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# Global wild rice germplasm resources conservation alliance: World Wild-Rice Wiring

Wild relatives of crop are key genetic resources serving as diversity reservoirs for crop improvement under changing environments. Rice (*Oryza sativa*) is one of the most important crops in the world, providing staple food for half of the world's population. Wild rice is thus a critical germplasm resource for sustained global food security, ensuring high production yields, improved quality, and stress resistance in the face of climate change. Wild rice is closely related to domesticated rice and has a rich genetic diversity and exceptional adaptability to extreme environments. It has played a pivotal role in the history of rice hybridization and has become a key resource for rice breeding programs. The identification of wild-type cytoplasmic male sterility resources paved the way for the achievement of the ''three lines'' goal in hybrid rice, leading to a significant increase in rice yields. In addition, the use of resistance alleles found in wild rice is making rice production more resilient to losses caused by environmental stresses. However, wild rice germplasm resources are threatened due to habitat destruction and other anthropogenic factors. At the same time, the lack of centralized distribution of wild rice has hampered the sharing of basic information on wild rice resources and the utilization and conservation of wild rice in each country, as well as collaboration among scientists.

The Global Wild Rice Germplasm Resources Conservation (GWRGRC) alliance is a scientists' community that will be dedicated to wild rice resource protection and research in a cross-regional and interdisciplinary manner. The alliance's primary focus lies in conserving global wild rice germplasm resources and understanding the ecology of wild rice environments. This includes identifying and addressing threats such as habitat destruction and climate change, as well as scientific issues related to biotechnology. Moreover, the alliance strives to define effective pathways for utilizing wild rice in rice improvement and provide valuable data for decision-making.

## MISSION OF THE ALLIANCE

The alliance is a non-governmental organization and a global collaboration platform comprising researchers, scientists, and scholars from various countries. The primary focus of the alliance is to promote the conservation, research, and utilization of wild rice germplasm resources. The alliance has a grand vision of ''establishing a global wild rice system that supports sustainable agricultural development and food security.'' Its mission is centered around ''creating an optimal environment for the exchange of wild rice germplasm resources and promoting rice breeding and seed innovation.'' The alliance upholds the values of openness, inclusivity, and equality, fostering a spirit of cooperation, mutual learning, and sharing to achieve mutually beneficial outcomes. It actively encourages participation from experts and scholars in all countries and fields of study, aiming to collectively contribute to the conservation and sustainable utilization of wild rice genetic resources in order to ensure improved rice productivity or yield and, hence, food security.

## ACTIVITIES OF THE ALLIANCE

(1) Our main task is to ensure sustainable development by strengthening international cooperation and shared commitment to expand scientific collections of wild rice, improve utilization of germplasm resources, and conserve and utilize wild rice germplasm resources globally.
(2) The alliance will protect, manage, and monitor wild rice germplasm resources in their natural habitats, allowing for their continued natural evolution and ensuring their availability for sustainable utilization.
(3) The alliance will address key needs for improving rice yield by using wild germplasm to explore new genes, using cutting-edge breeding methods, applying data mining, and bioinformatics tools and will utilize expertise in crop molecular and biological processes contributed by scientists from various countries.

## PRINCIPLES OF THE ALLIANCE

The alliance will make significant contributions to global food security, crop diversity, and equitable sharing of benefits with unified regulations.

## ACCESS PRINCIPLES

(1) The alliance recognizes that the individual sovereignty of each member country on their own genetic resources and accessibility is contingent upon the laws of each respective country.
(2) The alliance strictly follows the guidelines of International Treaties on Plant Genetic Resources for Food and Agriculture and the Convention on Biological Diversity, aiming to protect and sustainably utilize all plant genetic resources.
(3) The alliance considers the individual wishes of members and allows personnel from all parties related to wild rice to enter without threatening the security of wild rice germplasm resources.

### Resource sharing

Resource acquisition and benefit sharing are core parts of the alliance. These efforts involve acquisition and utilization of wild rice germplasm resources, working to ensure that any germplasm sharing is contingent upon the laws of each respective country and the development of fair and reasonable sharing of the

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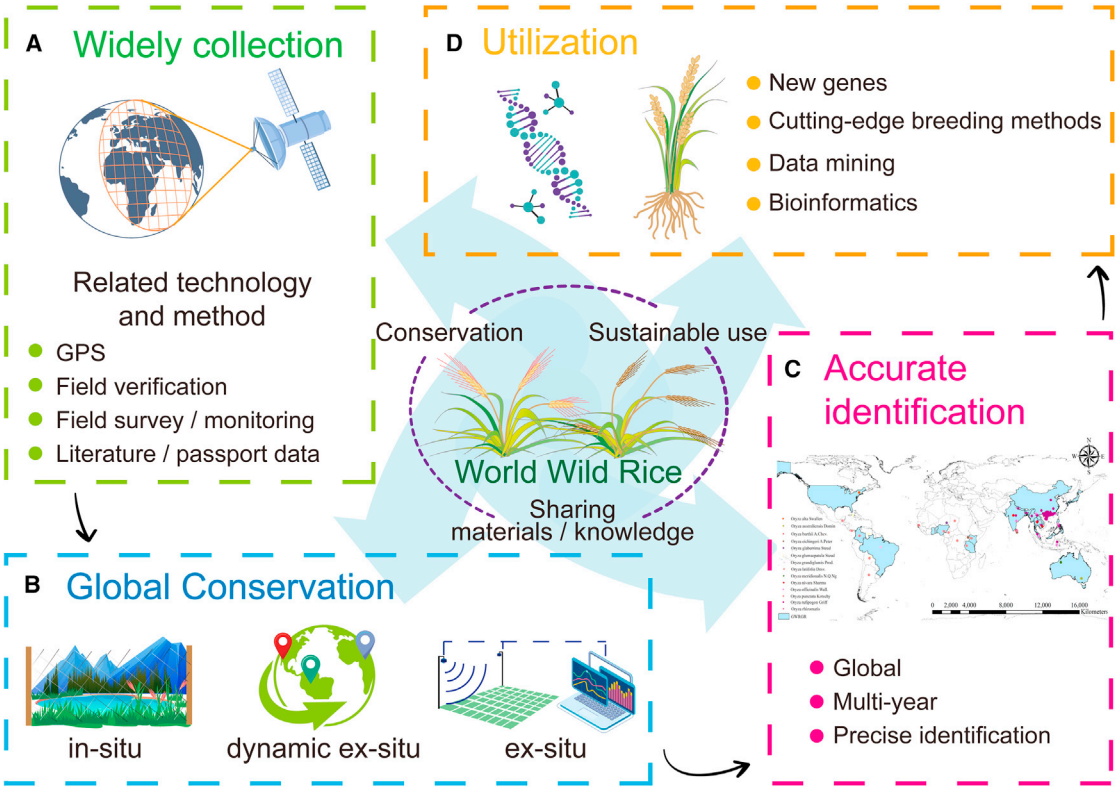


**Figure 1. Operational overview of the GWRGRC alliance.**

**(A)** Integrate advanced technologies such as global positioning system, remote sensing technology, and geographic information system to survey and collect global wild rice germplasm resources.

**(B)** Blend interdisciplinary knowledge such as ecology, genetics, molecular biology, and environmental science to develop strategies for the *ex situ* conservation of wild rice germplasm resources.

**(C)** Leverage resources from global research institutions, academic networks, and collaborative projects, thereby expanding the research area of the Wild Rice Alliance to cover more geographical and ecological regions. We hope to establish a global shared, comprehensive protection, and sustainable utilization system of wild rice germplasm resources and further promote applied research on wild rice.

**(D)** Use phenomics, genome assembly, bioinformatic analysis, and other multi-omics methods to precisely identify wild rice germplasm resources.

resulting benefits, including technology transfer, information exchange, and application of benefit-sharing mechanisms.

(1) Establish a global system to obtain wild rice germplasm resources, ensuring equitable sharing of benefits among farmers, plant breeders, and scientists based on rules for sharing mechanisms.
(2) Organize national research teams within the alliance to jointly address key issues in the conservation and use of wild rice. Broad support and participation of countries in the FAO Treaty are crucial for the conservation and sustainable use of these genetic resources.
(3) Conduct training and exchange activities regularly on the conservation strategies and distribution pattern of wild rice to enhance knowledge and understanding among scientists from different countries. Strengthen resilience to climate change impacts, learn from past best practices, and promote transformative adaptation policies, plans, and actions.

## Resource conservation

To ensure the effective conservation and sustainable use of wild rice germplasm resources, we will employ a diversified approach. This will involve adhering to scientific principles and implementing local conservation methods based on the specific conditions of member countries. Our emphasis will be on the following points.

(1) Establish *in situ* conservation sites for wild rice germplasm resources in their natural habitat (*in situ* conservation).
(2) Develop and implement *ex situ* conservation plans for wild rice germplasm resources.
(3) Promote the sustainable utilization of wild rice germplasm resources in rice breeding programs.
(4) Prioritize implementation of conservation plans by conducting feasibility tests and employing specific measures for conservation and sustainable use of wild rice genetic resources. This will help to determine the level of threat and conservation status of the wild rice species or genetic resources (Figure 1).

Wild rice serves as a vital reservoir of genetic diversity for sustainable rice breeding. The GWRGRC alliance is instrumental in addressing threats to wild rice bybringing together scientists globally to conserve rice gene pool diversity. The alliance's approach spans around habitat conservation and

interdisciplinary research on the wild rice. The researches may include ecological, morphological, genetic, and biotechnological researches. The wild rice displays a critical role in enhancing rice yield. The alliance's efforts are therefore pivotal for resilient agriculture. The alliance's comprehensive strategy includes identifying and mitigating anthropogenic threats and ensuring the conservation of invaluable wild rice genetic resources. The GWRGRC alliance not only contributes to wild rice germplasm conservation but also strives to integrate these resources into rice breeding (improvement) programs and therefore overcome existing constraints. Ultimately, the alliance plays a key role in shaping global food security by safeguarding wild rice diversity (species diversity and genetic diversity), promoting sustainable agricultural practices, and highlighting the importance of collective action for future generations.

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