

作物改良課

Crop Improvement Section



稻作

稻作改良主要工作為水稻品種改良及栽培技術之研究與推廣。品種改良方面，以選育良質、豐產、抗病蟲害及特殊用途之優良水稻品種為目標。近年來先後育成台梗4號、台梗6號、台梗10號、台梗16號、花蓮19號及花蓮20號等六個優良品種。其中台梗4號為香米品種，米飯清香，具有特殊風味；台梗16號豐產、食味佳、強稈、抗褐飛蝨，年栽培面積曾高達2.9萬公頃，占全國稻作面積9.6%，頗受稻農及消費者歡迎；花蓮20號米質外觀優良、食味佳、強稈、抗稻熱病。此外，本場負責全省各試驗場所之水稻新品種(系)穗上發芽率與脫粒性之特性檢定，

平均每年檢定約190個品種(系)以供水稻育種家選育品種之參考。

在栽培技術方面，本場曾經從事水稻直播及再生稻等省工技術研究，以降低生產成本。為提昇本區稻米品質，本場致力於改善稻米米粒外觀及米飯食味之研究，除發展利用近紅外光光譜分析技術，測定稻米成分以強化稻米品質分析能力外，持續進行土壤與施肥等栽培技術改進之試驗工作，並研究探討微氣候環境與米質之關係，以作為調整稻作田間栽培模式之參考，期全面提高本區稻米品質。

花蓮地區環境純淨無工業污染，適宜有機水稻之發展，本場致力於水稻有機栽培管理技術之研究，並建立水稻有機栽培體系，輔導花蓮及宜蘭地區種植有機水稻，年栽培面積超過653公頃，對於提高農民收益及農業生態環境改善均具正面效果。

此外，花蓮地區原住民部落蘊藏豐富之原生稻種原，本場蒐集及保存光復香糯、陸稻等原生稻種原，進行品種純化及應用之研究，並輔導農民改進栽培管理技術，以進一步利用此多樣化種原。



水稻台梗16號 Rice Taikeng 16



水稻花蓮20號 Rice Hualien 20

Rice

The major research activities include the improvement of rice varieties and cultural techniques. The goals of our breeding program are to breed varieties with high yield potential, superior quality, resistances to diseases and insect pests, and/or characteristics for special utilization. During the past few years, we have successfully bred and released six varieties, i.e., Taikeng 4, 6, 10, 16 and Hualien 19, 20. Taikeng 4 is a scented rice variety which releases special fragrance and flavor upon cooking. Taikeng No. 16 is a high-yielding variety with good taste and resistances to lodging and brown plant hopper. Its cultivating area used to reach 29,000 hectares or 9.6% of the total rice acreage in Taiwan. The rice variety Hualien No. 20 has excellent grain appearance and eating quality, strong stalk and resistance to rice blast disease. In addition, this Station is responsible to screen breeding materials sent by various institutions around Taiwan for characters of preharvest on-panicle sprouting and shattering.

In cultivating techniques, the labor-saving and low-cost methods of direct-seeding and ratoon rice culture have been well developed. To improve rice quality, studies have been conducted for better grain appearance and eating quality. Techniques of near infrared (NIR) spectroscopy have also been developed to correlate grain composition with eating quality. Other important



利用合鴨進行水稻有機栽培
Raising ducks (Aigamo, Japanese) in paddy field for organic rice farming.



水稻花蓮20號白米外觀
Grain appearance of rice Hualien 20

projects include studies of the soil and fertilizer management and the relationship between micro-climate factors and rice quality. The information is important in establishing cultivating models best suitable for locations with unique environmental conditions.

As the environment in Hualien district is naturally clean without industrial pollution, it is very suitable for organic farming. We have developed organic cultivation system of rice for farmers' practice. The area grown to organic rice farming in Hualien and Yilan area exceeds 650 hectares nowadays which not only increases the farmers' profit but also helps to improve the ecological environment.

To expand the biodiversity of rice germplasm used for variety improvement, the abundant native rice germplasm found in the aboriginal villages are collected and preserved. Germplasm such as Kwan-Fu aromatic rice and upland rice are purified and their distinct characters studied for possible utilization. Improved cultural techniques of the native rice have also been recommended to the aborigines.



規劃良質米適栽區 Scheming areas for high quality rice production.

光復香糯田間栽培技術觀摩會 Demonstrating cultural technique of growing Kwan-Fu aromatic rice.

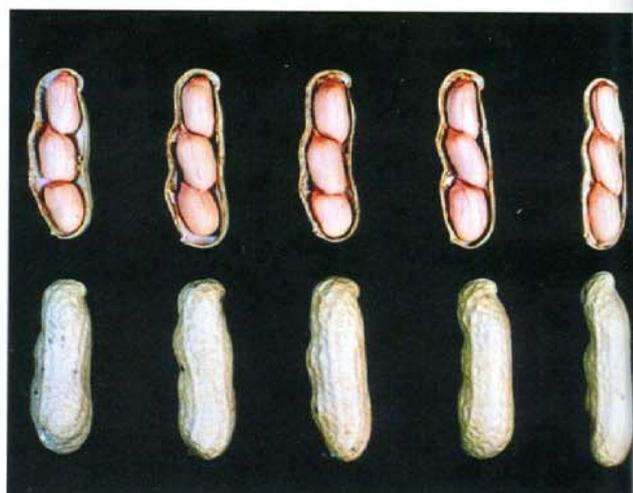


雜糧與特作

雜糧與特作以落花生、芋仔甘藷、山藥及特用作物等優良品種之選育與栽培技術改進為主。近年來育成豐產、質優、耐黃化、適合機械收穫的西班牙型落花生品種花蓮1號，推廣面積曾高達700餘公頃。育成大莢、多粒、適合鮮食及加工用之瓦倫西亞型落花生品種花蓮2號(三莢公)。育成長形山藥品種花蓮3號(長白山藥)，肉質白色，富粘性、抗莖枯病、耐貯藏，推廣面積達30公頃。選育出芋仔甘藷優良品系，肉質鮮艷紫色，食味佳。

在長形山藥栽培技術方面，利用低溫打破種薯休眠，利於調整栽培期；開發塑膠穴管誘導栽培法及畦面覆蓋不織布防除雜草，提高長形山藥之產量與品質。在特用作物方面，蒐集東部原生保健植物種原，建立種原示範圃，透過台美農業科技合作計畫，研究保健植物健康管理栽培技術，並開發保健植物產品。

為配合稻田休耕政策與休閒觀光產業之發展，篩選出大波斯菊、黃波斯菊及青葙等作物適合於本地區休耕農田種植，已形成特殊景觀帶，增進休閒觀光之可看性。



「三莢公」落花生花蓮2號
“Tripe pod King” peanut Hualien 2



較耐葉部黃化之落花生—花蓮1號Peanut Hualien 1 that has higher tolerance to leaf chlorosis

Upland and Special Crops

Researches on the improvement of varieties and cultural practices have been executed in upland crops of peanut, taro-like sweet potato, yam, and several special crops. This Station has successfully bred and released a Spanish-type peanut, Hualien 1, which is high in both yield and quality, tolerant to leaf chlorosis, and ideal for mechanical harvest. Its cultivating area has reached 700-plus hectares. The Spanish-type peanut variety, Hualien 2 (Triple-pod King) is characterized by large pods and suitable for both table use and processing. A long-shaped, white-flesh yam, Hualien 3 (Chang-bai yam), is high in stickiness, resistant to Phoma disease, and suitable for long-term storage. Another superior character is the high stickiness of the pulp. The cultivation acreage is about 30 hectares. As for taro-like sweet potato, many superior strains bred with bright purple flesh color and nice flavor have already bred.

We used low temperature to break the dormancy of long-shaped yam to adjust the cultivation period. The techniques of using inductive plastic pipe for cultivation and non-weave cloth for weed control have also been developed and applied by the farmers. These techniques can significantly improve both yield and quality of the long-shaped yam.

Regarding to special crops, this Station has collected germplasm of medicinal herbs and healthy plants from the aboriginal area in eastern Taiwan. A demonstration garden has been established for the purposes of experiments and education. Through the collaborative project with the American scientists, this Station has been carrying on studies on the cultivation techniques and processing of various plants.

To cope with the government's policy of promoting paddy fallowing and developing leisure and recreation agriculture, we have selected *Cosmos bipinnatus* Cav., *Cosmos sulfurous* Cav., feather cockscomb (*Ceolosis argentea* L.) and other crops to grow in the fallowed land. These crops not only function as green manure but also beautify the landscape and the countryside as a whole.



芋仔甘藷優良品系 Excellent breeding lines of taro-like sweet potato



長形山藥—花蓮3號
Long-shaped yam - Hualien 3



原生保健植物—小葉黃鱔藤 Native health improving plant - *Berchemia lineata* (L.) DC



兼具觀賞之原生保健植物—綬草
Native health improving plant for ornamental - Chinese ladies tresses (*Spiranthes sinensis* (pers.) Ames)



保健植物種原圃 Germplasm garden of medicinal herbs and healthy plants.



大波斯菊美化田園景觀 *Cosmos bipinnatus* Cav., for landscape beautification.



黃波斯菊構成一片花海
Flower sea formed by *Cosmos sulfurous* Cav.

「青箱」迷宮增加休閒農業資源
Another resource for leisure and recreation agriculture - feather cockscomb maze.



園藝作物

園藝作物以瓜類、原生蔬菜、文旦、明尼桔柚、加蜜蛋黃果、百合及香草植物等品種選育與栽培技術改進為工作目標。

果樹方面，針對本區最大宗的文旦進行提高品質栽培技術改進研究。另為配合產業結構調整，已篩選出適合花蓮地區種植的柑桔品種明尼桔柚。此外，配合地區發展休閒農業，篩選出具有特色並適合於花蓮地區栽培的新興果樹加蜜蛋黃果。

蔬菜方面，進行蔬菜育種及原生蔬菜栽培技術改進之研究，育成小型冬瓜品種「花蓮1號」，具豐產、抗多種病毒病之特性。持續進行小型優質冬瓜、高節成性且早熟之山苦瓜及山蘇蕨菜等新品種選育工作。已建立火蔥、山蘇蕨菜、瓦氏鳳尾蕨等作物之種苗繁殖及栽培模式，推廣面積超過400公頃。

花卉方面，已引進多種切花百合品種試種成功，並研究促成栽培技術以調節花期；百合外層鱗片經變溫處理可促使鱗片基部長小鱗莖以供做大量繁殖材料；另外還致力於本土化百合雜交新品種選育與食用百合栽培技術研究。香草植物開發利用方面，已經建立適合薰衣草、迷迭香、羅勒及薄荷等四種具有發展潛力作物之扦插繁殖體系。推動台灣百合與鐵炮百合復育，成果豐碩，每年春天3~5月間都能欣賞到原生百合綻放於東部海岸地區。

在園產品採收後處理技術研究部分，已建立金針鮮蕾保鮮技術與長形山藥切口處理技術，可延長產品櫥架壽命。持續進行黃藤心、山蘇蕨菜與箭竹筍等原生作物保鮮技術之研究，以延長產品櫥架壽命與增進經濟效益。



甜薰衣草生育良好，具開發潛力 Sweet lavender - a new crop to Taiwan with high potential for exploitation.

Horticultural Crops



山蘇蕨菜在平地網架栽培
Net-supported culture of
nest fern (*Asplenium nidus*
L).



加蜜蛋黃果適合休閒農園栽培
Abiu (*Pouteria caimito* Radlk)
grown in a garden for leisure
and recreation.

Our tasks regarding to horticultural crops are focused on crops of cucurbitaceous vegetables, native vegetables, Wentan pomelo, minneola tangelo, abiu (*Pouteria caimito* Radlk), lily and aromatic herbs.

In fruit trees, techniques of cultural practice of the most important fruit crop in this district, Wentan pomelo, have been improved for better quality. The tangerine species, Minneola tangelo, has been selected for commercial production in accordance with the adjustment of the local horticultural industry. In addition, the culture of a new

and promising fruit species, abiu (*Pouteria caimito* Radlk) which is adapted to the environment of Hualien, has been promoted for the development of leisure and recreation agriculture.

Researches in vegetable crops are focused on the improvement of cultural techniques and native vegetable varieties. A wax gourd cultivar, Hualien 1, has been successfully bred and released for its small fruit size, high yield, and resistance to various virus diseases. The goals of the current breeding programs include the improvement of the quality of wax gourd, the early maturity and fruit-bearing ability of balsam pear, and the yield and quality of nest fern (*Asplenium nidus* L.). The standard models of seedling propagation and cultural management have been set up for Bakers garlic (*Allium chinense* G.), nest fern, *Pteris wallichiana* Ag. and a number of other crops. The total cultivation area of these vegetable crops has already exceeded 400 hectares.

In flower crops, various lily varieties for cut-flower use have been introduced and successfully cultivated. The development of forced culture technique enables the adjustment of blooming season and hence increases the market values. Treating the outer scales of lily's bulbs with a combination of different temperatures facilitates bud formation at the base of the scales, which provides an efficient and economic method for the mass-propagation of planting materials. Other research projects include the breeding of new lily varieties from native germplasm and the culture techniques of edible lily. In the development and utilization of potential aromatic herbs, the propagation systems by cutting for lavender, rosemary, basil, and mint have already been developed. Significant achievements have been made in the restoration of native Taiwan lily and easter lily (*Lillium longiflorum* Thumb.) Once endangered species, now the lilies bloom widely along the coastline of eastern Taiwan from March to May every year.

In the post-harvest treatments of crop products, techniques of preserving the flower buds of edible daylily and treating the cut surface of yam have been developed to prolong the freshness and shelf life. Studies have also been conducted on several native crops such as yellow rotang palm (*Daemonorops margaritae* (Hencei) Beccar), nest fern and arrow bamboo for longer freshness and higher economic profits.

具高產潛力之山苦瓜雜交新品系
New bitter gourd hybrids
possessing high yield potential
production.



低溫處理，可延長金針鮮蕾櫛架壽命
Prolonged shelf life of the flower buds
of daylily by low temperature
treatment.



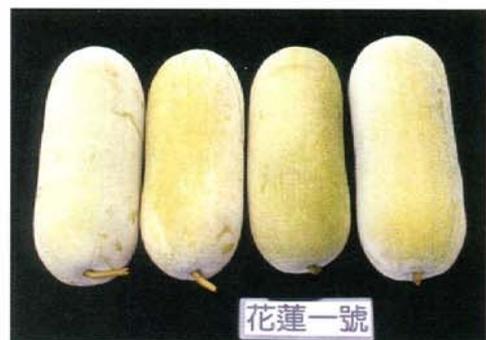
明尼桔柚，果色橙紅風味佳
Minneola tangelo with orange fruit
color and superior flavor.



鐵炮百合在東海岸復育成功 Successful restoration of easter lily (*L. longiflorum* Thunb.) in the east coast of Taiwan.



台灣百合與亞洲型百合雜交後裔FA1 開花情形 Blooming of a hybrid, FA1, from Taiwan lily and Asiatic lily.



小型冬瓜花蓮1號，豐產質優且抗多種瓜類病毒

Wax gourd cultivar, Hualien 1 - high in yield and quality and resistant to various cucurbitaceous viruses.



香草植物試驗及展示園

Experimental and demonstration garden of aromatic plants.

休閒香草植物開發利用研究
The development and usage
of herbs
1. 香草植物種類整理
2. 休閒植物選擇評估
3. 不同展期品種配植試驗
負責人: 蔡清雲, 潘文宜

農產加工

將本區生產之農產品，運用先進科技，研發萃取、發酵、醃漬、製罐等加工技術，製造新產品，以提高農產品附加價值。成功研發文旦精油、紅麴養生系列產品、山藥薈奶茶、山藥零餘子加工品、高膳食纖維黃金麵包果粉、以及香草沐浴包等產品。其中山藥薈奶茶、文旦精油、香草沐浴包等製作技術已轉移業者應用。為擴大為民服務範疇，積極追求最高服務品質，本場成立食品科學實驗室，投入龐大經費添購各式加工設備及人力，俾利研發新穎多元化之產品，以提升農產加工技術層次。



薰衣草及迷迭香沐浴包 Lavender and rosemary shower packs.

Agricultural Product Processing

By using the techniques of extraction, fermentation, salting, soaking, and can manufacture, agricultural products can be processed for higher added values and longer shelf life. We have developed techniques to produce essential oil from wentan pomelo, food supplements from monascus, milk tea and processed adventitious tubers from yam, golden powder containing high diet fiber from Ba-chu-lu (*Artocarpus altilis* (Park) Fosberg), and shower packs from a number of aromatic herbs. Many of the abovementioned techniques have already been transferred to private sectors for economic production. To expand our service scope and improve our service quality, a new laboratory equipped with advanced instruments for food science studies is currently being constructed. The purpose is to elevate the level of processing technology for the development of more diversified agricultural products.



本場研發之農產加工產品 Processed agricultural products developed by this Station

生物技術

生物技術以開發植物組織培養及基因轉殖技術，建立種苗繁殖體系，與創造作物新品種為工作目標。

在組織培養方面，已開發金針、山蘇花及觀賞鳳梨等園藝作物種苗繁殖量產技術，推廣供轄區內農友採行，結合組織培養與放射線照射技術，獲得葉部及果實具有斑紋的觀果鳳梨及普拉特草品系，極具觀賞價值。另持續進行寒梅、百合、白及及綬草組織培養技術之研究。

基因轉殖研究方面，已成功建立番茄、水稻基因之轉殖系統，進一步將功能性基因轉殖於上述作物，以增進作物之抗病蟲害特性及有益健康成分。



綬草組織培養瓶苗 Tissue-culture seedlings of *Spiranthes sinensis* (Pers.) Ames.



鳳梨誘變後產生之突變體葉片和果實均具有嵌紋現象 Mutated leaves and fruits of pineapple showing embedded stripes after induced mutation.



水稻台梗17號基因轉殖植株於含抗生素培養基再生之情形 The regeneration of transgenic Taikeng 17 rice plant in culture medium with antibiotics.

Biotechnology

Major research activities include the development of techniques in tissue culture and gene transfer in order to establish mass-propagation systems and develop new crop varieties with unique characteristics.

In the tissue culture field, techniques of mass-propagating several horticultural crops, such as daylily, nest fern and bromelias, have been developed and transferred to farmers for economic production of seedlings. By combining the techniques of tissue culture and radioactive irradiation, mutants of bromelias and pratia (*Pratia nummularia*) with stripes on leaves and fruits have been obtained, which are valuable sources for the development of new ornamental crop varieties. Experiments are also being done on other crops including flowering quince, lily, *Bletilla formosana* (Hayata) Sschltr and *Spiranthes sinensis* (Pers.) Ames.

The gene transfer systems for tomato and rice have been successfully developed. Efforts are being done to transfer functional genes into the crops in order to breed new varieties possessing specific chemical constituents and/or resistances to diseases and insect pests.



GUS標示基因成功轉殖於番茄植株，果實呈現藍色反應 Blue fruit color of tomato indicating the successful transfer of GUS-tagged gene.



普拉特草誘變後之葉片具有鑲嵌突變體

Leaves of pratia (*Pratia nummularia*) with embedded inlay after induced mutation.