Figure 1 Our first round bale of spring (over-wintered) switch grass straw mulch is shuttled by flat rack from a neighbor's field to our home garden at Scotch Hill Farm near Brodhead, Wis.

PROGRESS REPORT 2012
North Central Region Sustainable Agriculture Research and Education SARE Program

Project Title: Developing round-bale systems to mulch vegetable tranaplants
Project Number: FNC12-857

Producer/Project Leader: Tony Ends, Scotch Hill Farm
Address: 910 Scotch Hill Road, Brodhead, WI 53520
Phone: 608 897-4288 / 354-3243
Email: tony@scotchhillfarm.com
Web site: www.scotchhillfarm.com

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(1) Description of Work Activities in First Year

Coordinating and Planning Project in Challenging Drought Year: Made copies in January of approved project and sent to (1) Dr. Jim Stute, who studied and compared qualities of our small grains straw mulch and switch grass mulch with vegetable crops in our first SARE project; and to (2) my son Joel, 24, who has a technical college welding degree and who agreed to help fabricate

extensions to a water wheel trans-planter to use with rolled bales of switch grass in this second SARE project. I lost partnership in January, however, with a neighboring commercial fruit and vegetable producer for whom I'd baled switch grass on shares for both of us to use as mulch since 2008. He informed me that he no longer needed my machinery or help, as he had finally gotten his own baling machine repaired. This cut out a significant source of prairie grass mulch on which I was relying for this study. I then called a very large commercial and organic cash grain owner in Rock County, seeking partnership with him in plantings (unsuccessfully). I contacted Applied Ecological Services and Taylor Creek Restorations, which manages hundreds of acres of native species seed, including switch grass and which harvests such seeds from private landowners' properties in southern Wisconsin. I sought from them a referral or another switch grass partner (unsuccessfully, thus far). I still hope to work with the Green-Rock Audubon Society to establish switch grass cooperatively on some of the land they own or manage near our farm. A second major challenge to establishing additional stands of switch grass to make large round bales, was the severe drought affecting 14 or more states in the Upper Midwest. My Extension Agent and project adviser, Dr. Jim Stute, alerted me early on in 2012 that severe drought was predicted and warned me not to invest much in establishing grass or hay fields in spring 2012. Our family and farm interns worked very hard through the season and 7 weeks of no rainfall, mid-season, to keep our commercial vegetable crops alive and satisfy our obligations to more than 200 subscribers during the 20-week and November seasons. Much time that I could have devoted to this SARE grant project was invested in shuttling a 460-gallon tank to and from remote fields to gravity feed drip tape irrigation, and moving sprinklers around where well water was available. We got through the season, but about 25 percent of our rented acreage (sweet corn, dried beans, fall squash, hay) was a total loss, surplus vegetables were not available and hay and switch grass straw yields were cut more than in half from the previous year's harvest. This robbed me of time I needed to seek out machinery and equipment needed for this project. It left little switch grass available for experimentation with the round baler that we purchased early in the year. I am going to need a 9-month to 1-year no-cost extension to complete project objectives. A running log through the year follows, summarizing work I was able to accomplish on the project thus far:

Laying groundwork to accomplish objectives

February (2012) – Rented our own 3.5-acre planting of switch grass from the Steve Herr family for a 4th year, but we were told that we may not get to rent this land in the future, as family members and neighbors are competing with us to rent the property for other purposes.
February to April – Negotiated with second property owner (Barbara Goss on County Hwy E) in neighboring Green County to rent additional 9.5 acres of land as option for establishing additional switch grass field in the event we lose our first rented field of switch grass. Signed a 4-year contract to rent this land; visited it with our organic certifier ***(May 14)*** and enrolled the property in organic certification. Disked entire field in late April and sowed half to organic oats and hay. Later in spring, did not sow balance of field to switch grass, however. Unseasonably mild winter with 60-degree weather in March and deficit of moisture pushed into late spring and summer with record drought and heat for southern Wisconsin and entire Upper Midwest. Planting switch grass in such conditions would have been a lost. Oats on balance of field planted yielded poorly and under-seeded grass and hay did not establish and were lost completely.
April 14 – Sold and delivered switch grass and wheat straw mulch to Fitchburg Fields (a community garden and non-profit educational center), using pick-up truck and trailer.

April 25 – Tried unsuccessfully to reach Texas round baler representative for small and large baling equipment manufactured in Japan. Bought used round baler from neighboring farmer through implement dealer in Monroe for $4,500.

May 2 – Talked informally to Green-Rock Audubon Society board about my idea of partnering with them on some of the 250 acres they own or conserve in easements to raise switch grass mulch as a conservation measure and source of revenue for expanding and consolidating their work. They agreed to make the project a topic of future meetings and discussion.

May 5 – Sold 8 bales of switch grass mulch ($8 to $10 each) to urban gardeners and the Green Home Expert eco garden products manager of the store in Oak Park, Ill., at a spring sales event. The gardener reported later in the fall that the bales had held up very well as mulch in a community garden and that she would purchase more of them from me this spring (2013). The store doubled the price of the bales and sold all of them they took on consignment. That price compared with organic cedar wood chip bales (1/3 the size of my switch grass bales), which GHE was selling for $15 per bale to cover an advertised 27 cubic feet of garden space as mulch.

May 9 – Emailed and called Roeters Farm Implements in Michigan about purchasing additional water wheels for trans-planter to modify for deeper penetration of straw mulch. They tried to find wheels but could not locate any for 1-foot spacing.

May 10 – Purchased used large round baler was delivered to neighboring stand of switch grass, recently cut after over-wintering as a cover for nesting turkeys and pheasants. Selling farmer helped demonstrate and coach me on using the baler to produce two round bales about 500 lbs in size. After advising me that my JD 3020 tractor would work with this baler, it was discovered that I lacked the two additional hydraulic hose ports necessary to operate the round baler. A larger AC tractor with the required ports had to be borrowed from the host switch grass field landowner. I purchased fuel, wire and hardware necessary to adapt the tractor for one day's use on the spot. Neighboring landowner kept one bale to mulch melons and squash plantings. Brought second 500-lb. round bale home on flat rack ***(May 11)*** and put into protective shed to roll out later as mulch for vegetable transplants in our 1-acre home garden. Grass was very brittle, like deteriorating wheat straw, and was extremely difficult to bale because (against my advice) the landowner had insisted the switch be overwintered and cut in spring. Stand had been poorly cut and windrowed with a ground-driven rake and pickup truck, compounding large baler use difficulties.

May 11 – Drove 20 small square bales of switch grass to a gardener in Sun Prairie, using my trailer and pick-up truck. She paid me $8 per bale, plus 50 cents per mile delivery ($20) fee. On follow-up inquiry later in October, this gardener stated by email that the bales had worked out very well and that she wanted more bales this spring.

May 12 – Gave talk and showed PowerPoint on switch grass mulch to urban gardeners and commercial growers at Fitchburg Fields (a non-profit community garden and learning center) and sold 2 bales of mulch ($8 each) to two gardeners.
May 15 – Rolled out first experimental 500-lb. bale of round spring switch grass mulch in 1-acre home garden. Covered a 75-foot stretch of ground so thickly that we spread the straw over in both left and right directions from one, double-row bed, into a second and third double-row bed. Two rows were then transplanted into the straw with pepper and eggplant bedding plants. The third row consisted of hills of Patty Pan summer squash and flowers. The squash and peppers grew and yielded well. The eggplants were lost eventually to intense flea beetle infestation brought on by the severe drought. The brittle consistency of the spring prairie grass was a problem in transplanting the eggplant and peppers by hand (with mulch sliding back into the punched holes) faster than we could insert transplants. However, a substantial time was saved in application of the round bale mulch, rather than following transplants with separation of square bales and piecing in chips of mulch around the vegetables starts. Very little weeding (only spot weeding, immediately around the transplants) over the course of the season had to be done in this entire area, with strong, successful weed suppression. Peppers and summer squash lasted a full season, with harvest extended into fall by frost protection under floating row cover and plastic.
June 16 – Drove to Studer's Super Service in Monroe to order attachment with four ports necessary to connect and operate hydraulic hoses for large round baler. Picked up and paid for unit at Studers on ***June 22.***
June 19 – Disked newly rented field a second time for planting switch grass. Extremely dry and dusty. Too hot and dry to plant field without very high risk of losing the seed. No means of irrigation.
Aug. 3 – Discussed with both Jim Stute of UW Rock County Extension and Brian Buenzow of the Wisconsin DNR options during the severe drought for establishing any seed in the space I'd rented for additional switch grass planting. Buenzow said that he was going to try to plant millet for a quick turn-around crop before late fall planting of switch grass. He said that he had no previous experience with millet, but that his best establishments of switch grass in the past had been very late fall, just before winter ground freezing and snow.
Aug.6 & 7 – Disked field (previously intended for switch grass) to plant millet; ordered millet seed from Albert Lea's Seedhouse in Minnesota. Planted entire field to millet on Aug. 12. Lost field to frost in September. Decided to use the lost millet as a plow-down cover crop. Concerns over plants taking up unhealthy substances because of frost. Ordered and purchased switch grass from source Buenzow recommended in Missouri. Decided to plant a different field to switch grass in spring.
Oct. 8 – Emailed Wisconsin Farmers Union planning committee members and staff regarding our making a presentation on using switch grass mulch in commercial vegetable crop production at a

regional CSA conference in January 2013 at UW Eau Claire. Also, tried a second time to talk with dealer of new Japanese-made small round baler, but could not reach satisfactory agreement about purchasing machinery, training on machinery, observing machinery use, getting machinery for demonstration at the regional CSA conference, or meeting somewhere between his location in Texas and our farm in Wisconsin to pick up machinery.

Oct. 11 – Ran classified ad in Country Today farm publication published in Eau Claire, Wis., seeking operable Allis Chalmers 1940s era Roto Baler. Over the next 10 days after publication, I received 5 phone calls from northern Wisconsin farmers and used implement dealers, some of them owning 3 machines, in response to my advertisement. We had no one helping us with our fall share harvests, and very little help with end-of-season field and garden work (bedding down for winter). Also, took annual vacation to see family out of state. Couldn't arrange to drive 3 to 4 hours north of our farm to see available Roto Balers.

Oct. 31 – Drove to Antigo (4-hr drive from Brodhead) to pick up shipment of potatoes and to see used small round baler for this grant project, but ran out of time. Implement dealer had closed by the time I found his business in the dark.

Nov. 21 – Drove a second time to Lakeside Implement (2½ hrs. north of Brodhead), to see three AC Roto Balers. Very old machines, yet one had been used as recently as the previous spring to bale hay. Lakeside also had spools of baling twine for this machine, operating instructions and old service manuals. Couldn't find trailer to transport machine. Couldn't negotiate lower price. Offered payment for transporting machine to Brodhead and for helping me get machine to operate. Offered $250 for hauling equipment and $30 per hour for 2 hours of lessons. They tried to discourage me from purchasing the machine and urged me to transport the machine on my own. They said I would be happier with a new small round baler.

Nov. 21 – After returning from Lakeside Implement, drove later the same day to rented field and cut 3 acres of switch grass with first snow of the winter season threatening within days. However, 6-inch end of cutter bar on haybine broke toward dark, and cutting of the field was a little uneven and incomplete.

Nov. 22 – Baled 81 square bales of switch grass at dusk into the dark (on Thanksgiving Day). My son in-law Aaron and daughter Holly brought flat rack to field and helped stack and haul the mulch home. This was about 1/3 the yield on this field from the previous yield. Drought was responsible. Also, could not finish cutting and baling the entire field because rain set in, then snow, frost and cold thereafter.

Nov. 26 – Ordered 30 lbs. of Cave in Rock variety switch grass at $9 per lb. plus $15 shipping ($285 total) from Osenbaugh Grass and Wildflower Seeds in Lucas, Iowa (phone 800 LUCAS88), to establish additional plantings for study. This is a native species of Illinois, an improved cultivar for cold tolerance, developed by natural selection at the Plant Material Center of Missouri for the USDA The planting rate can be anywhere from 4 to 8 lbs.; I purchased 6 lbs. to the acre to establish 5 acres. The Foundation Farm in Nebraska is selecting from this variety over a 10-year period to develop an improved palatability forage for grazing animals. Shawnee will be its name once this breeding process is complete. Received shipment on ***Nov. 29.*** Will try to work up ground and plant this Cave in Rock seed in the early spring.

(2) Summary Project Results and Findings in First Year

From the calendar accounting of our activities in the first year of this project, it's clear that obtaining sufficient land committed to growing perennial prairie grasses such as switch grass is

problematic for a small grower in our region. Severe drought conditions, such as we endured in 2012, also cut deeply into yields for all types of grasses and hay. Yet it did not negatively impact small grains oat and winter wheat straw harvest yields. In fact, given the extremely warm, dry winter leading into the growing season, our certified organic small grains experienced the lowest weed pressure we've ever faced. Straw harvested was the cleanest and most free of weeds that we've ever been able to produce. Our first experimental attempts to make and employ a large round bale of switch grass was marred by the landowner's decision to over-winter the stand (as a wildlife cover), deteriorating the grass material to a dry consistency more like wheat straw than the mat of switch grass we'd hoped to bale and employ with vegetable transplants. This made the switch grass crumble, flake and slip into holes punched for vegetable transplants. Anticipating problems of application such as this, we're re-thinking the apparatus we hope to invent and adapt to large round bales. Rather than extending spikes of a water wheel for transplanting into a rolled out large bale of mulch, we may try to fabricate a more elaborate ground-driven machine to follow behind the transplanted plants, with shields to protect the transplants and knives to cut the large bale as it unravels its mulch around the transplanted plants. We plan to begin working on this device in February in a machine shed we've renovated for this purpose, adjacent to our hay mow. Our first experimental attempts to sell switch grass straw resulted in sales of more than 50 bales at $8 or $10 per bale. We've contacted three of these individuals this winter following the past growing season, and all three were enthusiastic about using the switch grass in their gardens. All wanted more mulch this spring 2013. We have not been able yet to produce small round bales or test interest, sales and urban use potential. I'm trying to secure my present 3.5 acres of switch grass on rented land a 5th year and trying to establish more switch grass ground, but drought has hampered planting, and establishment takes at least 2 years.

(3) Plan of Work for Second Year – 2013

Field work: UW Rock County Extension Agent Dr. Jim Stute and I met in Janesville in January 2013 to discuss challenges raised by the severe 2012 drought lingering into a second year, the dearth of switch grass for this study and prospects for achieving goals and objectives of my project in the coming growing season. Ideally, if organic or at least non-sprayed large round bales of both switch grass and wheat straw can be made or obtained in the coming spring, the following fieldwork plan will proceed starting in June. Jim will conduct a field trial similar to our previous SARE Farmer Rancher grant project on Scotch Hill Farm near Brodhead, Wis. This time, two large round bale mulch materials (with wheat straw and prairie grass/switch grass respectively) will be compared in two systems: high traffic (tomato) and low traffic (cole crops). Individual rows will be mulched on both sides with a specific straw type at a rate of approximately 1 bale per 40 feet of linear row in June 2013. Tomatoes will be trellised on 3-foot centers, cole crops grown in rows on 1-foot centers. Other than mulch type, normal cultural practices for commercial vegetable crops will be used in both systems. Jim will employ measurements to include (1) straw/mulch composition (nitrogen, phosphorous, potassium, carbon; (2) weed density 40 days after mulching, with weed measurements taken within 3 random 2.5-square-foot areas within each mulch type; and including weed number, average height, species present and an estimation of predominant species. Beds will be hand-weeding if necessary, following rating; (3) visual assessments of mulch performance (as a weed barrier, persistence) throughout the growing season; (4) comparison of carbon to nitrogen ratio comparison; and observation and comparison of any incidence of rust or plant disease. If large round bales cannot be made or obtained this spring, a non-cost one-year extension of this project

into 2014 will be necessary to complete this plan of work. We are following up with at least four 2012 purchasers and garden/garden center users of our switch grass mulch in the past year to continue documenting effectiveness and consumer demand for this mulch on an ongoing basis in spring 2013. We've purchased a 23-foot trailer for $1000, and we're repairing its brake light system so that we can purchase a small round baler once we've located one for this study. We've also located used forks for three-point tractor use with large round bales and will obtain them in the next month. Hydraulic fitting for our tractor will be completed this spring so that we can use large and small round balers, too.

Outreach: We're continuing to discuss field day prospects with the Wisconsin Farmers Union's new event planning staff member, Dr. Sarah Lloyd. She expressed enthusiasm for this collaboration in January 2013. Lloyd scheduled our participation at the Upper Midwest CSA Conference in January 2013 We'll follow up on the 90-minute "Dealing with Weeds Organically on a CSA Farm" workshop, which was held in early January 2013 as part of the regional CSA Conference at UW Eau Claire. The follow-up will consist of a field day at Scotch Hill Farm, possibly in late summer 2013. The Madison Area CSA Coalition, UW Extension and DNR field office staff in Janesville will be expected to take part in that event led by the Farmers Union. Timing for this field day will hinge on whether large and small organic round bales can be made or obtained for the study this growing season, application apparatus can be fabricated by Joel ends for laying the mulch around transplants or for transplanting into the laid mulch.

(4) Sharing Information with Others

We've given two talks, showed our expanding Powerpoint, and distributed 2- to 4-page handouts on our use of switch grass mulch in the past project year to:

(a) Fitchburg Fields Spring 2012 Sustainable Gardening Workshops and Plant Sale (about 100 people attended this annual non-profit educational program to promote sustainable gardening practices. Of this number, about 15 attended our PowerPoint presentation on using organic straw and switch grass mulch with vegetable crops).

(b) Regional CSA Conference sponsored by Wisconsin Farmers Union and others, including Fairshare CSA Coalition based in Madison, Wis. (several hundred growers, from novice to advanced, attended this 2-day conference, the first of its kind held in a number of years in our region; The 250 participants in the conference had 3 workshop options during our time slot. About one-third of those who stayed until the end of the second day of the conference selected our 90-minute presentation and discussion; with nearly 50 of them taking the available handouts).

We are discussing with the state Farmers Union, our UW Agriculture Extension Service agent and other collaborators additional workshops and/or field days to be held in the next year. We'll write press releases and a feature story about our project for dissemination to agricultural and general circulation newspapers toward the end of our project, including Wisconsin State Farmer, The Monroe Times and The Janesville Gazette..