

# Geography Information System for Horticultural Crop Wild Relatives

## Scenario

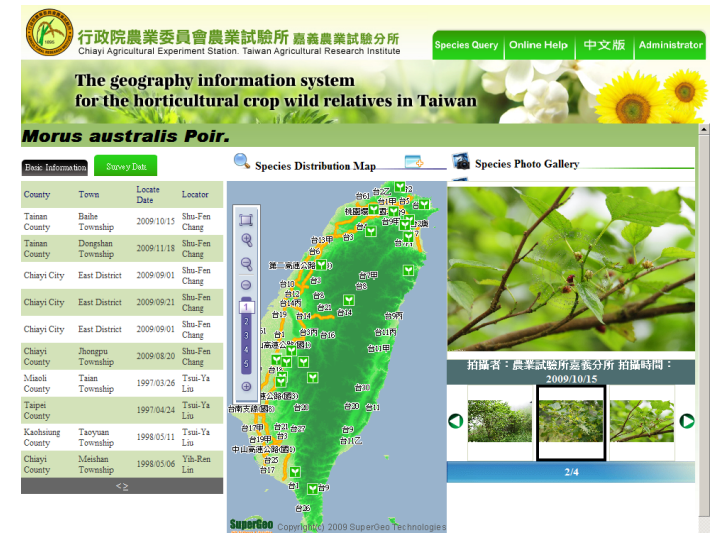
Plant Genetic Resources for Food and Agriculture (PGRFA) are the motivations to modify the species of crops and also are the basics of sustainable agricultural development. Crop Wild Relatives (CWR) refer to the original species of cultivation crop or the wild species of the relatives with close genes, which are disease-resistant, insect-resistant, resistance to the environmental stress, and also the sources of important economic traits. CWR also increases the productions and quality and decreases poverty.

However, due to the scientific breeding, agricultural commercialization, global environment change, land abuse, and habitat disappearing, the number of the agricultural plant inheritance sources and the gene divergence are extremely declined so that the world food faces a serious crisis.

Nowadays, horticultural crop wild relatives in Taiwan also face the same crisis. In order to deal with the global crisis, Chiayi Experimental Branch Station, Central Research Institute in Taiwan wanted to apply a WebGIS system to have long-term monitor on the habitats of horticultural crop wild relatives in Taiwan and observe the evolution trend. Therefore, the change of gene database can be the references for the conservation.

## Solutions

Geography Information System for Horticultural Crop Wild Relatives is a query system which includes database management and WebGIS. The system applies SuperWebGIS 2.1 and Microsoft SQL Server 2008 Express to be an internet GIS platform and the database platform respectively. It contains the database of species list and survey data as well as GIS technologies, which provides the related staffs with the integrated data of species' characteristics and distribution space as references for conservation.



The screenshot shows a web application interface for the 'The geography information system for the horticultural crop wild relatives in Taiwan'. The interface includes a header with the logo of the Chiayi Agricultural Experiment Station, navigation links for 'Species Query', 'Online Help', '中文版', and 'Administrator', and a title 'The geography information system for the horticultural crop wild relatives in Taiwan'. Below the title, there is a section for 'Morus australis Poir.' with a 'Basic Information' tab selected. This tab displays a table of survey data. To the right of the table is a 'Species Distribution Map' showing a map of Taiwan with markers indicating the locations of the surveyed species. Below the map is a 'Species Photo Gallery' showing a photo of the species.

County	Town	Locate Date	Locator
Tainan County	Baibei Township	2009-10-15	Shu-Fen Chang
Tainan County	Dongshan Township	2009-11-18	Shu-Fen Chang
Chiayi City	East District	2009-09-01	Shu-Fen Chang
Chiayi City	East District	2009-09-21	Shu-Fen Chang
Chiayi City	East District	2009-09-01	Shu-Fen Chang
Chiayi County	Jhongpu Township	2009-08-20	Shu-Fen Chang
Miaoli County	Tainan Township	1997-03-26	Tsui-Ya Liu
Taipei County		1997-04-24	Tsui-Ya Liu
Kaohsiung County	Tasyuan Township	1998-03-11	Tsui-Ya Liu
Chiayi County	Menshan Township	1998-03-06	Yin-Ren Lin

Users can gain the related data, distribution, pictures of the species via the platform.

## Solutions

- Use SuperWebGIS to build a WebGIS system
- Through the WebGIS, users can query the species and display the results online.

## Results

Geography Information System for Horticultural Crop Wild Relatives mainly provides the data query of horticultural crop wild relatives and system management. Through the Internet, the associated staffs can connect to the front end of the system to query species, browse query results, map navigation, etc; also the staffs are allowed to manage and maintain user accounts and database.

The functions of the front end contains 3 parts, Basic Map Manipulation, Species Query, and Query Result Display.

1. **Basic Map Manipulation:** The system provides several basic map navigation tools such as Zoom In/Out, Zoom to Full Extent, Pan, and so on.
2. **Species Query:** The system provides two ways to query, Compound Condition Query and Map Query. Map query allows users to click a city to look up the data of the species in the city. On the other hand, Compound Condition Query enable users to query species family, key word, city name, altitude, etc to get the best query results.
3. **Query Result Display:** Through the species query functions mentioned above, the system can show the information of the species you query on the platform. In addition, the database of the system records the coordinates of the species distribution, so users can know the distribution of the species via the WebGIS platform.

The back end includes 3 parts, User Management, Survey Data Management, and Species List Management.

1. **User Management:** This function assists the administrator in adding new users and setting the role of the users when adding a new user. Users with different

roles have different rights to use the system.

2. **Survey Data Management:** Administrators can use the function to add, modify and remove the data. In addition, administrators is also allowed to view the latest updated survey data or download the updated record via the function of Updated Data Browsing to clearly manage the updated situation and accuracy of the data.
3. **Species List Management:** It allows administrators to add the data of a new species or modify the data if administrators find the details of the species are incorrect or need to add the more information.

R e s u l t L i s t		
Moraceae		Top
Small-leaved Mulberry (小葉桑) <i>Morus australis</i> Poir.	1	23
Cucurbitaceae		Top
(苦瓜) <i>Momordica charantia</i> L.	1	6
Trapaceae		Top
(台灣莛) <i>Trapa taiwanensis</i> Nakai	1	1
(鬼菜) <i>Trapa natans</i> L. var. <i>japonica</i> Nakai	1	1
Convolvulaceae		Top
(蘿藦) <i>Ipomoea aquatica</i> Forsk.	1	4
Wild Morning-glory (野牽牛) <i>Ipomoea obscura</i> (L.) Ker-Gawl.	1	11
(馬鞍藤) <i>Ipomoea pes-caprae</i> (L.) Sweet	1	3
(紅花野牽牛) <i>Ipomoea triloba</i> L.	1	13
Solanaceae		Top
(光果龍葵) <i>Solanum americanum</i> Miller	1	14
Geld Silver Nightshade (刺茄) <i>Solanum virginianum</i> L.	1	7
False Jerusalem Cherry (佛手珠) <i>Solanum pseudocapsicum</i> Vell. var. <i>difflorum</i> Bitter	1	9

Clicking a city on the map, users can query the data of the species in the city.

## Results

- WebGIS allows users to query, display, etc horticultural crop wild relatives through the Internet browser.
- The mechanism of access control can maintain and update the database effectively.
- The service platform integrating GIS and species data can not only improve the convenience of data providing but also enhance the usability of the data.

## Software Used

- SuperWebGIS 2.1
- Microsoft® Windows Server 2003
- Microsoft® SQL Server 2008 Express