

**APPLICATION FOR  
FEDERAL ASSISTANCE**

Version 7/03

<b>1. TYPE OF SUBMISSION:</b> Application <input type="checkbox"/> Construction <input checked="" type="checkbox"/> Non-Construction		<b>2. DATE SUBMITTED</b> 4/27/06	Applicant Identifier
<input type="checkbox"/> Pre-application <input type="checkbox"/> Construction <input type="checkbox"/> Non-Construction	<input checked="" type="checkbox"/> Construction <input type="checkbox"/> Non-Construction	<b>3. DATE RECEIVED BY STATE</b>	State Application Identifier
		<b>4. DATE RECEIVED BY FEDERAL AGENCY</b>	Federal Identifier

**5. APPLICANT INFORMATION**

<b>Legal Name:</b> South Dakota State University		<b>Organizational Unit:</b> Department: Agricultural and Biosystems Engineering	
<b>Organizational DUNS:</b> 92-992-9743		Division:	
<b>Address:</b> Street: Box 2201, Admin 130		<b>Name and telephone number of person to be contacted on matters involving this application (give area code)</b>	
City: Brookings		Prefix: Dr.	First Name: Hal
County: Brookings		Middle Name: D	
State: SD	Zip Code: 57007	Last Name: Warner	
Country: USA		Suffix:	
		Email: hal.werner@sdsstate.edu	

<b>6. EMPLOYER IDENTIFICATION NUMBER (EIN):</b> 46-6000364	Phone Number (give area code) 605-688-5673	Fax Number (give area code) 605-688-6764
---	---	---

<b>8. TYPE OF APPLICATION:</b> <input checked="" type="checkbox"/> New <input type="checkbox"/> Continuation <input type="checkbox"/> Revision If Revision, enter appropriate letter(s) in box(es) (See back of form for description of letters.) Other (specify) <input type="checkbox"/> <input type="checkbox"/>	<b>7. TYPE OF APPLICANT:</b> (See back of form for Application Types) 1 - State controlled institution of higher learning Other (specify)
---	---

<b>10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER:</b> 10-912	<b>9. NAME OF FEDERAL AGENCY:</b> USDA - NRCS
---	--

<b>11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:</b> Automated Irrigation Water Management for Water Conservation
--

<b>12. AREAS AFFECTED BY PROJECT (Cities, Counties, States, etc.):</b> Butte, Fall River, Lawrence, Meade, and Pennington Counties - South Dakota
--

<b>13. PROPOSED PROJECT</b> Start Date: July 1, 2006 Ending Date: December 31, 2007	<b>14. CONGRESSIONAL DISTRICTS OF:</b> a. Applicant: First - South Dakota b. Project: First - South Dakota
---	--

<b>15. ESTIMATED FUNDING:</b>	<b>16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECUTIVE ORDER 12372 PROCESS?</b>
a. Federal \$ 72,450.00	a. Yes. <input type="checkbox"/> THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON DATE:
b. Applicant \$ 61,133.00	b. No. <input checked="" type="checkbox"/> PROGRAM IS NOT COVERED BY E. O. 12372
c. State \$ .00	<input type="checkbox"/> OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW
d. Local \$ .00	<b>17. IS THE APPLICANT DELINQUENT ON ANY FEDERAL DEBT?</b>
e. Other \$ 15,600.00	<input type="checkbox"/> Yes If "Yes" attach an explanation. <input checked="" type="checkbox"/> No
f. Program Income \$ .00	
g. TOTAL \$ 149,183.00	

**18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT. THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARDED.**

<b>a. Authorized Representative</b>		
Prefix Dr.	First Name John	Middle Name Joseph
Last Name Ruffolo		Suffix
b. Title Associate Dean of Office of Research and Sponsored Programs and Graduate School		c. Telephone Number (give area code) 605-688-4181
d. Signature of Authorized Representative <i>John J. Ruffolo</i>		e. Date Signed 4/27/06

## **2. PROJECT ABSTRACT:**

### **a. CIG component:**

State: Natural Resource Concerns

### **b. Project title:**

Automated Irrigation Management for Water Conservation

### **c. Project duration:**

One and one-half years from 7/1/06 to 12/31/07

### **d. Project director:**

Dr. Hal D. Werner  
South Dakota State University  
Agricultural and Biosystems Engineering  
Box 2120, 1400 N Campus Drive  
Brookings, SD 57007  
605-688-5673  
FAX 605-688-6764  
hal.werner@sdstate.edu

### **e. Project collaborators:**

RESPEC Consulting  
3824 Jet Drive  
Rapid City, SD 57703

AgSense, LLC  
601 Lincoln Ave NW  
Huron, SD 57350

### **f. EQIP eligible cooperators involved in the project:**

Several hundred EQIP eligible producers are in the five counties selected for the field trials (Over 400 within the Belle Fourche Irrigation District itself.). Three EQIP eligible irrigation farmers will be selected as cooperators.

### **g. Natural resource concern/technology to be addressed:**

Water Resources: 3. Irrigation management for water conservation

### **h. List of deliverables/products:**

Irrigation water management automation packages featuring monitoring, control, and irrigation scheduling.  
Technology transfer system that would enable unlimited additional users.  
Detailed record management providing crop water use, irrigation amounts, weather, and soil moisture data.

### **i. Summary of work to be performed:**

This project will implement the development of innovative center pivot automation (CPA) systems for irrigation water management (IWM) and test the systems in the field with EQIP cooperators. The CPA system includes monitoring and control hardware, weather and soil moisture sensors, communications, and irrigation scheduling software. The system calculates evapotranspiration (ET) and soil water balances from the weather data, forecasts future crop water needs, and manages irrigation water applications. The irrigation scheduling software maximizes water use efficiency and crop production for a given crop, soil water holding capacity, and irrigation capacity. The farmer maintains overall control and management of the irrigation system but is relieved of the daily tedium of irrigation scheduling.

### **j. Total project cost: \$149,183**

### **k. Total Federal funds requested: \$72,450**

### **3. PROJECT DESCRIPTION: Automated Irrigation Management for Water Conservation**

**a. Project Background:** Scientific irrigation water management (IWM) is required to get the greatest return from center pivot irrigation while making efficient use of water. Considerable research has documented how scientific IWM can improve water conservation, decrease operational costs and improve productivity (Heermann et al., 1976, Field et al., 1988, Steele et al., 1994, Steele et al., 2000). Scientific IWM considers factors such as soil water holding capacity, crop water use, and allowable depletions in order to apply the optimum water needed for crop production. Research has documented the significance of each of these factors for science-based IWM (Wright and Jensen, 1978, Camp et al., 1990). Oswald (2006) developed irrigation scheduling software to manage center pivots. Results of the study indicate that center pivots can be successfully managed automatically.

Shearer and Vomocil (1981) found that adoption of scientific irrigation scheduling was well accepted by growers but the practice was not sustained once technical support was reduced. Leib et al. (2002) determined that the number of irrigators using scientific irrigation scheduling, even with the availability of consultants for technical support, may have been as low as 18% as of 1998. Technical service providers in many parts of the country provide IWM assistance but serve a relatively small number of growers. Today, irrigation scheduling practices for most farmers rely largely on past practice. Scientific input is minimal due to constraints of training, experience, time, and other resources. This is in spite of the fact that tools are now widely available for scientific irrigation scheduling including evapotranspiration (ET) information (Trooien and Alam, 1998, Elliot et al., 2000) and scheduling software (Henggeler, 2002). Many sensors are available for real-time monitoring of weather conditions and soil moisture at the

irrigation field. Likewise, various telecommunication technologies have become economically feasible for relaying in-field measurements to remote computers.

Using scientific IWM for center pivot irrigation would have the potential to impact water conservation since center pivots irrigate more than 300,000 acres in South Dakota. Center pivots are popular among irrigators because of labor savings and increased efficiency over surface irrigation. Automating the center pivot is the next step that will allow the farmer to integrate these technologies to implement scientific irrigation scheduling using real-time soil moisture and weather data. Thus, the farmer can increase crop production while saving water and enhancing the environment without requiring significant amounts of time during the growing season.

Center pivot irrigation systems have been monitored and controlled from remote locations (Freitag and Stegman, 1982, Thomson et al., 1982, Heermann et al., 1984, Wagner et al., 1985, Buchleiter and Heermann, 1986, Homan et al., 1988). Most center pivot manufacturers, along with several third-party vendors, offer remote monitoring and control packages as options.

AgSense LLC markets a variety of remote monitoring and management tools for agriculture using both radio and cellular communication technologies connected to the internet. They have the expertise and technology to build and integrate sensor, communication, and control systems. AgSense, in collaboration with SDSU, has developed a monitoring and control system for center pivot irrigation and installed well over 100 units in five states. Valmont Irrigation, the world's largest manufacturer of pivots, has entered into a contractual agreement with AgSense to market the monitoring and control systems through their dealer organization. Even with available remote monitoring and control, farmers still need routine input and management to decide when and how much water to apply to the crops. This requires the farmer's time and attention and remains a tedious routine for the farmer throughout the irrigation season.

SDSU and AgSense have developed a prototype IWM system that combines the AgSense monitoring and control package with irrigation scheduling software to automate the operation of center pivots to perform scientific IWM. SDSU brings the scientific expertise to design the irrigation water management. The resulting center pivot automation (CPA) system is unique in that it integrates both in-field hardware and irrigation scheduling software. The system monitors center pivot status, soil moisture, and on-site weather, then calculates ET and soil water balances to schedule irrigations and operate the center pivot with minimal operator intervention. The irrigator will keep control of the higher level decisions involved in water management and have “override” capability to change the operation of the center pivot at any time.

The innovative CPA package will automate IWM and encourage irrigation operators to use science-based irrigation scheduling. Irrigators will be freed from the drudgery of routinely monitoring all inputs and deciding when and how much to irrigate. Completion of this project will bring the full automation product to market sooner and help center pivot irrigators begin realizing increased irrigation performance while conserving our nation’s water resources.

**b. Project Objectives:** Specific objectives are to:

- Complete the development of the CPA system by integrating the monitoring and control hardware with the irrigation scheduling software.
- Develop a user-friendly interface for cooperators to use when monitoring and controlling the irrigation system.
- Conduct field trials of the CPA system to test how well the automation performs and whether the cooperators are able to improve irrigation water management.
- Monitor the CPA system under field conditions to determine water use and efficiency.

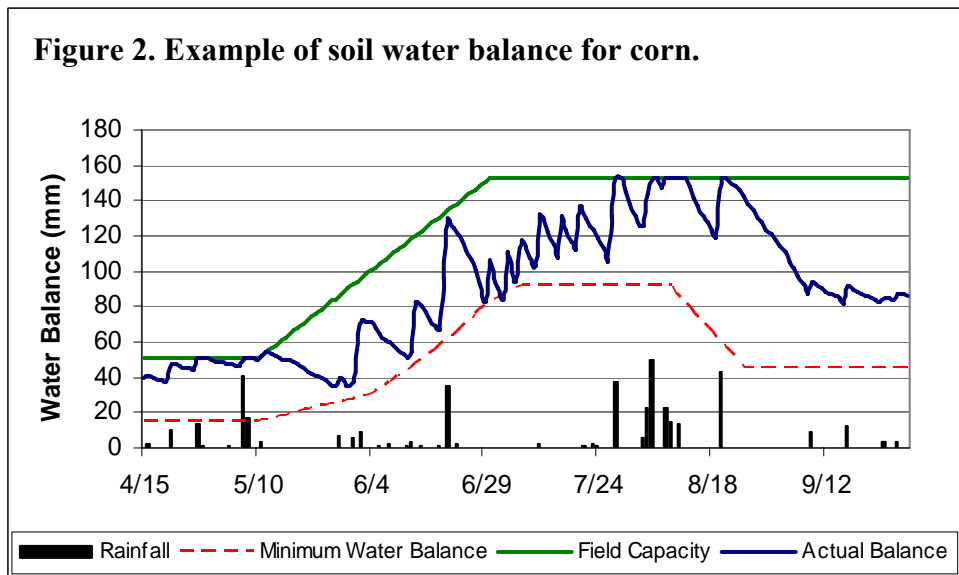
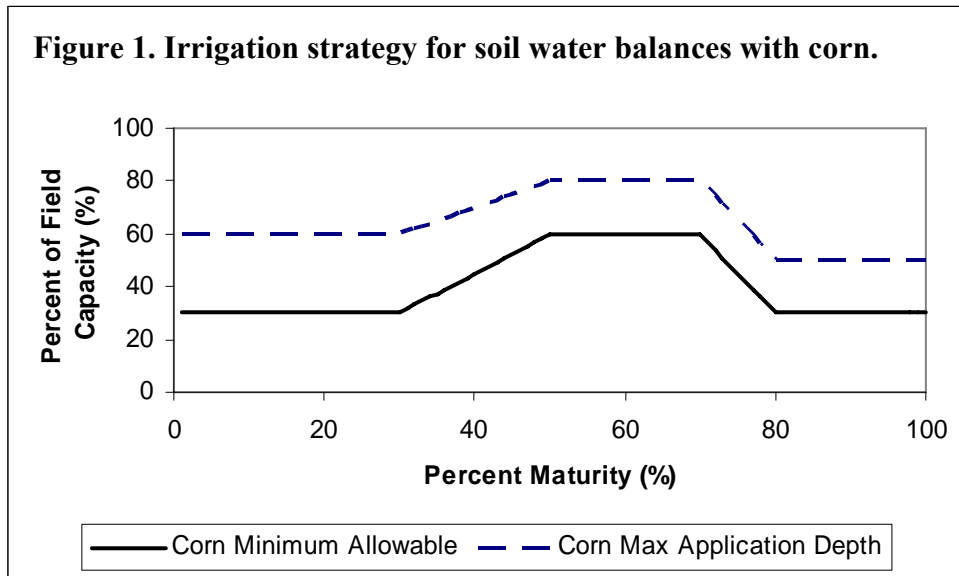
The overall **goal** of this project is to implement an effective water management system for center pivot irrigation that farmers will accept and use. The **expected outcome** is that farmers will improve production and save water while protecting the environment.

**c. Project Methods:** The center pivot automation (CPA) system combines a proven monitoring and control package with an irrigation scheduling software package. The CPA hardware developed by AgSense interacts with the control panel of the center pivot machine. Flow, pressure, and electrical sensors monitor the status of the center pivot while GPS monitors its position. Weather sensors mounted on the irrigation system monitor rainfall, temperature, wind, relative humidity, and solar radiation. Soil moisture sensors are strategically placed within the irrigated area and radio telemetry is used to transmit readings back to the main panel. Data are collected continuously and transmitted by telemetry providing access from anywhere via the internet.

The unique component of the CPA system is the irrigation scheduling software. This innovative software collects real-time data from in-field sensors and develops an irrigation schedule including when to start and stop the irrigation machine along with how much water to apply. The software uses the ASCE Penman equation for a tall crop reference to calculate  $ET_r$  from in-field weather data (Equation 1). After applying a crop coefficient and a soil water coefficient, the soil water balance is calculated and crop water needs are forecasted for individual segments of the irrigated field.

$$ET_r = \frac{0.408\Delta(R_n - G) + \gamma \frac{1600}{T + 273} \mu_2 (e_s - e_a)}{\Delta + \gamma(1 + 0.38\mu_2)} \quad \text{Equation 1}$$

The CPA software logic is complex due to the operation of the center pivot machine, i.e. it may take several days to complete the irrigation cycle. At the same time, soil moisture balances need to be maintained above prescribed levels at all parts of the field while leaving storage for rainfall (Figure 1). Figure 2 shows an example of how the scheduling software maintains the soil water balance.



The center pivot may also have multiple crops that need to be managed differently. Each crop type has a distinct crop coefficient to use when calculating ET from the ASCE reference ET. Additional constraints may include low system capacity, time restrictions on the water supply, and downtime for maintenance or as a result of electric load management. The software also considers any operator-imposed management constraints.

The center pivot will be automatically operated and managed within the constraints of the system to best achieve the irrigation schedule. Simulations conducted by SDSU have shown that the software performs well over a wide range of locations, soils, and system capacities (Oswald, 2006). Finally, the software monitors and records all of the sensor data to maintain a complete record of operation including hours of operation, water used, weather conditions, and soil moisture balances.

The CPA system will be installed and tested on a minimum of three selected EQIP cooperators during 2006 and 2007. Technical assistance and training will be provided to the cooperators by the project team. Where possible, water use and crop production for the CPA systems will be monitored and compared to nearby systems that use typical grower management.

Finally, results of the project will be delivered to farmers and the irrigation industry through publications, web pages, and media reports. A dedicated web page will be developed for the project. Presentations will be made at local, state, multistate, and national meetings. Project staff will work with NRCS staff to develop recommendations for implementing CPA as an eligible IWM practice that meets the requirements of the South Dakota Technical Guide and the National Irrigation Handbook, Irrigation Chapter.

**d. Location and size of project or project area:** Field testing of the CPA system will be conducted in a five county area of western South Dakota that has about 150,000 acres of

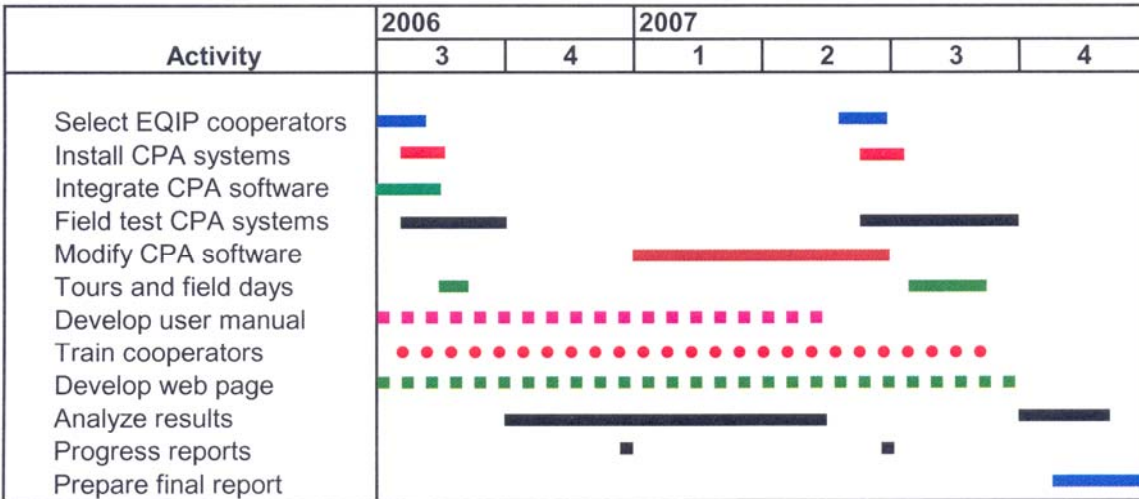


permitted irrigation including three Bureau of Reclamation projects. At least 30 to 40 center pivots currently exist in the area with plans to convert more surface irrigated acres to center pivots in the future. The CPA system could be used for IWM with center pivots on many of the 300,000 acres in South Dakota and the 20 million acres nationwide.

For this project, the CPA system will be installed and tested on a minimum of three center pivots in the five county area, irrigating from 300 to 400 acres. These center pivots will be the focal point of a variety of educational events. The CPA system will be available for use by any farmers that would install the required components.

**e. Producer participation:** EQIP-eligible producers will be selected to participate for the field trials. Cooperators will be selected with the assistance of NRCS and irrigation district staff. This project will provide the CPA hardware that will be installed by project staff. Each producer will provide in-kind commitment of land use for the trials and will be expected to provide suitable internet access for the remote monitoring and control. The cooperators will participate in training on soil moisture, ET, irrigation scheduling, data collection and use, and operation and maintenance of the CPA system. They will also keep records, collect production data, and provide feedback on the CPA system including benefits and drawbacks.

f. **Project action plan and timeline:** Activities and proposed timeline are shown below.



Note: the anticipated start date is July 1, 2006, rather than August 1, 2006. This would facilitate operating the CPA field tests for a longer portion of the irrigation season.

**g. Project management:**

Director: Dr. Hal Werner, SDSU

The project director will be responsible for project management including maintaining progress toward the objectives, collaboration with RESPEC and AgSense, selecting and training EQIP cooperators, liaison with cooperators and other staff, evaluating the results of the project, and preparing reports. He will also provide the technical expertise on irrigation scheduling, soil moisture, crop water use, and water management aspects to the project. The project director will supervise the preparation of the CPA operator’s manual that will be used for training and operation.

Subcontractor: RESPEC Consulting

RESPEC Consulting will provide operational management services to the project. They will assist with installation of the hardware, provide software services, provide training and technical assistance on-site to the cooperators, and analyze water management results.

RESPEC Consulting has considerable experience in water resources management, especially water resources in the Belle Fourche River watershed area. Jared Oswald, who developed the irrigation scheduling software for the CPA system, has recently joined the RESPEC team and should be a valuable resource to the project.

Collaborator: Mel Wieting, President, AgSense, LLC

Mel Wieting and his staff will provide technical expertise in electronics, telemetry, software integration, and interfacing/control.

Other staff: Area and county NRCS staff together with irrigation district staff will assist with selecting cooperators for the project and verifying their eligibility for EQIP participation.

Irrigation district staff will schedule water deliveries during the irrigation season.

**h. Benefits or results expected and transferability:** Science-based irrigation scheduling has been shown to save water and increase yields (Field et al., 1988, Steele et al., 1994, Shae et al., 1999, Heinemann et al., 2000, Steele et al., 2000). Steele et al. (2000) were able to save 30% in irrigation inputs (water and energy) with 5% higher yields using scientific practices in field trials in North Dakota as compared to grower practices. The CPA system should allow farmers to achieve similar results with a minimum of labor and time.

CPA will relieve center pivot operators from the daily tasks of checking soil moisture, obtaining weather data, calculating ET, planning an irrigation schedule, and then controlling the center pivot either on-site or remotely. The CPA system will perform all of these tasks with minimal intervention, freeing the operator to concentrate on higher-level management inputs.

Primary beneficiaries of the CPA system will be irrigation farmers. CPA should improve crop yields while saving water, energy, and time/labor. The water that is saved may be available to the farmer for other fields or for other uses/users. This is critical as water shortages emerge

now and in the future, especially in western South Dakota. Finally, the CPA system minimizes excess water application that could cause runoff or leach agrochemicals into the ground water.

Results of the testing of the CPA systems under this project would be transferable to many of the 200,000 center pivots in the United States. The monitoring and control system marketed by AgSense can be used on most existing center pivots and is currently installed on a variety of center pivot brands, some of which are more than 20 years old. Any system that can be controlled remotely can be managed by the irrigation scheduling software.

**i. Project evaluation:** Evaluation of the project will be ongoing by the project director in collaboration with RESPEC Consulting. By its very nature, this project will be able to closely monitor and record water use, hours of operation, ET, weather, and soil moisture status.

Improvements to the CPA system will be based on field evaluations and farmer feedback after each of the irrigation seasons along with assessment of potential customers needs.

**j. Environmental impacts:** The project will have no known negative environmental impacts. However, improved water efficiency as a result of using CPA should be beneficial to the environment.

Note: References cited in the project description and vita of project staff are available on request

from Hal Werner at 605/688-5673 or [hal.werner@sdstate.edu](mailto:hal.werner@sdstate.edu) .

**BUDGET INFORMATION - Non-Construction Programs**

OMB Approval No. 0348-0044

**SECTION A - BUDGET SUMMARY**

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1.		\$	\$	\$	\$	\$
2.						
3.						
4.						
5. Totals		\$	\$	\$	\$	\$

**SECTION B - BUDGET CATEGORIES**

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total (5)
	(1)	(2)	(3)	(4)	
a. Personnel	\$	\$	\$	\$	\$
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies					
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges (sum of 6a-6h)					
j. Indirect Charges					
k. TOTALS (sum of 6i and 6j)	\$	\$	\$	\$	\$

7. Program Income	\$	\$	\$	\$	\$
-------------------	----	----	----	----	----

**Authorized for Local Reproduction**

**SECTION C - NON-FEDERAL RESOURCES**

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
8.	\$	\$	\$	\$
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	\$	\$	\$	\$

**SECTION D - FORECASTED CASH NEEDS**

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	\$	\$	\$	\$	\$
14. Non-Federal					
15. TOTAL (sum of lines 13 and 14)	\$	\$	\$	\$	\$

**SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT**

(a) Grant Program	FUTURE FUNDING PERIODS (Years)			
	(b) First	(c) Second	(d) Third	(e) Fourth
16.	\$	\$	\$	\$
17.				
18.				
19.				
20. TOTAL (sum of lines 16-19)	\$	\$	\$	\$

**SECTION F - OTHER BUDGET INFORMATION**

21. Direct Charges:	22. Indirect Charges:
23. Remarks:	

#### **4. Budget justification for federal funds:**

**Title:** Automated Irrigation Management for Water Conservation

##### **Federal Funds**

Personnel funds include labor (student and other) to assist with development of the CPA system including the online interface, assist with field installation and monitoring, and analyze field data. Personnel fund expenditures are heavily weighted during the summer 2006 and 2007 seasons. Fringe benefits on the personnel funds are included.

Travel funds will be used to install the CPA systems and provide technical assistance and training to EQIP cooperators. Travel funds include mileage and per diem for project staff (Project Director and others) to travel from SDSU to the project areas.

Equipment costs include the direct cost of three monitoring and control packages to be installed on cooperator's irrigation systems. The packages include flow and pressure sensors, soil and weather sensors, GPS receivers, microprocessor encoders, and in-field telecommunications.

Other supplies include various materials to interface the system such as connectors and cable and field materials such as instrument enclosures, flags, markers, miscellaneous small tools, etc. Supplies also include office and miscellaneous expenses including copying, computer supplies, telephone, etc.

Contractual costs include subcontracting to RESPEC Consulting for assistance with CPA system installation, development of the on-line user interface, on-site monitoring, CPA system maintenance, training and technical assistance for EQIP cooperators, and analysis of results.

Indirect costs are included calculated at a rate of 15% of the direct federal funds.

##### **Non-Federal Matching Funds**

Federal funds will be used to pay for the CPA system hardware for EQIP cooperators. The cooperators will pay for any additional equipment costs including accessories, office computers and networking, and network access charges. The EQIP cooperators will also contribute in-kind match including time for monitoring and operation of the CPA system, training, and assisting with educational events. The cooperators will also provide a suitable irrigation system, operation (fuel and water costs) and maintenance, and land use charges such as potential crop loss due to equipment installation and monitoring. Cooperators will also provide access to the irrigation site for project personnel and educational events.

AgSense, project collaborator, will provide in-kind matching support for staff time to develop the interface between their hardware package and the online data base. AgSense will also contribute additional staff time for development and troubleshooting, electronic supplies and equipment, and design and fabrication of components. AgSense also provides the telecommunications system/network for data collection and access to the monitoring and control features of the CPA system.

Matching funds from South Dakota State University include time commitments of faculty and staff toward the project, access to resources for development, and support for overall project management. Additional matching funds include fringe benefits for staff and indirect costs for salary match.

**5. Declaration of EQIP Eligibility:**

This project will demonstrate and test the automated irrigation water management package with cooperators who are EQIP eligible. At least three farmers from within five western South Dakota counties will be selected. All of the farmer cooperators in the project will be EQIP eligible. Project staff will coordinate selection of the cooperators with local and area NRCS staff. NRCS will verify that the cooperators are EQIP eligible.

**6. Declaration of Beginning Farmer or Rancher or Limited Resource Farmer or Rancher, or Indian tribe:**

Farmers meeting the designation of Beginning Farmer or Limited Resource Farmer or Rancher will be considered equally during the process of selecting irrigator cooperators.

**7. Certifications:**

Attached is Standard Form 424B – Assurances, Non-construction Programs.

**8. DUNS Number:** SDSU DUNS Number is 92-992-9743.

**9. CCR Registration:** SDSU is registered in the Central Contractor Registry database.



**ASSURANCES - NON-CONSTRUCTION PROGRAMS**

Public reporting burden for this collection of information is estimated to average 15 minutes per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to the Office of Management and Budget, Paperwork Reduction Project (0348-0040), Washington, DC 20503.


**PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.**

**NOTE:** Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.
2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.
3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.
4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.
5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).
6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.
7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.
8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.
10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is \$10,000 or more.
11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).
12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.
13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).
14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.
15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.
16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.
17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."
18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL 	TITLE Assoc. Dean of Office of Res. and Spons. Prog.	
APPLICANT ORGANIZATION South Dakota Sate University		DATE SUBMITTED April 26, 2006

**COLLEGES AND UNIVERSITIES RATE AGREEMENT**

EIN #: 46-6000364

DATE: January 24, 2000

INSTITUTION:  
South Dakota State University  
P.O. Box 2201

FILING REF.: The preceding  
Agreement was dated  
March 3, 1999

Brookings SD 57007-1998

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

**SECTION I: FACILITIES AND ADMINISTRATIVE COST RATES\***

RATE TYPES: FIXED FINAL PROV. (PROVISIONAL) PRED. (PREDETERMINED)

TYPE	EFFECTIVE PERIOD		RATE (%)	LOCATIONS	APPLICABLE TO
	FROM	TO			
PRED.	07/01/99	06/30/01	42.0	On-Campus	Organized Research
PRED.	07/01/01	06/30/04	42.5	On-Campus	Organized Research
PRED.	07/01/04	06/30/06	43.0	On-Campus	Organized Research
PROV.	07/01/06	06/30/08	42.0	On-Campus	Organized Research
PRED.	07/01/99	06/30/06	26.0	Off-Campus	Organized Research
PRED.	07/01/99	06/30/06	45.0	On-Campus	Instruction
PRED.	07/01/99	06/30/06	26.0	Off-Campus	Instruction
PRED.	07/01/99	06/30/06	30.0	On-Campus	Other Spons. Act.
PRED.	07/01/99	06/30/06	23.3	Off-Campus	Other Spons. Act.
PROV.	07/01/06	UNTIL AMENDED	Use same rates and conditions as those cited for fiscal year ending June 30, 2006.		

\*BASE: Modified total direct costs, consisting of all salaries and wages, fringe benefits, materials and supplies, services, travel, and subgrant and subcontracts up to the first \$25,000 of each subgrant or subcontract (regardless of the period covered by the subgrant or subcontract). Equipment, capital expenditures, charges for patient care and tuition remission, rental costs, scholarships, and fellowships as well as the portion of each subgrant and subcontract in excess of \$25,000 shall be excluded from modified total direct costs.

INSTITUTION:  
South Dakota State University

AGREEMENT DATE: January 24, 2000

---

SECTION II: SPECIAL REMARKS

---

TREATMENT OF FRINGE BENEFITS:

This organization charges the actual cost of each fringe benefit direct to Federal projects. However, it uses a fringe benefit rate which is applied to salaries and wages in budgeting fringe benefit costs under project proposals. The fringe benefits listed below are treated as direct costs.

TREATMENT OF PAID ABSENCES:

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims for the costs of these paid absences are not made.

DEFINITION OF OFF-CAMPUS: A project is considered off-campus if the activity is conducted at locations other than in University owned or operated facilities and indirect costs associated with physical plant and library are not considered applicable to the project.

DEFINITION OF EQUIPMENT

Effective 07/01/99, equipment is defined as tangible nonexpendable personal property having a useful life of more than one year and an acquisition cost of \$5,000 or more per unit.

The following fringe benefits are treated as direct costs:

FICA, STATE RETIREMENT, UNEMPLOYMENT INSURANCE, HEALTH/LIFE INSURANCE, AND WORKERS COMPENSATION.

INSTITUTION:  
South Dakota State University

AGREEMENT DATE: January 24, 2000

SECTION III: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the organization were included in its facilities and administrative cost pools as finally accepted: such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The same costs that have been treated as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Office of Management and Budget Circular A-21 Circular, and should be applied to grants, contracts and other agreements covered by this Circular, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

BY THE INSTITUTION:  
South Dakota State University

\_\_\_\_\_  
(INSTITUTION)

Michael P. Reger  
(SIGNATURE)

Michael P. Reger  
(NAME)

Vice President for Administration  
(TITLE)

2/1/00  
(DATE)

BY THE COGNIZANT AGENCY  
ON BEHALF OF THE FEDERAL GOVERNMENT:

\_\_\_\_\_  
DEPARTMENT OF HEALTH AND HUMAN SERVICES

(AGENCY)

David S. Low  
(SIGNATURE)

David S. Low  
(NAME)

\_\_\_\_\_  
DIRECTOR, DIVISION OF COST ALLOCATION

(TITLE)

January 24, 2000

(DATE) 1085

HHS REPRESENTATIVE: Robert W. Lee

Telephone: (415) 437-7820