

摘 要

98 年度本場共執行科技研究計畫 46 項，示範推廣計畫 27 項，廠商委託計畫 18 項，其它機關委託補助計畫 25 項，茲將摘要擇錄如下：

稻作：98 年一期作及二期作分別完成 11 個及 18 個雜交組合。高級試驗選出優良水稻品系花稈育 108 號參加 99 年區域試驗。水稻豐歉試驗兩期作試驗結果，各品種稻穀產量均較歷年平均值減產。具保健功能之機能性水稻品種研發，在具高或低蛋白質含量潛力品種（系）篩選上，有 6 個品系蛋白質含量低於 4.5%，14 個品系蛋白質含量高於 8%；初步建立低昇糖指數品種篩選方法及完成樣品分析。水稻新品種示範分別於花蓮縣玉里鎮、光復鄉及宜蘭縣冬山鄉、三星鄉進行，示範品種為桃園 3 號、桃園 4 號、台農 74 號、台農 75 號、台中 192 號及花蓮 21 號。有機水稻栽培輔導，花蓮地區一、二期作輔導花蓮市、玉里鎮及富里鄉等 7 班共 328 公頃；宜蘭地區一期作輔導礁溪鄉、三星鄉及羅東鎮等 5 班共 95 公頃。於花蓮縣富里鄉、玉里鎮及宜蘭縣五結鄉輔導設立稻米產銷專業區六處，全年執行面積 2,940 公頃，輔導面積較去年成長 18%。

雜糧及特作：飼料玉米新品系在花蓮地區以 12 月至翌年 1 月播種者之籽實產量表現較高，品種方面以台南 20 號籽實產量表現較佳。有機大豆栽培法試驗，春作大豆花蓮 1 號在每公頃基肥及追肥各施 500 公斤及花蓮 2 號以每公頃施用 1,000 公斤有機肥料籽粒產量較高、秋作則以每公頃基肥及追肥各施 650 公斤有機質肥料籽粒產量較高。有機栽培黑豆種原收集及評估利用，春作以 Santa Maria 等三品系（種），秋作以 PI 201422（G01770）等二品系（種）籽粒種較高。景觀綠肥作物之開發利用，整地二次可有效控制百日草田區雜草之發生，萬壽菊之播種量試驗以每公頃 8~10 公斤處理之花數等園藝性狀表現較佳。花蓮地區大豆有機栽培試作，春作以壽豐鄉志學地區及秋作以富里鄉羅山地區籽粒產量表現較佳；落花生有機栽培春作以壽豐鄉志學地區之花蓮 1 號產量表現較佳；羅山地區秋裡作紅豆有機栽培之籽粒公頃產量 733 公斤。宜蘭地區毛豆栽培示範以 3 月 4 日有效莢重產量較 3 月 18 日種植較高。保健作物丹參不同種植期之試驗，株重、根重及有效成分含量等均以秋作較高。不同行株距對半枝蓮產量之影響，以行株距 30×20 公分單位面積產量較佳。當歸在花蓮縣 5 個不同地區之調查結果顯示：單株平均重

量、平均根重、阿魏酸 (ferulic acid) 含量及藁苯內酯 (z-ligustilide) 含量均以玉里地區最高。黃芩之栽培試驗，不同栽培密度試驗結果顯示：單株平均重量以行株距 100×45 公分者最高，單株平均根重以行株距 100×60 公分者最高；有效成分之分析結果，黃芩苷 (baicalin)、黃芩素 (baicalein) 及漢黃芩素 (wogonin) 均以行株距 100×45 公分者最高。

蔬菜：98 年山苦瓜春夏作品系共純化留種 52 品系。山苦瓜新品系組合力以 7153、5572 及 2355 品系表現較好。分析不同施肥處理的苦瓜採收還原能力 (FRAP value) 顯示以施用半量有機肥料及施用全量有機肥料表現較佳。國內外收集南瓜種原及商業品種共計 51 種，其中 6 種小型南瓜品種值得進一步純化與選拔優良單株。有機設施南瓜以雙蔓留 3 果的整枝方式可兼顧果實產量與品質。葉菜甘藷桃園 2 號以施用半量有機質肥料或僅施用有機質基肥有較佳的抗氧化力與產量表現，而台農 71 號則以半量有機質肥料較佳。青蔥耐熱品種選育，98 年春作以品系 HAF10490 的單叢重較高且園藝性狀表現較好；夏作雖因氣候炎熱，植株生育較差，但仍以 HAF10490 的單叢重較高。夏季優質青蔥產銷體系之建立，試驗結果發現以遮陰設施栽培夏季青蔥，其植株生育情形良好且缺株率較低；設置簡易防颱設施栽培青蔥，產量較露天栽培者低，且植株較細弱；施用微生物肥料+減量施肥栽培青蔥，可維持青蔥生育正常、品質良好。建構作物優質生產的知識整合平台—青蔥栽培管理知識庫，本計畫透過與農試所合作所建立的知識整合平台，將提供生產者和推廣人員都能快速且正確地獲取品種選擇、生產知識、合理化施肥、病蟲害診斷防治、氣象災害預警防範等的整合型優質資訊。具食用價值水生植物水合歡在宜蘭地區自 7 月下旬至 10 月上旬約可採收 6 次，平均每月採收量可達 4,500 公斤/公頃以上，最佳採收間隔在 14 天以上。

花卉：本場培育之百合雜交品系與對照品種間，植株生育及開花性狀差異明顯。選取 15 個本場選育之優良萱草雜交品系，並以 7 個商業品種作為對照，進行耐銹病與耐褐斑病評估，以及品系之新穎性、一致性、穩定性等特性檢定；本場所培育之一優良萱草品系於 98 年 5 月 5 日完成命名，為萱草新品種花蓮 1 號 (粉佳人)。香氣蝴蝶蘭 29 個雜交組合，利用固相微量萃取裝置 (SPME) 配合氣相層析-質譜儀 (GC-MS) 分析蝴蝶蘭香氣，採用 Supelcowax-10 管柱較 ZB-5MS 可得到更精確的圖譜。此法可測得 Phal. Kung's Roth-Fairy 花朵之香氣成分，包括橙花

乙酸酯 (Neryl acetate)、 β -香茅醇 (β -Citronellol) 及香葉草醇 (Cis-Geraniol) 等氣味成分。以 9°C 的深層海水供降溫育苗利用，能培育無簇生化的的洋桔梗種苗，利用花寶四號稀釋 2000 倍處理，可有效促進種苗生長。本年度共 15 個銀柳營養系參試，其株高略低於中國上海種；90 公分以上分枝數則與中國上海種相當。營養系之花苞寬度較中國上海種為高。寒梅至今已蒐集約 100 個品種，包括觀花或採果等用途。寒梅不同品種之果實及種子產量差異甚大，取得之種子經低溫層積處理發芽率自 0% 至 91% 之間。原生觀賞花卉方面，現已蒐集具有觀賞潛力之種原約 350 種，其中小杜若及台灣何首烏之扦插效果較佳。毛過長沙進行數種株高控制處理，並進行水中觀賞品質與壽命調查，以探討株高控制對有莖型水草水中觀賞壽命的影響。在種原繁殖過程以五種株高控制方法，可使植株型態更加緊密，外觀更佳。

果樹：明尼桔柚採收後常溫櫥架壽命為 4 週，果實品質劣變現象為病原菌感染導致的腐敗；使用塑膠袋包裝較有利於明尼桔柚果實硬度之維持，但對外觀顏色等品質性狀之影響則不明顯。花蓮地區文旦柚果實之品質會隨發育時間之增加而逐漸提升，並且品質主要增加時期為花謝後 22 至 24 週為主。新興優質柑桔新品種 (系) 比較以紅江橙及蜜柑表現較優；高接梨葉面噴施 5 次鈣資材果實糖度較高，梨蜜症發生率較對照區為低；高接梨台中 2 號 (晶圓梨) 以盛花後 185 天採收果實糖度最高；梨新品種對本地區氣候適應性栽培，屬幼株期，但以台中 2 號發育較快；蓮霧排水處理以施免深耕 (藥劑) 打破心土層區果重較大；蓮霧增施鉀肥以氧化鉀每棵施用 3.6 公斤處理區之果重較大；蓮霧提早催花於 11 月 23 日進行者開花結果成功率為 100%，分析公頃產量 12,000 公斤，純收益 105 萬元，獲利佳，值得推廣。

農產品加工：以花蓮地區所生產之有機米、有機大豆等農產品開發有機加工產品研發養生穀類飲品，產品色澤、風味、口感等品質均佳。以花蓮地區生產之當歸及保健作物，已開發出藥膳即食粥餐包。柑橘發泡錠產品之開發，已針對萃取加工條件建立最適方法，並開發出柑橘錠劑產品。

生物技術：利用農桿菌轉殖蘇力菌蛋白基因 CryIIc，確認 5 個株系為轉殖植株，共 2 個不同轉殖事件。轉殖植株系皆有表達 CryIIc 基因。取苦瓜品種共 37 個品種 (系)，利用 ISSR 引子進行品種鑑定及遺傳相似度分析，可由 27 條 ISSR

引子獲得 238 條條帶，其中 121 條具再現性及多型性，多型性比率為 50.8%，進一步進行 UPGMA 之遺傳相似性分析可區分成兩大群。收集一種斑葉綠花摩帝拖鞋蘭，取其側芽生長點為母瓶，已經建立一種污染率及死亡率低於百分之十的消毒方式。綠背脈葉蘭種子在低基鹽及低蔗糖濃度下處理，種子發芽率最高。以中基鹽濃度、中高蔗糖濃度培養脈葉蘭根莖則其鮮重增加率最高；植物生長調節劑並搭配有機添加物對脈葉蘭根莖繁殖及球莖生成均有助益。國蘭桑原晃根莖在植物生長調節劑及椰子水組合處理下，每 15 公分根莖最多可誘導 14 個芽體。金荷芽體於植物生長調節劑及有機添加物組合處理之效果最佳。

植物保護：有機水稻連續施用大蒜精及印楝素對瘤野螟防治效果佳。利用非農藥防治資材肉桂油與丁香油處理皆可減輕南瓜白粉病，但均有藥害及植株生長變差情形。綠籬植物馬利筋上的害蟲天敵種類最多，以六條瓢蟲和黃斑粗喙椿象密度最高。百日草葉斑病以溫湯浸種處理防治效果最佳，但發芽率差；向日葵黑斑病種子以邁克尼處理防治率可達 89.7%。青蔥種苗消毒試驗結果新殺蟎+福賽得之組合處理產量最高，田間綜合防治則以佈飛松+嘉賜銅較佳。感染根瘤線蟲之番石榴以土壤添加物及果園種植萬壽菊處理 6 個月後番石榴生長勢恢復，結果率及糖度均增加。賜諾殺、阿巴汀、亞滅培與可尼丁等非有機磷劑對瓜實蠅平均致死率均達 90%以上。利用 GIS 與 GPS 系統建立東方果實蠅與瓜實蠅族群變化及掌握其防治適期，東方果實蠅與瓜實蠅的發生高峰分別為 7~10 月與 6~8 月。宜蘭地區甜菜夜蛾及斜紋夜蛾發生高峰分別為 6~8 月及 10~11 月，旬密度最高分別為 24.8 及 93.4 隻/誘蟲盒。花蓮地區斜紋夜蛾的發生高峰則於 6~7 月與 10~11 月兩段時間，旬密度最高為 207.5 隻/誘蟲盒。宜蘭縣梨產區全年偵測共 17 次，均未偵測到梨木蝨。滅鼠週前後之野鼠與緬甸小鼠密度分別由每公頃 25.4 隻減為 4.3 隻與 24.5 隻減為 8.9 隻。發佈作物病蟲害發生預報 12 次、警報 6 次、新聞稿 8 次、氣象資訊及農作物防範措施 28 次。作物病蟲害診斷及防治處方服務計 572 件。輔導花蓮縣及宜蘭縣辦理事物安全用藥講習計 81 場次，98 年農藥殘留抽測合格率達 94.3%。

土壤肥料：水稻栽培利用定址養分管理並配合葉色調整追肥之施肥量，可以改善水稻後期之生長狀況，提高產量。以特定比例之米糠、豆粕、廢菜葉以及糖蜜製作之有機醱酵液肥，可使數種葉菜類作物生產穩定。金柑較適合作為營養診斷採取的葉片樣品時間為 8 月中旬，部位為當年春梢不結果枝及分枝之第 3 至第 5

展開葉，當歸採樣時間以 4-5 月為宜，建議採樣部位為每株之第 2 展開葉之頂端小葉。有機稻米不同部位之抗氧化能力分析結果皆呈現米糠最佳，糙米次之，精白米最弱的趨勢。改裝現有之燃糠式稻殼乾燥機為一獨立之燃糠式稻殼炭化機並提出專利申請。完成花蓮縣及宜蘭縣 16 張土壤主題圖更新以及建立資料庫所需 200 處之定點採樣調查。辦理合理化施肥講習、宣導及示範 194 場，植體營養診斷與土壤肥力分析總件數 2,617 件，服務農民 467 人次。

農業機械：開發附掛式綠肥播種機，可紓解人工播種作業辛勞，提升播種作業時之均勻度。研製改良青蔥田間作畦打洞作業裝置，成功開發作畦打洞功能機械，使達到一貫化作業之目的。研發石蓮花簡易網室防颱設施，結構採用活動式組裝，拆裝容易，鋼架外周圍鋪設黑色遮陰網，夏季遇颱風豪雨來襲，可抗風暴、防積水、透氣及調節日照量；冬季可保溫及避免霜害，減少災害。開發簡易防颱活動式支柱關節，係將原固定式支架加以改良，其中支架下方設有上下組合之活動關節，當颱風來襲前讓作物支架平貼在地面上，對降低颱風災害具顯著效果。開發連續式種子溫湯消毒機係以物理方法連續式溫湯消毒代替化學藥劑消毒，減少農藥使用及對環境污染，降低生產成本，提高農民收益，提升健康優質種苗；主要結構有自動軟水製造裝置、殺菌蒸氣產生器裝置、溫度感應系統、加溫桶裝置、儲水桶恆溫裝置、溫度控制系統、振動式自動輸送出料裝置、鏈條重疊式輸送裝置、輸送機微電腦溫度控制裝置、溫湯噴灑裝置、冷卻噴灑裝置等。

農業推廣教育：為培育具備現代化經營管理與科技應用能力之優質農業人力資源，辦理農民農業專業訓練 3 班，培訓 91 人。為推動終身學習，辦理核心技術教育訓練 5 班，培訓 146 人。為落實推動農業人力培育計畫，鼓勵青年築巢留農以引進農業生力軍，辦理築巢營 4 梯次，培訓 120 人。為培育 35 歲以上對農業經營有興趣但未曾經營農業者之人士，辦理園丁訓練 1 梯次，培訓 30 人。為協助失業者學習農業基礎技能，協助其轉向農業發展，辦理農業短期職業訓練 1 梯次，培訓 30 人。

農業經營管理：推動農業產銷班組訓及輔導工作，共計輔導整合花蓮縣及宜蘭縣 406 班。輔導三星地區、冬山鄉及壽豐鄉農會推動農業經營企業化營造優質農業環境(中衛體系)。推動小地主大佃農工作，輔導三星地區及壽豐鄉農會試辦。推動三星地區農會農業經營專區業務，輔導栽培技術與經營管理工作。推動安全

農業，輔導 45 個生產單位，436 位農民通過產銷履歷驗證，生產產銷履歷農產品面積達 639.97 公頃。

農村生活改善：推動農村優質生活體系，輔導轄區各級農會辦理「強化家政班功能」、「高齡者生活改善研習班」共 213 班。輔導轄區農村婦女創業「田媽媽」田園料理及手工藝班之經營管理共 23 班，辦理田媽媽經營管理與衛生講習訓練 2 場次，培訓 157 人。為推廣轄區在地農特產品之多元化利用，舉辦 98 年度宜蘭花蓮兩縣活力健康盒餐競賽並編印食譜一冊。為推廣台灣好伴手品牌，輔導轄區研發 6 項地方特產伴手產品，舉辦「地方農產伴手產品開發研習班」1 場次。為推動花蓮地區麵包果產業發展，舉辦「2009 花蓮麵包果節」活動並編印食譜一冊。輔導 9 個社區推動創新鄉村社區人文發展。以羅山有機村為據點，進行有機村產業群聚發展之評估規劃研究，以擴大有機栽培面積及產業發展效益。

農業資訊傳播：為將試驗研究成果及產銷推廣活動訊息提供媒體刊登及播出，本年度於農委會辦理記者會 1 次，提送行政院農業委員會新聞發佈之試驗研究成果主題共 16 則，電視行銷新聞主題 22 則，提送地方新聞媒體新聞稿 104 則，經媒體採納發佈共 147 次。發行農業推廣雜誌共編印「花蓮區農業專訊」季刊 4 期，「花蓮區農情月刊」12 期及花蓮區農技報導 4 期。充實「花蓮區農業改良場全球資訊網（www.hdais.gov.tw）」，提供各項農業技術資訊，讓社會大眾可共享農業資源，更新資料計 436 筆。新增「莫拉克颱風技術服務團」專欄，彙整及分類莫拉克颱風相關最新資訊，協助農友取得災後重建所需各項訊息。充實農業主題館內容，水生植物、銀柳、青蔥 3 個主題館獲頒優等獎。

為民服務：推動「以人民需求為中心」之單一窗口服務體系，農業資訊查詢服務共辦理 61 件 E-mail 查詢服務。農業技術參訪服務共接待國內外團體及人員 43 次，參訪人數計有 1,747 人。另有 35 位農民前來本場索取推廣書刊及農業資料。於 4 月 24 日辦理「98 年健康效率永續經營農業成果展暨慶祝 70 週年場慶活動」，共規劃設計 19 項活動及展示區，邀請一般社會大眾參與，總計有超過 3,000 人參加各項活動。

Summary

In 2009, 46 research projects, 27 demonstration plans and 43 commissioned projects from other organizations had been performed. The results were summarized as follow:

On rice: The rice breeding program was derived from cross breeding progenies surveying their rice quality, yield potential and agronomic traits. In 2009, HKY108 was selected from advanced yield trial to regional yield trail. The yields of all varieties in rice yield forecasting trial were less than last years. On the research of rice varieties for health purpose, 6 lines with lower protein and 14 lines with higher protein contents were obtained. One method of selecting low glycemic index varieties had been established, and 40 varieties had been analyzed. Six new varieties were demonstrated in Hualien and Yilan area. For organic rice production, a total of 328 and 95 hectares were grown respectively in Hualien and Yilan Counties. Six rice producing districts of good quality rice, a total of 2,940 hectares, were guided and established in Hualien and Yilan Counties.

On upland and special crops: The best sowing date of feed corn was from Dec. to Jan., and Tainan No. 20 performed high yield in Hualien area. Soybean Hualien No.1 performed high yield potential by spraying 500 kg/ha of organic fertilizer and Hualien No.2 performed higher yield potential by spraying 1,000 kg/ha of organic fertilizer in spring, Hualien No.1 and Hualien No.2 performed high yield potential by spraying 650 kg/ha of organic fertilizer in fall. The collection of the germplasm and the investigation of agronomic traits on black soybean for organic purpose were conducted, and the results showed that three lines black soybean including Santa Maria etc. in spring crop and two lines including PI 201422(G01770) etc. in the fall crop performed higher yield potential. The occurrence of weed were well inhibiting when twice of soil preparation were done in *Zinnia elegans* Jacq., and the best seeding rate of *Tagetes erecta* was 8~10kg/ha. The yield trial of organic fertilizer for upland crop showed that soybean performed high yield potential in Shoufeng township in spring crop and Fuli township

in fall crop, respectively. In organic culture of peanut, the average yield of peanut variety Hualien No.1 had higher yield potential in Shoufeng township. The average hectare seed yield of Adzuki bean Kaohsiung No.8 was 733 kg/ha in the fall crop of 2009. In Yilan area, the soybean was adaptable planting in the late February in spring crop and the vegetable soybean was adaptable planting in the middle March in spring crop, respectively. In comparison of different crop season of *Salvia miltiorrhiza*, the fall crop season had higher yield and active ingredient than spring crop season. The effect on the different spacing treatments of *Scutellaria rivularis*, the space 30×20 cm had higher yield than the others. In comparison of the average root weight and active ingredient for *A. acutiloba*, the highest value was obtained from which cultivated in Yuli area. In different spacing trial of *S. baicalensis*, the space 100×45 cm had the higher mean plant weight, space 100×60 cm had higher mean root weight, and space 100×45 cm had higher active ingredient content than the other spaces.

On vegetables: 52 wild and foreign lines of bitter melon in spring and summer crops were purified. The combination ability of new lines 7153, 5572 and 2355 are better than other lines. FRAP value analysis revealed that the bitter melon fertilized with half-quantity organic fertilizer, and full-quantity organic fertilizer performs high antioxidant capacity. We've collected 51 species of pumpkin germplasm and commercial varieties from domestic and foreign areas. Among these accessions, 6 species with small fruits were worthy to be purified and were selected for further selection. Pumpkins cultivated organically in the PE-house by double vine training with three fruits performed higher productivity and quality. A preliminary conclusion was that leafy sweet potato cultivar 'Tainung No.71' fertilized with half-quantity organic fertilizer, and only using pre-planting organic fertilizer performed high yield, antioxidant capacity and phenolics. On green onion breeding, the results showed that new line HAF10490 have good performance with higher yield potential. On the study of green onion production and marketing system in summer season, the yield of green onion grown in green house covered with shady net were better than controlled treatment. Another kind of green house facilities was developed for reducing typhoon

damage, but the yield of green onion was lower than field culture. The microbial fertilizer was applied for green onion, and the results showed that the quality was better than controlled treatment. Establishing the knowledge integrated platform for high-quality green onion production via cooperation with Agricultural Research Institute, and it could provide farmers and extension-workers with integrated information on variety selection, production knowledge, suitable fertilizer, disease/pest diagnosis and climate-damage prediction. Water mimosa can be harvested 6 times annually from July to October when cultivated in Yilan area. The averaged monthly yield of cultivated water mimosa was 4,500 kg/ha. The harvesting interval should be longer than 14 days.

On flower crops: Two lily breeding lines FA3-N1 and 92FA3-2 were shown significantly different from those two commercial varieties. Fifteen superior daylily breeding lines and 7 commercial varieties were investigated. The main investigation focused on evaluating leaf-rust and leaf-streak diseases, and DUS (Distinctness, Uniformity, and Stability) tests. One superior breeding line was named 'Happy Smiling' as a new variety at May 5th. SPME with GC-MS was used to detect the volatile compounds for 29 hybridized *phalaenopsis*, it revealed that the Supelcowax-10 column was better than the ZB-5MS. With this method, Neryl acetate, β -citronellol and *Cis*-Geraniol were detected in the Phal. Kung's Roth-Fairy flowers. Using high-efficiency plate heat exchanger could cool down osmosis water and created 19-20 °C cooling air for seedlings incubated. There were 15 clones of Cat-tail Willow investigated, and the results showed that the plant height of Cat-tail Willow clones were shorter than Chinese Shanghai variety. The number of branches over 90 cm in length of Cat-tail Willow clones and Chinese Shanghai variety was not different. The flower bud width of Cat-tail willow clones lies between 0.85 and 0.95 cm, which was wider than Chinese Shanghai variety. More than 100 flower-quince varieties were collected in 2009. Different flower-quince varieties had considerably different fruit and seed production. The germination rate of seeds treated by low temperature stratification varied tremendously from 0% to 91%. More than 350 varieties of native ornamental plants were collected. Giant bacopa were treated with different chemical reagent and then

cultivated in water to investigate the performance and display life. The height control treatments can create more compact and higher quality appearance and keeping quality.

On fruit tree : The shelf life of Minneola tangelo was 4 weeks when stored at room temperature. The deterioration of fruits was induced by disease and decayed. PP plastic bag packaging could maintain the hardness of Minneola tangelo, but the influence of other quality was not significant. The quality of Wentan pomelo in Hualien area increased during the period of fruit development and the main quality increasing period was 22 to 24 weeks after flower dropping. 'Hongjiang' orange and 'Honey' tangerine were the two better cultivars than other citrus cultivars tested in Yilan area. Top-grafted pears that were sprayed with calcium five times per season produced fruits with higher sugar contents and fruits with significant lower percentage of watercore as compared with the control. Top-grafted 'Taichung No. 2' pear harvested at 185 days after full bloom had the highest sugar content. In the study of accommodation of the new pear cultivars to the climate of Yilan area, the 'Taichung No. 2' grew faster than others at the juvenile stage. Wax-apples that were treated with "Agri-Sc" soil opsonin into the heart-layer to facilitate drainage produced larger fruits. Wax apples treated with 3.6 kg per tree of potassium chloride had the largest fruit. The date of flower forcing treatment of wax apple at November 23th resulted in the fruit-set ratio of 100%. The yield of this treatment was 12,000 kg /ha which resulted in a net profit of NT\$ 1,050,000. It is concluded that this flower forcing treatment was very profitable and is worth introducing to the growers.

On food processing: The organic processing technology had been developed by using the organic rice and soybean which were cultivated in Hualien area. The results showed that cereal drink had good quality in color and flavor. The *Angelica acutiloba* and the other medicinal plants were used in processing porridge retort food product. The organic soybean sauce product was made by fermentation process. The extraction and processing condition were established and a citrus tablet product was developed in this year.

On biotechnology: The results of PCR, southern blot and northern blot assay

revealed that 5 tomato transgenic lines were transferred with CryIIIC gene truly. ISSR markers were obtained for thirty seven bitter melon cultivars and breeding lines. There were 121 of 238 fragments generated from the 27 ISSR primers were polymorphic bands. These markers were sufficient to differentiate these material. The UPGMA analysis showed that these material could cluster to two major groups. The *Paphiopedilum* orchids Maudiae type cultivar with green flowers were collected as research material, and the aseptic shoots propagation system was established with high efficiency. The results of *in vitro* seed germination of *Nervilia argoana* Gaud showed that the fittest medium was low salt-base strength and low sucrose concentration. Middle salt-base strength and middle-to-high concentration of sucrose combined treatment had best fresh weight rate of *Nervilia spp.* rhizome. The results showed that complex plant growth regulators with organic additions could advance rhizome growth and induce bulb formation. In rhizome induced shoots formation experiment of *Cymbidium*, the results showed that the best treatment was low concentration of plant growth regulators with coconut milk. In shoots elongation of *Cymbidium*, the results showed that the best treatment was plant growth regulators with organic additions.

On plant protection: Controlling rice leaf roller is efficient with the garlic oil and neem oil (azadirachtin) on organic rice. The powdery mildew of pumpkins could be controlled by clove oil and cinnamon oil. Planting milkweed (*Asclepias curassavica* L.) as a hedge could be good for abundant nature enemies which include ladybugs (*Cheilomenes sexmaculata*) and stinkbug (*Cantheconidea furcellata*). The controlling effect is the best for the leaf spot disease of zinnias by treating seeds with hot waters, and the *Alternaria* leaf spot of sunflower by coating seeds with Myclobutanil. The highest yield of green onion was treated by the combination of Bromopropylate and Fosetyl-Al, and by the composition of Profenofos and Kasugamycin + Copper Oxychloride on the integrated control test. The nematode-infected guava tree revived the yields and sugar content increased with integrated control after 6 months. Spinosad, Abamectin, Acetamiprid and Clothianidin revealed significant lethal effect for melon flies. The long-term monitoring points of

oriental fruit fly and melon-fly in Yilan and Hualien are established by GIS and GPS system. The high peak of oriental fruit fly population density was from July to Oct. and melon-fly population density was from May to June in cucumber field. The highest density of beet armyworm was 24.8 adults/trap occurred from June to Aug., and *Spodoptera litura* was 93.4 adults/trap from Oct. to Nov. in Yilan. The highest density of *Spodoptera litura* was 207.5 adults/trap occurred from June to July and Oct. to Nov. in Hualien. The *Psylla* spp. was not detected in Yilan County pear orchards in 2009. The density of wild mouse and little Burmese rats were respectively down to 4.3 and 8.9 mouse/ha after baiting. In order to control plant disease and pest at suitable time, the plant pest forecasts were issued 12 times, the pest warning, prediction report and meteorological information were issued 6, 8, and 28 times respectively. There was no quarantine pest in Hualien area after surveying. A total of 572 cases of diagnosis and prescription were conducted. There were 81 times of seminars for farmer in Hualien and Yilan for pest control and safety use of pesticide. The chemical residue qualified rate was 94.3% in this year.

On soil and fertilizer: Site-specific nutrient management (SSNM) and the leaf color chart (LCC) could assist farmers to optimally supply their crops with essential nutrients, and the yield of rice could be enhanced. Applying the specific organic fertilizers making by rice bran, soybean cakes, wasted vegetables and fermented sugars to leafy vegetable could make the constant yield. The best sampling periods were the middle ten days of August for kumquat, and April or May for *angelica*. The best sampling positions were the third to fifth leave of young branches for kumquat, and the second leaf of the branch top for *angelica*. The amounts of each elements and antioxidant capacity of organic culture rice decreased as following: rice bran > brown rice > polished rice. A new type of rice hull charcoalizing device with husk burner was designed and built, which will be applied for a patent. Sixteen soil maps and 200 places of soil sampling of Hualien and Yilan counties were finished. One hundred and ninety four courses of training activities and presentations for the promotion of appropriate fertilizer utilization were held. A total of 2,617 plant diagnosis and soil fertility analysis

were made, and 467 farmers were served in 2009. These data were used to adjust fertilizing dosing.

On agricultural Machine: A green manure seeding machine had been developed to alleviate the hard work of sowing and raise the degree of sowing uniformity. The successful renovation of ridge making and holing machine for green onion had achieved the requirement of integral work for ridge making and holing concurrently. An anti-typhoon facility was developed with simple net and movable parts, which was easily assembly and disassembly. A foldable joint pillar was developed basing on the original fixing pillar. There are up and down combining foldable joints at the lower part of the pillar. The upper part can be laid down before a typhoon comes to attack, which will let the crop fit perfectly on the ground surface. It had an obvious effect on reducing the loss from typhoon. The continuous seed warming and sterilizing machine is sterilizing the seed with continuous warm water to replace the use of chemicals in sterilization. It can tremendously reduce the use of pesticide and pollution on the environment, lower producing costs, increase farmers' profit, and provide healthy and excellent quality seedlings. The continuous seed warming and sterilizing machine is sterilizing the seed with continuous warm water to replace the use of chemicals in sterilization.

On agricultural extension education: In order to assist farmers to learn modern business management and utilize new techniques, three professional agricultural training courses were held with 91 participants. To push lifelong learning for farmers, 5 core-technique courses had been held with 146 participants. To enforce agricultural training plan and encourage the youth to take part in agriculture, 4 teams of advanced Wandervogel camp had been carried out with 120 participants. To offer an opportunity for those who are older than 35 years old and still interested in agriculture, the Gardener course was held with 30 participants. To assist the unemployed to learn basic skills and take part in agriculture, the agricultural short-term vocational training course was held with 30 participants.

On agricultural management: To promote the development of agricultural

producing and marketing works, a total of 406 farmers' groups were organized and assisted in Yilan and Hualien Counties. Sunshin, Dongshan and Shoufong Farmers' Associations were assisted to promote the 'Center-Satellite Network System' project. Sunshin and Shoufong Farmers' Association were assisted to promote the 'Small Landlords and Big Tenant-Farmers' project. To promote the 'Specific District of Agricultural Management' project, Sunshin Farmers' Association was also assisted to manage agricultural cultivation and management affairs. To carry out Safety Agriculture policy, there were 45 production units and 436 farmers been assisted to get TAP certification, and the certificated land areas were 639.97 hectares.

On improvement of rural life: To promote the quality of rural life, all the farmers' associations were assisted to push rural activities, and there were 213 workshops been held. To help rural women to run their own business, 23 courses including cooking and handicraft making were held. Moreover, 2 workshops of 'Business Management and Cooking Sanitary' had been held for Tian-Mama with 157 participants. A competition of 'Boxed Lunches of Energy and Health in Yilan and Hualien Counties' had been conducted, and a recipe book had been published. The farmers' associations had been assisted to develop 6 kinds of local specialty gifts, and a workshop of developing local specialty gifts was held. An activity of '2009 Breadfruit Festival of Hualien' was held, and a recipe book had been published. Nine communities had been assisted to promote the innovative development of humanities in the rural areas. To extend the areas of organic cultivation and expand the benefits of organic industry, one research had been conducted, which is about the evaluation and planning of organic-industry clusters surrounding Loshan organic village.

On agricultural information distribution: To release the news about our research achievements and promotion activities, one press conference had been held in Council of Agriculture. There were 22 items of marketing news been broadcasted on TV ; 104 items of local news releases been sent to the media, and the media had issued 147 times of those. Agricultural extension magazines had been published including 4 issues of 'Hualien District Agricultural Special Proceedings', 12 issues of 'Hualien District

Agriculture Monthly’ and 4 issues of ‘Hualien District Agricultural Technique Pamphlet’. To offer all kinds of information concerning agricultural technology to the public, ‘Hualien District Agricultural Research and Extension Station Worldwide Web (www.hdais.gov.tw)’ had been timely updated and continuously enriched, and 436 documents were updated. To compile and classify latest information of Typhoon Morakot and assist farmers to restore as soon as possible, a column of ‘Technical Services Team of Typhoon Morakot’ was added. The contents of agricultural theme museums were enriched. The museums of aquatic plants ,cat-tail willow and green onion were awarded the excellence prizes.

On public services: To promote a single window service system of ‘the needs of the people as the center’, 61 E-mails about agricultural inquiries had been answered. To offer the guide of agricultural technique visiting, the Station had received 43 times of visiting with 1,747 national and international visitors. Besides, 35 farmers came to the Station asked for agricultural promotion books and information. One ‘Open Day’ activity had been held in 24th, Apr. to show the achievements to the public, and there were more than 3,000 people attended this activity.