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Group-based Crop Change Planning: Application of SmartScape™ Spatial Decision Support System for Resolving Conflicts

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Abstract: Agricultural changes are complex and managing an appropriate type of crop change to satisfy stakeholders with various interests is challenging. Decisions regarding a crop change need to be debated among multiple stakeholders with various conflicting viewpoints. Two kinds of conflicts might occur as a result of crop change in an agricultural landscape: 1) conflicts among multiple ecosystem services i.e., internal conflicts and 2) conflicts among multiple stakeholders i.e., external conflicts. In this study, we held a series of meetings with stakeholders, who were experts in economics, energy, soil erosion, greenhouse gas emission, surface water, and biodiversity, to develop two crop change scenarios by replacing perennial energy crops with annual energy crops (grass to corn) and vice versa (corn and soy to alfalfa). While the first scenario shows the stakeholders' interests in economy and energy, the second scenario represents the stakeholders' interests in soil erosion, greenhouse gas emission, surface water, and biodiversity. We applied SmartScape™ to Dane county, Wisconsin, U.S. to 1) run the two aforementioned scenarios separately in order to assess how effectively SmartScape™ enables decision makers to resolve internal conflicts while considering the relative values of multiple ecosystem services, and 2) run the two scenarios jointly to show how well SmartScape™ enables decision makers to resolve external conflicts in a group while taking into account the diverse goals of stakeholders. The outcomes of this study can inform policy-makers about both internal conflicts within a crop change scenario and external conflicts among stakeholders and provide a unique framework to resolve both types of conflict in an effective way. Obtaining acceptable crop change solutions among stakeholders with conflicting interests can lead us in moving from individual decision-making to group-based decision-making so that we can enhance sustainability in agricultural landscapes.

Keywords: SmartScape™, Internal and external conflicts, Crop change scenario, Ecosystem services trade-off, Group-based decision-making.