

Introduction to Environmental Economics in Agriculture

Introduction to Environmental Economics in Agriculture
Key concepts, why it matters, and how it is applied

1. What Is Environmental Economics?

Aspect	Definition
Scope	Study of how economic activities affect the environment and how environmental policies influence the economy.
Goal	Achieve an efficient allocation of resources while protecting natural capital (soil, water, air, biodiversity).
Tools	Cost-benefit analysis, externality pricing, market-based instruments, valuation of ecosystem services.

2. Why Focus on Agriculture?

Reason	Explanation
Land-Intensive	Agriculture occupies ~40% of global terrestrial land and directly shapes ecosystems.
Resource Use	Heavy demand for water, fertilizers, pesticides, and energy.
Externalities	Positive (pollination, carbon sequestration) and negative (nutrient runoff, greenhouse-gas emissions).
Food Security	Balancing production needs with long-term environmental sustainability is essential for feeding a growing population.

3. Core Economic Concepts Applied to Agriculture

Concept	Agricultural Example	Typical Policy Response
Externalities	Nitrogen leaching into waterways → eutrophication.	Pigovian taxes on fertilizer, nutrient-management regulations.
Public Goods	Pollination services from wild bees.	Payments for ecosystem services (PES) to maintain habitats.

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Concept	Agricultural Example	Typical Policy Response
Common?Pool Resources	Groundwater basins shared by many farms.	Individual water?withdrawal permits, collective management agreements.
Tragedy of the Commons	Overgrazing on communal rangelands.	Community?based grazing quotas, rotational grazing incentives.
Discounting	Valuing future soil fertility vs. present yields.	Adoption of long?term stewardship contracts, low?interest loans for conservation.

4. Valuing Environmental Impacts

1. Market?Based Valuation

- Direct price of goods (e.g., timber, fish) that depend on agricultural land.

2. Non?Market Valuation

- **Contingent Valuation** – surveys to gauge willingness to pay for cleaner water.
- **Hedonic Pricing** – property value differences reflecting proximity to polluted vs. clean farms.
- **Travel Cost Method** – value of ecosystem recreation (e.g., agri?tourism).

3. Ecosystem?Service Accounting

- **Provisioning** – crops, livestock.
- **Regulating** – carbon storage, flood control.
- **Cultural** – heritage landscapes, tourism.
- **Supporting** – soil formation, nutrient cycling.

5. Market?Based Instruments in Agriculture

Instrument	How It Works	Typical Use in Agriculture
Carbon Taxes / Cap?and?Trade	Price on CO? emissions; permits can be bought/sold.	Incentivize low?emission practices (no?till, precision fertilization).

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Instrument	How It Works	Typical Use in Agriculture
Nutrient Trading	Farmers with lower nutrient loads sell credits to higher-emitting farms.	Reduce total nitrogen/phosphorus loads in watersheds.
Water Rights Markets	Tradable permits for water withdrawals.	Allocate scarce irrigation water efficiently.
Payments for Ecosystem Services (PES)	Direct payments for maintaining or enhancing ecosystem functions.	Payments for maintaining hedgerows, wetlands, or cover crops.
Subsidy Reforms	Shift from input?	