Agriculture
Resilience & Sustainability
Where Does Crop Insurance Fit In?

By Dr. James Houx and Dr. Mechel Paggi, NCIS

Semantics with Distinction

Sustainability and resiliency are terms that are not new in agriculture and resource management. While the terms have different definitions based on economic, social, environmental, and ecological context, they are not mutually exclusive. To be sustainable, one might say that a practice or action must also be resilient. In turn, resiliency fosters sustainability. The inter-linkage of these terms has broad impacts relating to food production, land use change, Green House Gas (GHG) emissions, and the list goes on and on.

On the farm or landscape level, agricultural sustainability as defined by Iris Lewandowski in a 1999 issue of Crop Science suggests "agricultural crop production is (ecologically) sustainable if the productivity as well as the ability to function (among other things the regenerative power and the buffering capacity) of the open system within which plants are cultivated, are permanently maintained to the fullest extent." The definition further implies that to be sustainable, the agricultural ecosystem and its components are not irreversibly altered over the long run. The term buffering capacity used here is an older term bor-

Farmers widely use conservation practices to keep cropping systems sustainable. Contour farming is practiced in the upper Mississippi River watershed to reduce erosion and maintain soil health.

Farmers understand their soil's limitations and tailor their cropping systems for sustainable soil management.

rowed from chemistry and widely applied in soil science—it is what we call today, resiliency.

So, we have a grasp of sustainability, but what does buffering capacity or resiliency mean? This term is also defined in many ways depending upon who you ask. In agricultural production, resiliency is the ability to absorb or be buffered from short-term extremes in weather, or longer-term changes in weather patterns and extreme events. The ability to quickly rebound from extremes should also be implicit in this definition. These terms should consider both crop production and farm-level economic considerations as well. If crop production is sustainable and resilient, but results in economic distress and failure, the production system is neither sustainable nor resilient. In today's world the concepts of resiliency and sustainability must also be viewed in the face of an increasing global population that will require a more intensified food production system that increases output on existing agricultural lands.

As was in 1953 and still is today, crop breeders continually strive to develop yield-stable crops that are sustainable and resilient to the challenges that each growing season presents.

Another term that you will hear in discussions of resiliency and sustainability is regenerative agriculture. However, it is not so easily defined. But, as the name implies the aim of regenerative agriculture is to regenerate the agriculture ecosystem from a degraded state rather than simply sustain its current condition. The idea behind regenerative agricultural systems is to promote a holistic approach to improve soil health and landscape biodiversity using multiple conservation practices. Some go so far as to suggest that "artificial" fertilizers should be replaced with conservation-based practices, manure, and compost to improve soil fertility .

Sustainability and Resilience are Ever Present

The agricultural scientific community has always had resiliency and sustainability in mind. Starting with plant breeders that have perennially focused on higher yielding crops and yield stability across different environments and environmental extremes. Breeding for heat and drought resilience has and always will be an important focus, as is that for water-logging, flood, salt, and pest tolerance. Plant agriculture is not alone in this quest. Animal agriculture is focused on developing breeds and feed rations for feeding efficiency, and grazing systems that are sustainable and create ecosystem resiliency, concomitant sustainability, and improve biodiversity across the landscape.

On the farm, farmers understand that managing for resilience and sustainability involves soil health. Reduced tillage and soil health-promoting activities, like cover crops, are increasingly relevant. But it does not stop at the soil. Farmers have readily adopted precision agriculture that increases the overall biological efficiency of a cropping system. This is accomplished through technology that includes exact plant placement, variable seeding and fertilizer applications, and pesticide placement and application methods. Deciding when, and if, pesticides are applied is based on sound agronomic scouting to determine if pests are present and if they may cause yield loss. This practice called integrated pest management has been used for decades.

Farmers will always try new things. The costs of investing in many of the management changes required to stay relevant, resilient, and sustainable require several years to recoup. Long-term users of cover crops know that changes do not happen over-night and the benefits come several years down the road. The same can be said for precision agriculture. The technology improves resource use efficiency and management decision-making, but it is not inexpensive. Variable rate seed placement requires specialized planters, and the simple cost of crop genetics and inputs dictate that farmers must use these resources judiciously to remain sustainable in their operations.

The financial investment that farmers are willing to make to adapt to changing markets, adopt new technology, improve management, and maintain resiliency, sustainability, and efficiency is directly proportional to the certainty they have that they will remain in business in years to come. The uncertainty of success when trying new things has always been a hindrance to adoption. But how do farmers cope with the risk that accompanies uncertain success?

The current components of the farm safety net provide the financial stability that allow farmers to make the longer-term investments required to enhance resiliency and sustainability of agriculture. A bad crop year, combined with added expenses of implementing efficient, sustainable technologies or trying new management practices that increase the resiliency of their soil, crops, or livestock could be ruinous without such a safety net. In addition, the support of financial institutions to support farmers to undertake these initiatives is less likely without such back stop.

Crop insurance is the foundation of the current safety net that contributes to financial stability and sustainability for farmers and allows them to continue to make those long-term investments. In addition, crop insurance accommodates adaptive and innovative practices, and fosters and promotes adoption of practices that enhance resiliency and sustainability. Crop insurance also allows farmers to implement flexible, context-specific solutions to production problems on their land.

Just to Name a Few

Organic production practices are regenerative as they rely on a holistic approach to cropping system management. Such systems can provide benefits on a landscape level by integrating biodiversity, soil health practices, and crop rotation to name a few. The crop insurance industry recognizes that organic production is rapidly growing and has fostered the practice through policies that provide coverage options for farmers during transition years, specific price elections, and contract pricing.

Another example is crop insurance support for the increased adoption of intermittent flood,

Precision Agriculture technologies such as yield mapping and variable rate seeding allow farmers to optimize the capabilities of their soils and reduce inputs like fertilizer and pesticides.

sprinkler, and furrow irrigated rice cropping systems. These practices allow farmers to cultivate rice on land that may not be suitable for continuous flood cultivation. The practices utilize newer hybrid rice genetics that tolerate a drier soil environment. Less irrigation water is used in general, and even less water is required when rainfall supplements the water needs. These rice growing practices also allow for rotations with other crops and contribute to the reduction of overall greenhouse gas emissions.

In the Great Plains, peak crop water demand can exceed irrigation supply capacity resulting in limited irrigation situations. For some farmers, this is a regular occurrence, and has led to cropping system management practices including rotations with less water demanding crops and reduced tillage that captures more precipitation in the soil profile. Under reduced irrigation, greenhouse gas emissions (N_2O and CO_2) are also lower. The flexibility of the crop insurance program has allowed for a recognition of these conditions in parts of Kansas and offers farmers coverage options if they choose to limit the amount of irrigation applied to their crops.

Increased adoption of cover crops in the past decade has resulted in this practice receiving significant attention. Along with reducing tillage, this is the primary combination of practices that may be most promising for row-crop agriculture having a major impact on sequestering carbon. Both practices reduce topsoil erosion which imparts production sustainability, along with the soil health aspects that add a buffering capacity and improves cropping system resiliency. Cover crops and related conservation practices are considered good farming practices for crop insurance purposes and are supported by the industry.

Precision agriculture and other technologies have revolutionized modern cropping system management. The technology improves efficiency and has numerous benefits such as reducing inputs including fertilizer, pesticides, seed, and fuel. Through yield mapping farmers identify high and low yielding portions within their fields and can adjust management to take advantage of soil limitations and capabilities. Crop insurance has allowed technology to be a value-added enterprise as farm records derived from precision agriculture equipment can be used for acreage and yield reporting.

Crop insurance recognized the importance of biotechnology traits and was instrumental in the adoption of multi-trait biotech seed varieties. After specific biotech seed varieties were shown to lower risk, farmers who planted such biotech crops saw their premium rates reduced in accordance with actuarial soundness requirements. The benefits of the biotech traits are now undisputed in the United States and are rapidly gaining acceptance worldwide as other countries are fully understanding these benefits. Pest deterring biotech traits reduce yield loss allowing more production per unit of land and reduce pesticide use.

These are just a few examples of how crop insurance fosters and promotes sustainability and resiliency. The credit for creating and implementing these practices goes to farmers who continually battle risky markets and unpredictable weather. No one understands the need for sustainability and resiliency in their production systems better than they do. Farmers integrate science and innovation into their farming activities daily. Crop insurance is there to provide the financial stability to build confidence that the support is there, if needed, so that they can weather the rough patches and sustain their lands and operations for seasons to come.