

摘 要

97 年度本場共執行科技研究計畫 45 項，示範推廣計畫 21 項，接受委託計畫 29 項，茲將摘要擇錄如下：

稻作：高級試驗選出優良水稻品系花稈育 100 號參加 98 年區域試驗。水稻豐歉試驗兩期作試驗結果，各品種均較歷年減產。栽培管理模式採苗箱播種量 160 公克處理及行株距 30 公分 x 15 公分處理時分別可得到較佳產量表現；苗箱播種量 200~240 公克處理及行株距 30 公分 x 30 公分處理時則分別可得到較佳米質表現。水稻新品種示範分別於花蓮縣玉里鎮、鳳林鎮及宜蘭縣冬山鄉、礁溪鄉進行，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。有機米產銷班經營輔導方面，花蓮地區一、二期作輔導花蓮市、玉里鎮及富里鄉等 6 班共 598 公頃；宜蘭地區一期作輔導礁溪鄉、三星鄉及羅東鎮等 4 班共 73 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七處，全年執行面積 2,502 公頃。

雜糧及特作：落花生區域試驗春作以南改系 178 號等 6 品系，秋作以花育 23 號等 5 品系之表現較佳。芋仔甘藷新品系 TLSP-024 號春作公頃鮮塊根產量為 24,167 公斤。引進景觀綠肥作物試作，雞冠花較適於 6 月播種，播種量以每公頃 5 公斤為佳，蜀葵適於 9~10 月栽培，播種量以每公頃 10 公斤為佳。景觀綠肥作物混合花色時可增加休耕田之多樣性。飼料玉米試驗，新品系 PGH96-2 與新品種台南 20 號之公頃產量分別為 4,063 公斤與 3,935 公斤，較對照品種台農 1 號分別增產 79.5%與 73.9%。有機大豆栽培法試驗，以每公頃施用 1,000 公斤有機質肥料籽粒產量較高。甘藷有機栽培，以台農 57 號及台農 68 號之塊根產量較高。有機栽培黑豆種原收集及評估利用，春作以 Avoyelles (G01911)等三品種系，秋作以 PI 201422 (G01770)等四品種系之單株粒重較高。不同栽培密度對丹參之根部產量影響試驗，以株距 60 公分之處理產量較高。當歸在不同地區栽培之調查結果顯示，單株平均根重以瑞穗地區的最高。黃芩在不同栽培環境之試驗結果，單株平均重量及平均根重以玉里地區最高。以牛樟芝醱酵液及丹參等保健作物，已開發複方保健產品。

蔬菜：苦瓜新品系 WB33 於 1 月 22 日取得植物品種權，品種名為‘花蓮 4 號’；

苦瓜新品系 WB36 栽培密度以 5 公尺×2 公尺最佳。山蘇新品系 HA178 之栽培密度，以行株距 80x80 公分之生長表現最佳。番茄育種方面，抗捲葉病毒病大果型番茄之新品系區域試驗，96 年秋作以 FM1176 品系的平均產量及果實性狀表現較佳，將提出申請植物品種權。青蔥耐熱品種選育，97 年春作以 HAF10526 及 HAF10484 的單株重較高，但 HAF10484 在園藝性狀的表現較佳，另優良青蔥新品系 HAF10167 命名為新品種蘭陽 4 號，於 97 年 5 月 6 日獲得植物品種權。夏季優質青蔥產銷體系之建立，為降低颱風災害進行簡易遮陰設施栽培試驗，結果顯示以 50% 遮陰網栽培之青蔥植株生育情形良好，具有較高的單株重和蔥白長。建構作物優質生產的知識整合平台—青蔥栽培管理知識庫，本計畫與農業試驗所共同合作，調查收集在地的青蔥生產動態性資訊，以建置青蔥栽培管理知識庫。

花卉：百合品種改良，其中雜交品系 92FA3-2 及 FA3-N1 植株高度介於 33.9-54.9 公分之間，適合當盆花栽培；並完成不同試區百合種球繁殖試驗。香草植物甜薰衣草及齒葉薰衣草，在本地栽培結果與精油產能均相當高而穩定；調製完成 1 種清潔產品與 3 種護膚保養產品。本年度繼續推動與加拿大合作關係雙方研究人員互訪，邀請加拿大種原中心主任 Dr. Ken Richards 來本場訪問與進行一場專題演講。萱草開花期比往年略晚但開花情況佳，234 個萱草品種系中有 160 個開花，選出 6 個性狀優良的雜交品系完成開花性狀調查。鳶尾 Colorific 在草坪試驗，植株生育及開花特性表現均極佳。利用深層海水冷源特性作為洋桔梗涼溫育苗可生產高品質無簇生化種苗以取代進口苗之利用，除部份晚生品種對溫度要求嚴苛而簇生外，其他品種皆能達到商品水準。聖誕紅以‘Ice Punch’品種為接穗能形成最寬的樹冠展幅，同時具有最多的側枝數及葉片數，可產生較具美感且密集緊致的樹型產品。已建立白花野牡丹生產體系，並開發美容系列產品與飲品，期能開創兼具休閒及保健美容之新興產業。高溫是造成採收後銀柳切枝花苞脫落最主要的原因，研究結果以低溫乾貯方式效果最佳，貯藏時間以不超過 5 週為原則。若無冷藏設備者可採常溫插水貯藏，時間則以不超過 3 週為宜。已蒐集超過 100 個寒梅品種，觀花或採果兼而有之。以 5℃ 低溫層積處理 12 週以上，可顯著提高寒梅種子發芽率。原生觀賞植物種原仍持續蒐集，已蒐集具有觀賞潛力之種原約 350 種，培植於田間及溫室中進一步觀察。俄氏草觀花為主，扦插成活率低，自播種至成盆約需 6 個月。鋪地蜈蚣可作為觀葉小盆景，其 2 節插穗扦插成活率較高，達以

86%，自扦插至成盆約需 3 至 4 個月。蒐集國內外金絲桃屬植物 16 種，進行保健成分分析，其指標成分 Hyperforin 之萃取量，以浸泡乙酸乙酯方式為最高。斑葉香蒲種植 150 天後，以水深 3-5 公分者株數最多，每株可長出 48.3 株。燈心草則以不堪水者新生莖桿數明顯較多，達 299.2 支。蒐集具食用價值之水合歡一種，6 月開始生長，7 月至 9 月植株長迅速，11 月中植株生長停頓，葉片黃化萎凋，花期為 8 月至 10 月底。

果樹：套袋處理可明顯增加明尼桔柚果實重量，而使用單層白色紙袋套袋，可增加果實外觀之紅色度。明尼桔柚果實採收後靜置一週以上，可提高果實品質。文旦柚於中果期噴施腐植酸溶液，可增加果實之可溶性固形物含量與糖酸比。柑桔新品種系比較，以臍橙及 P158-2 品系表現較優；金柑健康苗芽系單果重以 HF-1-1 號和 HF-1-5 號最大，超過 20 公克。高接梨葉面噴施 5 次鈣資材，可提高果實糖度達 11.3 °Brix，且梨蜜症發生率較低。豐水梨採收後貯藏在 1 至 2℃ 低溫環境下，櫥架壽命可延長為 8 週。蓮霧增施鉀肥，以每棵施用氧化鉀 3.6 公斤處理者，其果實較重。蓮霧提早於 12 月 17 日進行催花，開花結果成功率為 65%，果重達 133.4 公克。

農產品加工：以花蓮地區生產品質優良之稻米研發具養生保健之飲品。並利用花蓮地區所生產之農產品研發出具養生及適合銀髮族營養需求之即食餐包產品。研發之產品整體接受度高、具食用安全性、便利性、易保存及易運輸等優點。

生物技術：利用農桿菌轉殖抗蟲基因 Cry1AC 及 Cry1IC 進入菊花中，通過抗生素篩選的再生芽體總數為 14-19 株，菊花品種「龍鳳紫」的轉殖效率較高。利用 touchdown PCR 技術將番茄未熟果果實 DNA 片段，加以定序，並利用 RACE 技術將其全長增幅並定序，其 cDNA 核苷酸長度為 1171-1209bp，蛋白質長度分別有 329-348 個氨基酸。比較 SYBR Green 及 Taqman 兩種定量 PCR 方式檢測基改木瓜，結果顯示，TaqMan 方式的重複性及準確度較好，可偵測到 0.0002ng/μl 濃度之樣本。

台灣白及於低濃度之細胞分裂素處理下，其增殖倍率為 3.6 倍最高，過高濃度細胞分裂素之處理易造成培植體褐化；綬草組培苗在適宜的馴化體系下，存活率可高達 100%，且生育情形良好。高基鹽濃度、中高蔗糖濃度、添加有機物之處理與添加 Auxin 類之植物生長調節劑有助於國蘭桑原晃根莖之培養，鮮種增加率最高可達 3 倍以上。

植物保護：本年度植物保護工作，就本轄區農友栽培作物在生育期中所發生之病蟲害進行各項作物綜合防治及非農藥防治資材試驗研究、示範推廣及農藥安全使用監測追蹤等工作。利用非農藥防治資材防治蔬菜病蟲害，樟腦油、菸草浸液、無患子液與苦楝油皆具有防治韭菜薊馬之潛力。比較種植綠籬植物對於有機作物生長的影響，結果天敵的種類在馬利筋上最多，包含六條瓢蟲、龜紋瓢蟲、赤星瓢蟲和蜘蛛，各植株的生物相以五月份最豐富。以蟲生真菌進行生物檢定，粉蝨寄生菌對銀葉粉蝨之感染率為 27.3%，防治率達 70.95%，顯示具有一定程度之防治效果。瓜園栽培區瓜實蠅之族群高峰在 5 月中旬至 6 月下旬，其族群變動的差異推測與瓜園周圍作物相關。東方果實蠅在番石榴園及蓮霧園的族群高峰均從 7 月下旬到 8 月下旬，此時正好為番石榴及蓮霧採收後期，園內常棄置大量不良果，造成東方果實蠅族群數量上升。甘藷蟻象在甘藷主要產期 1 至 2 月達族群高峰。大波斯菊新病害在盆鉢中以貝芬菲克利粉衣種子效果最為顯著，田間試驗則 6 種藥劑均較對照具顯著防治效果。以葉菜類茼蒿、莧菜與薤菜為對象，應用低毒性農藥與非農藥防治措施，建立病蟲草害管理模式，結果示範區葉斑病、白銹病發病率均較一般慣行栽培區為低。甜菜夜蛾 97 年度之月平均密度為 4.8 隻/誘蟲盒，較去年降低甚多。經全年調查宜蘭縣五鄉鎮梨產區梨木蝨，均未偵測到梨木蝨存在。在花蓮地區施放老鼠毒餌劑後野鼠與緬甸小鼠防治結果為每公頃密度分別降至 2.5 隻與 12.7 隻。為把握水稻病蟲害適期防治及轄區經濟作物疫情監測，計發佈作物病蟲害發生預報 12 次、警報 7 次、新聞稿 11 次、氣象資訊及農作物防範措施 20 次。針對地區偵測結果本轄區無發現法定檢疫害蟲。執行作物病蟲害監測及防治處方服務，計診斷作物 50 餘種 344 件。輔導花蓮縣及宜蘭縣辦理作物安全用藥講習計 55 場次，96 年農藥殘留抽測合格率達 96.4%。

土壤肥料：定址養分管理透過最佳養分供應率及最適施肥時期等方式達到最佳肥料利用效率的目標，水稻台南 11 號減施一半穗肥卻可增產 8.3%。敷蓋稻桿對雜草的抑制效果最佳，新鮮芒草、新鮮韭菜及稻殼等其它資材次之。文旦 6 月中旬所採取葉片樣品中磷濃度與果實糖酸比呈顯著負相關；高接梨 4 月中上旬所採取葉片樣品中鉀濃度與果實糖酸度呈顯著正相關，氮及磷濃度則與果實糖度呈顯著負相關。強酸性土壤之蓮霧園應於每年採收後，每公頃深施以 10 噸有機質肥料及 3 噸苦土石灰改良。已取得 1,942 件土壤及植體樣品並完成區域性土壤資料庫及

農業環境地理資訊系統之更新。辦理合理化施肥講習、宣導及示範 84 場，作物營養診斷及土壤肥力分析總件數為 4,684 件，服務農民 384 人次，作為農民施肥參考依據。

農業機械：開發成功附掛式綠肥播種機，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。另為加速推廣曳引機承載整地施肥作畦播種一貫作業機，辦理地區性示範觀摩會，介紹該機機構與功能，俾使農民瞭解與採用。

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 5 班，培訓 140 人。推動終身學習，辦理核心技術教育訓練 6 班，培訓 171 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，辦理農業體驗營 8 梯次，培訓 140 人，築巢營 3 梯次，培訓 72 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 3 班，培訓 92 人。

農業經營管理：推動農業產銷班發展工作，共計輔導與整合花蓮縣及宜蘭縣 401 班。推動農業經營企業化營造優質農業環境之中衛體系計畫，輔導三星地區、冬山鄉及壽豐鄉農會辦理。推動小地主大佃農工作，輔導三星地區及壽豐鄉農會試辦。推動農業經營專區業務，輔導三星地區農會辦理栽培技術與經營管理工作。輔導文旦產業策略聯盟，建立優質品牌的形象，提升銷售量及附加價值。推動安全農業，辦理 4 場次產銷履歷資訊系統教育訓練，培訓 65 人，輔導 38 個生產單位，538 位農民通過產銷履歷驗證，具有產銷履歷農產品生產面積達 958.76 公頃。

農村生活改善：為推動優質農村生活，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」活動，總計 236 班。輔導轄區農村婦女創業，辦理「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 1 場，培訓 55 人。為推廣花蓮地區丹參保健植物之多元化利用，舉

辦花蓮區丹參養生保健創意料理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 8 項地方特產伴手產品，舉辦「花蓮宜蘭兩縣伴手產品展覽」，展出產品共 16 項。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，推動有機村產業群聚發展評估規劃研究，藉以擴大有機栽培面積及產業效益。

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 2 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 15 則，電視行銷新聞主題 19 則，提送地方新聞媒體新聞稿 109 則，經媒體採納發佈共 121 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，為擴大服務層面，推廣轄區有機農業的產業發展及資訊傳播，建置「有機農業資訊網」，提供有機栽培技術、有機市集及有機相關服務訊息。

為民服務：推動「以人民需求為中心」之單一窗口服務，農業資訊查詢服務共辦理電話服務 54 次及 E-mail 43 件。農業技術參訪服務共接待國內、外團體及人員 45 次，參訪人數計有 1,795 人。另有 83 位農民前來本場索取推廣書刊及農業資料。

Summary

In 2008, 45 research projects, 21 demonstration plans and 29 commissioned projects from other organizations had been performed. The results were summarized as follow:

On rice: In 2008, a breeding line HKY100 was selected from the advanced yield trial for testing in regional yield trail. The yields of all varieties in rice yield forecasting trial were less than last years. On the rice standard operating process, the trial of 160g seed rating and 30 cm x 15 cm cultivated density were better on grain yield, 200 to 240g of seed rating and 30 cm x 30cm cultivated density trial were better on rice quality. In new varieties extension, TY3, TY4, TNG74 and TNG75 were grew in Hualien and Yilan area. To promote organic rice production, a total of 598 and 73 hectares were grown respectively in Hualien and Yilan Counties. And seven rice producing districts of good quality rice, a total of 2,502 hectares were guided to be established in Hualien and Yilan Counties.

On upland and special crops: Six breeding lines of peanut including Nan-Kai-si 178 in the spring crop and five breeding lines including Hua-Yu No. 23 in the fall crop performed high yield potential. The root tuber yield of sweet potato breeding line TLSP-024 was 24,167 kg/ha in the spring crop. The results of landscaping green manure trial showed that *C. argentea* var. *plumosus* was suitable for planting in June with the best sowing volume 5 kg/ha. The hollyhock was suitable for planting in September to October with the best sowing volume 10 kg/ha. Mix flowers design could increase the diversification of fallow fields. The average yield of feed corn varieties PGH96-2 and Tainan No.20 were 4,063 kg and 3,935 kg/ha respectively, which were increased than control variety Tainung No.1 with 79.5% and 73.9% respectively. In organic cultivation trials, soybean sprayed with 1,000 kg/ha organic fertilizer could get higher yield. Germplasm collection of black soybean for organic purpose were conducted, and the results showed that three breeding lines including Avoyelles (G01911) in spring crop

and four lines including PI 201422 (G01770) in the fall crop performed higher yield potential. Sweet potato variety Tai-Nung 57 and Tai-Nung 68 performed high yield potential in organic cultivation. The results of density trial for *Salvia miltiorrhiza* showed that density 60 cm had higher root yield than others. In comparison of the average root weight for *Angelica acutiloba*, the highest value was got from plants cultivated in Zueshue area. In comparison of the average root weight for *Scutellaria baicalensis*, the highest value was got from plants cultivated in Yuli area. Products made from fermented liquid of *Taiwanofungus camphorates* and plant material of *Salvia miltiorrhiza* were developed this year.

On vegetables: A bitter gourd breeding line WB33 was permitted to have a plant variety right and was registered as a new variety 'Hualien No. 4' in January 22, 2008. Another breeding line WB36 has finished a spacing test, and the best planting space was 5m x 2m. The results of plant spacing test for nest-fern breeding line HA178 revealed that the planting space 80 cm x 80cm was the best. For tomato breeding, the regional trial of tomato with resistance to tomato leaf curl virus had been conducted, and breeding line FMTT1176 had the highest yield and better fruit quality than others in autumn, 2007. FMTT1176 will be submitted the plant variety right next year. On green onion breeding, the results showed that breeding line HAF10484 had good performance in spring, 2008. Breeding line HAF10167 was permitted to have a plant variety right and was registered as a new variety 'Lanyang No. 4' in May 6, 2008. Green house facilities covered with silver shady net were tried to cultivate green onion in summer season, and the 50 % shady net was better than other. On constructing the knowledge integrated platform for high-quality green onion production, collection of local dynamic information was made to establish a knowledge base of green onion cultural management for developing high-quality green onion production knowledge integrated system via cooperation with Taiwan Agricultural Research Institute.

On flower crops: To create new lily varieties, the height of breeding lines 92FA3-2 and FA3-N1 were between 33.9 and 54.9 cm, which made them suitable for cultivating as pot plant. Bulb propagation experiments were conducted in four different

experimental places. The plant growth and essential oil content of *Lavandula heterophylla* and *Lavandula dentate* were investigated. The results indicated that the growth conditions and yield in both varieties were quite stable. One cleaning and three cosmetic products were established as well. To enhance the cooperation we had invited the director of the Canadian Genetic Resource Program to visit our Station. In general, the flowering time of daylilies was late but the flowering rate was better than last year. There were 234 varieties and breeding lines investigated and 160 of them produced flowers. There were 6 superior breeding lines selected and the flower characteristics had been measured. The growing and flowering performance of *Iris* 'Colorific' were shown excellent in the lawn field experiment. The use of cold deep seawater to incubated *Lisianthus* seedlings could produce high quality and non-rosette seedlings for replace the imported seedlings. The result of this study revealed part of the late-flowering varieties that had stricter temperature requirements and hence presented rosette, but other varieties could reach the commercial standard. Used scion of 'Ice Punch' for grafting had wider crown and increased leaves and branches, could make the tree poinsettia more compact and artistic. The propagation and cultivation system for common *Melastoma* were established, and the related cosmetic and drinking products were developed as well. It has shown that high temperature was the major factor resulting in post-harvest injury for willows. The best way to stored cat-tail willow shoots was in low temperature without water, and the storage time should less than 5 weeks. It could also store in room temperature, but should treat with water and the storage time was shorter than 3 weeks. More than 100 varieties of flower-quince were collected until 2008, including both for ornamental and fruit purpose. The germination rate of flower-quince seeds could be enhanced while treated with 5 °C for more than 12 weeks. The native ornamental is still collected this year, and there are approximately 350 potential varieties grown in the field and green house for further observation. On cutting trials of *Cotoneaster morrisonensis* and *Titanotrichum oldhamii*, according to the results, the survival rate of *Cotoneaster morrisonensis* was very lowest, it took about 6 month to achieve bonsai stage. The survival rate of *Titanotrichum oldhamii* is 86%,

and it took only 3 to 4 month to achieve bonsai stage. Sixteen varieties of *Hypericum* were collected and investigated, both from native and foreign. The highest content of Hyperforin was observed from those material extracted by Ethyl acetate. Variegated cattail plants cultivated in field with 3-5 cm water depth has the highest proliferation rate, with 48.3 shoots emerged in 150 days. And for common rush the highest proliferation rate was observed while cultivated in field with no surface water, with 299.2 stems emerged. Water mimosa (*Neptunia oleracea* Lour.) has been collected to develop edible aquatic plant industry. The plants started to grow in June, sprawled fast between July and September, and stopped growing in November. The flowering period in Yilan is between August and late October.

On fruit tree : Bagging could increase the fruit weight of Minneola tangelo significantly. Single layer bagging with white paper bag could increase the red color of fruit appearance. The quality of Minneola tangelo could be increased while stored for more than one week. Sprayed with humic acid during the developmental stage could increase the total soluble solid content and sugar/acid ratio for Wentan pomelo fruits. 'Navel' orange and 'P158-2' were the two best cultivars among others tested in I-Lan area. Within the healthy bud-lines of kumquats, HF-1-12 and HF-1-8 produced the largest single fruit that exceeds 20 grams. Top-grafted pears that were sprayed with calcium five times per season produced fruits with higher sugar contents of 11.3° Brix and with significantly lower percentage of watercore fruits as compared with the control. After harvesting the 'Feng-shui' pears storied at 1-2°C could extend the storage life to 8 weeks. Wax-apple trees treated with 3.6 kg/tree of potassium chloride got the largest fruit of 113.3 grams. The wax-apple trees were forced to induce flowering at December 17th, which resulted in higher fruit-set ratio of 65%, and larger fruits of 133.4 grams.

On food processing: The objective of the study was to develop health-promoting drink with rice which cultivated area was more popular in Hualien area. Use the local agricultural products to develop ready-to-eat meal as health promoting foods for elderly people. The advantages of these products have edible safety, convenience, easy storing and transportation.

On biotechnology: The pBI121AC and pBI121IC genes were transferred into chrysanthemum mediated by *Agrobacterium*. There were 14-19 transgenic lines survived under kanamycin selection. The gene transformation efficiency for cultivar Lung-feng-zi was better than others. The cDNA fragments amplified by touchdown PCR and the full length of cDNA amplified by RACE technique were certified. The length of nucleotide is 1171-1209bp, and the proteins contain 329-348 amino acids. The SYBR Green and TaqMan quantitative PCR methods were used to detect GM papaya. By the reproduction and precision consideration, TaqMan was better than SYBR Green method. The results showed that low concentration of cytokinins treatment could induce *Bletilla formosana* explants to form 3.6 shoots per explants, and the explants would get browning in high concentration treatment. In rhizome culture experiments of *Cymbidium*, high salt-base concentration, high to medium sucrose concentrations, organic addition treatment and auxin treatment could increase fresh weight of rhizomes over three times after four month culture in the above-mentioned treatments.

On plant protection: The integrated and non-chemical controlling, safety using of chemicals in crops were conducted in this year. *Thrips tabaci* could be controlled effectively by tobacco extracts, soapberry extracts, neem oil, and camphor oil. The investigation result of plant hedges in organic farm revealed that many kinds of natural enemies on milkweed (*Asclepias curassavica* L.), which include *Cheilomenes sexmaculata*, *Propylea japonica*, *Lemnia saucia*, and spiders. The abundance of natural enemy was higher in May than in other months. The infection rate and control rate of silverleaf whitefly-pathogenic fungus in screen house were 27.3% and 70.95% respectively. The severity of new disease in common cosmos could be decreased effectively by coating seeds with Carbendazim and Hexaconazole. A successful management pattern for crown daisy chrysanthemum, amaranth, and water convolvulus had been set up. In this model, by treating with low-toxic fungicides and non-chemical control, both water convolvulus leaf spot and white rust disease incidence were lower than conventional culture. Melon-fly population dynamics depend on the surrounding crops near cucumber field. The higher peak of melon-fly population density was

observed from May to June in cucumber field. On the other hand, the higher peak of oriental fruit fly population density was observed from July to August in wax apple and guava field. Because there were many discarded fruits during this period. The higher peak of sweet potato weevil population density was observed from January to February, which is sweet potato production season. The monthly average density of beet armyworm on green onion was 4.8 adults/trap in 2008, which was greatly lower than last year. The *Psylla* spp. was not detected in Ilan County pear orchards. The rate of wild mouse and Brumese mouse was down to 2.5 and 12.7/ha respectively after controlled. In order to control rice pest at suitable time and monitor plant epidemic, the plant pest forecasts were issued 12 times, and the pest warning and prediction report and meteorological information were issued 7, 11, and 20 times, respectively. There was no quarantine pest in Hualien area after surveying. A total of 344 cases of diagnosis and prescription were conducted among 50 kinds of crops. There were 55 times of seminar of farmer in Hualien and Yilan for controlling crop pests and safety of using pesticide. The chemical residue qualified rate was 96.4% in this year.

On soil and fertilizer: Site-specific nutrient management (SSNM) could assist farmers to optimally supply their crops with essential nutrients. The yield of rice variety Tainan No. 11 with half fertilizer quantity of heading dressing was 8.3% higher than the control. Weeds in organic farming field were inhibited effectively by mulching with mass rice straw. Phosphorus concentration in the wentan pomelo leaves sampled in the early June showed high negative relation with the fruit acid content. Nutrient concentration in the top grafted pear leaves sampled in the early April showed high relation with the fruit sugar content. With deep-plowing application 10 tons organic manures and 3 tons dolomitic limestone per hectare was the best treatment for wax apple growing in acid soil. There were 1,942 soil and plant samples been made for establishing the local soil database and renewing the agriculture environment geographic information system.

Eighty four courses of training activities and presentations for the promotion of appropriate fertilizer utilization were held, 4,684 plant nutrition diagnosis and soil

fertility analysis were made, 384 farmers were served in 2008, and these data are use to adjust fertilizing dosing.

On agricultural Machine: A green manure seeding machine has 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 has achieved the requirement of integral work for ridge making and holing concurrently. The anti-typhoon's facility with simple net for houseleek uses movable parts for easy assembly and disassembly. The black net shield covered around the steel frame can not only prevent the houseleek from storms and water but also allow ventilation and sunshine adjustment during the typhoon season of summer. In winter it can keep houseleek warm and prevent it from frost attack in order to reduce the disasters to the minimum. 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. This has an obvious effect on reducing the loss from typhoon. One project was conducted in order to accelerate the wide application of an integrated agricultural machine for seeding, bedding and fertilizing. Through local demonstration of the machine farmers can realize its mechanism and functions and would like to use it.

On agricultural extension education: In order to assist farmers to learn modern business management and utilize new techniques, five professional agricultural training courses were held with 140 participants. To push lifelong learning for farmers, six core-technique courses had been held with 171 participants. To enforce agricultural training plan and encourage the youth to take part in agriculture, 8 teams of the Wandervogel camp had been carried out with 140 participants, together with 3 teams of advanced Wandervogel camp and 72 participants. To offer an opportunity for those who are older than 35 years old and still interested in agriculture, three Gardener courses were held with 92 participants.

On agricultural management: To promote the development of agricultural

producing and marketing works, a total of 401 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. The Wentan Pomelo Strategic Alliance was assisted to establish a well image for pomelo fruits, and the added value for pomelo fruits were raised as well. To carry out Safety Agriculture policy, 4 training courses of TAP (traceability of agricultural products) information system had been held with 65 participants. There were 38 production units and 538 farmers been assisted to get TAP certification, and the certificated land areas were increased to 958.76 hectares.

On improvement of rural life: To promote the quality of rural life, all the farmers' associations were assisted to push rural activities. There were 236 workshops been held, which including 'Strengthen the Functions of Home Economics Improvement Club' and 'Improve the Life Quality of Senior Citizens'. To help rural women to run their own business, 23 courses including cooking and handicraft making were held. Moreover, one workshop 'Business Management and Cooking Sanitary' had been held for Tian-Mama with 55 participants. To promote the diverse utilization of *Salvia miltiorrhiza*, a competition of 'Creative Cuisine of Tan-Shin' had been conducted, and a recipe book of *Salvia miltiorrhiza* had been published. To promote the brand of Taiwan specialty gift, the farmers' associations had been assisted to develop 8 kinds of local specialty gifts. An exhibition of local specialty gifts belonging to Hualien and Yilan County had been held and 16 products were displayed. 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: In order to release the news about our

research achievements and the promotion activities of production and marketing, two press conferences had been held in Council of Agriculture. 15 items of research achievements news had been submitted to Council of Agriculture. There were 19 items of marketing news been broadcasted on TV, and 109 items of local news releases been sent to the media, and the media had issued 121 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. To expand the service and promote the industrial development of organic agriculture, 'Yilan & Hualien Organic Agriculture Website (organic.hdais.gov.tw)' had been established as well. The website provides information about organic cultivation techniques, a platform of organic markets and other relevant services.

On public services: To promote a single window service system of 'the needs of the people as the center', 54 phone calls and 43 e-mails about agricultural inquiries had been answered. To offer the guide of agricultural technique visiting, the Station had received 45 times of visiting with 1,795 national and international visitors. Besides, 83 farmers came to the Station asked for agricultural promotion books and information.