Research Center conducts agronomic research and education programs for agriculture in the dryland and irrigated areas located in nine counties of south central Montana (Fig. 1). This report contains information gathered from research trials conducted at the Southern Agricultural Research Center and in the surrounding counties during the 2003 calendar year. 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 41 agronomic field experiments and 19 weed management experiments were conducted by the Southern Agricultural Research Center personnel during the 2002-2003 cropping season. The experiments cover variety and germplasm testing, cropping systems, alternative crop evaluations, herbicide evaluations, weed ecology and improved weed management. These studies are condensed into the progress reports that comprise most of this publication. 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. The FY2004 allocation represents a 10.4 and 22.1 percent reduction in funds to the research center compared to the FY2003 and FY2002 allocations, respectively.

Table 1. State-funded MAES allocations to SARC for FY2002 through FY2004.

<table>
<thead>
<tr>
<th>Budget Item</th>
<th>FY2002 1/</th>
<th>FY2003 1/</th>
<th>FY2004 1/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salaries</td>
<td>$223,983</td>
<td>$224,618</td>
<td>$207,596</td>
</tr>
<tr>
<td>Labor</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Operations</td>
<td>42,200</td>
<td>42,200</td>
<td>42,200</td>
</tr>
<tr>
<td>Capital Equipment</td>
<td>54,470</td>
<td>12,000</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Allocation</strong></td>
<td><strong>$320,653</strong></td>
<td><strong>$278,818</strong></td>
<td><strong>$249,796</strong></td>
</tr>
</tbody>
</table>

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

In 2003, the Agronomy and Weed Science programs at SARC received $115,500 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:

Ag Reliance
Ag. Value, Inc.
Arizona Plant Breeders
BASF
Bayer CropScience
Busch AG
Beta Seed Company
Coors Brewing Company
Dow AgroSciences LLC
E.I. du Pont de Nemours and Company
Garst Seed Company
General Mills
Integra Seed Ltd.
Interstate Seed Company
Kaystar Seeds
Kussmaul Seed Company
Monsanto Company
Montana Alfalfa Seed Committee
Montana Board of Research and Commercialization Technology
Montana Wheat and Barley Committee
Mycogen Seeds
Pioneer Hi-Bred International, Inc.
Seedex Inc.
Syngenta Crop Protection Inc.
Syngenta Seed Inc.
Valent USA Corporation
W.G. Thompson & Sons
Wensman Seed Company
Western Plant Breeders
Western Sugar Cooperative Research Committee

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																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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Figure 2. Newly completed SARC greenhouse in December, 2003.
In November, 2003, SARC received authorization from the MAES Director to proceed on the design, development and construction of a new 6,000 square foot office/laboratory building to replace modular units leased since 1998. Estimated cost including new water and septic systems is $650,000. One half of the funds for the new building were provided by the 2001 Montana State Legislature from the state's long term building bond fund. The remaining funds have been provided by public and private donations. The new building will be designed and constructed under the direction of Myhre Atwood Architects and Planners of Billings, Montana. Occupancy of the new building will likely occur in late 2004/early 2005.

2003 Weather Conditions

Weather conditions experienced at SARC during the cropping season from September, 2002 to August, 2003 are summarized in Table 2. This region of the state entered it's fifth consecutive year of drought, with the year once again being dryer and warmer than normal. Total annual precipitation was 2.2 inches below the expected average, but most of the shortfall in annual precipitation was experience during July and August. Average temperature for the year was 1.9 ºF warmer than normal. Month to month variation in temperature from normal values were quite extreme. Much warmer than normal temperatures occurred from November, 2002 to February, 2003, averaging 4.1 ºF above normal during this 4 month period. March temperatures, particularly those occurring in early March, were unusually cold which delayed planting and slowed early crop growth. Warmer conditions returned in April. Early May experienced slightly cooler temperatures and above average precipitation. Above average temperatures and dry conditions were again experienced throughout the months of July and August.

The frost-free period at Huntley during the summer of 2003 was from May 20th to September 14th or 116 days in length (Table 2). The 2003 frost-free period was 9 days shorter than normal and 4 days shorter than the frost-free period experienced the previous season. Accumulated heat units (GDD50, GDDcorn) for the summer growth period were above normal in spite of the shortened length of the growing season.

Dryland winter wheat studies planted in the fall of 2002 and harvested in 2003, performed much better than similar studies planted the previous cropping year. Rainfall levels experienced by the winter wheat crop were 98 percent of normal by the third week of June. While fall-planted studies performed much better than expected, most spring-planted dryland trials received less than 3 inches of rainfall during crop development. The extremely hot, dry conditions that began in late June and continued throughout the months of July and August, hastened maturity of most spring planted dryland crops, severely depressing yields and reducing crop quality. Dryland alfalfa trials planted in the spring of 2000, 2001 and 2002, produce sufficient growth to warrant harvesting in 2003, but stand losses resulting from the extended drought had a far bigger impact on yield levels than the yield differences observed between the varieties planted in these trials.

Electronic Availability of SARC Information

Home page for the Southern Agricultural Research Center is “http://www.sarc.montana.edu/”. Annual reports from 1999 to the present year are available to the public over the World Wide Web from this site. Simply select the main menu listing for “Annual Reports +” to locate individual reports by the years listed.

An electronic weather station was put into operation during 1999, and continues to provide real time weather information by using radio telemetry to broadcast data to a receiving computer. This information is accessible by the public over the Internet at:

“http://www.sarc.montana.edu/wx/”

Additional weather-related information can be accessed from the research center's home page by selecting the main menu listing for “Weather Information +” and scrolling through the displayed options.

Acknowledgements

Special recognition goes to the following individuals who provided their time, land and additional resources in support of SARC’s off-station research programs:

Mr. Gary Ballensky, Farmer Cooperator, Ft. Smith
Mr. Gary Broyles, Farmer Cooperor, Rapelje
Mr. Keith Schott, Farmer Cooperor, Broadview
Mr. Frank Deveny, Farmer Cooperor, Hysham
Mr. Mike Hammond, Farmer Cooperor, Huntley
Mr. Jeff Heyd, Farmer Cooperor, Worden
Mr. Don Holland, Farmer Cooperor, Forsyth
Mr. Dave Kelsey, Farmer Cooperor, Molt
Mr. Greg Lackman, Farmer Cooperor, Hysham
Mr. Bill Linger, Farmer Cooperor, Molt
Mr. John Mehling, Farmer Cooperor, Hardin
Mr. Carter Miklovich, Farmer Cooperor, Lodge Grass
Mr. Ervin Schlemmer, Farmer Cooperor, Fromberg
Mr. Tony Zinne, Farmer Cooperor, 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 3).

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, Mariah Baumann, Lacy Capra, Amanda Felton, Anna Fischer, Lee Fischer, Brad Hofmann, Jason Kephart, Abigail Miller, Debra Pulasky, and Valerie Swanson.

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.
Table 2. Summary of climatic data by months for the 2002-2003 cropping year (September-August) compared to averages for the period of record from 1911 to 2002 at the Southern Agricultural Research Center near Huntley, Montana.

<table>
<thead>
<tr>
<th></th>
<th>2002</th>
<th>2003</th>
<th>Year Total</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 (2002-2003)</td>
<td>1.36</td>
<td>0.74</td>
<td>0.10</td>
</tr>
<tr>
<td>Average (1911-2002)</td>
<td>1.30</td>
<td>1.01</td>
<td>0.63</td>
</tr>
<tr>
<td>Difference</td>
<td>+0.06</td>
<td>-0.27</td>
<td>-0.53</td>
</tr>
<tr>
<td>Mean Temperature (ºF)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current Year (2002-2003)</td>
<td>59.4</td>
<td>40.7</td>
<td>38.3</td>
</tr>
<tr>
<td>Average (1911-2002)</td>
<td>57.8</td>
<td>46.9</td>
<td>33.4</td>
</tr>
<tr>
<td>Difference</td>
<td>+1.6</td>
<td>-6.2</td>
<td>+4.9</td>
</tr>
</tbody>
</table>

- **Last Killing Frost in Spring**
  - 2003......................... May 20 (25 ºF)
  - Average (1911-2002) .......... May 16

- **First Killing Frost in the Fall**
  - 2003......................... September 14 (29 ºF)
  - Average (1911-2002) .......... September 19

- **Frost-free period**
  - 2003............................... 116 days
  - Average (1911-2002) .......... 125 days

- **Growing Degree Days (Base 50)**
  - 2003............................... 2,211 GDD (ºF)
  - Average (1911-2002) .......... 1,864 GDD (ºF)

- **Growing Degree Days (Corn)**
  - 2003............................... 2,059 GDD (ºF)
  - Average (1911-2002) .......... 1,925 GDD (ºF)

- **Maximum Summer Temperature**
  - 105 ºF on July 24, 2003

- **Minimum Winter Temperature**
  - -21 ºF on February 24, 2003

1/ In this summary, 32 ºF 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 ºF based on observations from 1911 to 2002.

2/ Growing degree days calculated from temperatures observed during the frost free period from May 20 through September 14 for 2003, and for the same 116 day interval from the period of record of 1911 to 2002.
Table 3. Southern Agricultural Research Center Advisory Committee Membership, January 1, 2004.

<table>
<thead>
<tr>
<th>Member</th>
<th>County</th>
<th>First Appointed</th>
<th>Current Term ¹/²</th>
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<tbody>
<tr>
<td>Mike Greytak ³/</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>(vacant)</td>
<td></td>
<td></td>
<td></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>Tony Zinne ³/</td>
<td>Musselshell/Golden Valley</td>
<td>1995</td>
<td>2004</td>
</tr>
<tr>
<td>(vacant)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Greg Lackman</td>
<td>Rosebud/Treasure</td>
<td>1996</td>
<td>2005</td>
</tr>
<tr>
<td>Kim Nile</td>
<td>Rosebud/Treasure</td>
<td>1998</td>
<td>2004</td>
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<tr>
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<td></td>
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<tr>
<td>Mike Bernhardt</td>
<td>Stillwater</td>
<td>1996</td>
<td>2005</td>
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<tr>
<td>David Kelsey (Chair)</td>
<td>Stillwater</td>
<td>1996</td>
<td>2005</td>
</tr>
<tr>
<td>Terral Balzer (Vice Chair) ²/</td>
<td>Yellowstone</td>
<td>1995</td>
<td>2004</td>
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<tr>
<td>Warren Frank</td>
<td>Yellowstone</td>
<td>2003</td>
<td>2006</td>
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<tr>
<td>(vacant)</td>
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<tr>
<td>Montana Cooperative Extension County Agent (Ex Officio) Members</td>
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<tr>
<td>(vacant)</td>
<td>Big Horn</td>
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<tr>
<td>(vacant)</td>
<td>Carbon</td>
<td></td>
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<tr>
<td>Kent Williams</td>
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<tr>
<td>John Pfister</td>
<td>Musselshell/Golden Valley</td>
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<tr>
<td>(vacant)</td>
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<tr>
<td>Lee Schmelzer</td>
<td>Stillwater</td>
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<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.