Doug Crabtree walks through a field at Vilicus Farms in northern Montana.

Doug Crabtree takes pest inventory.

PHOTOS COURTESY OF VILICUS FARMS

Sustainable Stewardship

Organic Farming on a Grand Scale

by LAUREN TURNER

Anna Jones-Crabtree and her husband, Doug, own Vilicus Farms, a successful large-scale organic farm in northern Montana. They believe farming is the highest calling, and they take a holistic view of organic farming and strive to create a self-sustaining ecosystem that mimics natural processes.

Anna and Doug seed over 20 varieties of dry land organic crops, including oilseeds, legumes, heirloom grains and cover crop cocktail mixes on their land. This is in stark contrast to most neighboring, non-organic farms growing monocultures, mainly wheat.

Anna describes their operation as a "craziness of diversity," referring to the complexity of their field layout and management of a diverse selection of crops. Diversity and crop rotation require a longer season, and planting times for different crops vary, meaning multiple plantings. Harvest occurs at different times spanning two to three months. Different crops require different machines; requiring a wider variety of equipment than a single crop. The Crabtrees have five tractors, a plethora of implements, two air seeders, two hauling trucks and several wagons and trailers for hauling and storage.

The Crabtrees are conscious of their environmental footprint regarding farm equipment. They use GPS to reduce overlap with their field operations and reduce fuel consumption. Their newest tractor is a model year 2000. They right-size tools for the job – larger implements allow for fewer passes across a field, limiting compaction and fuel consumption.

The Crabtrees use approximately 20 percent biodiesel for their equipment. They include oilseeds in their crop rotation not only to increase diversity and interrupt disease and pest cycles, but also because they are committed to a long-term reduction of their petroleum-based fuel usage.

The fuel market for oilseed isn't as good as the food market, and the Crabtrees make higher profits selling to the food market. Even selling the oilseed as food pays much less than selling grain. Still, they are committed to sustainability; if they can grow oilseed and purchase biodiesel they feel they are vested in a system that is incrementally better, in hopes that their engagement with this system can help support the much bigger transition away from fossil fuels. They grow safflower and contract the oilseed to the Oil Barn, a Montana-based organic company also committed to sustainability. The Oil Barn presses the Crabtree's safflower into food-grade oil.

FOCUS ON CONSERVATION

Anna and Doug believe that farming can, and must, be practiced in a manner that improves the soil and associated natural resources. Besides their conservation and pollinator buffers, which help prevent soil erosion, they use extensive multi-species flowering cover crop rotations that build soil organic matter, disrupt pest and

disease cycles and help create seamless corridors for beneficial species to move throughout the farm.

The Crabtrees farm 80 percent of their land for profit – the rest is in conservation buffers that provide pollinator habitat and other ecosystem benefits. Crop strips range from a half-mile up to 2 miles long and 240 feet wide, each usually planted in one crop, but sometimes interseeded with two crops. Twenty to 30-foot wide conservation buffers border each crop strip.

Pollinator Protection

They wanted to implement pollinator conservation at the field-level scale, so they designed conservation buffers in partnership with the Xerces Society as a pilot for a pollinator project. From the beginning, Doug saw the larger picture – he envisioned that as they scaled up they would have conservation areas distributed across their entire operation. So far, about 20 acres of their buffers are in some sort of pollinator mix. The rest were left in the Conservation Reserve Program (CRP) mix that was in place when they bought their land.

The conservation buffers support pollination by wild bees, which have been shown to increase yields of a larger variety of crops, dependent on pollination, and to a greater degree than the yield produced from pollination by domesticated honeybees.

Natural pest control is another benefit of the buffers, attracting beneficial insects into adjacent crops. Russian wheat aphids are one of Montana's worst grain pests, and extensive research shows that wildflower habitat near grain crops increases populations of parasitoid wasps that attack the aphid.

Soil loss from wind erosion is another concern for northern plains farmers. The conservation buffers reduce wind velocity for adjacent crops, reducing overland surface water and sediment runoff. The buffers also capture wind-blown weed seed before it can settle in production fields.

Native Habitat

Establishing high-quality native wildflower habitat using organic methods presented challenges. Crested wheatgrass occupied the areas to be converted to pollinator habitat, and a non-toxic method was needed to destroy the grass and prevent it from returning.

> Different crop types are planted each successive year, generally following a pattern of legume, spring grain, green manure, broadleaf and then winter grain.

The Xerces Society worked with the Crabtrees to design trials to determine which cultivation strategies would work best. The trials included wide chisel plowed swaths to open up bare ground strips that could be re-seeded and another set of treatments using moldboard plowing to invert the entire sod layer and create a totally barren, grass-free surface. The moldboard treatment had a high potential for wind erosion, but it turned out to be the most successful treatment. There was little to no re-growth of crested wheatgrass, and without competition the native plants grew quickly and abundantly.

The goal was to have a plant community rich in wildflowers, but some native grasses were included in the mix to occupy the space and the root zone between wildflowers to form a tight mat that resists weed invasion. The optimal native plant seed mix chosen for the land includes several species of low-growing native grasses, comprising almost 15 percent of the seed mix along with the wildflower seed. Both warm and cool season species are included.

Montana's northern plains receive little rainfall, and the Crabtrees don't irrigate. Drought-adapted western native species form the foundation of the seed mix, and some annual wildflowers help provide immediate habitat for beneficial insects, while rapidly covering the soil to prevent erosion. Seed was planted in late spring, immediately after plowing, just before the area typically receives most of its 12 inches of annual rainfall. Ben-

Doug Crabtree examines a crop strip. A conservation buffer is seen in the foreground.

eficial insects moved in immediately, including many species of wild bees and beneficial predators.

BUILDING SOIL

A five-year crop rotation is the foundation of the Crabtrees' soil building program. Different crop types are planted each successive year, generally following a pattern of legume, spring grain, green manure, broadleaf and then winter grain. Within the rotation, the green manure is incorporated and not harvested to provide nitrogen and phosphorus, or to address other soil needs. A crop strip may be planted in lentils in year one, Kamut wheat year two, cover crop cocktail mix for incorporation year three, safflower year four and winter grain in year five. Some far-flung fields may have a six-year rotation with two to three years in green manure. Each crop strip is in a different part of the rotation so there is also great diversity across any given field.

Tillage

Doug views tillage as the "art" of farming that requires thought about *how* to till – incorporating green manure, for example, with as little detriment as possible, aerating and feeding soil biology at appropriate times.

A combine unloads beluga lentils into a truck at Vilicus Farms.

Knowing the right timing, depth and tools also requires working with nature. Doug likes to quote, "for everything there is a time and a season." There are times to minimize disturbance and appropriate times to invert and incorporate organic matter. The appropriate tools minimize disturbance. The art is in knowing when, where and how.

Livestock

The Crabtrees also apply cow manure to improve soil fertility. They plan to incorporate livestock into their operation, but currently they obtain manure from a neighboring farmer with a surplus of manure in exchange for the farmer's use of the Crabtree's manure spreader. That farmer uses chemicals in his operation, but not on the hay fields that feed the cattle, so the manure is clean.

HELPING HANDS

Anna and Doug have entered several contracts administered by the USDA Natural Resources Conservation Service (NRCS), such as the Environmental Quality Incentives Program (EQUIP) cost-share contracts under the Farm Bill that implement conservation practices. One of the cost-share contracts supports soil testing. NRCS also contributed to the pollinator project, and they helped create a salt-tolerant grass mixture to mitigate impacts of a saline seep located on the farm.

The Crabtrees routinely consult such organizations as the National Center for Appropriate Technology (NCAT), The Center for Rural Affairs, The National Sustainable Agriculture Coalition (NSAC) and the Farm Service Association (FSA) on matters related to sustainable farming and on programs that help beginning farmers with financing and other practical concerns.

They have built an international network of buyers. They sell mostly to Montana-based mills and manufacturers, who in turn reach international markets in Canada and Europe. The majority of their crops are delivered in Montana within 200 miles.

EXPANDING OPERATIONS

In the past five years, the Crabtrees have increased the size of their farm from 1,280 acres that they bought when they started their farm to nearly 5,000 acres. They lease about 800 acres adjacent to their home, which keeps more acres free of chemicals. Recently they have entered into an agreement with Nature's Path, North America's largest organic cereal company, who purchased an additional 2,760 acres for them to farm under

a crop share arrangement. Nature's Path has similar arrangements with other farmers. Nature's Path specifies the crops to be grown on their land to meet their manufacturing needs, with input from the farmer to address the soil's needs. Nature's Path promises to purchase a percentage of the crops, and the farmer sells the rest to other markets.

The Crabtrees' agreement with Nature's Path seems more like a marriage than a contract, since both share values regarding land stewardship responsibilities. Nature's Path has been organic for over 30 years. They are in 42 countries and have kept about 13 million pounds of chemicals out of the earth.

GUIDING THE NEXT GENERATION

Nature's Path, along with several other food companies, shares Anna and Doug's concern that there are not enough youth going into organic grain production. The Crabtrees offer a unique apprenticeship for select young farmers. Their end goal is to help the apprentices find land and carry on the organic farming methods that they teach. Annie's, Kamut International, Dave's Killer Bread and Nature's Path are all sponsors of Vilicus Farms' apprentice program.

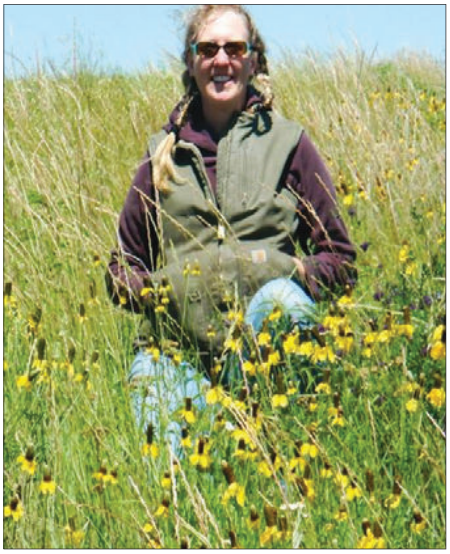
Cultivating more than just the land, Anna and Doug are growing future farmers. They see beginning farmers as the key to growing organic agriculture. Anna and Doug are committed to mentoring new farmers. When their apprentices establish their own farms, Anna and Doug hope that they will bring their ideas along, and a new generation of land stewards will take root across the northern plains.

Anna and Doug screen applicants carefully, realizing there is a risk that they will invest time and energy in an apprentice who may ultimately not be ready to commit to the long-term adventure of farming and a particular location. For the apprentice willing to commit, it is an opportunity of a lifetime. The Crabtrees' vision is that apprentices will go on to run their own farms as land stewards, growing the Vilicus Farms model to a network of like-minded farmers with collective buying and contracting power.

Phase 1 of the program is the *Immersion* year; the apprentice gets hands-on experience in all aspects of the farm, some formal education, and completes a research project based on personal interests and the needs of the farm. After the immersion phase, the apprentice can commit to a longer-term relationship that leads to farm ownership in the Northern Great Plains. During Phase 2, *Growth and Development*, the apprentice continues learning and begins to develop a farm business plan that will evolve into an independent enterprise. Phase 3 is called *Launch*. The apprentice hones the business plan and graduates into managing an independent operation, with continuing mentorship from Vilicus Farms' network of organic farmers. Mentoring could include equipment sharing, joint crop marketing and shared labor.

The Crabtrees have started farming the parcel purchased by Nature's Path. They left the buffers in sod and will roll them into pollinator buffers like the ones at Vilicus over the next two years.

When they started Vilicus, both Anna and Doug had full-time jobs, yet integrated operation of a large, sustainable, organic farm into their busy lives. Doug has since turned to farming full-time, after serving for 11 years as the organic certification program manager for the Montana Department of Agriculture. Anna is still a full-time engineer for the U.S. Forest Service who, during her career, has developed and directs a national program for advancing sustainability in the Forest Service. On the farming side, she was recently appointed to Secretary Vilsack's Advisory Committee on Beginning Farmers and Ranchers. Doug previously worked as an organic inspector, educator, researcher, farm manager and farmer. He received the Organic Trade Association's Organic Farmer of the Year award in 2014.



Anna Jones-Crabtree at Vilicus Farms.

Anna wants to focus on sustainability across the entire food system, developing more sustainable farming systems. She and Doug try to do this with their farm, using it as a model and an experiment. Their farm has given them many opportunities to advocate for greater sustainability in the farm and food systems.

NEED MORE INFORMATION?
For more information visit *www.vilicusfarms.com* or email *anna@vilicusfarms.com* or *doug@vilicusfarms.com*. Anyone wishing to learn more about a partnership with Nature's Path can contact Dag Falck at *dfalck@naturespath.com*.

Lauren Turner is a freelance writer specializing in agricultural, environmental and community topics. She retired from a 30-year career with the U.S. Forest Service working as a wildlife biologist, ecosystem manager and district ranger. An avid organic gardener, she lives in Sequim, Washington, with her husband and three cats.