

摘要

94 年度本場共執行科技研究計畫 71 項，示範推廣計畫 10 項，接受委託試驗 4 項，茲將摘要擇錄如下：

稻作：94 年由高級試驗選出花梗育 72、79 號參加 95 年組區域試驗。肥效反應試驗結果顯示：花梗育 53 號與花梗育 69 號二品系之稻穀產量均以每公頃施用氮素量 200 公斤時為最高。穗上發芽率檢定顯示梗稻品種在一、二期作皆易穗上發芽；秈稻品種穗上發芽較難。梗、秈稻第二期作脫粒性檢定均屬中等。水稻豐歉試驗第一期作試驗結果，以參試品種台農 67 號產量最高，其次為台梗 2 號，各品種均較歷年減產。水稻新品種示範中晚熟品種，在花蓮與宜蘭地區以台南 11 號產量表現較好。花蓮地區良質米品質增進之研究結果顯示台梗 16 號及高雄 139 號在富里及玉里地區不同肥料處理之食味表現相近，台梗 2 號及台梗 9 號食味則表現各異。有機產銷班經營輔導部分，花蓮地區一、二期作輔導花蓮市、玉里鎮及富里鄉等 6 班共 573 公頃。宜蘭地區一期作輔導礁溪鄉、三星鄉及羅東鎮 3 班共 78 公頃。輔導良質米生產改進計畫，花蓮縣富里鄉、玉里鎮兩期作共執行 920 公頃，宜蘭縣於五結鄉、冬山鄉、礁溪鄉、三星鄉、員山鄉等一期作共執行 2,600 公頃。另於花蓮縣富里鄉輔導設立稻米產銷專業區 2 處。

雜糧及特作：雜糧及特用作物研究重點包括落花生、芋仔甘藷及山藥品種改良、景觀綠肥作物種類之開發利用、保健作物產業之開發及能源作物研究等，本年度重要成果有：選育出 HL88-11 及 HL89-02 等 2 個優良落花生品系，預計晉入 96 年全省性區域試驗。芋仔甘藷新品系 TLSP-024 以種植後 180 天採收之公頃塊根產量為最高，肥料用量以每公頃施用 N:P:K=120:30:360 之平均公頃鮮塊根產量為最高，栽培密度以 1 公尺×30~40 公分之平均公頃鮮塊根產量為最高。長形山藥以深耕栽培較塑膠穴管栽培之產量較高。研究景觀綠肥作物栽培法，黃波斯菊春作適於 2~4 月播種，秋作適於 8~10 月播種，小油菊適於 8~10 月播種。保健作物之開發利用研究結果顯示臺灣天仙果之果實抗氧化能力較葉及莖為高。於 800 公尺高海拔地區種植之當歸其產量較 600 及 500 公尺低海拔地區為佳，並成功開發出當歸保健複方飲品。在宜蘭縣三星鄉辦理大豆、向日葵及大油菜等能源作物示範 30 公頃，結果顯示大豆及向日葵較適宜本區生長，而大油菜並不適宜。於羅山有機村水田試行輪作 4 種雜糧作物，結果以輪作食用白玉米之經濟效益較高。

蔬菜：完成新育成雜交一代冬瓜品系 SFW03，及對照品種綠虎與吉豐的園藝性狀調查，SFW03 品系主蔓直徑、主蔓節長分別為 8.2、18.1 公分，分枝數為 9.0 支。幼葉與老葉均為掌狀，具有淺缺裂，葉面絨毛多，葉柄長 15.4 公分，成熟葉長、寬分別為 20.2、29.7 公分。植株生育旺盛，株型為普通大小。母蔓上第一朵雌花開花節位在第 22 節，播種至第一朵雌花開花所需天數為 71 天，為中生品系，子房外觀呈長圓筒形，表皮多絨毛。植株無論莖葉均未觀察到炭疽病、疫病、病毒病、蔓割病等病徵。果實為長橢圓形，縱徑 65.3 公分，橫徑 19.0 公分，平均果重 12.4 公斤，果皮表面有蠟粉，底色為淺綠色，果肉白色，厚

5.3 公分，果實橫切面略空心。94 年春作山苦瓜品系比較試驗參試 4 個品系以 WB36 品系之表現最佳，單株結果數約 251 個，小區產量達 29.7 公斤。94 年夏作區域試驗經過一年二個地區之試驗結果 WB33 品系之平均小區產量 58.9 公斤，每公頃估計產量為 21.8 公噸比對照品種 F1327 平均小區產量 23.8 公斤，每公頃估計產量 8.8 公噸為多。山蘇蕨菜區域試驗在花蓮縣秀林鄉、光復鄉及富里鄉等 3 個地區的表現以品系 HA178 最佳，3 個地區平均葉數 24.4 片，平均葉長達 60.3 公分。常溫環境下塑膠袋包裝之箭竹筍櫥架壽命為 2 日，0℃ 低溫貯存可以延長為 10 至 12 日。使用 0.1M 檸檬酸與抗壞血酸混合液浸泡 1 分鐘，可以延長 0℃ 貯存環境下之箭竹筍櫥架壽命為 12 至 14 日。

青蔥耐熱育種之研究，以國內、外收集之青蔥種源與雜交後裔進行耐熱品種選拔工作，94 年春作調查結果顯示，品系 HAF10526 之單株重最高為 393.4 公克，蔥白長 24.5 公分，園藝性狀表現良好。94 年夏作品系比較試驗期間遭遇 3 個強烈颱風及豪雨影響，調查結果以 HAF10509 單株重為 163.9 公克較重，但仍以對照品種福蔥—蘭陽三號的 253.6 公克表現最佳。花蓮區番茄新品系區域試驗，與亞洲蔬菜研究發展中心合作，於 94 年 12 月提出抗晚疫病新品種「花蓮亞蔬 17 號」及抗捲葉病毒病新品種「花蓮亞蔬 18 號」之植物品種權申請，並於 95 年 1 月 18 日通過。抗番茄捲葉病毒病桔黃色小果型番茄新品系區域試驗，94 年春作每公頃平均產量以 CHT1417 最高。抗晚疫病暨番茄捲葉病毒病之大果番茄新品系區域試驗中，每公頃平均產量以 FMTT1047 的 51.8 公噸最高，較對照品種台中亞蔬十號增產 20 %。

花卉：百合品種改良選拔 FLME1-22 等九個雜交百合優良品系，植株陸續開花，隨即調查開花特性，其中以 FLME1-32 品系開花期最早。另自荷蘭引進 8 個切花百合品種，研究其適合外銷之潛力，比較箱植與露地栽培之優劣，結果以箱植栽培之切花品質較佳。就 Yelloween (O/T) 品種而言，切花採收後試行外銷日本 2 個拍賣市場，結果以廣島市中央拍賣市場價格較高，國內市場以台北花市較高，每年 12 月至隔年 4 月為最佳外銷時機。園藝休閒作物資源開發研究，結果發現精油產能隨生育日數增加而有提高之趨勢，但品種間有差異。德克斯特薰衣草品種，於種植後 120 天採收新鮮莖葉進行萃取，其精油產能最高，運用氣相層析質譜儀(GC-MS)分析不同品種薰衣草精油成分含量差異。探討不同種類水生植物週年生產小品盆栽之可行性，巴戈可採用頂芽或中段插穗；4-9 月扦插時速率最快，頂芽扦插 3-6 天即達成品。丁香水龍在 7-9 月扦插者只需 1 週即可達成品。三種盆栽的成活率除田字草在 1-3 月間低於 50% 之外，其餘都達 100%。蒐集獲得之楊柳科品種其扦插存活率可達 85 % 以上，僅雪柳一種較低。赤柳在初夏期間容易罹患青枯病。銀柳營養系株高介於 130.5 公分至 222.5 公分間，分枝數介於 2.0 枝至 7.67 枝間。在採後處理研究方面，中國上海種及蘭陽一號之結果相似，處理溫度越高且時間越長，切枝的傷害越嚴重，花苞脫落率越高。在品種方面，蘭陽一號之花苞脫落率比中國上海種為高。國外引進的 23 個寒梅品種中，樺長壽、十二一重、夢繪卷、萬華鏡等新品種之生育較為健壯；開花期集中於 10 月至翌年 5 月間，樺長壽之花期涵蓋全年為最長。採收得到其中 6 個新品種之種子，發芽率為 18%~74% 不等。初步扦插之成活率以丹頂紅 54% 最高。原生觀賞植物種原累積至今年約蒐集得 330

種。山菊播種試驗之發芽率以 1 月份最佳。雞兒腸扦插介質試驗，各季成活率均達 95~100%。穗花斑葉蘭扦插介質試驗，成活率以冷涼之 10 月份及 1 月份最佳，扦插介質以砂為佳，插穗以莖頂芽較佳。

果樹：柑桔品種試作，計有南柑 20 號等 12 個品種(系)，開花結果期介於 3 月上~下旬之間，經調查果重以清見及 Dream Navel 平均 521.2 及 452.5 公克較大，成熟期較早的品種為興津 3 號及南柑 20 號，果實糖度以 P158-2 號達 12.7°Brix 最高，茂谷柑果實糖度亦達 11.6°Brix，均具有栽培價值。不同砧木對明尼桔柚植株營養生長之影響不大，但以利用枳柚為砧木者，具有最多的小果數。

提昇金柑產業競爭力之研究進行健康苗品系選育以 HF-1-3、HF-1-5、HF-1-9、HF-1-10 號及 HF-1-15 號 5 個芽系具粒大豐產之特性，健康芽體嫁接不同砧木結果以實生柚及酸桔當砧木之單果重平均為 16.6 公克表現較佳，單株產量則以廣東檸檬平均 5.2 公斤較多。選育高品質之金柑品種高接比較，分枝數以選育品系代號(圳頭)HF-91-2-52 及選育品系代號(三民)HF-91-2-6 號均為 5.8 支最多，結果數平均以選育品系代號(圳頭)HF-91-2-52 號 55 粒較多。確立防治金柑疫病之用藥時期及施藥方式，測試六種化學藥劑，27.12%三元硫酸銅 (Tribasic copper sulfate) 水懸劑 800 倍液在三次田間藥效試驗，均可顯著性地($p=0.05$)防治疫病；50%達滅芬 (Dimethomorph) 可濕性粉劑 3000 倍液、80%福賽得(Fosetyl-Al)水分散性粒劑 500 倍液與 58%鋅錳右滅達樂(Mancozeb + Metalaxyl)可濕性粉劑 500 倍液，有兩次均顯著性地($p=0.05$)防治金柑疫病。

蒐集蓮霧 4 個品種(系)之實生芽體，高接樹齡屬 4 年生，調查果重以鳳試所 73-1 號 209.2 公克較大，果實糖度測定以阿塗大粒種上半部為 10.7°Brix，下半部達 13.1°Brix，具有栽培價值。不同品系之加蜜蛋黃果試種結果初步顯示，加蜜蛋黃果植株生育性狀之表現與品系來源地點無關，而與品系之特性關係較為密切。紅龍果常溫貯存之櫥架壽命為 10 日，品質劣變現象為萎凋與腐爛。利用 PP 塑膠袋配合 5 低溫貯存可以延長產品櫥架壽命至 28 日，不同厚度之 PP 塑膠袋對於低溫貯存環境下紅龍果櫥架壽命之影響不明顯。

生物技術：基改木瓜檢測由種苗繁殖場提供數個階段盲樣測試。設計 CPMO、35S829、PAPA215、GUS861 等核酸引子並進行 PCR 反應，結果顯示可以區分基改與非基改木瓜樣本，偵測靈敏度可達 1% 之基改木瓜葉片樣本。進行百合 LA2 及 LG41 癒傷組織細胞基因轉殖試驗，經基因槍處理後的癒傷組織，褐化率以 DFR1AGUS 載體最高，CHIAGFP 最低，進一步誘導產生植株，經過篩選再生後之部分植株有 GUS 基因呈色現象。綬草以授粉後 20 天，紫蘭以授粉後 25-30 天成熟度果莢播種發芽率較佳，無菌播種培養改以 1/2MSMP 及 OWRS 培養基配方發芽率較佳，以 OWRS 培養基可以減低褐化速度及減少綬草及紫蘭之繼代次數。以含高濃度 BA 及低濃度 NAA 之 OWRS 培養基可以獲得紫蘭較多不定芽。以波斯頓腎蕨伸出盆外之纖匐枝為試驗材料，消毒之污染率低於 20%。波斯頓腎蕨培植體以 1/2MS 至 1/4MS 間之基鹽濃度最為適宜，其抽芽率、芽體株高及葉片數表現最為良好且無褐

化或玻璃質化情形。低濃度之 BA 處理可誘導波斯頓腎蕨培植體產生芽體，以 0.5 至 1ppm 處理濃度芽體數多且生育情形良好。

農產品加工：山藥零餘子即食餐包加工利用研發 運用花蓮 3 號山藥所著生之零餘子，其外觀為橢圓形，長徑 11~20mm、短徑 10.2mm、平均重量 1.17g，大小適中最具加工特性，並富含維生素與礦物質和活性物質：如鋅達 0.84mg/100g、膽鹼 19.3mg/100g、總酚類 3130ppm、超氧化酶活性 83.9 units/gm 等元素，為開發銀髮族養生產品之適當食材。產品以殺菌立式軟袋（Retort pouch）與真空調理水煮軟袋（Sous-vide pouch）包裝，並以水淋式殺菌釜殺菌，以全自動電腦控制梯度升溫升壓系統模式進行殺菌，其條件為 1SP（80 °C、0.35 kg/cm³）、2SP（95 °C、0.85 kg/cm³）、3SP（110 °C、1.6 kg/cm³）、4SP（121 °C、1.8 kg/cm³）121 °C、15 min。而水煮軟袋以 72 °C、120 min 條件進行烹煮，同時必需置入於-20 °C 冷凍庫中保存。結果顯示：殺菌軟袋破碎率微高、肉質稍硬、口感微差、湯汁濁度微高等小缺憾，但產品整體接受度高、並具食用安全性、便利性、易保存、易運輸等優點。

植物保護：本年度植物保護工作，就本轄區農友所栽培之作物在生育期中所發生之病蟲為害進行各項作物有機栽培、非農藥防治及生物製劑之試驗研究、示範推廣及農藥安全使用監測追蹤等工作，並規劃轄區內植物疫情之偵測、監測及預警系統，以期提高病蟲害防治管理效益與產品品質，並維護消費者之健康，並可使花蓮地區兼顧農業發展與農業環境資源永續利用。文旦試驗區結果均無黑星病及潰瘍病危害。銀葉粉蝨成蟲對阿巴汀與益達胺感受性高，卵對藥劑則無感受性。利用透明塑膠布或吸收紫外光塑膠布搭設隧道棚栽培草莓可有效降低及延遲草莓灰黴病之發生率。芽孢桿菌 B190 具有抑制洋香瓜白粉病及番茄灰斑病。含蓖麻粕及菸葉粕之栽培介質添加 C2-C-60、PBCAB 等拮抗菌，均可降低茄科疫霉病率 10 至 36.7%。百利普芬處理梨接穗對梨之開花率與結果率均無影響。宜蘭地區未發現中國梨木蝨。以 75%滅普寧可濕性粉劑粉衣消毒菠菜種子可有效防治菠菜立枯病，胡瓜育苗土添加 1%蓖麻粕可防治苗期立枯病及根瘤線蟲。單一使用 19.7%得芬諾水懸劑 2000 倍液防治青蔥甜菜夜蛾最具效果。應用 10.3%蘇力菌水分散性粒劑 1000 倍液和 19.7%得芬諾水懸劑 2000 倍液輪流施用防治效果最佳。在大雨前適時施用亞托敏及亞磷酸可有效抑制韭菜疫病的發生。以本土重要蟲生病原真菌白殭菌 *Beauveria bassiana* 防治富里地區水稻水象鼻蟲，田間防治效果尚不顯著。以文旦象鼻蟲及金花蟲上分離的白殭菌菌株測試對於文旦象鼻蟲防治效果，致死率分別達 86.7 至 100%。東方果實蠅共同防治結果顯示密度皆較前三年為低，果實受害率同時減少，而青蔥甜菜夜蛾共同防治區之密度其為害率較對照區減少 50%。緬甸小鼠及野鼠監測與防治結果顯示防除率達 66.7%。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、警報及新聞稿共計 36 次。發佈氣象資訊及農作物防範措施達 30 次。針對地區主要法定檢疫害蟲設置偵測點，結果顯示本轄區無該類檢疫害蟲。並執行紅火蟻鑑定 10 件以上，並宣導 2 場次。執行作物病蟲害監測及防治處方服務，計診斷作物 50 餘種 319 件。輔導花蓮縣及宜蘭縣蔬菜用藥安全，並核發吉園圃標章使用計 103 班。

土壤肥料：不同含微生物之有機質肥料應用於蔬菜有機栽培之研究結果顯示小胡瓜以每公頃施用大豆粕有機質肥料(氮：磷酐：氧化鉀=3.4：1.5：1.3%) 17,650 公斤之產量 52,563 公斤為最高，甜椒則以本場自製之稻殼堆肥(氮：磷酐：氧化鉀=1.9：4.0：2.4%) 15,800 公斤者之產量 11,256 公斤為最高。利用假堆稻殼介質養液栽培系統之研究結果顯示，提高鉀肥濃度對番茄之產量與品質有提升之效果，尤其春作番茄其效果比秋作效果為佳，而假堆二年之稻殼對作物水分的供應能力不輸於其他栽培介質，是值得推廣使用的栽培介質。作物堆肥及介質之研發試驗結果發現，稻殼堆肥中水溶性及交換性鉀、鈣、鎂隨堆肥時間先升後降，而以 4 月齡之樣品最高。另外，在相同施用量下，條施堆肥可使作物初期生長較佳。強化蔬菜抗風雨之栽培技術改進試驗以每公頃施用稻殼 20 公噸並增加畦溝深度至 40 公分深可加速田區排水通氣，降低浸水對作物的傷害。本年度「土壤及植物營養診斷服務」共辦理 2,219 件診斷服務，其中植體分析 908 件，土壤分析 1,048 件，另外有機資材及堆肥之分析亦有 263 件，除提供分析資料外，同時亦進行作物營養及土壤肥力狀況之診斷分析，提供農民施肥建議及參考。

農業機械：花蓮區農業機械研發包括二項重點，田間作業機械方面為青蔥田間打洞作業裝置之研製，本裝置係利用本場開發之動力承載作業機體，利用其動力與行走裝置，並配合相關作業裝置機體承載，使方便跨越在畦床上之行走作業方式，機構中亦設計有機體升降調整裝置，以利配合田間作業高度之調整。在文旦機械加工方面，進行Ⅱ型文旦自動去皮作業機改良試驗，利用空壓機結合機械原理設計自動進料作業平台，並配合三組筒刀及形式規格之三組不同大小承杯轉盤及夾具等，以及延遲電鐸、電磁閥、近階開關等之組合而成之自動去皮作業裝置。蔬菜種子直播機具模具之開發作業，經由二個階段加以實施，首先完成播種室、播種室蓋板、開溝導板、種子箱及種子箱蓋等。在開模過程為模組合理分配及加工成本之考量，分成三組金屬模具進行開發製作，包括：播種室、播種室蓋板加開溝導板、種子箱與種子箱蓋。第二階段製作四組模具包括傳動輪、支撐調整板加鏈箱導引蓋、自由調整固定板，以及可更換各式播種室滑塊之播種盤組。輔導轄區內蔬菜自動化育苗本年度育苗總量 80.9 萬株。本場結合多功能型肥料撒佈機及有機質肥料撒佈機之優點，開發Ⅲ型肥料撒佈機，本年度推廣 47 台。專利部分取得二項專利，承載型直播機結構改良新型專利及穴盤播種器結構發明專利。

Summary

In 2005, 71 research projects and 10 demonstration plans were conducted, 4 commissioned projects from other organizations were accepted. The results were summarized as follow:

On rice culture: HKY72 and HKY79 was submitted to attend the regional yield trial of 2006 set. The fertilizer test on breeding line HKY53、69 had shown that the highest yield was obtained on the application of nitrogen at 200 kg/ha in both lines. The panicle sprouting rate is higher in the first and second crop for Japonica type of rice. It's lower for Indica type of rice in both crops. In shattering character, most varieties are graded in middle scales for Indica and Japonica type of rice. In yield forecasting trial, the yield of TNG67 was highest and the yields were lower than the past years in every variety. In new varieties extension, the highest yield was obtained in TN11 in Hualien and Ilan area. In the research of promoting the quality of rice in the valley of Hualien, the trial of different fertilizer including organic fertilizer coupling with chemical fertilizer were tested, and the results showed that the eating quality of TK16 and KH139 were similar but TK2 and TK9 were different under different treatments. To promote organic rice production, a total of 573 and 78 hectares were grown respectively in Hualien and Ilan Counties. To enhance the production of good quality rice, a total of 920 and 2,600 hectares were guided respectively in Hualien and Ilan Counties. And two rice producing districts of good quality rice were established in Hualien.

On upland and special crops: The key works of upland and special crops including improvement of peanut, taro-like sweet potato and long-shaped yam varieties, development of green manure for landscape, development of species crops and productive estimation of energy crops are summarized as followed in this year: The two elite breeding lines of HL88-11 and HL89-02 which performed high yield potential would enter the regional trials of newly peanut lines in 2007. In the improvement for cultural practice of taro-like sweet potato, the yield performed better harvested in the 180 days after planting, high amount of fertilizer and plant spacing of 1m×0.3~0.4m performed high yield potential. The higher yield potential of the deep-plow practice in long shaped Hualien No.3 was more than the plastic-pipe practice. In the development of green manure for landscape, the niger and *Cosmos sulfureus* were introduced, and the adaptable planting period was Aug to Oct. There were 10 lines of *Ficus formosana* in antioxidant capacity was detected, and the DPPH scavenging effect of fruits was higher than stems and leaves. The yield of *Angelica* spp. in higher 800m altitude Tsukosan was higher than other areas of lower 500~600m altitude, and we have successfully develop processing products such as drinks product and the product of Dang-gui crop is good for people health. Estimation of energy production showed that the soybean and sunflower was best adaptation in I-Lan area, but the *Brassica napus* was not adaptable. Rotation on 4 upland crops in the paddy field of Losan organic village, and the net profit of rotation on green white maize in first crop was the best.

On processing of agricultural products: The shape of the bulbils of Chinese yam (*D. opposite* Thunb. cv. Hualien No. 3) is ellipsoid with average long axis 11-20 mm , short axis 10.2 mm. The average mass of particle is 1.17 g. The overall size showed that these bulbils are suitable for further processing. The results of chemical compositions analysis showed the yam bulbils enriched with nutritive materials such as zinc 0.84mg/100g, choline 19.3mg/100g, polyphenolic compounds 3130ppm, superoxide dismutase (SOD) 83.9 units/g. The bulbils are appropriate to prepare as health-promoting food for elderly people. Two type of product were developed, standing retort pouch and Sous-vide pouch. The retort pouches were sterilized with a pressurized hot water retort at step control procedure (1SP, 80 °C 0.35 kg/cm³ ; 2SP, 95 °C 0.85 kg/cm³ ; 3SP, 110 °C 1.6 kg/cm³ ; 4SP, 121 °C 1.8 kg/cm³) and sterilization conditions 121 °C 15 minute. The Sous-vide pouches were cooked with hot water at 72 °C for 120 minute and stored at -20 °C after cooking. The result of product quality investigation showed: the broken ratio of bulbils in retort pouch was slightly higher. The tenderness of meat in retort pouch was slightly tougher. The turbidity of soup in retort pouch was also slightly higher. But the overall acceptance of both products showed no significantly difference.

On vegetables: The characteristics of a new wax-gourd F1 breeding line SFW03 were described, together with two controlled varieties Green Tiger and Chifong. SFW03 possesses the following characteristics: the diameter and internal length of the main stem is 8.2, and 18.1 cm respectively. The number of branch shoot is 9.0. Both young and old leaves are palmate, with shallow splits on the margin and much hair on the surface. The length of a petiole is 15.4 cm. The length and width of a mature leaf is 20.2, and 29.7 cm respectively. The plants are vigorous growing, with a common size. The first female flower appeared on 22nd node of the main stem. The day taken from seed sowing to the first female flower blooming is 71, which mean it is a middle maturation breeding line. The ovary has a long cylinder shape, with much hair outside. There were no anthracnose, blight, virus, and *Fusarium* wilt symptoms observed. The fruit has a long bolong shape, with 65.3 cm in length, and 19.0 cm in width. The average weight is 12.4 kg. The fruit skin is little green, and covered with white wax after maturation. The flesh color is white, with a little hallow in the middle, and thickness 5.3 cm. The 2005 spring crop new variety comparison test of wild bitter gourds has the results as: variety WB36 is the best of all, with small-area production above 29 kilograms and single plant fruiting number of 251. The experiment result of summer crop wild bitter gourds at three regions this year is: Average small-area production of variety WB33 is 58.9 kilograms and the estimate production per hectare is 21.8 tons, this is much better than the comparison variety F1327 with average small-area production 23.8 kilograms and its estimate production per hectare 8.8 tons. Regional trial of nest fern new lines HA178 was the best in three areas , The mean of leafs is 24.4 , The mean length of leaf is 60.3 cm. At room temperature, the

shelf life of Usawa cane shoot was 2 days when packed in PP bags, it was 10 to 12 days when stored at 0°C. Soaking the shoot in a solution containing 0.1M citric acid and 0.1M L-ascorbic acid for 1 minute before storage could extended the shelf life of Usawa cane shoot to 14 days when stored at 0°C.

Studies on breeding of green onion, results of horticultural characteristics showed the HAF10526 new line of hybrid progeny has good performance under spring season with highest weight and longest length of blanched. Preliminary trial was also made on summer crop, the 'Futsun Lanyang No.3' showed highest yield after 3 strong typhoons. The Asian Vegetable Research and Development Center (AVRDC) developed new lines of tomato for regional trial. Tomato new variety 'Hualien Asveg 17' with resistance to late blight and 'Hualien Asveg 18' with resistance to tomato leaf curl virus (*ToLCV*) were registered in January 18, 2006. Regional trial of orange-yellow cherry tomato new lines resistance to tomato leaf curl virus was made, yield of CHT1417 was better than the other new lines. Another regional trial of tomato new lines with resistance to late blight and tomato leaf curl virus was also made, the FMTT1047 showed highest yield.

On flower crops: To create new lily varieties, nine superior hybrid lines of lily were selected, which includes FLME1-22 etc. Flower characteristics were measured at the flowering time, and line FLME1-32 was the earliest flowering one. Eight lily varieties were introduced from Holland to investigate their potential for exporting. Comparison between the bare-land and boxed cultivation were conducted. It showed that boxed cultivation method got a better quality. Flowers of the variety Yelloween (O/T) had been exported to two Japanese auctions, and the price from Hiroshima central auction was higher than that of another auction. In Taiwan, the price from Taipei auction was the highest one. The best period for exporting lily to Japanese markets is between December and April. Three lavender varieties were cut at different growing stages after planted to the soil. It showed that the essential oil content was gradually increased accompany with the growing stage. However, there was a little different between varieties. The highest essential oil content was got from the variety Devantville lavender. The differences of essential oil composition among varieties were analyzed and compared by using GC-MS. The potential of year-round production of small potted plants was investigated, and three aquatic plant species was compared, which includes Giant bacopa (*Bacopa lanigera*), needle-leaf ludwigia (*Ludwigia arcuata*), and water clover (*Marsilea crenata*). The results indicated that both apical and intermediate shoots are suitable cutting types. Those cultivated in April and September recovered apparently fast. The cutting from shoot apexes to become salable needs 3 to 6 days. Ludwigia cultivated during July and September needs only one week to become salable. The survival rates of giant bacopa, needle-leaf ludwigia and water clover in every month were 100% except water clover grew in January to March-that were less than 50%. The cutting

survival rate of *Salix* varieties were over 85%, only 1 variety was low. Plant height of Cat-tail Willow clones were between 130.50cm and 222.50 cm, the branches of Cat-tail Willow clones were between 2.0 branches and 7.67 branches. The results of the post harvested experiment showed that high temperature (30, 25) treatments, the quality of Cat-tail Willow, ex. injury grade and flower buds falling-off ratio, were worse than 20 and room temperature treatments, and there were no effects in flower bud-scales color and flower bud-scales falling-off ratio. 11 new varieties of flower-quine were introduced in 2005. Among the 23 new varieties, the growth of KABATYOJU, JUNIHITOE, BENIGOROMO and MANGEKYO are more vigorous. Anthesis of which mostly concentrates between October and May to next year. KABATYOJU's anthesis is the longest, covering whole year. Got seeds of 6 varieties in which; germination percentage ranges between 18%~74%. In terms of survival rate of preliminary cutting, TANCHOBENI is the highest, 54%. The germination percentage of seeding test of *Farfugium japonicum* (L.) Kitam is the best in January. The survival rate of *Aster indicus* L. in cutting medium testing can reach 95~100% in all seasons. As to cutting medium testing of *Goodyera procera* (Ker) Hook, the highest survival rate is in October and January; sand is the best cutting medium; terminal buds are the preferred cottage.

On fruit tree: Twelve citrus cultivars/lines, including 'Nankan No. 20' and others were evaluated for their adaptation to I-Lan area. All tested plants bloomed between early to late March. The cultivar 'Kiyomi tangor' and 'Dream Navel' had the highest fruit weight with 521.2 and 452.5 grams, 'Shinjin No.3' and 'Nankan No. 20' were the two cultivars that matured earlier. 'P158-2' had highest soluble solid content of 12.7 degree Brix, and 'Murcott' had 11.6 degree Brix. These cultivars/lines are regarded to have the potential for cultivation in this area. The optimal new variety of citrus in Hualien area was 'Minneola tangelo', the highest small fruit number of 'Minneola tangelo' was grafted on stock Citrumelo, but it is not significantly different in the effect of stock on plant growth situation.

The virus-free healthy kumquat line 'HF-1-3', 'HF-1-5', 'HF-1-9', 'HF-1-10' and 'HF-1-15' were good for the characters of fruit size and product. The stock pomelo and Sunki had the largest fruit size of 16.6 grams, stock Rangpur lime had the largest product of 5.2 kilograms. The healthy kumquat line 'HF-91-2-52' and 'HF-91-2-6' was good for the highest shoot number of 5.8, kumquat line 'HF-91-2-52' had the largest fruit number with 55 fruits. 27.12% Tribasic copper sulfate SC was significantly controlled the occurrence of Phytophthora disease of kumquat ($p=0.05$) in field test of three times. 50% Dimethomorph WP, 80% Fosetyl-Al WG and 58% Mancozeb + Metalaxyl WP were effectively controlled the occurrence of Phytophthora diseases of kumquat (significance, $p=0.05$) in field test of two times.

Buds of four cultivars/lines of wax apple were collected and top-grafted onto 4-year old stocks. Among them, the 'Feng-Shan No. 73-1' had the largest fruit size of 209.2 grams. With respect to

fruit sugar content, the 'A-Tu Large' had the highest of 10.7 and 13.1 degree Brix in the upper and lower half of its fruit and is highly recommended for cultivation. The growth situation of abiu in Hualien area depended on the characters of different variety of abiu. The shelf life of pitaya that stored at room temperature was 10 days, the deterioration was wild and decay. Utilizing PP plastic bag and 5 °C stored temperature could extend the shelf life to 28 days. Effect of different PP plastic bag thickness on the shelf life of red dragon ball stored at 5 °C was not significantly.

On biotechnology: To develop the detected technique of the seeds and seedlings of genetically modified (GM) papaya, the Seed Improvement and Propagation Station designed and supplied five steps blind samples tests. The primers, CPMO, 35S829, PAPA215, GUS861 and so on, were designed according to the gene sequence in the NCBI database. The results revealed that GM and non-GM papaya could be distinguished by the PCR assays. The 1% GM powder samples also were detected by the 35829 primer and the fragments of CaMV 35S promoter were amplified in the PCR assays. The LA2 and LG41 lilies callus lines were transferred gene into lilies' callus by particle bombardment method. The brown proportions transferred with DFR1AGUS plasmid were highest than other constructions. The brown proportions transferred with CHIAGFP plasmid were lowest than other constructions. The transient callus were continue to induce plantlets on the selection medium. Some regenerated plantlets expressed the GUS gene. When the capsules ages of *Spathoglottis plicata* were 25-30 days and the capsules age of ribbon grass was 20 days, the embryo germination percentages were better than other capsules ages. If the 1/2MSPMP or OWRS medium were used as germination medium, the embryo germination percentages were also better than other medium. It could reduce the subculture frequency when the OWRS medium was used as subculture medium. It could obtain more adventitious shoot when the *Spathoglottis plicata* explants cultured on the OWRS medium with high concentration of BA and low concentration of NAA. Runners of Boston fern are good tissue cultural materials. The fittest salt strength of tissue culture medium is between 1/2MS and 1/4MS. In these conditions, the shoot forming, shoot height, and leaves number of explants were expressed well, and there were no vitrification. Low concentration of BA would induce shoot formation. Between 0.5 and 1 ppm of BA concentrations were the best for proliferation of Boston fern explants.

On plant protection: The organic cultivation in crops, non-chemicals controlling and biological pesticides preparation, agricultural extension and safety using of chemicals in crops were conducted in this year. Besides, we also set up the detection, and monitoring system of plant epidemic to enhance pest control efficacy and produce quality, so as to guaranty the health of the consumer and protect the agricultural environments. The citrus canker and black spot of pomelo was not found in field. The adults of *Bemisia argentifolii* were highly sensitive to Abamatic and Imidacropid. The culturing tunnel made of transparent plastic film or ultra-violet light absorbent plastic film was

effective on delaying or reducing the incidences of grey mold on strawberry. *Bacillus amyloliquefaciens* B190 mixed with adjuvants effectively controlled powder mildew of muskmelon and gray leaf spot of tomato in bioassay trials. The highest effect for controlling the *Pythophthora* disease of tomato and sweet pepper were found in the treatment which mixed with castor cake (60:1) or tobacco cake (70:1), and the isolates of PBCAB and C2-6-60 were proved to be the best. There was no adverse effect on scion of pear when dipped with 1000 ppm of pyriproxyfen. The detection of *Cacopsylla chinensis* on topgrafting pear at Yilan area showed that Yilan is still free of *Cacopsylla chinensis*. The damping off on spinach seedlings was effectively controlled by seed coating with 75% Mepromil WP (2g/kg seed). The nursing soil amended with castor cake (1%,w/w) showed the effect on reducing the incidences of damping off and root-knot nematode on cucumber. The insecticide 19.7% Tebufenozide (500ppm) controlled beet armyworm effectively. Alternate spraying of 10.3% *Bacillus thuringiensis* (1000ppm) and 19.7% Tubufenozide effectively controlled beet armyworm in the field. The leaf blight on leek was predicted well and controlled by application of Azoxystrobin and phosphorous acid. There was no significant control effect on rice water weevil by weekly spray 3×10^7 spores/ml of *Beauveria bassiana* on rice in the field. On the contrary, the control rate of wentan pomelo weevil was 86.7% and 100% by spraying 3×10^7 spores/ml of weevil strain and leaf beetle strain of *Beauveria bassiana*, respectively.

The density of oriental fruit fly and damage ratio was lowered by whole area controlling scheme this year in Yilan area. As a result, the density of beet armyworm of green onion was also reduced by 50%. The population of Brumese mouse and wild mouse were surveyed before and after baiting, the controlling rate reached 66.7%. 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 report and meteorological information were issued 12 and 36 times, respectively. The survey points for quarantine harmful insect have been set, results indicated that there was no quarantine pest in Hualien area. More than 10 samples of suspected red imported fire ant were identified and control guidance was recommended. 319 cases of diagnosis and prescription were conducted among 50 kinds of crops. 103 groups using of GAP mark in Hualien and Yilan were assisted.

Soil and fertilizer: In the study of applying bio-fertilizer on organic farming of vegetables, the results indicated that it got the highest yield 52,563 kg per hectare of cucumber when treated with powder of soybean cake ($N : P_2O_5 : K_2O = 3.4 : 1.5 : 1.3\%$) 17,650 kg/ha, the highest yield 11,256 kg/ha of sweet pepper when treated with bio-fertilizer 15,800 kg/ha of rice hull compost ($N : P_2O_5 : K_2O = 1.9 : 4.0 : 2.4\%$). In the study of pseudo-composted rice hull medium and hydroponics technique, the preliminary results showed that: 1. Both the yield and quality of tomato will be promoted by increasing the potassium concentration and its effect of spring cropping is better than autumn crop 2. The pseudo-composted rice hull is merit extension to the protected

culture, because the two year pseudo-composted rice hull is same as the other culture medium on water supply ability to crop. In the research on the medium and compost for horticultural crops, the fractionation of water-soluble and exchangeable potassium, calcium and magnesium in the rice hull compost showed the highest level at four month age. The compost application rate could be reduced by band application. In the study of developing technique of vegetable growing under strong wind and heavy rain, the results indicated that soil redox-potential of the treatment adding 20 tons/ha rice hull and having 40 cm furrow deep could recover to 300 mV in eight hours after drainage, that is, could avoid the flooding injury. In 2005, there were 2,219 samples of soil and plant tissues were analyzed, including 908 samples of plant tissue, 1,048 samples of soil, and 263 samples of organic materials. Those data were used to make recommendation of soil fertility and plant nutrition for farmers.

On agricultural machine: Agricultural machine development and improvement: There are three potions with agricultural machine development in HDAIS agricultural office. In the farmland machine, the scallion transplanting and holing machine has been developed. This machine was used the wheel part of the cultivator. And its depth can be adjusted to match the different ridge. The holing machine combines the limit switch, a head of liquid, solenoid valve and liquid hose. It was designed application from 800mm ridge width, 150mm holing depth and 25mm diameter. It can hole four holes one circle. In the process machine of wentan pomelo fruit, it improves the peeling process. And the air compressor is used to the automatic entry the wentan pomelo fruit. It used the wentan pomelo fruit that has been planted 18 years. In the mold development of vegetable seeding machine, it includes seed case, seed case cover, seed channel, seed box, seed box cover, wheel, fixed frame, chain cover, free adjusted keep, and three kinds seed discs. The seed disc includes Water Convolvulus, Spinach, and Radish seed disc. The vegetable seeding machine can be used very convenience and popularization with different machines carrying.