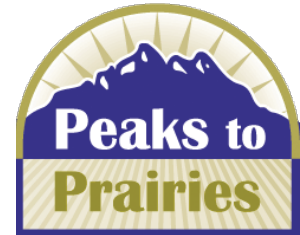


E3 IN MONTANA AGRICULTURE

E3.PeaksToPrairies.org



Peaks to Prairies Pollution Prevention Information Center



- Regional P2Rx center for EPA's Region 8
www.peakstoprairies.org
- Located at Montana State University in Bozeman
- Part of Housing and Environmental Health Dept in Extension
- Also coordinate the nationwide Tribal P2 workgroup
www.tribalp2.org and Greening Local Government Initiative
for Region 8 www.greenlocalgovernment.org

Tribal P2

Pollution Prevention
Network
www.tribalp2.org



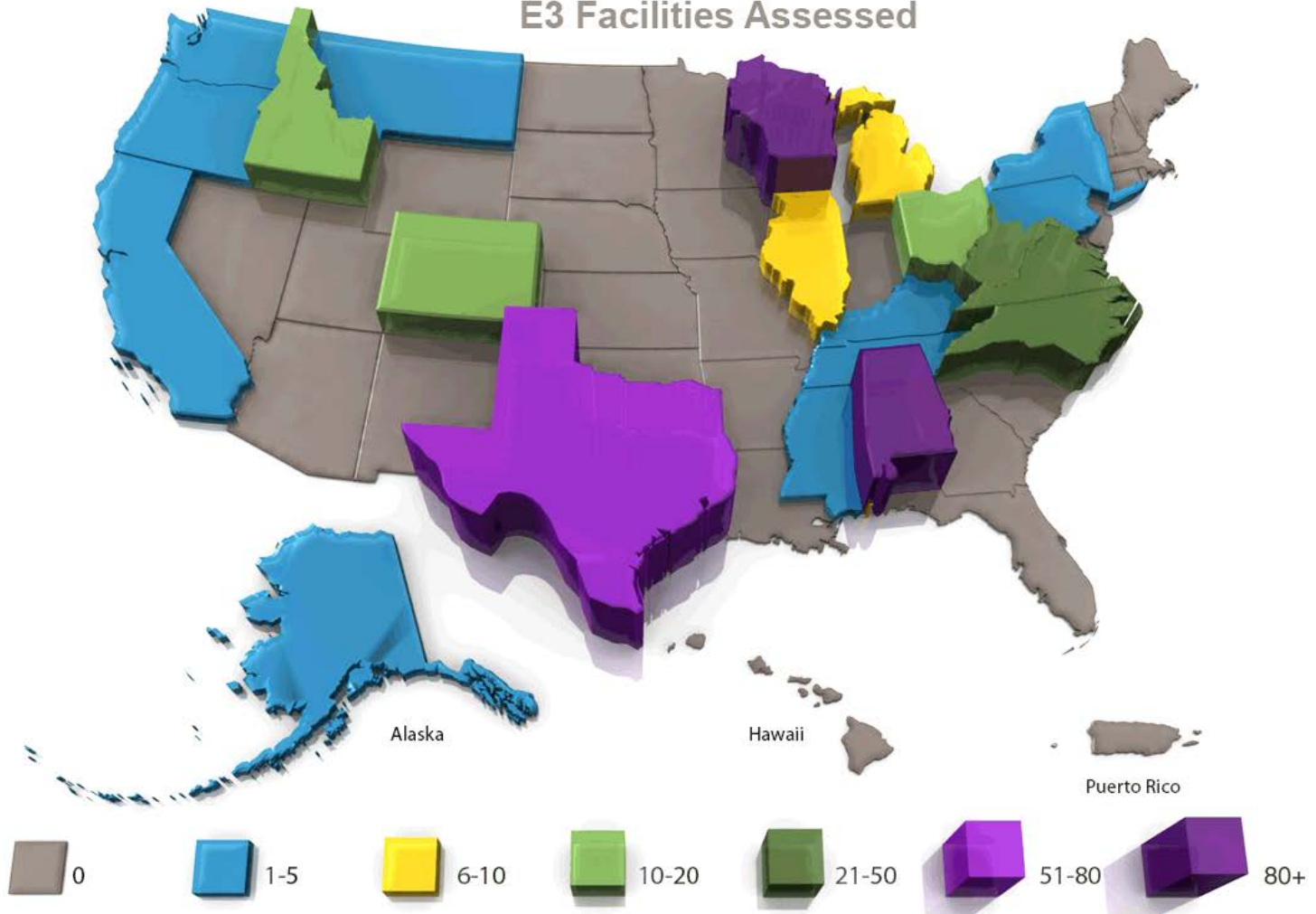


E3: ECONOMY • ENERGY • ENVIRONMENT

SUPPORTING MANUFACTURING LEADERSHIP THROUGH SUSTAINABILITY



E3 Facilities Assessed



March 2014

E3 in Montana Agriculture

- Initial discussions began in spring 2012
- Oct 2012 EPA Region 8 awarded Peaks to Prairies a Source Reduction Grant of \$110,626
- Objective: Through hands-on E3 assessments we work with our agricultural community to reduce energy consumption, increase productivity, minimize carbon emissions, prevent pollution, & drive innovation.
- Fall 2012 filled with a series of phone and personal meetings to discuss partnership opportunities with potential stakeholders.
- Fall 2013 – Awarded a Region 8 Source Reduction Grant of \$90,000 to expand pilot to statewide implementation (12-15 assessments).

E3 in Montana Agriculture GOAL

- Our goal is to ensure that by participating in E3, we have put our agricultural producers in the best position possible to maximize available financial opportunities in order to implement E3 recommendations.

What is the highest bar?

How do we make it happen...

1. Finding willing producers
2. Conducting assessments
3. Securing implementation dollars





Partnerships



Cooperative Extension Service, USDA

Montana State University Extension – Professionals in each county of the state are in place to help Montana agricultural producers and land owners increase profits, reduce loss, protect our food supply and sustain future resources. They have an established trust relationship with producers and are essential in:

1. Finding producers willing to participate in an E3 assessment
2. Communicating the benefits of an E3 assessment and subsequent implementation of recommendations, and
3. Communicating successful outcomes to other producers in the state.

Natural Resource Conservation Services (NRCS) - NRCS conservationists work on agricultural land through field offices that serve every county in the state.

1. NRCS has developed numerous technical tools such as the Cropland Energy Estimator that will be important in calculating many of the E3 metrics.
2. NRCS also has funding sources such as the Environmental Quality Incentives Program (EQIP). This is our highest bar, so we must ensure our assessments are compliant with EQIP technical service provider requirements.



Rural Development (RD) – Montana (Region 8) is almost entirely a rural state and the mission of RD is to improve the quality of life for rural Montanans. The grants and loan opportunities that RD has available for agricultural producers include:

- Renewable Energy for America (REAP) program,
- Value added producer grants, and
- Loan guarantee programs.

Farm Services Agency (FSA) – FSA makes guarantee loans to family farmers and ranchers to promote, build, and sustain family farms in support of a thriving agricultural economy.

- Guaranteed Conservation Loan - provides a maximum loan amount of over a million dollars to implement any conservation practice in an NRCS approved conservation plan.

E3 IN MONTANA AGRICULTURE

E3.PeaksToPrairies.org







Myla Kelly, Coordinator Peaks to Prairies at Montana State University
myla.kelly@montana.edu 406-994-6948



Photo Courtesy of USDA NRCS



Photo Courtesy of USDA NRCS

Landscape Evaluations



Irrigation System Audit Report

Date of Audit: 06/10/04

Skinner Angus Ranch

System Information

Account Number(s): 589729

Brief Description: Centrifugal pump, 1/2 circle pivot

Meter Number: 56 554 474

Pumping Plant

Motor Nameplate Data

Make: U.S. Electric Motors
Model or Serial No.: AA95
Rated HP: 25
Rated Volts: 230/460
Rated Amps: 60/30
Frame: 284JPZ
Service Factor: 1.15
RPM: 1775
Rated Efficiency: 92.4%
No. Phases: 3

Pump Nameplate Data

Make: Cornell
Type: Centrifugal
Model: 4RB-25-4
Serial No.: 116570
Impeller Diameter: 10.5 Inches
Rated Flow: GPM
Rated Head: FT

Suction Side of Pump

Suction Pipe Internal Diameter: 0 in.
Pipe Material: Steel
Suction Lift/Pumping Water Level: 1.5 FT
OR Suction Head: 0 FT
Pipe & Fittings Friction Loss: 0.42 FT

Discharge Side of Pump

Discharge Pipe Internal Diameter: 7.794 inches
Pipe Material: Steel
Discharge Pressure: 40 psi
Water Source: Ditch
Pipe & Fittings Friction Loss: 0.33 FT

Results of Pumping Plant Efficiency Audit

Electrical Measurements

Electrical Power Input: 17.6 kW
Input Horsepower: 23.6 HP

Method Used: Power Measurement Method

Input horsepower is the power delivered to the motor. It is the power that you are actually billed for.

Flow and Head Measurements

Discharge Velocity: 4.4 FPS
Flow Rate: 647.0 GPM

Type of Flowmeter Used: Ultrasonic
Total Dynamic Head (TDH): 95.6 FT

Horsepower & Efficiency Calculations

Water Horsepower: 15.6 HP
Overall Pumping Plant Efficiency: 66.3%
(Efficiency of Pump and Motor Together)
Brake Horsepower: 21.8 HP
Motor Efficiency: 92.4% (est.)
Pump Efficiency: 71.8%
(Estimated efficiency of Pump alone)

Overall pumping plant efficiency is the ratio of the output power into the water to the input power to the motor.

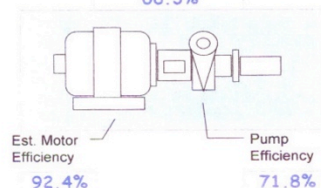
Brake horsepower is the power actually delivered to the pump impeller. It's the horsepower value you see on pump curves.

Pumping Plant Efficiency

The Pumping Plant Efficiency of your 25 HP Centrifugal Pump= 66.3%

Your Overall Pumping Plant Efficiency
66.3%

This is compared to an achievable efficiency of 70%



Achievable Pumping Plant Efficiencies

Motor HP	Turbine Pumps	Centrifugal Pumps
0-25	67%	70%
25-75	69%	71%
75-150	70%	72%
150 +	71%	74%

Irrigation System Audit Report

Skinner Angus Ranch

Energy Consumption

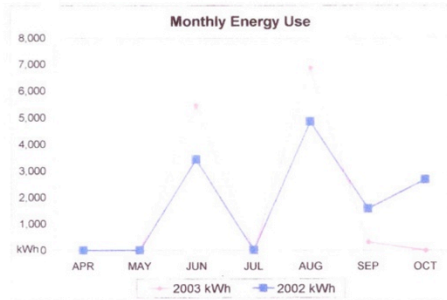
Account Number(s): 589729
Meter Number: 56 554 474

25 HP Irrigation Pump
Acres Irrigated on this Account 90

Year: 2003 kWh per Acre-Foot: 99.6
Total Cost per Acre: \$10.77

MON	KWH	KW	\$KWH	\$KW	TOT ELE \$
APR					
MAY					
JUN	5,457	21	\$184	\$169	\$352
JUL					
AUG	6,870	21	\$299	\$169	\$467
SEP	303	17	\$13	\$137	\$150
OCT					
TOT	12,630	59	\$495	\$474	\$969

% TOTAL ENERGY COSTS Energy 51.1% Demand 48.9%



Year: 2002 kWh per Acre-Foot: 131.7
Total Cost per Acre: \$11.35

MON	KWH	KW	\$KWH	\$KW	TOT ELE \$
APR					
MAY					
JUN	3,424	21	\$90	\$169	\$258
JUL					
AUG	4,847	17	\$163	\$137	\$300
SEP	1,569	17	\$53	\$137	\$189
OCT	2,671	23	\$90	\$185	\$275
TOT	12,511	78	\$395	\$626	\$1,022

% TOTAL ENERGY COSTS Energy 38.7% Demand 61.3%



Rate Schedule before 6/30/02

Demand Metered Irrigation Pumps
Energy (\$/kWh) \$0.026228
Demand (\$/kW) \$8.031622

Rate Schedule from 7/15/03 to 2004

Demand Metered Irrigation Pumps
Energy (\$/kWh) \$0.043455
Demand (\$/kW) \$8.031622

Remarks:

2004 Irrigation rates are subject to monthly adjustments

Rate Schedule from 7/01/02 to 7/14/03

Demand Metered Irrigation Pumps
Energy (\$/kWh) \$0.033627
Demand (\$/kW) \$8.031622

Rate Schedule for 2004

Demand Metered Irrigation Pumps
Energy (\$/kWh) \$0.042802
Demand (\$/kW) \$8.031622



Energy Estimator: Irrigation Tool

User Input

State: **Montana**
Irrigation System: **Sprinkler**
Power Source: **Electric**
Well Lift: **3 (ft)**
System Pressure: **44 (PSI)**
Energy Cost: **\$.105 / KWH**

System Modifications
No Flow Meter
Yes Irrigation Scheduling
Yes Maintenance & Upgrades

Crop: **Hay**
Acres irrigated: **135 (acres)**
Application: **10 (ac-in/ac)**

Seasonal Irrigation System						
Description	Water Use Analysis		Energy Costs Analysis		<u>Pumping Plant</u> Evaluation Added	
	Current Water Use (ac-ft)	Reduction in Water Usage (ac-ft)	Energy Costs (\$)	Energy Costs Savings (\$)	Energy Costs (\$)	Energy Costs Savings (\$)
Your System Today	113		\$2,265		\$1,925	\$340
Add Flow Meter to your system	106	7	\$2,133	\$132	\$1,813	\$452

Congratulations! By using Irrigation Scheduling and Maintenance and Upgrades you are saving \$315 irrigating this crop with your system today.

The above results are estimates based on NRCS models to help you understand your irrigation water and pumping usage on your farm. For site specific irrigation water and pumping recommendations, contact your local land grant university. Please visit your local NRCS office for additional assistance.

AN NRC
CROPLAND
ENERGY
ESTIMATION
TOOL

Directions: Step: 1 Fill in the orange and red shaded cells located in this "Input" tab. All required input cells are located in this tab and are separated into a Benchmark or currently operated and a Planned or potential operation through energy reduction measures of a

field. An explanation of each input variable is contained in the Definitions tab. Additional shaded cells will appear as additional crop names are selected from the "Crop Interval, Name, and Growth Dates" tables.

Step 2: Formatted energy balance summaries are located in the Report* tabs for printing.

BENCHMARK

Start Date

5/15/2013

End Date

9/30/2020

Rotation Period (Yrs)

7.38

Landowner Information	
Landowner	Skinner Ranch
State	Montana
County	Granite
Date	11/26/2013
Latitude, [decimal degrees]	46.5972
Longitude, [decimal degrees]	113.2769

Background Information	Benchmark
Field Acres	260
Field ID	
Field Description	

Crop Interval, Name and Growth Dates					
Crop Interval	Crop Name	Specific Crop Description	Year Crop Harvested [YYYY]	Biomass Yield ratio [-]	Labor [hr/acre]
1	Alfalfa brome	Alfalfa brome, fall seed senes to yr2 regrowth	2013	1.00	10.0
2	Triticale	Triticale, hay	2020	1.00	10.0
3					
4					
5					

Field Operations Diesel Use: Crop Interval 1 (Benchmark)				
Crop Name	Operation	Operation Description	Number of Times per Interval	Diesel Use [gal/ac]
Alfalfa brome	Tillage	Plow, moldboard	1	1.87
	Tillage	Disk, offset, heavy	2	1.8
	Tillage	Harrow, spike tooth	1	0.34
	Planting	Planter, double disk opnr	1	0.44
	Harvest	Mower, swather, on stubble 4in	2	0.7
	Harvest	Bale combine windrows	2	0.76
	Manual Input	Manually Input Operation Description and Diesel Use (if needed)	NA	
	Manual Input	Manually Input Operation Description and Diesel Use (if needed)	NA	
Field Operations Diesel Use: Crop Interval 2 (Benchmark)				
Triticale	Tillage	Plow, moldboard	1	1.87
	Tillage	Disk, offset, heavy	1	0.9
	Tillage	Harrow, spike tooth	1	0.34
	Planting	Planter, double disk opnr	1	0.44
	Harvest	Mower, swather, on stubble 4in	1	0.35
	Harvest	Bale combine windrows	1	0.38

Diesel
 Use
 [BTU/gal]

Home Page

Greenhouse Gas Table

GHG Emission Coefficients (EC)

in lbs. per unit of energy input

Energy Input

Units

Energy

CO₂

N₂O

CH₄

Total CO₂

SO₂

NO_x

[MMBTU]

[lb]

[lb]

[lb]

Equivalent [lb]

[lb]

[lb]

Liquid

Diesel

Gal

0.1400

22.3769

0.0005

0.003

22.586

0.0003

0.018

Gasoline

Gal

0.1260

19.6432

0.0006

0.003

19.888

0.0003

0.011

BioDiesel B2

Gal

0.1262

21.9139

0.0005

0.003

22.126

0.0001

0.010

BioDiesel B5

Gal

0.1262

21.2526

0.0005

0.003

21.461

0.0001

0.010

BioDiesel B10

Gal

0.1262

20.1282

0.0005

0.003

20.337

0.0001

0.010

BioDiesel B20

Gal

0.1273

17.9015

0.0005

0.003

18.110

0.0001

0.010

BioDiesel B100

Gal

0.1183

0.000

0.0005

0.003

0.209

0.0001

0.010

SVO

Gal

0.1231

0.000

0.0005

0.003

0.209

0.0001

0.010

Gas

Propane

Gal

0.0916

12.6545

0.0004

0.002

12.821

0.0001

0.010

Natural Gas

CCF

0.1020

11.6977

0.0004

0.002

11.864

0.0001

0.010

CNG

CCF

0.1000

12.0372

0.00386

0.002

13.275

0.0001

0.010

Electricity

Electricity

KWH

0.0034

0.8588

0.00001

0.00002

0.900

0.0013

0.0015

Other Energy Input

Soil Admendments

Ton

11.25

0.000

0.0000

0.000

0.000

0.0000

0.000

Agrichemical

lb

Varies

0.000

0.0000

0.000

0.000

0.0000

0.000

Labor

Day

0.0119

0.000

0.0000

0.000

0.000

0.0000

0.000

Zip Code

59832

Headquarters Considerations



Farm Name: Skinner Ranch

[illegible]

** T12 - T12 Fluorescent (1-1/2" dia), T8 - T8 Fluorescent (1" dia), T5 - T5 Fluorescent (5/8" dia),
HO - High Output Fluorescent (example T12 HO)
CFL - Compact Fluorescent Lamp, MV - Mercury Vapor, MH - Metal Halide,
PSMH - Pulse Start Metal Halide, HPS - High Pressure Sodium, IN - Incandescent, H - Halogen

This is a list of the lamp types / wattages typically found in agricultural enterprises and included in the tool.

Lamp Type / Model / wattage

Incandescent - 25W
 Incandescent - 34W
 Incandescent - 40W
 Incandescent - 52W
 Incandescent - 60W
 Incandescent - 65W
 Incandescent - 75W
 Incandescent - 90W
 Incandescent - 100W
 Incandescent - 120W
 Incandescent - 150W
 Incandescent - 200W
 Incandescent - 300W
 CFL - 11 W - "40" #
 CFL - 13 W - "60" #
 CFL - 15 W - "60" #
 CFL - 18 W - "75" #
 CFL - 20 W - "75" #
 CFL - 23 W - "100" #
 CFL - 25 W - "100" #
 CFL - 30 W - "120" #
 CFL - 40 W - "150" #
 CFL - 42 W - "150" #
 CFL - 55 W - "200" #
 CFL - 60 W - "250" #
 CFL - 80 W - "350" #
 CFL - 100 W - "400" #
 CFL - 150 W - "650" #
 CFL - 200 W - "850" #
 Halogen - 75 W
 Halogen - 100 W
 Halogen - 150 W
 Halogen - 250 W
 Halogen - 300 W
 Halogen - 350 W
 Halogen - 500 W
 Halogen - 600 W
 Halogen - 800 W
 Halogen - 1000 W
 Halogen - 1500 W
 T-12 Fluorescent 1 bulb x 4ft
 T-12 Fluorescent 2 bulb x 4ft
 T-12 Fluorescent 1 bulb x 8ft
 T-12 Fluorescent 2 bulb x 8ft
 T-12 Tandem Fluorescent 1 bulb x 8ft (2- 48" bulbs)
 T-12 Tandem Fluorescent 2 bulb x 8ft (4-48" bulbs)

Lamp Type / Model / wattage

T-12-HO Fluorescent 1 bulb x 4ft
 T-12-HO Fluorescent 2 bulb x 4ft
 T-12-HO Fluorescent 1 bulb x 8ft
 T-12-HO Fluorescent 2 bulb x 8ft
 T5 1-bulb x 45"
 T5 2-bulb x 45"
 T5 4-bulb x 45"
 T5 6-bulb x 45"
 T5-HO 1-bulb x 45"
 T5-HO 2-bulb x 45"
 T5-HO 4-bulb x 45"
 T5-HO 6-bulb x 45"
 T-9 Circular
 T8-1 bulb x 4 ft
 T8-2 bulb x 4 ft
 T8-6 bulb x 4 ft
 T8-1 bulb x 8 ft
 T8-2 bulb x 8 ft
 T8-Tandem 1 bulb x 8 ft (2-48" bulbs)
 T8-Tandem 2-bulb x 8 ft (4-48" bulbs)
 T8-HO 1 bulb x 8 ft
 T8-HO 2 bulb x 8 ft
 Mercury Vapor - 100 W
 Mercury Vapor - 175 W
 Mercury Vapor - 250 W
 Mercury Vapor - 400 W
 Mercury Vapor - 1000 W
 Metal Halide - 100 W
 Metal Halide - 150 W
 Metal Halide - 175 W
 Metal Halide - 250 W
 Metal Halide - 320 W
 Metal Halide - 350 W
 Metal Halide - 400 W
 Metal Halide Pulse Start - 100 W
 Metal Halide Pulse Start - 150 W
 Metal Halide Pulse Start - 175 W
 Metal Halide Pulse Start - 250 W
 Metal Halide Pulse Start - 320 W
 Metal Halide Pulse Start - 350 W
 Metal Halide Pulse Start - 400 W
 Hi-Pres. Sodium - 70 W
 Hi-Pres. Sodium - 100 W
 Hi-Pres. Sodium - 150 W
 Hi-Pres. Sodium - 200 W
 Hi-Pres. Sodium - 250 W
 Hi-Pres. Sodium - 400 W

W - watt of electricity

- "XX" - Value in quotes indicated the approximate equivalent wattage for an incandescent bulb with the same light output.

Next Steps – Matching project recommendations with funding mechanisms

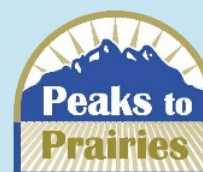
- USDA
 - Farm Services of America
 - Rural Development
 - REAP
 - Renewable Energy and Energy Efficiency Loan Guarantees
 - Value- Added Producer Grants
 - Natural Resources Conservation Service
 - EQIP
- Department of Commerce
- Department of Energy
- Small Business Administration
- Department of Labor
- Environmental Protection Agency
- Sustainable Agriculture and Food Systems Funders <http://www.safsf.org/>

Next Steps

- Identify a good fit
- Sit down/communicate with local offices to get an indication of whether you're on the right track
- For projects that don't cleanly fit within a program, what are other creative funding mechanisms?

Funding Opportunities for Energy Efficiency Projects in Agriculture Production

Using E3 (Economy, Energy and Environment) to identify and fund energy efficiency and environmental projects for agricultural producers



Funded in part by grants from US EPA's Office of Chemical Safety and Pollution Prevention
© 2013 Montana State University Extension Housing & Environmental Health Program

Farm Services of America

Guaranteed Conservation Loans

Program Description: Conservation loan funds are used to implement any conservation practice in an NRCS approved conservation plan, as well as being used to refinance debts related to implementing an NRCS approved conservation plan. The rate on these loans is determined by the lender for a term not to exceed 30 years and there is a loan guarantee fee of 1.5%.

Example projects include: Funds can be used to implement a conservation practice approved by the Natural Resources and Conservation Service, such as to reducing soil erosion, improving water quality, and promoting sustainable and organic agricultural practices.

Who is eligible: Eligibility requirements include being a citizen of the United States, a non-citizen national, or a qualified alien, as well as possessing the legal capacity to obtain a loan. The operation must be a family farm or ranch, and the majority of the physical labor and management is provided by you, a family member, or another entity member, as well as not having any debt to the U.S. Government.

Funding Amount: \$1,355,000 (amount adjusted annually for inflation)

How/when to apply: applicant information available on www.fsa.usda.gov

Link: <http://www.fsa.usda.gov>



Farm Services of America

Direct Operating Loans

Program Description: Operating loans will help you purchase livestock, poultry, equipment, feed, seed, farm chemicals and supplies, and pay for minor real estate repairs and annual operating expenses. It will also assist with soil and water conservation, or to refinance debts with certain limitations.

Example projects include:

Who is eligible: Eligibility requirements include being a citizen of the United States, a non-citizen national, or a qualified alien, as well as possessing the legal capacity to obtain a loan. You must be able to prove that you cannot obtain credit elsewhere at reasonable rates and terms, and have good credit history. Your operation must be a family farm or ranch, with the majority of the physical labor and management being provided by you, a family member, or another entity member. The loanee cannot have experienced debt forgiveness or be behind in any debt to the U.S. Government when the loan is closed.

Funding Amount: \$300,000

How/when to apply:

Link: <http://www.fsa.usda.gov>



Program sustainability

- Building this knowledge & awareness of implementation opportunities/ funding mechanisms is another large area of capacity building, training potential that we are developing but need partner support.
- Increasing the number of Extension Agents trained in all aspects of the process

E3 IN MONTANA AGRICULTURE

E3: Economy, Energy, and Environment is a coordinated federal and local technical assistance framework that helps communities adapt and thrive in a new business era focused on sustainability by providing customized, hands-on assessments of production processes.

Montana is leading the nation by using this framework with our agricultural producers to reduce energy consumption, increase productivity, minimize their carbon footprint, prevent pollution, and drive innovation.



Identifying and Delivering Energy Savings for our Agricultural Producers

We are currently seeking agricultural producers for E3 Assessments in 2014!

What is involved:

- Producers cooperate with their trained, local Extension Agent to collect on-farm information for: past and current energy usage, irrigation efficiency, diesel maintenance, lighting, harvest and planting regimes, production practices, etc
- Data is collected through pre-assessment interviews and an on-site audit
- Agents compile an E3 Assessment Report with a series of energy efficiency recommendations
- If the producers have an interest, agents will work to align recommendations with potential funding opportunities

How producers benefit:

- ✓ Identification and calculation of energy saving opportunities
- ✓ Assessment results are suitable for submission to multiple federal and state funding programs including USDA NRCS, RD & FSA; MT DEQ; and SBA



To get involved and for more information:

e3.peakstoprairies.org

Myla Kelly – Project Coordinator

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myla.kelly@montana.edu

E3 IN MONTANA AGRICULTURE

E3.PeaksToPrairies.org

