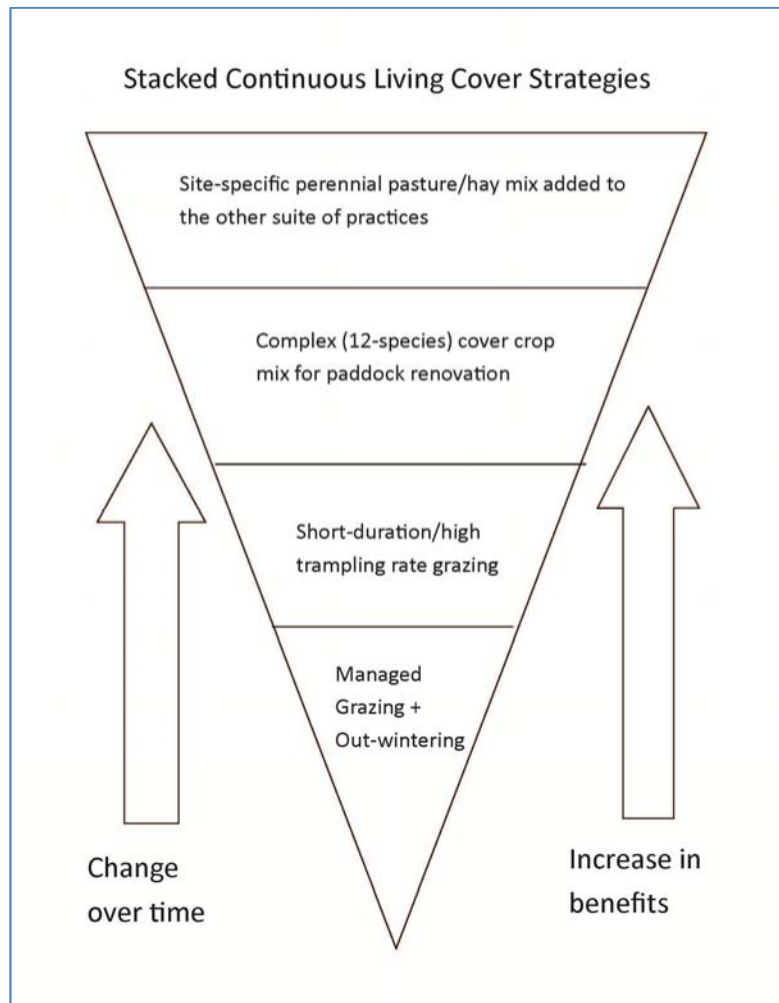


Kent and Linda Solberg



Kent & Linda Solberg Profile
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When Kent & Linda Solberg moved to their farm in 2003, they found thistles and sandburs and a sandy topsoil that was essentially dead. Six-year-old cornstalks lying on the soil surface had not decomposed. There were no worms or dung beetles. The Solbergs started out with a conventional dairy. They used inexpensive and locally-available byproduct feeds as about 30% to 40% of the cows' ration. They grazed the cattle in the summer on every patch of forage they could find: fields, road ditches, woodlot. They relied on rented ground for



Stacked continuous living cover strategies: The Solbergs started restoring a degraded soil through managed grazing and outwintering of cattle. Adding the technique of short-duration grazing with a high rate of trampling of forage helped them make progress in soil health and forage production. Their next step was using complex cover crop mixtures to facilitate renovation of pastures. Now they are working on designing site-specific mixtures of perennials for their pastures, in addition to maintaining and improving their other strategies.

Use All of the Soil Health Tools

Kent and Linda emphasize the importance using all of the available tools for improvement of the soil.

Kent's top four tools to achieve soil health:

- Diversity of species
- Representatives from each of the four crop groups in the pasture and cover crop mix rotation: cool-season broadleaves, cool-season grasses, warm-season broadleaves, warm-season grasses
- Integration of livestock
- Minimize (not necessarily eliminate) tillage

summer forage for youngstock. Managed grazing along with manure via outwintering, and compost application to the paddocks, was the Solbergs' start at restoring soil health and improving the yield capacity of their farm.

A crisis came in 2007. They went for 17 weeks with no rain that summer. Every forage plant dried up. Purchased forage got them through, but it was very expensive. It did help add

some fertility to the soil; they systematically fed hay out in the pastures, similar to the outwintering feeding method, to add fertility to the soil.

They knew they needed more organic matter in their sandy soil, but it was difficult to make progress in a drought situation. They looked into installing irrigation. A neighbor had a central pivot irrigation system on his organic dairy farm and was able to make substantial progress at building soil organic matter due to the availability of moisture for forage production and soil microbes. The Solbergs looked into an irrigation system of "pods" every 50' that would work with their odd-shaped fields. Kent's requirement was that they had to be able to water every five days to keep things growing during hot, dry weather. When the quote for the irrigation installation came back, it was for \$1700 per acre and Kent couldn't cash-flow that investment. They had to look for another way to grow forage.

Kent felt that he had hit a ceiling with management-intensive grazing, application of compost, and outwintering. Productivity of the forage stands was increasing, but not enough. The forage stands were a near-monoculture of quackgrass with some Kentucky bluegrass and smooth brome grass. The sod formed by the roots of those cool-season grasses only reached down about 9" into the soil, and were susceptible to drought.

The Solbergs took another hard look at their land, what assets they had, and what they could do to take advantage of those assets. Their topsoil was sandy and dried out quickly. Two weeks of no rain and 80° daytime temperatures would dry up their forage. Yet, the

Diverse Cover Crop Mix

Kent is a strong promoter of diverse cover crop mixes. He acknowledges that some farmers have had disappointing results with cover crops, and suggests that better success could be achieved by understanding what each cover crop species can do, and blending cover crop mixes to achieve specific goals within the context of the farm's resources.

In his case, he wants to graze the cover crops and also use them to establish a perennial forage crop. Warm-season grasses provide high productivity of forage for grazing during the mid-summer. Cool-season small grains are good nurse crops for establishing a perennial forage. Brassicas like turnip provide late-season forage. Legumes supply nitrogen to the soil. He does have a plow pan, and deep-rooted crops like forage radish help to break that up. His current cover crop mix for pasture renovation includes 14 species.

A favorite source of cover crop information:
greencoverseed.com

water table was only 8' below the soil surface and did not drop lower during dry years. Kent started looking for a way to get roots down to the level of the water. He identified deep tap-rooted plants like alfalfa, yellow sweetclover, and chicory; and deep fibrous-rooted plants like intermediate wheatgrass; and planted those as part of his pasture mixes. He also experimented with annual warm-season grasses that had a much lower water and nutrient requirement than corn: sorghum/sudangrass and pearl millet.

Next, they began a different approach to grazing. Rather than careful timing of the graze to keep everything in a vegetative state, Kent began letting the forage grow to a taller and more mature state, and then letting cattle trample some of it back into the soil as they grazed. Kent allowed the cows to select 40 to 50% of the available forage and trample the rest. They

did three daily moves of the cows to keep good forage in front of them.

Another crisis came in 2011. They lost access to the rented ground for youngstock, and also some sources of cheap byproduct feed. They felt like they were just beginning to make real progress on improving their soil and forage production, but now things needed to change, and fast.

The conventional dairy model had worked financially – they had paid down their farm debt in seven years – but it couldn't hold up to the loss of the byproduct feed. They sold all but a

few cows and a handful of youngstock and focused on improving their soil, with a goal of seeing how much forage they could produce without irrigation.

They turned to complex mixes of cover crops to renovate pastures. Kent uses tillage to establish cover crops for pasture renovation. He is aware of and admires the no-till cover cropping of the farmers in Burleigh County, ND – but on his farm, he sees so much mounding and tunneling from badgers and pocket gophers that he feels the tillage and leveling is necessary on ground that he intends to both hay and graze. He also experimented with no-tilling and with frost-seeding of legumes into his grass sod, and had zero legume establishment; another reason he now relies on tillage. He currently has about ¼ of his acres in annuals for forage and ¾ in perennials. He’s planning to shift that to 1/8 to 1/10 of acreage in annuals and the remainder in perennials, with a long rotation of tillage and renovation on a field every 8 to 10 years. He estimates a cost of seed cost of \$40/acre to establish his cover crop mixes, and thinks he’s gaining more than that back in forage for the cattle plus soil health improvements.

Grazing cattle with frequent moves, outwintering and bale grazing, and use of complex cover crop mixes in the rotation has enabled the Solbergs to make great strides in their soil health and farm productivity. In 2013 they experienced 6 weeks of no rain, and their forage stands remained green. Also in 2013, they were able to take a hay crop of about 2.5 tons/acre (65% DM equivalent) in June following early-season grazing. When they first began their soil improvement efforts they barely got a hay crop of around 1.1 tons/acre with no grazing. Kent estimates that 2/3 of their hay acreage is grazed early, before haying; and will be grazed again one or two times after haying. There has been more than a three-fold increase in their forage productivity since they began on the soil improvement path.

Next steps for the Solbergs include the

Perennial pasture & hay forage mix for the Solberg farm:

Sandy topsoil, acidic, drought-prone

Intermediate wheatgrass
soft-leaf endophyte-free tall fescue
orchardgrass
alfalfa red
clover
birdsfoot trefoil
yellow sweetclover
chicory

Kent notes that the yellow sweetclover, birdsfoot trefoil and chicory can dominate the first year or two of pasture establishment. Those three species will be mostly gone by year four as the other species establish.

gradual renovation of all their pastures to a perennial pasture and hay mix, custom-designed for their site. Kent has found it beneficial to apply 2 tons/acre of lime prior to seeding perennial pastures, and to apply poultry litter at a rate of 3 tons/acre every other year on hay ground.

The Solbergs are currently grazing and milking a small herd of cows and are working on a crossbreeding program to rebuild their herd, with a goal of being back into the full swing of dairy production and supplying at least 80% of the feed for their herd within three years. Kent emphasizes the degraded state of their soil when they bought their farm. With managed high-trampling grazing, outwintering, and cover crop use, he says, "There is the potential to take poor ground and make it productive in five to seven years."