



Key Continuous Living Cover Cropping Strategies

An extensive toolbox of CLC crops and cropping systems is available to use in a wide range of situations. One way to organize that toolbox is in terms of five key CLC strategies promoted by Green Lands Blue Waters.¹

Agroforestry



Agroforestry is a land management approach that integrates trees and shrubs with plant and animal farm operations. A commonly-used definition identifies five types of agroforestry: silvopasture, alley cropping, forest farming or multi-story cropping, windbreaks, and riparian forest buffers. The common theme of all these practices is that they involve positioning a strategically sized and placed subset of the agricultural system into tree cover. This can bring disproportionate benefits back in the form of conservation impacts and increased productivity of other crops in the system. When an agroforestry cropping system involves harvested tree crops, such as fruit and nut trees, it can provide supplemental economic returns, or can become the central economic activity in the field. Well-managed agroforestry systems bring a high level of conservation benefits in general, but notably in climate change mitigation. Out of all perennial crop options, tree crops have a uniquely high potential to store carbon in standing biomass – tree trunks, branches, and roots in the soil. This provides easily assured carbon sequestration, sidestepping the complexities involved in managing and measuring soil carbon.

Perennial Biomass



Perennial biomass crops are grown and used for renewable energy. They can be grown as cover crops, perennial grasses, and short-rotation trees. Many of these plants can be used as forage for livestock. While not widely produced for energy needs now, perennial biomass crops offer future opportunities for a renewable energy source with ecological benefits. The conservation benefits provided by herbaceous perennial biomass crops are similar to those provided by perennial forages, discussed below. Woody biomass crop benefits are likewise similar to those provided by other tree crops. Woody plants, however, require managing the harvest with great care to avoid introducing a window of high vulnerability to soil erosion and other problems.

Perennial Forage



Perennial forage refers to land planted with perennial plants that feed livestock, including grasses, legumes like alfalfa and clover, and other herbaceous species. Carefully managed grazing or hay production can benefit the environment by improving soil health, reducing runoff and soil erosion, creating wildlife habitat, sequestering carbon, and conserving resources. One standout characteristic of well-managed perennial forage crops is the ability to produce extensive root systems that provide highly assured benefits for soil health and water quality, and potential for substantial soil carbon sequestration. Well-managed rotational grazing of ruminants can benefit farmers by improving the quality and production from these systems.

Perennial Grains



Unlike annual grains, perennial grains are crops that are alive year-round and are productive for more than a year. They can have deeper root systems and longer growing seasons and therefore absorb and hold more rainwater and better capture nutrients – leading to less erosion and runoff of soil and nutrients into water supplies. Compared to annual crops, perennial grains may maintain and capture more carbon in soil, require smaller amounts of fertilizer and herbicide, and reduce or eliminate the need for tillage. Perennial grain crop options are just beginning to emerge, with early-stage varieties of intermediate wheatgrass Kernza® (*Thinopyrum intermedium*) perennial grain in limited production in the Midwest and other parts of the U.S. More than half a dozen other perennial grain crops are under development around the world,² with researchers aiming to combine conservation benefits – traditionally only obtainable from perennial forages and tree crops together – with a level of productivity and food quality historically only available from annual grains. Perennial grains may be grown in a dual-purpose grain and forage system, providing management benefits and multiple revenue streams.

Cover Crops, Winter Annual Crops, and Rotations



A variety of options exist for adding CLC to existing annual crop rotations when converting a field to permanent perennial cover is not possible. Cover crops are legumes, grasses, or other plants grown to maintain and improve a farm's natural resource base, as well as the broader surrounding ecosystem. While the cover crop role is most often filled by annual species, increasing attention is being placed on developing options for perennial cover crops, also known as mulch crops: short-stature perennials that annual grain crops can be interplanted into each year. There are also promising harvestable winter-annual oilseed crops currently in development that can be grown in a double or relay cropping system. For example, field pennycress (*Thlaspi arvense*) and winter camelina (*Camelina sativa*) can provide the conservation benefits of traditional annual cover crops, but can also be harvested and sold as another crop in a farm's portfolio. Finally, perennial forages or perennial grains can be placed into rotation with annual grain crops, providing two or more years of perennial cover in the system. Well-managed rotational grazing of ruminants may prove to be helpful in managing these systems and provide another revenue stream.

On-Farm Integration and Stacking of CLC Practices

On the farm, these strategies rarely operate in isolation. An integrated, whole-farm system is the goal. All of these strategies offer paths to get there and any individual farm often “stacks” several of these practices, arranging them in a mosaic structure or rotating them sequentially on the same piece of land to capture maximum benefits. These integration efforts are a key stimulus for innovation on the part of farmers and scientists. Definitions periodically need to expand to encompass these innovations. Prairie strips in the middle of fields, herbaceous perennial buffer practices at the edge of fields, and perennial cover crops are all examples of integration and stacking.



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