Profitable Forage Systems: Is Double Cropping BMR Sorghum followed by a Winter Grain a Viable Cropping System Alternative in the NE?

Problem Statement: Adequate forage production of high quality is paramount in dairy and livestock production for farm profitability and sustainability. The established king and queen of forages; corn and alfalfa, do not perform competitively on low pH, poorly drained, steep and/or HEL (highly erodible land) rated fields. But these are the characteristics of at least half of the southern tier soils of NYS. Alternative crops that yield well at a reasonable cost of production are needed for expanding options for cropping systems on less than optimal ground.

Weather patterns present a second condition that has a growing impact on productivity and sustainability. We have experienced an increase in variable temperature, rainfall, pest events and violent storms within and across seasons. Wet springs affect crop establishment schedules and crunch already tight windows for timely spring's work, dry conditions delay germination and stress crop growth to the point of reducing yields or causing crop failure. Over the last two seasons alone we have experienced localized hail storms, extended mid-season dry periods, and hurricane caused flooding and severe crop loss at worst and difficult conditions for harvest at best.

We want to gain experience with a crop that has not traditionally been grown in the Northeast - sorghum. Sorghum appears to be a reasonable substitute for corn silage offering similar yields, at a lower cost and an equally efficient harvest as a single chop system that can substitute for corn silage with nearly the same nutrition.

The National Sorghum Producers describe sorghum as "among the most efficient crops in conversion of solar energy and use of water" and that it has "inherent tolerance to marginal lands and environmental conditions" – Sorghum 101

> "When it comes to feed grains, corn gets all the glory. Point out that grain sorghum is almost equal to corn in nutrient value and that it will out produce corn in dry climates, and in fact, will grow in dry climates where corn won't, and you are met with silent disbelief. A great many people have never even heard of grain sorghum." -Gene Logsdon in Small Scale Grain Raising.

Sorghum is a tropical crop that does well in warm, dry soils. The challenge with sorghum will be the unpredictable variability in our growing seasons. If we have an unusually cool summer with cool night temperatures it will be challenging for the crop to mature and reach an appropriate dry matter for good ensiling. If we have an unseasonably warm and dry summer it might out perform corn. Understanding the necessary management to overcome some of these challenges with sorghum is the main interest for getting it out on farms to monitor its performance.

We want to see how well it will fit in a double cropping system with a fall grain harvested for early spring forage. Can this cropping combination provide a cost effective crop with consistent performance, adequate yield and help to overcome some or all of the outlined constraints?

Proposed Solution: Tom Kilcer[1], an independent agronomist, and innovator in cropping systems, is promoting an 80-85 day brown midrib (bmr) (gene 6) dwarf type forage sorghum. He professes that this crop offers yield and quality competitive with corn at a lower cost. Tom has 2 years of experience with this crop in the Capital District of NYS. I am proposing to field test this crop under the conditions of 4 farms in the south central NY area, specifically in Cortland, Onondaga and Chemung counties. Our extension team currently serves a 3-county region in south central NY with over 400 dairy and grain farms.

Studies on sorghum in the NE are rare. Penn State tested sorghum as a renewable energy crop 2009/2010(Penn State Live, 2010). In that study it yielded 5-10 tons of dry matter per acre but was very wet and lodged making it difficult to harvest. Many farms have used sorghum-sudangrass as an emergency forage or booster of summer feed. Previous SARE studies, (Cerosaletti and Fields, 2004; Leverett, 1995) have outlined some of the challenges such as inconsistent performance depending on the growing season; poorer when it's cool and better when it is hot. At harvest it is often hard to dry down for a good fermentation. Sorghum would be harvested one time, direct chopped like corn silage.

I received several inquiries after putting Mr. Kilcer's article, *New Crop Old Use; New Use Old Crop* in our Feb 2012 newsletter. One farmer took a leap of faith and planted 15 ac. of sorghum. I was very impressed when I visited the field in Sept prior to harvest. Considering the mid-summer drought I didn't have high expectations. The crop was lush. The plants tiller heavily (several stems per plant) which should offer an advantage for weed suppression in both organic and conventional systems. I propose to work with 4 farm cooperators to test this cropping system using Kilcer's recommended practices as well as standard agronomic practices from its traditional growing area. As a new crop to this area we will learn first hand about its agronomic characteristics. The trial sites will provide a demonstration of this crop for the farm community.

Methods: I will document the experience of four farms with this cropping system as case studies. Three of the farms are conventional and one is organic. Sorghum will be planted with each farm's equipment once soil temperatures stabilize to 60 degrees, sometime between mid-May to early June. Two farms plan to rent a no-till drill from their local soil and water conservation district. Sorghum will be drilled at 3 sites and planted with an International Harvester cyclone planter on the 4th. Establishment will be in 15 or 30" rows at 10 lbs per acre, 10 ac per farm. The four farms will apply their typical fertility practices and weed control. On the conventional farms the safener, concept®, will be applied to the seed in order to use an annual grass herbicide (metolachlor). On the organic farm, compliant organic seed will be used and cultivation will provide weed control. Weather and soil conditions at the time of planting will be recorded. All field procedures and inputs will be recorded for each farm including; final seeding rate, row width, tillage, fertility inputs, weed control and harvest. Harvest will be measured with field equipment to the extent possible. We will use portable scales to record representative truck or wagon weights and record loads from the field. Forage samples will be taken for moisture and quality. If it is not possible to measure the machine harvest, a representative hand harvest will be taken. Fields will be visited on a no greater than 2 week interval so crop growth can be monitored closely as well as any potential pests or problems. An in-season field day will be

scheduled mid to late season as a 'teachable moment' of the crop's growth habits and performance.

After harvest a winter grain; triticale, wheat or rye, will be established at 100 lb/ac seeding rate either drilled or broadcast. The crop will provide a winter cover, providing food and an attenuated environment for soil biology as well as an early forage crop for the farm. The cover crop yield will be measured and a forage analysis taken.

Timetable: This project is proposed for growing season 2013 through spring of 2014 to capture the cover crop harvest.

Field Establishment:
Early spring 2013: finalize planning with cooperating farms.
May: begin tracking soil temperatures
Mid-May: calibrate planting equipment,
Mid May-June: plant sorghum (as site conditions and farmer's schedules dictate).
During growing season: observe and photo document crop progress.
Mid-September to mid-October: harvest – measure yield, take sample for feed analysis
Immediately following harvest – seed fall cover crop (Even at the later harvest date rye can be established.)
April/May 2014 – harvest cover crop, measure yield, note stage of maturity, collect sample for feed analysis

Outreach Activities:
Newsletter articles to be published spring, mid-summer 2013 and final report - summer 2014
Field Day – begin planning March/April 2013.
Select site and set date for event and begin publicity by June 30
-Contact collaborators and presenters for field day
Outreach to extension field crop colleagues at fall gathering– Nov. 2014
Small Farms Quarterly article, What's Cropping Up article, Spear Nutrient Management Factsheet Series and Webinar- fall 2014 through March 2015.

Outreach Plan: This project will be highlighted in our Extension newsletter (circulation 700) - 3 times during the coming year to introduce the project, provide a mid-season update and final report. I will hold an in-field meeting during the growing season to showcase the project. I will partner with local seed companies to broaden outreach and attendance at the field day. The meeting will be advertised in our newsletter and website, through the Cornell Small Farms Program and general press releases including ag newspapers such as Country Folks and Lancaster Farmer. A final report will be adapted for several print and electronic sites to increase accessibility for example our extension team's website, the Cornell Spear Nutrient Management Site which hosts a fact sheet series, and an article to be published in the Cornell Small Farms Quarterly (SFQ) News that is distributed in print through the Country Folks Newspaper. The SFQ is hosted at their website and delivered to 17,000 mailboxes from Pennsylvania to Maine. I will write an article for *What's Cropping Up*, a newsletter for NY Field Crops and Soils published by the Extension Group in the Crop and Soils Department at Cornell. I will share the

results of this project with my statewide field crops extension colleagues at our annual fall inservice. I will offer a webinar during the winter workshop season to share our findings.

Qualifications: I am an agronomist with an MPS degree in plant protection and BS in agronomy, both from Cornell University. I have worked as a Field Crops Specialist with Cornell Cooperative Extension for over 20 years. I have participated in many applied research projects during my tenure. Most recently in 2012/2011, I established on-farm organic food grade soybean trials on 2 cooperator farms in collaboration with the Cornell Organic Cropping Systems Project. Dr. Laurie Drinkwater, PI and Brian Caldwell, project coordinator. I have worked with Cornell Field Crops Extension faculty Bill Cox (2010/2011) on soybean farm trials comparing 4 seeding rates with treated and untreated seed. A 3 year study (2009-2011) with Dr. Quirine Ketterings looking at the potassium needs for alfalfa in NY. I collaborated in on-farm trial to compare efficacy of herbicides for the control of annual grasses post emergence in corn with Dr. Russ Hahn (2009). I collected and interpreted data from farm cooperators in the Mass Nutrient Balance Project for NY Dairy & Livestock Farms (2007-2009) with Dr. Ketterings. I received and successfully completed a SARE Partnership Grant in 2008 ONE-08-082, *A study to Look at Practices Aimed at Reducing Mechanical Cultivation in Organic Corn Production*.

Cooperating Farmers: Mr. Carlton Dawson and Kevin Streeter of Streeter Holsteins co-manage 80 milking cows and custom raise heifers. Both partners have off-farm jobs. Their land is all hill ground, elevation 1350 ft, with predominantly mardin and volusia soils which are medium textured soils, moderately well drained to somewhat poorly drained, subject to erosion, with a fragipan present at varying depths. They have been satisfied with sorghum-sudangrass but are interested in trying sorghum since it is a one-harvest crop and want to gain higher energy than they have gotten with sorghum-sudangrass. Their sorghum-sudangrass has tested .68 NEL but they would like to attain .76 NEL and wonder if sorghum can deliver that.

Mr. Dennis Birdsall farms 450 acres to support his beef herd and produce cash crops. For the past 5 years he has grown sorghum-sudangrass to protect highly erodible ground, and as mid-summer pasture. The sorghum potentially offers similar yield to corn, at a lower cost of production and an efficient harvest as a single chop system that will replace corn silage on marginal ground while offering nearly the same nutrition for his livestock.

Mr. Dave Stow has a beef herd. He grows corn, oats as a cover crop for new seedings, hay and pasture. He can't grow enough hay alone to meet the herd's feed needs for pasture supplementation and winter feed. Dave is the one area farmer that I know that has any experience with sorghum, planting it for the first time this past season. Although the crop presented many challenges, late planted because he had to modify the seed drum of his cyclone air planter, uneven emergence because of dry soil at planting, in season lodging and high moisture at harvest he is not disappointed with the crop and wants to make improvements in another year. He has grown sorghum-sudangrass in the past and never found a good way to dry it down to ensile well. He always ended up with sour silage. Greenchopping was not an option for him. Since corn has become expensive to plant and grow he is looking for lower cost crop with comparable yield and energy.

Mr. Jason Tuning has an organic dairy farm. He grazes his herd and grows hay for winter feed. He rents 160 acres that has low pH and fertility and requires significant inputs to upgrade its productivity. Because of the expense of inputs improving the fields has been slow. As a result productivity is average and meeting his forage needs is a challenge. With hay as his only crop supplemental energy has to be purchased, which is costly. Jason has tried sorghum-sudangrass with disappointing results. We want to try sorghum to see if it will be manageable in an organic system and provide a decent yield of high energy feed.

Dawson-Street Holsteins is located in E Homer/Truxton NY, Tuning in Cincinnatus, both in Cortland County. Birdsall is in the town of Spafford, southern Onondaga County and Stow in Horseheads, Chemung County.

Notes: [1] Tom Kilcer is the principal operator of Advanced Ag Systems, an independent agronomy consultancy.

References:

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