

Integrated Systems Mitigate Land Degradation and Improve Agricultural System Sustainability

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Rain-fed agricultural production supported by exogenous inputs is not sustainable because a continuous influx of expensive inputs (fertilizer, chemicals, fossil fuel, labor, tillage, and other) is required. Alternatives to traditional management allow natural occurring dynamic soil processes to provide the necessary microbial activity that supports nutrient cycling in balance with nature. Research designed to investigate the potential for integrated systems to replace expensive inputs has shown that healthy soils rich in soil organic matter (SOM) are the foundation upon which microbial nutrient cycling can reduce and eventually replace expensive fertilizer. No-till seed placement technology effectively replaces multiple-pass cultivation conserving stored soil water in semi-arid farming systems. In multi-crop rotations, cool- and warm-season crops are grown in sequence to meet goals of the integrated

farming and ranching system, and each crop in the rotation complements the subsequent crop by supplying a continuous flow of essential SOM for soil nutrient cycling. Grazing animals serve an essential role in the system's sustainability as non-mechanized animal harvesters that reduce fossil fuel consumption and labor, and animal waste contributes soil nutrients to the system. Integrated systems' complementarity has contributed to greater soil nutrient cycling and crop yields, fertilizer reduction or elimination, greater yearling steer grazing net return, reduced cow wintering costs grazing crop residues, increased wildlife sightings, and reduced environmental footprint. Therefore, integrating crop and animal systems can reverse soil quality decline and adopting non-traditional procedures has resulted in a wider array of opportunities for sustainable agriculture and profitability.