

14. Crop Breeding for Better Disease Resistance and Yield

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Abstract

This article explores the concept of "Nature's Balance Sheet," highlighting the importance of economically valuing ecosystem functions and services that are essential to human well-being and economic development. Ecosystems provide a range of services—such as climate regulation, water purification, soil fertility, and pollination—that are often overlooked in conventional economic systems. By assigning monetary value to these services, policymakers and stakeholders can make more informed decisions that align with sustainable development goals. The article discusses various valuation methods, presents real-world case studies, and emphasizes the integration of natural capital into economic planning. It advocates for a paradigm shift where the environment is recognized not as an externality, but as a fundamental asset underpinning all economic activity.

Introduction

Contemporary measures of economic performance largely omit the contribution of ecosystems, even though forests, wetlands, grasslands, and oceans quietly sustain human welfare and national prosperity (Costanza et al., 1997). Treating these natural assets as entries on a “balance sheet” makes their value explicit and encourages policies that protect—and invest in—planetary health (Dasgupta, 2021).

Ecosystem Functions and Services

Ecosystem functions—nutrient cycling, water filtration, habitat provision, climate regulation—translate into ecosystem services when they benefit people. Commonly grouped into provisioning, regulating, cultural and supporting services (TEEB, 2010), these flows underpin everything from food security to mental health. Yet they remain largely “off-book” in national accounts, fostering over-extraction and degradation (Barbier et al., 2011).

Why Economic Valuation Matters

Assigning monetary values to ecosystem services helps correct market failures by revealing the hidden costs of environmental loss and the benefits of conservation. Natural capital accounts integrated with GDP—such as those promoted by the UN’s System of Environmental-Economic Accounting (SEEA) (UN, 2021)—provide policymakers and investors with a fuller picture of national wealth (Balmford *et al.*, 2002).

Valuation Techniques

Technique	Typical Application	Example
Market pricing	Goods already sold in markets	Timber, fish
Replacement/avoidance cost	Cost of built substitutes	Wetlands vs. water-treatment plant
Hedonic pricing	Ecosystem attributes capitalised into property values	Urban green belts raising house prices
Travel-cost method	Recreational value	National Park visitor spending
Contingent valuation & choice experiments	Non-market values via stated	WTP to preserve mangroves

	preferences	
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Combining multiple techniques often yields the most robust estimates (IPBES, 2019)

Case Studies

Indian Mangroves: Avoided damages from cyclones and storm surges exceed ₹12,000 ha⁻¹ yr⁻¹—far more than alternative land uses (Barbier *et al.*, 2011).
Global Pollination: Insect pollination adds US \$235–577 billion annually to crop output, reinforcing the economic case for habitat conservation (IPBES, 2019).

Urban Trees: Shade and evapotranspiration can cut city cooling costs by 20–30 %, reduce particulate pollution and improve mental health—values that outweigh maintenance budgets (Balmford *et al.*, 2002).

Integrating Nature into Decision-Making

- National Accounts: Countries including the UK, India and Costa Rica now publish experimental natural-capital accounts alongside traditional economic statistics (UN, 2021).
- Corporate Reporting: Firms are beginning to disclose biodiversity dependencies and set “nature-positive” targets, following frameworks such as the Taskforce on Nature-related Financial Disclosures (TNFD) (Dasgupta, 2021).

- Payment for Ecosystem Services (PES): Schemes from Costa Rica's Forest-protection payments to India's CAMPA Green Fund channel financial incentives to conservation.

Challenges and Outlook

Valuation must grapple with data gaps, uncertainty and the risk of commodifying sacred or intrinsic values (Costanza et al., 1997). Yet, when combined with qualitative assessments and inclusive governance, economic metrics remain powerful tools for aligning development with planetary boundaries (IPBES, 2019). Building robust natural-capital accounts—and acting on them—will determine whether tomorrow's balance sheets add up.

Conclusion

Recognizing and valuing ecosystem functions through the lens of "Nature's Balance Sheet" is essential for achieving sustainable development. Ecosystem services such as climate regulation, water purification, and biodiversity support form the foundation of both environmental and economic stability. Ignoring these contributions in traditional economic models has led to widespread resource degradation and misinformed policy decisions. By integrating natural capital into national accounting systems and decision-making processes, societies can better align economic growth with

ecological sustainability. The way forward involves not only quantifying nature's value but also fostering a deeper appreciation for its irreplaceable role in supporting life, livelihoods, and long-term prosperity.

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