

Incorporating Crop Wild Relatives into the Ecosystem Services Framework

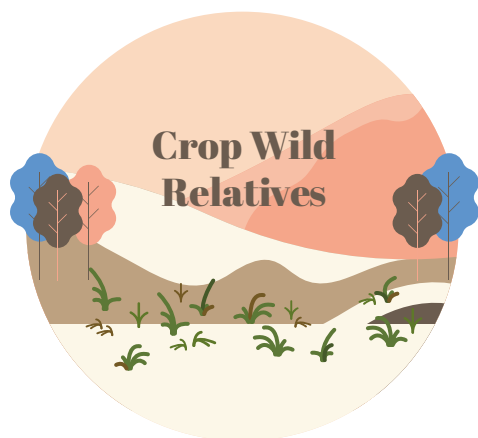


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Key facts and recommendations:

- Crop wild relatives deliver key ecosystem services that benefit humankind both directly and indirectly.
- In spite of the often substantial value of these services, crop wild relatives have yet to be integrated into strategies supporting the continued provision of ecosystem services.
- Incorporating crop wild relatives into current ecosystem services projects offers a valuable opportunity to both improve their sustainable conservation and harness their potential to contribute to global food security in the 21st century.



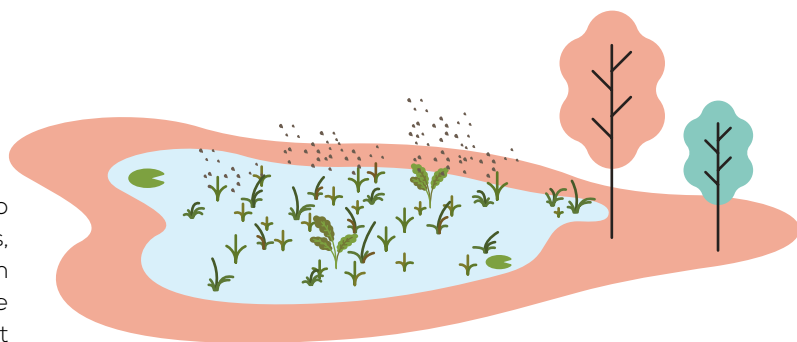
What are crop wild relatives?

Crop wild relatives (CWR) are wild plant species that are related to crops. CWR possess many important traits not found in their cultivated cousins that can be used to breed improved varieties of crops. These include pest and disease resistance, tolerance to drought and salinity, and even "hidden" genes for higher yields. CWR are a valuable resource for developing better, more resilient crop varieties to feed a growing world population under climate change.

What are ecosystem services?

The potential of CWR to provide valuable traits to crops, in addition to many other important functions, can be regarded as an ecosystem service. Ecosystem services are the benefits that ecosystems, including the biodiversity they harbour, provide to people. In recent years, there has been a strong research focus on the integration of ecosystem services within existing nature conservation efforts.

CWR, however, have not yet been widely recognized in the rapidly expanding ecosystem services field or included in practical studies. Their inclusion is important since CWR, along with most biodiversity, face many threats, including urbanization, climate change, habitat destruction and the introduction of invasive species.



What ecosystem services do crop wild relatives provide?

Ecosystem services can be divided into four main categories. An important ecosystem service provided by CWR conservation is the supporting service of gene pool protection, which preserves the existing genetic diversity and allows it to continue to evolve through time, and safeguards the option to use CWR genetic resources in the future to support the productivity and resilience of agriculture. The value of this ecosystem service is realized through the collection and use of CWR germplasm in plant breeding, a provisioning service. CWR also offer other ecosystem services, including regulating and cultural services (see Table 1).

| Ecosystem service | Examples |
|-----------------------------|--|
| SUPPORTING SERVICE | The conservation of CWR populations maintains genetic diversity and allows for the continuing evolution of the gene pool as a resource for future crop improvement, providing an important supporting service to help meet future demand for improved crop varieties and resilient agricultural systems. |
| REGULATING SERVICE | CWR can regulate certain ecosystem processes, such as pest and disease control, erosion control, pollination efficiency, nutrient cycling, decomposition, erosion control, and carbon sequestration. |
| PROVISIONING SERVICE | Crop wild relatives provide a provisioning service of genetic resources when CWR germplasm is collected from wild populations and used by plant breeders to develop improved varieties. In addition, some CWR can also be directly consumed as food. |
| CULTURAL SERVICE | CWR are a part of our natural heritage, with potential for ecotourism. |

Table 1. List of ecosystem services provided by CWR as classified by The Economics of Ecosystems and Biodiversity (<http://www.teebweb.org/resources/ecosystem-services/>)

The ecosystem services framework

Property rights and institutional arrangements are essential for the effective governance of ecosystem goods and services. The area where the service (e.g. CWR) is found can be common property, in the hands of local landowners, owned by the state, or by the private sector. Changing the management of any ecosystem service can lead to both benefits and costs for the (often numerous) stakeholders involved, making the fair and equitable sharing of benefits essential. At the same time, political insecurity can make arrangements between stakeholders challenging in the long term in some areas.

The Ecosystem Services Framework (ESF) is a response to the demand for a standardized valuation structure and integrates ecosystem services into a decision-making process. The ESF is interdisciplinary, bringing together natural and social sciences. Many case studies have been developed using the ecosystem services framework. Figure 1 shows a simplified visualization of the framework, with all the steps thought to be essential to successfully develop an ecosystem services-based project (following Turner and Daily 2008).

IDENTIFICATION AND SCALING



MODELS AND MAPPING



SCENARIO ANALYSIS



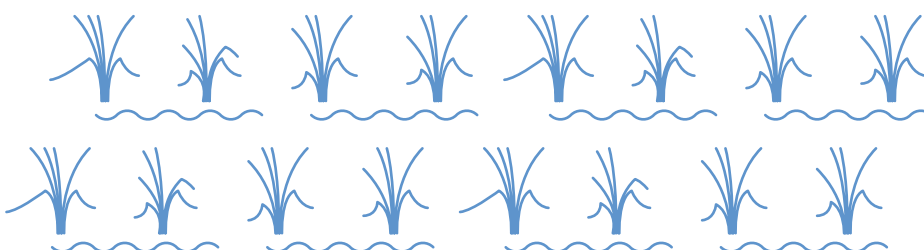
BENEFIT CAPTURING



CAPACITY BUILDING AND MONITORING



RE-EVALUATION





Project mechanisms

Numerous ecosystem services projects are currently underway, managed by research organizations, governments, NGOs and intergovernmental bodies around the world at a local, regional, national and global level. Some of these projects have the potential to include CWR.

CWR, like all biodiversity, rely on many other ecosystem services, like soil quality, water quality and interaction with other flora and fauna both above and below the ground. This makes the inclusion of CWR in existing ecosystem services projects a natural step. Examples of such projects can be found in Table 2.

| Project Mechanism | Explanation |
|---|---|
| BIODIVERSITY BANKING | Biodiversity banking (or biobanking) is a mechanism where developers of projects with a certain environmental impact can purchase biodiversity credits from the land-owner of a biobanking site, who can in turn use it for land restoration and conservation activities. |
| GENERATION OF ADDITIONAL FUNDING | Valuation of CWR followed by the development of financing mechanisms can be used to generate additional funding for the conservation and restoration of protected areas. |
| GENE FUND | Many CWR can be found in places where the majority of natural and semi-natural areas are in the hands of local communities. Supporting these groups in their efforts to preserve biodiversity would benefit CWR conservation efforts. The establishment of a gene fund could also be a powerful incentive for local landowners to conserve CWR. A fund could be based on grants, but also on the provision of loans to get farmers committed to a specific conservation task. |
| CERTIFICATION | The establishment of a protected area, focused specifically on the conservation and sustainable use of genetic material of a certain crop. This instrument aims to conserve species that can be regarded as providing a provisioning ecosystem service. |

Table 2. List of ecosystem service project mechanisms.

Opportunities

The conservation of genetic resources is essential for the resilience of crop production worldwide and thus global food security. The ecosystem services concept provides a significant opportunity for the conservation of CWR. Many ecosystem service projects are currently ongoing that could be adapted to integrate CWR. Furthermore, given that many areas that provide habitats for CWR are in the hands of local communities, carefully designed projects aimed at the conservation of CWR also have the potential to contribute to poverty alleviation.

Policy recommendations

The value of CWR should not be underestimated, most importantly because of the rich genetic diversity they possess and the potential of these plants to contribute to global food security.

CWR should be included explicitly in ecosystem services-based projects worldwide, providing a much-needed contribution to the sustainable conservation of these useful plants.

Potential mechanisms to be explored are: bio-banking, including CWR conservation in management planning for existing protected areas, valuation, certification and the establishment of gene funds.



Further information and contact

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- Keep up to date with project activities by following us on Twitter and Facebook @CropWildRelativ
- The Adapting Agriculture to Climate Change: Collecting, Protecting and Preparing Crop Wild Relatives Project is generously funded by the Norwegian government, and managed by the Global Crop Diversity Trust in partnership with the Millennium Seed Bank of the Royal Botanic Gardens, Kew.

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