Opinion

Sustainable development and biodiversity: a brief history and main milestones

Abstract

The relationship between human societies, ecosystems, and sustainable agriculture has evolved significantly over recent decades. This chapter examines the shift from viewing nature solely as a resource for economic growth to recognizing it as the foundation for sustainable development. Starting with the rapid population growth from the 1950s to today, it highlights the increased demand for essential resources and the environmental challenges posed by this pressure. Using Mexico's New Vision for agriculture as a case study, it discusses strategies that incorporate biodiversity conservation, ecosystem services, and sustainability in agricultural policies. This approach acknowledges the socioeconomic importance of agricultural lands and integrates often-overlooked stakeholders, such as small producers, women, and youth, to promote equitable development. The chapter explores the importance of ecosystem services, governance models, and policy interventions that consider spatial and temporal dynamics, externalities, trade-offs, and synergies. The goal is to encourage sustainable agricultural practices that balance human needs with ecosystem health, ensuring long-term well-being for both people and the environment.

Keywords: sustainable agriculture, ecosystem services, biodiversity conservation, sustainable development, governance, environmental policy, agricultural practices, socio-ecological systems, ecosystem dynamics, trade-offs

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Introduction

The idea of the environment, natural resources and sustainable development has changed over time. Historical facts and scientific evidence have imposed a new way of seeing the relationships between dependence and impacts of human activities on ecosystems and biodiversity. The world population went from 2.6 billion in the 1950s to more than 7.7 billion people today (UN, 2019).[1] As a result, this increase in population has been accompanied by an increase in demand for water, food, energy and other resources necessary for human well-being and the economy.

However, the supply of these goods and products does not keep pace with their replenishment, and their maintenance is therefore threatened by the way we relate to nature, without recognizing it as the fundamental basis for sustainable development. Today, it is a challenge to deal with the losses resulting from the degradation of ecosystems and their negative effects on people and the economy. This is why a new approach is needed that considers ecosystem services in management plans and strategies for sustainable development. In addition, areas dedicated to agriculture must be considered strategic from the economic, social and environmental points of view, given their potential contribution to the conservation and sustainable use of biodiversity and ecosystem services. To understand the dynamics in the evolution of thinking about the environment and sustainable development, in this chapter we highlight some milestones, starting in 1950 and ending up to the present day.[2]

The new vision of agriculture in Mexico

Mexico is aware of the importance of conserving biodiversity for agriculture and food. Ensuring the continuity of ecosystem services is also a challenge for the Ministry of Agriculture; the quantity and quality of water, climate regulation, biological control of pests and diseases, pollination and maintenance of soil fertility are some of the services that only a healthy environment can provide. To move towards food self-sufficiency, the reduction of socioeconomic gaps in the rural population, and environmental care, the Ministry of Agriculture and Rural Development proposes a New Vision for food production where all Mexicans produce under a focus of sustainability, inclusion and territoriality.[3]

The implementation of this New Vision includes small producers, historically left behind by public policies, and incorporates in a differentiated way women and young people, who constitute more than half of the productive rural population. The aim is to promote a policy that encourages and increases sustainable production practices in the agricultural, aquaculture and fishing sectors to address the risks of climate change and consumer needs. It also seeks to feed a growing population, which is why it is necessary to work with the Secretariat's own programs and other government agencies. This highly relevant task involves synergies and constant dialogue between different actors.

The production model that the Ministry of Agriculture and Rural Development is seeking to promote recognizes that agriculture benefits most from biodiversity, and considers that its loss increases the effects of climate change, thus undermining food production. The purpose of this New Vision is for food production systems to reduce their negative effects on biodiversity, and to achieve a harmonious system between these and natural resources, thereby achieving the well-being of society in general, as outlined in the following Figure 1.

The thinking on society and environmental policies has needed time to broaden its perspective since the middle of the last century, moving from looking at nature as a source of raw materials for economic and industrial development to an integrated approach, where nature is recognized as the basis for the development of a fair, equitable and inclusive society, where the economy and economic growth are means to achieve sustainable development, calling for collective action and cooperation between the various actors and institutions involved.[4]

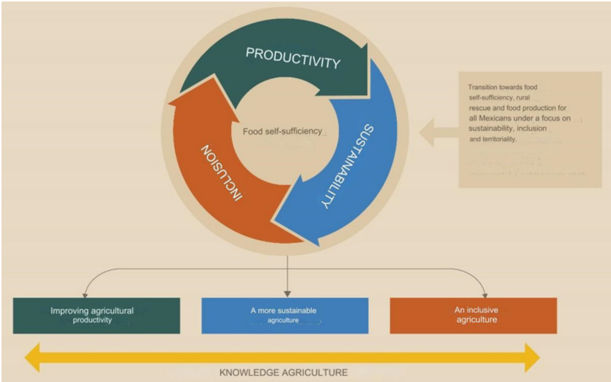

Figure 1 Production model.

This simple diagram presents the link between socio-economic systems and natural systems (also called socio-ecosystems) through the flow of ecosystem services and the drivers of change that exert pressures on ecosystems, either as a result of the use of ecosystem services or through the impact of human activities in general. It also shows how people benefit from ecosystem services. These **benefits** include, among others, adequate nutrition, access to clean air and water, health, security and enjoyment of natural environments. They also cover various dimensions of human well-being, such as basic human needs, economic needs, environmental needs and subjective happiness.

This approach implies that ecosystem services are valued by society not only from an economic point of view, but also from other types of values such as health, sociocultural value or conservation value. Hence, the non-monetary values of nature can reflect its instrumental value and its fundamental intrinsic values. In exchange for the benefits provided by ecosystem services, socioeconomic systems cause changes in ecosystems through different **drivers of change,** affecting their state.[5] Most of the time, the contributions to well-being and the values of ecosystem services during their use are not considered, nor are the negative impacts they receive taken into account, so there are medium and long-term risks in the continuity of the services, which in turn will end up affecting socioeconomic systems (Figure 2).

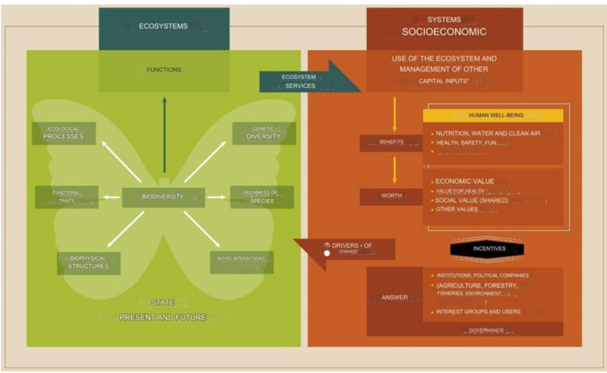

Figure 2 Relationship between ecosystems and socioeconomic systems.

Now that the drivers of change have been discussed, it is important to reflect on the **governance** of the socio-economic-ecological system, which becomes an integral part of the conceptual framework: institutions, stakeholders, and different users of ecosystem services affect ecosystems through these direct or indirect drivers of change. Policies related to natural resource management aim to influence the drivers of change achieve a desired future state of ecosystems. To do this, governments, in cooperation with other actors, formulate various types of **incentives** (see figure below), as they influence people's behavior. Thus, we have market-oriented incentives, such as user fees, taxes, or subsidies; regulatory incentives, such as property rights, laws, environmental standards and access restrictions; incentives for cooperation, such as measures that involve interest groups in the decision-making process, whether through roundtables, sectoral coalitions, sectoral chambers; and information incentives, such as audits, eco-labeling or certifications and *policy briefs* (Figure 3).[6]

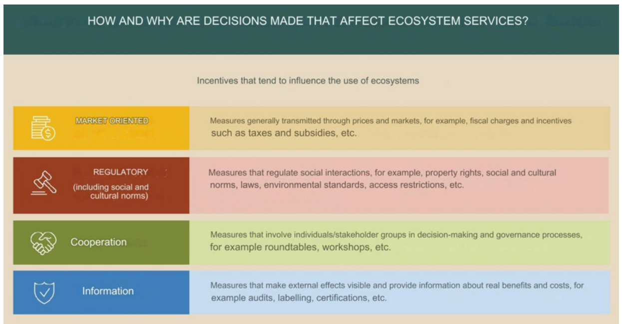

Figure 3 How and why do they make decisions that affect ecosystem services?

To understand how these and other elements influence stakeholders' decision-making, it is crucial to analyze their positions, interests and needs (this topic will be discussed in depth in another chapter). In this way, interventions must create consensus, involve individuals or interest groups and improve social interaction between people and institutions, to ensure fair agreements that conserve ecosystem services, minimize conflicts and promote more equitable access, use and distribution.[7]

Governance

Integrating ecosystem services into planning processes can be viewed as a step-by-step process, where the first task involves understanding the key ecological structures of the landscape, as well as their processes and functions, to identify those that are useful to society. Then, the next step is to understand the supply of ecosystem services, which can be expressed in physical units or any unit of measurement that is meaningful to generate a common understanding of what is being assessed (e.g., cubic meters of water, number of species, tons of carbon sequestered, etc.). Looking at the benefits that ecosystem services provide to society reflects the social demand for a service and how it is valued by different groups of people. Comparing the supply and demand of the service can measure whether there is a balance, whether degradation can be attributed to excess demand or some other form of impact.

The model presented above for understanding the relationship between ecosystems and socio-economic systems offers us a simple tool to understand the links between ecosystems, ecosystem services and human well-being. It also shows how this interrelation generates a series of changes and transformations in the basic ecological structures and processes to guarantee the flow of services in this cycle. In addition, it allows us to analyze how these relationships are influenced and mediated through institutions, regulations and policies.

Spatiotemporal dynamics and other characteristics of ecosystem services

Ecosystem services (ES) are not homogeneous across land and seascapes, nor are they static phenomena; rather, they vary spatially and evolve. Improving the management of agricultural landscapes and implementing effective policies and actions for their maintenance (and

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that of ecosystems) requires understanding the scale,[8] spatial pattern and temporal synchronization of ecosystem service flows. Ecosystem services are primarily provided in healthy and biodiverse areas. Their benefits can extend beyond the territories where they originate, being the basis of the local and regional economy and climate, and therefore they must be considered and recognized by the government, private and social sectors in their planning and decision-making processes.

Many of the ecosystem services that agroecosystems impact and depend on are found within and outside agricultural plots and fields. Sometimes, they are even larger areas at the territorial or watershed level, which is why it is necessary to assess from a landscape perspective to integrate biodiversity and ecosystem values into food systems.[9]

Four spatial and flow patterns of ecosystem services over time are shown.

The spatial dynamics of ecosystem services refers to the difference between the locations where the ES is provided and where the associated benefits are received. This contrast is crucial to identify trade- and drivers of change, therefore, it is essential to understand this spatial dynamic if appropriate policies are to be designed for a given reality.

The temporal dynamics of ecosystem services refers to the fact that as conditions change, ecological processes, services and benefits across the landscape also change over time. For example, agricultural land that has been continuously used does not provide the same ecosystem services for agriculture as an area that has recently been deforested.

The needs and preferences of society also change over the landscape and over time. For example, in a basin, the water needs of farmers in the middle part are different from those of city dwellers downstream, or of artisanal fishermen in the delta part.[10,11] On the other hand, fashionable foods, such as avocado, chia or soy, could motivate farmers to convert their lands to monocultures and thus receive those benefits in the short term, which can affect ecological structures and processes, the impacts of which would only be noticeable in the medium or long term.

On the other hand, because farms are managed by some farmers, the supply of ecosystem services depends on the aggregate practices of all of them. The aggregate results of management decisions made by these individuals affect the availability of ecosystem services not only for themselves, but for people in distant places and in the distant future. Consequently, activities that affect the flow, quality and quantity of ES in a given place can radiate their impact and affect ecosystems and biodiversity in other places. When analyzed through a landscape perspective, it is clear that farm management can affect not only the ecosystem services available at a local scale, but also at a regional and global scale, as shown in the following Figure 4.

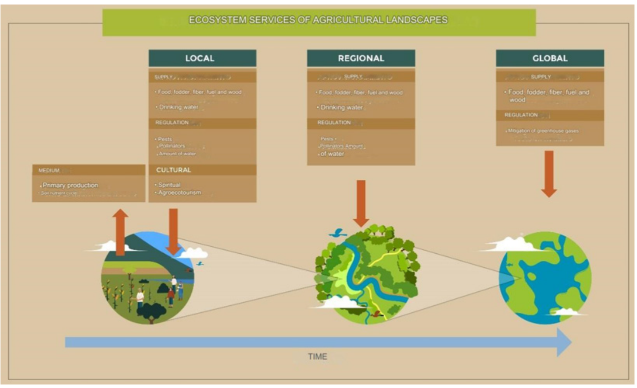

Figure 4 Ecosystem services of agricultural landscapes.

Externalities, trade-offs and synergies

The analysis of ecosystem services important for agriculture must consider the spatial and temporal distribution of benefits, as well as the context of actions and policies of other sectors, in addition to their relationship with ecosystem services, since some economic sectors generate impacts and externalities on the flow of resources, harming other economic activities, although the impacts are not visible in the short term.[12]

An externality occurs whenever a person or company carries out an activity that affects the well-being of others who do not participate in it, without paying or receiving any compensation for it. These costs or losses are perceived by others, by the economy in general, as transboundary effects or as having consequences for future generations and are manifested in the economic, social and environmental spheres.

There are positive or negative externalities. A positive environmental externality is when a landowner's investment in conserving natural vegetation in the upper part of the watershed benefits other downstream users (by allowing crop production due to the presence of water, favorable climatic conditions and low incidence of pests, and by being able to develop and implement agroecological or agroforestry practices). A negative externality is when water extraction for agriculture in the upper part of the watershed leaves an insufficient flow or quality of water for human and natural systems downstream, or when the application of agrochemicals in food production contaminates water for consumption by the nearby population.[13]

Externalities, trade-offs and synergies

As you may have noticed, agricultural activities carried out in the upper part of a watershed (or along a watercourse that flows into the coastal region) can influence and compromise the availability and quality of ecosystem services on the coast, altering habitats and, consequently, harming the supply of fish on the coast and the communities that live off artisanal fishing (beneficiaries of the service provided). In this way, local well-being and the economy are compromised, in addition to impacting biodiversity due to eutrophication of the coasts.

Some ecosystem services (such as food provision or carbon sequestration) can be maintained or increased within agroecosystems, but depending on the practices used, the provision of other services, such as soil fertility, nutrient cycling, the hydrological cycle or the cultural identity of a particular social group, can be affected. The fact that the various agricultural activities increase the provision of some services (food or fodder) does not mean that all social groups are benefiting equally, because other services could be affected, such as water filtration and provision, moderation of extreme events, protection against erosion, soil health and fertility or climate regulation.

The presence of externalities in human activities can generate trade-offs when making decisions between different development options and objectives.

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Trade-offs in decisions occur when the provision of one or more ecosystem services is reduced as a result of increased use of another ecosystem service. In some cases, these may be explicit choices, but in others, they arise from unpremeditated decisions or without awareness of their occurrence.

These unintended trade-offs may arise from ignorance of the interactions between ecosystem services, when our knowledge of their functioning is incorrect or incomplete, or when the ecosystem services in question do not have explicit markets. However, even if a decision is the result of an informed and explicit choice, it can also have negative implications.

An example from agriculture: monoculture production increases the quantity of food, but reduces soil quality, biological control, and air and water quality regulation. Moreover, a synthesis of over 200 cases of sustainable agriculture investments in developing countries around the world (in both drylands and non-drylands) showed that the application of diverse agricultural techniques and practices could lead to a reduction of trade-offs on ecosystem services, even as crop yields increased.

There is currently a wide range of tools to ensure sustainable food production without affecting the provision of ecosystem services. In the following table, you will find several examples in this regard.

Trade-offs can occur between services (e.g., provisioning vs. regulating services) over time (present vs. future generations) and space (upstream vs. downstream). By highlighting the relative impacts of trade-offs on the present and future provision of ecosystem services, we can focus on a critical element of making better decisions associated with managing the trade-offs themselves: understanding the distributional effects of changes in ecosystem services: who wins and who loses (Figure 5,6).

DECISION	AIM	EXAMPLE OF WINNERS	DECREASED ECOSYSTEM SERVICES	EXAMPLE OF THOSE WHO LOSE
INCREASE IN ONE SERVICE AT THE EXPENSE OF OTHER SERVICES				
Drainage of wetlands for agriculture	Increase in crops and livestock	Farmers, consumers	Regulation of natural hazards, water filtration and treatment	Local communities, including some farmers and downstream water users
Increase in the use of fertilizers	Increase in crops	Farmers, consumers	Fisheries, recreation (as a result of dead zones due to excess nutrients)	Fishing industry, coastal communities, tourism operators
Conversion of forests into agricultural areas	Temporary increase in timber extraction, increased crops, livestock and biofuels	Timber companies, farmers, consumers	Climate and water regulation, erosion control, wood supply, cultural services	Local communities, global community (due to climate change), local cultures
CONVERTING ECOSYSTEMS AND THEIR SERVICES INTO BUILT ASSETS				
Coastal development	Increase in fixed assets, job creation	Local economy, government, developers	Regulation of natural threats, fisheries (as a result of the removal of mangrove forests or wetlands)	Coastal communities, fishing industry (local and foreign), increased risks for coastal businesses
Replacement of forests, agricultural areas or wetlands with residential developments	Increase in fixed assets, job creation	Local economy, government, developers, home buyers	Ecosystem services associated with the removed ecosystems	Local communities, original property owners, downstream communities

Figure 5 Integration of ecosystem services in developmental planning.

CONVERTING ECOSYSTEMS AND THEIR SERVICES INTO BUILT ASSETS				
Coastal development	Increase in fixed assets, job creation	Local economy, government, developers	Regulation of natural threats, fisheries (as a result of the removal of mangrove forests or wetlands)	Coastal communities, fishing industry (local and foreign), increased risks for cost-effective businesses ros
Replacement of forests, agricultural areas or wetlands with residential developments	Increase in fixed assets, job creation	Local economy, government, developers, home buyers	Ecosystem services associated with the removed ecosystems	Local communities, original property owners, downstream communities
COMPETITION AMONG DIFFERENT USERS FOR LIMITED ECOSYSTEM SERVICES				
Increase in biofuel production	Reducing dependence on imported energy	Energy consumers, farmers, government	Using crops for biofuels instead of food	Consumers (food prices rise), livestock industry
Increased water use in upstream communities	Development of upstream areas	Communities and industries located upstream	Downstream water supply	Communities and industries located downstream
MAINTAIN A BALANCED MIX OF ECOSYSTEM SERVICES OR PROMOTE AN INCREASE IN ECOSYSTEM SERVICES IN GENERAL				
Introduction of agroecological practices	Increase crops, promote crop resilience	Farmers, consumers	The combination of ecosystem services could improve: provision of food, fodder and raw materials; pollination, erosion control	Agrochemical suppliers, farmers (more effort required)
Restoration of urban green areas	Increase access to green areas for urban residents	Urban residents, visitors	The combination of ecosystem services improves: habitats, recreation, aesthetic appreciation, health, provision of	Developers of grey infrastructure, settlements affected by new zoning

Figure 6 Converting ecosystems and their services into built assets.

Different uses of ecosystems in the agricultural landscape and the consequences of biodiversity loss on the availability of ES

In the animation you watched earlier, examples of three types of ecosystem land use and the ecosystem services provided are shown. Can you identify the ecosystem services trade-offs associated with changes in ecosystem use? Which of these is more sustainable in the long term?

A natural ecosystem with low intensity of use or degradation provides different products: wood, fibers, fuels, food (fruits, fish, honey, etc.), wild animals (as food sources and environmental regulators), medicinal plants and also a large reservoir of pollinators for native plants and species cultivated outside the natural ecosystem.

This ecosystem also ensures water purification and erosion containment, protecting the watershed. Clouds form over the ecosystem due to the process of evapotranspiration, which maintains the region's rainfall patterns important for agricultural activities. The ecosystem protects the soil from erosion caused by heavy rains and winds. The ecosystem's natural processes form soil and spread seeds, both necessary for the long-term health of the ecosystem.

Next, identify which ecosystem services were prioritized based on ecosystem use.

Opening up selected areas of forests for agriculture can increase the amount of food produced in the area. Similarly, if forests are well managed and wood production is handled sustainably, their encroachment on native forests is reduced.

As the landscape is maintained with diversified agroforestry systems (well-managed) others can continue to be generated. If biodiversity is maintained, agroecosystems and their environment will also continue to be more resistant to pests and other pathogens. There is evidence that when indicators of biological diversity are higher, production systems have higher levels of productivity and resilience to changes and external pressures, such as droughts and heat waves.

To increase the yield of a single service, such as food production, others are usually reduced to minimal levels (Figure 4). This creates negative effects on surrounding areas: soil erosion, sedimentation in rivers, decreasing the effectiveness of irrigation systems downstream; chemical fertilizers and pesticides can reduce water quality and affect wildlife, harm fisheries and exterminate microorganisms that help the

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soil nutrient cycle; without the necessary habitat, pollinating insects disappear, reducing crop productivity; without large-scale vegetation cover, regional rainfall patterns change and the soil loses its moisture, affecting the nutrient cycle. In many regions, investments in seeds, agrochemicals and technology do not compensate for the long-term loss of ecosystem health and productivity. The effects are devastating in the countryside and generate reflections in cities, mainly harming the supply of water and healthy food.

Although some ecosystem services may be maintained or increased within agroecosystems, many others decrease in quality and quantity. Typically, some ecosystem services that are increased or maintained are food production, carbon sequestration, and inspiration for art, culture, and science; while some that are typically lost are soil fertility, nutrient cycling, and so on. Of course, the maintenance or loss of ecosystem services also depends on the scale of agriculture, management practices, crop type, inputs, and so on.

It is important to note that the fact that agriculture or livestock farming increases the provision of some ecosystem services (such as food or fodder) does not mean that all groups of people benefit from it, since they may depend on other ecosystem services that are also impacted, such as recreation, water filtration and provision, or the moderation of extreme events.

Why should we take ecosystem services into account in agriculture?

The integration of biodiversity and ecosystem services, with an emphasis on agricultural landscapes, promotes sustainable decisions and a fairer and more equitable distribution of costs and benefits among individuals and interest groups in the territories. Understanding the relationship between ecosystems, agroecosystems and the well-being of society is crucial to promoting agricultural production and productivity (Figure 7).

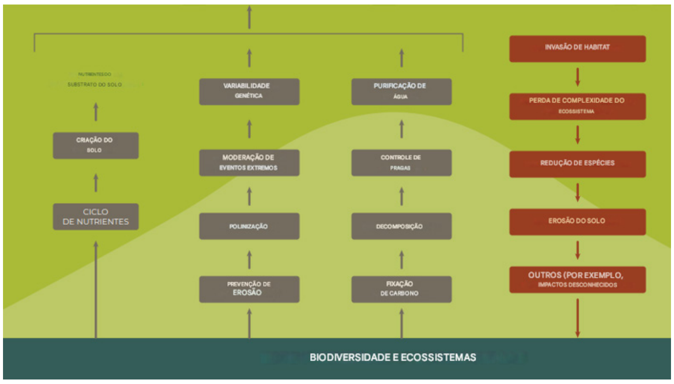

Figure 7 Biodiversity ecosystems.

This image highlights some of the significant flows between agri-food systems, human systems (economic or social), biodiversity and ecosystems. These flows are divided into two categories: visible ones, such as food and raw materials; and invisible ones, which are ecosystem services, such as pollination, regulation of the water cycle, prevention of erosion, mitigation of climate change or soil fertility.

To support effective policy design and planning that affect agricultural landscapes and agricultural management practices, there is a need to understand the flows of ecosystem services and their variations across agricultural landscapes, as well as the role of current policies in providing (or affecting) these services. This knowledge should provide information on the landscape's capacity to contribute to societal well-being, as well as the potential trade-offs and indirect effects of landscape management.

Why should we take ecosystem services into account in agriculture?

Ecosystem services (ES) are not homogeneous across land and seascapes, nor are they static phenomena, but rather they vary spatially and evolve. This is why understanding the scale, spatial pattern and temporal timing of ecosystem service flows is necessary to improve the management of agricultural landscapes and to implement effective policies and actions to maintain them (and ecosystems).

Ecosystem services are provided primarily in healthy and biodiverse areas. Their benefits can extend beyond the territories where they originate, forming the basis of the local and regional economy and climate. They must therefore be considered and recognized by the government, private and social sectors in their planning and decision-making processes.

Many of the ecosystem services that agroecosystems impact and depend on are found within and outside agricultural plots and fields. Sometimes, they are even larger areas at the territorial or watershed level, which is why it is necessary to assess from a landscape perspective to integrate biodiversity and ecosystem values into food systems.

The following video shows four spatial and flow patterns of ecosystem services over time.

The spatial dynamics of ecosystem services refer to the difference between the locations where the ES is provided and where the associated benefits are received. This contrast is crucial to identify trade-offs and drivers of change, therefore, it is essential to understand this spatial dynamic if appropriate policies are to be designed for a given reality.

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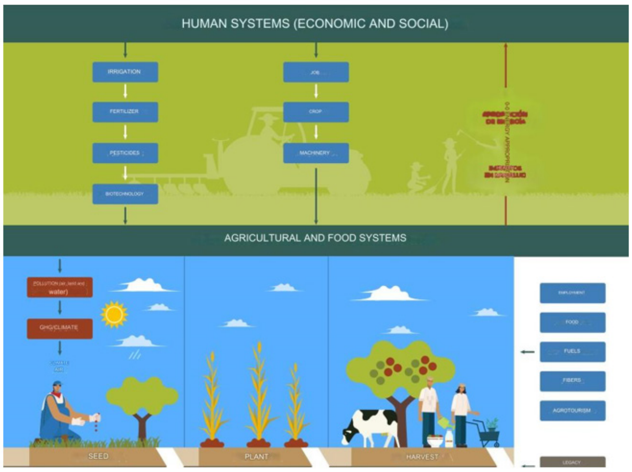

Figure 8 Visible and invisible flows of agricultural production (source: TEEB for agriculture and food, 2005).

The ISE approach aims to provide a practical and policy-relevant conceptual framework for integrating biodiversity and ecosystem services into development planning. The steps that comprise the ISE approach are summarized below.

In the following diagram the six steps of the ISE methodological approach (Figure 9).

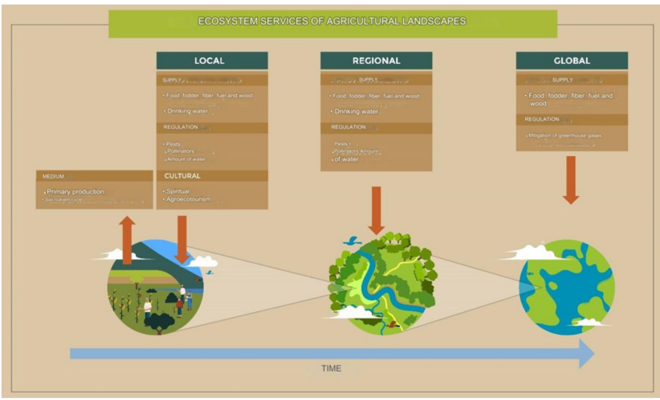

Figure 9 Ecosystem services of agricultural landscapes.

The basic concepts and the series of historical events seen above show that the prevailing development paradigm, in which the dimensions of sustainable development are recognized as separate elements, must migrate towards a vision where the economic dimension is conceived as a means to achieve more equitable and fair societies, living fully in a healthy and functional environment.

To achieve this, the integration of biodiversity and ecosystem services into development planning processes must be promoted, with a focus on agricultural landscapes, but how is this achieved?

This unit provides an introduction to the methodological approach that allows integrating ecosystem services into planning for the development of agricultural landscapes. It also offers practical tools to professionals to integrate ecosystem services into planning for the sustainable development of agriculture.

The examples have been adapted to a hypothetical situation that you will help solve through a case study in a fictitious country called Bakul, where the ISE approach is systematically applied, integrating biodiversity and ecosystem services into the review of a development plan.

You can study this unit in two ways: the first is to complete the methodology study and follow this unit from beginning to end; the second way is that when you finish studying each case of the methodology, you go to the corresponding step of the case study so that you can apply the knowledge in a hypothetical case.

Listen to the following podcast, which contains an introduction to the ISE approach to development planning, with a focus on agricultural landscapes.

The integration of ecosystem services (ISE) approach in development planning with a focus on agricultural landscapes

In the context of agriculture, there is a need to adopt policies that ensure a healthy and well-preserved environment, capable of providing ecosystem services (ES) that, in addition to producing healthy food, guarantee conditions of well-being for the population and the economy in the long term.

Recognizing ES in agricultural planning can help reduce public and private risks and expenditures, generate local opportunities and improve the living conditions and subsistence of local populations. This is particularly relevant in the current context, as ecosystems are increasingly under pressure from population growth, changes in land use and natural resource extraction.

Mainstreaming biodiversity, landscape and seascape approaches in policies and investments, and supporting farmers' rights to genetic resources are key to building resilient livelihoods. Using ecosystem services reduces the need for external inputs and improves efficiency.

Some ecosystem services and their management tools may have long-term effects and their benefits are not so evident in the short term. Therefore, they may be overridden by other needs and objectives that seem more urgent and desirable, which may lead to decisions being made without knowledge of the medium- or long-term social and environmental consequences.

The Ecosystem Services Integration (ESI) approach provides guidance to help public managers and development planners identify the connections between nature and development, while taking into account risks and opportunities arising from dependencies and impacts of economic activities, as well as other elements of well-being on ES (Figure 10,11).

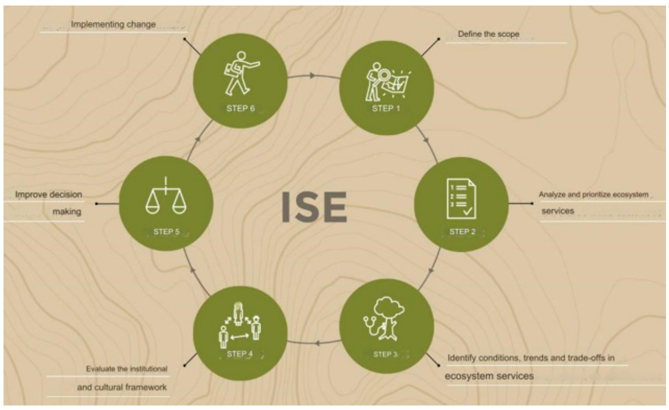

Figure 10 ISE: integration of ecosystem services.

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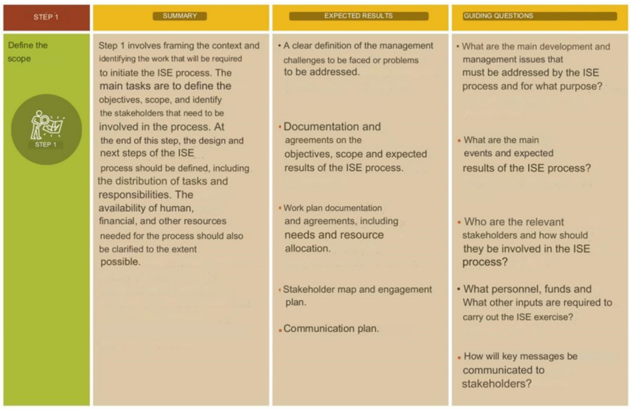

STEP 1	SUMMARY	EXPECTED RESULTS	GUIDING QUESTIONS
Define the scope STEP 1	Step 1 involves framing the context and identifying the work that will be required to initiate the ISE process. The main tasks are to define the objectives, scope, and identify the stakeholders that need to be involved in the process. At the end of this step, the design and next steps of the ISE process should be defined, including the distribution of tasks and responsibilities. The availability of human, financial, and other resources needed for the process should also be clarified to the extent possible.	• A clear definition of the management challenges to be faced or problems to be addressed. • Documentation and agreements on the objectives, scope and expected results of the ISE process. • Work plan documentation and agreements, including needs and resource allocation. • Stakeholder map and engagement plan. • Communication plan.	• What are the main development and management issues that must be addressed by the ISE process and for what purpose? • What are the main events and expected results of the ISE process? • Who are the relevant stakeholders and how should they be involved in the ISE process? • What personnel, funds and What other inputs are required to carry out the ISE exercise? • How will key messages be communicated to stakeholders?

Figure 11 Summary, expected results and guiding questions for Step 1.

Acknowledgments

None.

Conflicts of interest

The author declares that there are no conflicts of interest.

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