Coordinating Farm Management to Expand Provision of Ecosystem Services

Leah M. Harris and Scott M. Swinton
Department of Agricultural, Food, and Resource Economics
Michigan State University, East Lansing, MI

KBS LTER
Kellogg Biological Station
Long-term Ecological Research

MICHIGAN STATE UNIVERSITY

When appropriate physical, social, and economic characteristics align in a landscape, farmers can collectively manage agricultural areas to enhance ecosystem services.

Managing Agricultural Landscapes

Agricultural systems constitute the world's largest engineered landscape. Farm land is managed primarily for food, fuel, and fiber production, yet non-marketed ecosystem services (ES) are also provided.

Some ES are supplied at the farm-level (e.g. improved soil quality), but others depend on larger land areas (e.g. biological pest control).

The scale at which landscape-level ES are delivered does not match the scale at which farmers make management decisions. Farmers must coordinate management to successfully enhance landscape-level ES.

A landscape is an area that spans property boundaries and is characterized by its physical attributes, socio-economic characteristics of land managers, and the institutional policies governing the region.

Why Should Farmers Work Together?

Farmers' management choices directly impact the structure and functionality of the landscape. By coordinating management decisions at the landscape level, farm managers can provide certain ES at lower social cost than independent, individual decisions.

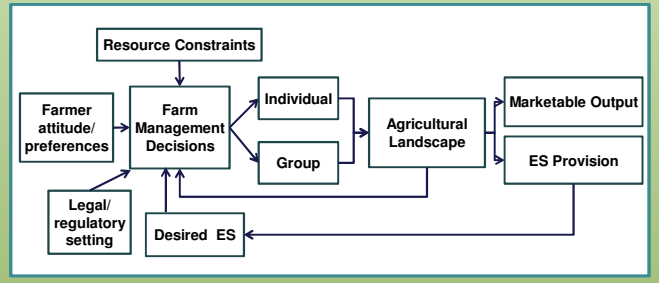


Figure 1. Farm management decisions are affected by multiple factors

What Influences Cooperation?

Coordinated management is feasible only under certain conditions. Agricultural regions can be appropriate settings for collective ES provision based on physical, social, and economic attributes. The success of managing landscapes to enhance ES ultimately depends on farmers' willingness to cooperate.

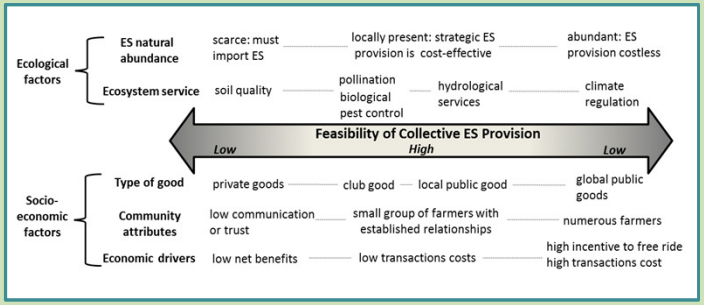


Figure 2. A range of physical, social, and economic attributes determine the feasibility of collective ES provision in an agricultural landscape.

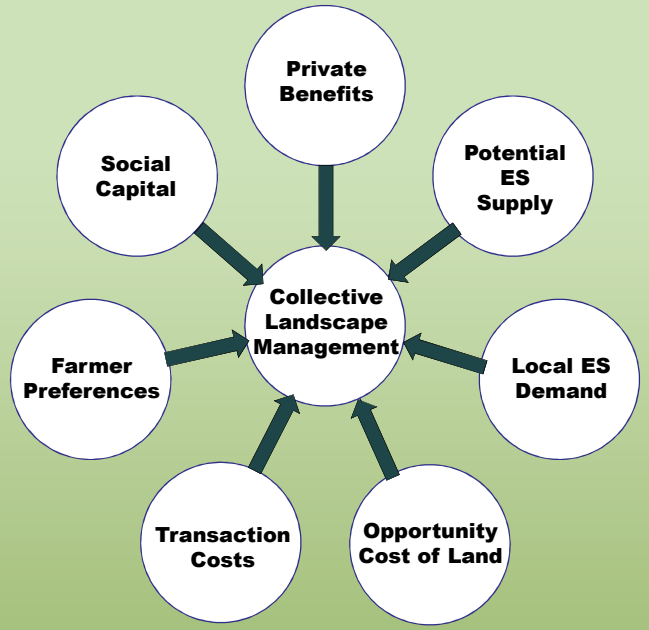
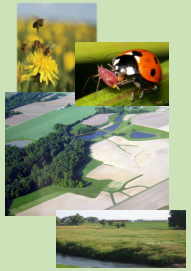


Figure 3. The social and economic drivers of collective action among farmers.

Scaling Up Ecosystem Service Provision



Pollination, biological pest control, and hydrological services (e.g. water purification and flood mitigation) have high potential for collective provision (Stallman, 2011).

Spatial distribution, connectivity of habitat, and biodiversity of plant species impact the dispersal of beneficial insects across crops areas (Landis et al., 2005). Pollination and natural pest control can be improved by connecting habitats with flowering strips, hedgerows, and forest patches.

Riparian buffers, cover crops, and responsible pesticide applications can reduce soil erosion and improve water quality.

Cooperation in Action

Successful conservation programs are only possible if the biophysical and socio-economic features of a landscape are compatible. The following examples illustrate the determinants of project success or failure. Favorable factors appear in green outline, while unfavorable ones are in red.

Payment for Hydrological Services in Mexico *(Muñoz-Piña et al., 2008)*	**Project**	**Payment for Reforestation in China** *(Gong et al., 2010)*
Payments for forest conservation that will improve water quality	***Description***	Pay landowners to allow companies to reforest land for ES provision
Agricultural lands with partial forest cover	***Biophysical Landscape***	Remote and degraded lands – some land is infertile
Annual payments equal the opportunity costs of land.	***Net Private Benefits & Opportunity Cost of Land***	Some payments are below opportunity costs.
Low supply due to deforestation	***Natural ES Supply***	Low supply due to deforestation
Strong demand for improved water quality	***Local ES Demand***	Government is demanding ES, but low local demand
Moderate - Community organizations help lower transactions costs.	***Transaction Costs***	Moderate to high – pooling land lowers costs, but developing necessary infrastructure is costly.
Believe healthy forests improve water quality	***Farmer Preferences***	Conflicting preferences
Strong - high levels of trust and communication	***Social Capital***	Weak - low trust, insecure land tenure
High compliance and forest conservation	***Project Outcome***	Only half of 4000ha target area has been reforested.

References

Gong, Y., Bull, G., Baylis, K., 2010. Participation in the world's first clean development mechanism forest project: The role of property rights, social capital and contractual rules. Ecol. Econ. 69, 1292-1302.
Landis, D.A., Menalled, F.D., Costamagna, A.C., Wilkinson, T.K., 2005. Manipulating plant resources to enhance beneficial arthropods in agricultural landscapes. Weed Science 53, 902-908.
Muñoz-Piña, C., Guevara, A., Torres, J.M., Braña, J., 2008. Paying for the hydrological services of Mexico's forests: Analysis, negotiations and results. Ecological Economics 65, 725-736.
Stallman, H.R., 2011. Ecosystem services in agriculture: Determining suitability for provision by collective management. Ecological Economics 71, 131-139.