

摘要

九十二年本場共執行科技研究計畫 67 項，示範推廣計畫 31 項，委託試驗 3 項，茲將摘要擇錄如下：

稻作：本年度選出表現優良的水稻新品種系花梗育 53 號參加 93 年組區域試驗。肥效反應試驗方面，花梗育 32、44、50 三品係以每公頃施用氮素 200 公斤產量最高。水稻穗上發芽率檢定試驗，結果顯示梗稻品種二期作容易穗上發芽，一期作較難；秈稻品種則均不易發生穗上發芽現象。脫粒性檢定結果顯示，梗、秈稻均屬於中等脫粒性。水稻豐歉因素測定試驗，一期作氣候良好，參試品種較歷年增產。新育成品種地方試作結果，桃園 1 號適合花蓮、宜蘭地區栽培，高雄 143 號因植株較軟弱，栽培時應注意避免倒伏。輔導轄區內農友生產有機米，花蓮縣 5 班 444 公頃，宜蘭縣 3 班 50.86 公頃。輔導生產良質米方面，花蓮縣 4,000 公頃，宜蘭縣 2,700 公頃。

雜糧及特作：本年度育成落花生新品種「花蓮 2 號」，商品名稱為「三莢公」，本品種具有大莢多粒之特性。落花生品種改良試驗，進行第三年品系比較，結果以 HL87-09、HL87-10、HL87-13 及 HK87-14 等 4 個品系表現較佳。落花生新品系區域試驗，春作以花育 15 號，秋作以南改系 168 號之表現較佳。芋仔甘藷品種改良第二年品系比較試驗，以 TLSP-024 品系之表現較佳。食用甘藷新品系區域試驗結果，以 TYY81-142 品系之表現較佳。山藥品種選育試驗結果，以 Y74-2 品系表現最佳。施用牛糞堆肥可提高長形山藥之塊莖產量。景觀綠肥作物開發利用研究結果顯示，大波斯菊適合於晚秋及早春播種；青稈適合於 4 月播種，其播種量以每公頃 3-4 公斤表現較佳。保健作物試驗結果顯示，栽培綬草之介質以溪沙加牛糞之組合最佳；山防風之栽培密度以株距 50 公分之生長表現較佳。

蔬菜：冬瓜育種研究已完成雜交一代之組合力檢測試驗，其中以花蓮一號 xTAI-2-2-22-3-13-4-18 品系的表現最佳，果實內部具有小間隙，果重 8.2 公斤，公頃產量 62.1 公噸。山苦瓜育種研究已完成品系比較試驗，其中以 HCM6333 品系表現較佳，公頃產量 4 公噸以上。引進 6 個牛番茄品種進行瓜果類蔬菜設施栽培試驗，其中以 FA832 及 HA852 品系表現較佳，適合於花蓮地區栽培。進行原住民園藝新興蔬菜產業發展之研究，山蘇蕨菜營養系第一年品系比較試驗，結果以 69 品系生長速率較快。黃藤心採收後保鮮技術研究結果，以真空包裝的保存方式，可隔絕氧氣，有效抑制藤心褐變。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選拔工作，選拔耐熱青蔥新品種，92 年夏作調查結果顯示，HAF10522、HAF10509、HAF10532 及 HAF10534 等品系單叢重較高，蔥白長，分蘖數適中。本土青蒜耐毒素病品系選拔方面，以珠芽繁殖且經病毒篩選之宜蘭白蒜蒜種，所產之青蒜在產量及園藝性狀等調查皆最佳，而亞蔬中心以莖頂培養的健康青蒜品系，經田間栽培一世代後，表現已不理想。花蓮地區番茄新品系區域試驗，選出富含 β -胡蘿蔔素之優良小果番茄新品系 CHT1200，於 92 年 6 月 20 日經命名審查委員評審通過命名為「花蓮亞蔬十三號」。此外，抗晚疫病番茄新品系區域試驗中，三試區每公頃平均產量以 FMTT795 最高，對照品

種花蓮亞蔬五號最低。

花卉：百合品種改良研究，以原生台灣百合為母本，亞洲型和東方型百合為父本，進行遠緣雜交，再以組織培養克服雜交胚隋化現象，本年度成功培育 1 個雜交組合，獲得雜交後裔 30 株。91 年度雜交成功之 6 個雜交組合品系，種植溫室內，共有 69 株開花，由其中篩選出 FLME1-22 等 9 個形色優美品系。休閒香草植物開發利用之研究，取甜薰衣草扦插苗為材料進行栽培試驗，分 72 格穴植苗及 3 寸盆鉢苗二種處理，以經過假植 3 寸盆鉢苗之栽培成果較佳。香草植物精油萃取試驗方面，以水蒸氣萃取法，可得到精油和花水之混合液。2 公斤迷迭香植株莖葉，以 4 公升蒸餾水萃取，可獲得精油 18 毫升。銀柳 89-73 營養系自中國上海種芽條變異選拔獲得，為大粒花苞性狀穩定且芽鱗色澤鮮紅之新營養系銀柳，經命名審查委員評審一致通過命名為「蘭陽一號」新品種，商品名稱為「貴妃」，寒梅以頂芽插穗之癒傷組織形成率及扦插成活較其它處理高。寒梅品種「長壽祿」之花期調節，春季結果以 5℃ 前處理表現最佳，春雷 100 倍表現次之。原生觀賞植物種原累積至今年約蒐集得 300 種，例如山椒草及石吊蘭。爵床之扦插成活率均幾近於 100%。蚊母樹之扦插發根率以泥炭土：珍珠石：蛇木屑 4 號（1：1：1）之表現較佳。山菜豆不同成熟度之插穗，以綠枝扦插成活率達 97% 為最佳。合鴨共棲放養密度每分地放養 10 隻合鴨為最適，對水稻生育負面影響最小，且稻米產值最高。日本紙莎草以 2.5mg/L 矮化劑 pp333 處理，可有效控制株高，達到小品盆栽化的需求。

果樹：新興果樹品種試種結果，以加蜜蛋黃果表現最佳，單果果重 150~250 公克，糖度 13~15° Brix。研究文旦樹齡與果樹品質之關係，結果 20 年生植株之單株產量顯著地高於 40 年生植株；而果實品質、可溶性固形物、酸度、果汁率等，二者之間差異皆不顯著。花蓮地區柑桔品種選育，花蓮縣壽豐鄉經過 5 年試種結果，以明尼桔柚表現最佳，單果重 200~300 公克，果肉糖度可達 12~13° Brix，其次為無酸橙及 Ortanique，均具有栽培價值。在宜蘭縣三星鄉試區則以 Fremont、Ortanique、茂谷柑及新品系 P158-2 號等品種具豐產優異表現。金柑優良單株選育 24 個品系，進行成株高接，芽體成活率以 kq-1-1、kq-1-5、kq-1-11 號等 3 個品系達 70% 最高。繁殖無毒金柑種苗 250 株，分別種植於平地及山坡地，每處面積 0.3 公頃。提高宜蘭地區蓮霧品質之研究，蒐集蓮霧 5 品種之枝條芽體進行高接，以阿塗大粒種單果重為 172.9 公克最大。

農產加工：山藥零餘子內外部分皆蘊藏著豐富珍貴的養生滋補保健成分，內部營養物價值甚至高於塊莖，外皮部份則含有豐富膽鹼及尿囊素，本年度已研發出山藥零餘子罐頭。運用紅麴天然之芳香代謝物質及亮麗色澤和特殊養生保健等成份，以地方特產開發紅麴低鹽醃漬品，並結合「花蓮網室健康豬肉」開發紅麴加工肉製品及研發完成紅糟麻糬及糕餅等休閒小點等產品。研發麵包果膳食纖維進行加工之應用，以麵包果粉取代高筋麵粉製作麵包果烘焙食品等，經消費者喜好性官能品評，以色澤與外觀、風味、口感度、香氣及接受性等評比，其整體接受度佳。以冷壓法進行量產文旦果皮精油，已完成技術移轉並進行專利申請中，精油加工製成數種化妝品。

生物技術：誘導觀果鳳梨組培苗產生叢生狀芽原體，再照射加馬射線，獲得 14 個變異性狀較為穩定之枝條。前一年度獲得之變異植株，定植於溫室中觀察，結果以 G9002、G9004、G9022 三株的變異性狀最為穩定，葉片具有美麗的嵌紋線條。進行水稻基因轉殖之研究，台農 67 號、台梗 16 號、台梗 17 號等三個水稻品種，以農桿菌法轉植 DFR 反義基因，結果獲得具有 GUS 基因表達之轉殖株。番茄花蓮亞蔬五號基因轉殖之研究，利用農桿菌轉殖法，以 PBI121 質體進行轉殖時，培植體平均再生芽體數為 1.8 至 3.4 個。以 MSG1 培養基之篩選後再生率較高，部分植株有藍色 GUS 基因表達現象。百合花色基因轉殖之研究，進行百合基因轉殖試驗，LA2 及 LG41 二個癒傷組織細胞系，以基因槍進行轉殖，部分癒傷組織帶有 GUS 基因表達現象。

植物保護：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，並可使花蓮地區農業經營產業發展與農業環境資源永續利用。花蓮地區山蘇有十一種主要病蟲害及山藥有十四種病蟲害，已建立其生態資料及防治技術研究，並篩選出歐殺滅對山藥根瘤線蟲防治效果佳。金柑疫病以三元硫酸銅乳劑及達滅芬可濕性粉劑可有效防治，另以三元硫酸銅混合石灰材質，塗佈於金柑莖基部亦可有效防治。韭菜根蟻非農藥防治以菸草浸液對根蟻防治率可達 59.6-77.2%。溫泉薺菜青枯病於採收後立即噴施嘉賜銅混合可濕性粉劑或於曬田期施用腐植酸可有效抑制青枯病為害。自柚皮堆肥分離出的拮抗菌對茄科疫病之防治效果較好，以蓖麻粕為基質之堆肥可使拮抗菌生長良好，其次為菸葉粕。氣象因子中以氣溫影響韭菜銹病之發生最為顯著，氣溫 25°C 以上，銹病發生率低，而降雨量與根蟻密度則呈正相關。雞糞-米糠堆肥 (CR) 可明顯抑制胡瓜疫病之發生，蓖麻粕之添加則可再提高抑制胡瓜疫病之效果。水稻上噴施丁香油及氯化鐵均對葉稻熱病有抑制之效果，亞磷酸則對枝梗稻熱病及稻苗徒長病具防治效果。應用枯草桿菌改良劑可明顯抑制洋香瓜白粉病及炭疽病菌之生長。試驗示範及推廣方面：東方果實蠅共同防治結果顯示密度最高時期較去年同期減少 60% 以上，為害率同時減少。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緬甸小鼠經設置長期滅除毒餌站其防除率達 89.4%，農田野鼠防除率達 87.3%。

土壤肥料：山苦瓜在每公頃施用有機質肥料 10 公噸下以氮：磷酐：氧化鉀=300：75：225 公斤者之公頃產量 16,260 公斤為最佳。以堆肥：水為 1：20 比率浸泡所得到之抽出液可作為液體肥料，而其固形殘餘物則可作為蔬菜之育苗介質使用。小胡瓜及番茄之假堆稻殼試驗結果顯示其產量與進口之泥碳栽培介質沒有顯著差異，但假堆稻殼栽培介質具有耐用、低鹽分、通氣性好及成本低等優點，因此具有取代進口泥碳介質之潛力。利用真空壓縮包裝技術，其總體密度可增加 2.2 倍，體積則可減少 15%，如此可便於搬運及儲存，並增加施肥之效率，進而達到降低成本之目的。寒梅摘心後分支比率各處理在 83.9~88.7% 之間，並以 5 公分之高度摘心及施用較多氮肥之表現較佳。在土壤調查資料應用方面，花宜地區土壤調查資訊系統之網頁已撰寫完成，內容包括土壤肥力主題圖顯示系統及以鄉鎮為單位之肥力網格

資料查詢系統，使用者只要利用平移、放大、縮小、拖曳及點選等功能即可完成資料之搜尋，操作簡單容易。

農業機械：農機試驗研究改良：蔬菜田間播種作畦施肥一貫作業機之研製：本機主要構造包括整地、攪拌裝置、施肥裝置、作畦開溝裝置、傳動機構裝置、播種裝置等五大部分。經由本機作業可同時完成施肥、作畦、播種一貫作業，在播種機具使用對白蘿蔔、菠菜、蕹菜、萵苣、葉萵苣、胡蘿蔔、白菜及向日葵等皆有良好播種效果。文旦去皮作業機之研製：文旦加工產品，需對於文旦原料之品質特性妥善加以規劃利用，作業效率之提升亦需經由整體規劃後，配合相關機具逐步開發，從分級、去端、果肉分離、果皮果肉壓榨等，開發整合一系列加工機械，使經由機械作業達到加工之目的。目前第一階段已開發完成 II 型文旦加工分級機，經由第一階段之原料統一分級，再配合第二階段完成立式文旦去皮裝置。產學合作方面有施肥作畦一貫作業機具之研製：作業過程包括當肥料施用至土壤時經由攪拌裝置，將肥料與土壤充分攪拌後，再經由後方之整平並利用油壓舉升作畦裝置。在自動化蔬菜育苗場輔導方面：花蓮縣本年度統計共 1153.46 萬株，包括甘藍 535.81 萬株、包心白菜 307.57 萬株、甜椒 96.77 萬株、番茄 213.31 萬株，對花蓮縣大宗蔬菜之供應穩定有重要地位。在農機推廣方面：本場開發之農機業經性能測定列入國產新型機業經推廣，截至本年度之機型分別有有機質肥料撒佈機 147 台、多功能型施肥機 486 台及花改型 III 型施肥機 8 台，由於施肥機之開發推廣對節省作業之工時將有助益。在服務農民方面：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 19 次。另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病蟲。執行作物病蟲害監測及防治處方服務，計診斷作物 60 種 206 件。92 年度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 81 班。本年度「土壤及植物營養診斷服務」共辦理 2,068 件診斷服務，其中植體分析 1,082 件，土壤分析 905 件，另外有機資材及堆肥之分析亦有 81 件。

Summary

In 2003, 67 research projects and 31 demonstration plans were conducted, 3 commissioned projects from other organizations were accepted. The results were summarized follow :

On rice : A superior breeding line HKY53 was submitted to attend the regional trials of 2004. The fertilizer tests on breeding lines, HKY32, 44, and 50, had shown that the highest yield was obtained on the application of nitrogen at 200 kg/ha. The on panicle germination tests showed that the germination rate of Japonica rice in the second crop was higher than the first crop. For Indica rice, however, it was rather low. On shattering tests, all Indica and Japonica type of rice were recorded as middle grade. On yield prediction trial, due to the good weather conditions, the yields in this year were higher than the average in the past. The results of local trials, for newly released rice varieties, showed that variety TY 1 is suitable for Hualien and Ilan area. Variety KH 143 appeared to be weaker and easier lodging, and that should be avoided in the future. To promote organic rice production, a total of 444 and 50.86 hectares were grown, respectively in Hualien and Ilan Counties. To enhance the production of good quality rice, a total of 4,000 and 2,700 hectares were guided respectively in Hualien and Ilan Counties.

On upland crops: A superior variety Hualien 2, commercial name Triple Pod, was released this year. The third-year trial for peanut was conducted, and four breeding lines HL87-09, HL87-10, HL87-13, and HL87-14 performed higher yield potential than the control. On regional trials, two breeding lines Hua-yu 15 and Nan-Kai-si 168 performed better than others respectively in the first crop, and second crop. On taro-like sweet potato selection trials, a breeding line TLSP-024 performed better than others. On table-used sweet potatoes, the results of regional trial indicated that TYY81-142 has the highest yield potential. On yam selection program, breeding line Y74-2 has the best performance. On the research of green manure for landscaping, the common cosmos (*Cosmos bipinnatus* Cav.) was suitable for late autumn and early spring. The suitable sowing time for feather cockscomb (*Coleosion argentea* L.) is April, and the best sowing quantity was 3 to 4 kg/ha. On the research of health improving plants, using fine sand together. With cow manure as culture media, the growth of *Spirunthes sinesis* was enhanced. The best planting density for *Echinops grijsii* Hance is 50 cm per row.

On vegetables: The combining ability tests were conducted for wax-gourd, and a hybrid combination Hualien 1×TAI-2-2-22-3-13-4-18 showed the best performance. The fruit weight is 8.2 kg, and the yield is 62.1 metric tons per hectare. In bitter gourd the comparison trials within breeding lines were conducted, and one superior line HCM6333 showed the best performance with yield potential 4 metric tons per hectare. There were six tomato varieties been imported and grown in the greenhouses for adaptation trials. Variety FA832 and HA852 had the heaviest fruit weight, and could be recommended to the farmers. On the development of vegetable crops for aboriginal areas, one Asplenium breeding line 69 was selected with fast growing habit. The post-harvest research on yellow rotang palm was conducted to reduce browning symptom. It showed that utilizing vacuum package could inhibit the enzymatic browning of yellow rotang palm. Studies on breeding of green onion showed that the HAF10522, HAF10509, HAF10532 and HAF10534 new lines of hybrid progeny have good performance under summer season with higher weight, longer length of blanched. A selection program for virus tolerant garlic was conducted. The results indicated that the virus free and bulbils lines have higher yield and better horticultural characteristics than the other varieties. The cherry tomato line with high β -carotene content CHT1200 was registered in June 20, 2003 as a new variety 'Hualien ASVEG#13'. Another regional trial of tomato new lines with resistance to late blight was also conducted, FM795 has highest yield in spring crop, 2003.

On flower crops: Crossings of lily were conducted by using *Lilium formosanum* as a maternal plant, and the Asiatic or oriental hybrid lilies as paternal plants. The hybrid embryos were rescued by using tissue culture techniques. One cross combination was obtained, and 30 hybrid plants were regenerated successfully this year. Sixty-nine plants, which were belonging to six combinations, started to bloom this year. Nine superior hybrids were selected and mass propagated. Studies on the development and usage of aromatic herbs were conducted. The cutting of sweet lavender was treated with 72-plug and 3-inch-plot, the 3-inch-plot treatment was better. The aromatic plants could be extracted to get essential oil by using stem distillation methods. It showed that 18 ml essential oil could be extracted from 2 kg of rosemary shoots. The clone 89-73 was registered in December 24, 2003 as a new Cat-tail variety 'Lanyang #1'. The Lanyang #1 had big flower buds and red bud-scales, which is a bud-mutative branch of Chinese Shanshing variety willow. In flower-quine, there were 12 new varieties have been recommended. The callus forming rate and cutting survival rate of apical-bud-cuttage of: 'Chang-Shou-Lu(CSL) is higher than other treatments. For the bloom regulation test of CSL, the performance of 5°C pre-processing is the best treatment. There are 300 species native ornamental plants were collected this year, for example *Peperomia nakaharai* Hayata and *Lysionotus pauciflorus* var *pauciflorus* Maxim. The results of cutting test indicated that the

survival rates were all nearly 100% in all treatments of *Justicia Procumbens* var. *Procumbens* L.. The media volume ratio of peatmoss: perlite:tree fern No.4 equal to 1:1:1 is best for *Distylium racemosum* Sieb. & Zucc. rooting. For *Radermachia sinica* (Hance) Hemsl., the survival rate of newly born green cutting was the highest, up to 97%, than other maturity shoot. For aigamo-rice integrated farming, 100 ducks/ha is the best duck density in field and has the highest production. Paclobutrazol application (2.5 mg/L) had made the *Cyperus haspan* plants well-performed miniature potted plants.

On fruit trees: Several fruit trees were imported and evaluated, and the biriba was selected for its good performance in Hualien area. The average weight of a biriba fruit was 150 to 250g, and the sugar content was 13 to 15° Brix. The relationship between tree age and fruit quality on wentan pomelo was investigated. The total yield of 20-year-old plants was significantly higher than the 40-year-old plants. However, the fruit quality including soluble solids content, acidity, percentage of juice, etc. was not significantly different. Breeding and selection of citrus cultivars in Hualien area, eight cultivars were planted at Shoufen of Hualien County in the past 5 years. 'Minneola' had the best performance with average fruit weight of 200-300 grams and total solid contents of 12-13 degree Brix. 'Acidless' orange and 'Ortanique' tangor was the second, both of them had the potential for commercial cultivation. Among the 12 citrus cultivars/lines tested in Sanshing of Ilan County, 'Fremont', 'Ortanique', 'Murcott' and new line 'P158-2' showed superior performance with high yield. A total of 24 lines of kumquat were top-grafted onto adult tree. Among them, kq-1-1, kq-1-5 and kq-1-11 had the highest bud-survival rate of 70%. A total of 250 virus free and seedlings were obtained, then planted at two of 0.3-hectare trial area. Improving fruit quality of was apple growing at Ilan area, five cultivars of wax apple were collected and top-grafted onto local-grown trees. 'A-tu large' had the largest average fruit weights of 172.9 gram.

On agricultural products processing: The aerial tubers of long shape yams contained abundant nutrition, which were even higher than underground tubers. To increase the add-value, the canned aerial tuber products were developed this year. Using the natural metabolites and the beautiful color of fermentative anka, several preserved vegetable products had been developed. The anka was also developed for making preserved pork products. Since the breadfruit flour contained abundant diet fibers, it was studied to substitute a part of the wheat flour when making baking foods. To evaluate the general acceptance of the consumers, the baking products were tasted. After evaluation the outlook, color, flavor, and taste of the products were acceptable.

On biotechnology: The bud primordia of ornamental pineapples, which were induced from stem nodes, were irradiated by the r-ray to induce mutations. There were 14 stable mutants obtained accordingly. The mutants obtained last year were planted in a greenhouse for further observation. It has shown that three mutants, G9002, G9004 and G9022 have stable performance with beautiful

chimeric leaves. Genetic transformation research was conducted for rice, and three callus lines induced from cultivars TNG67, TK16, and TK17 were investigated. An anti-DFR gene was successfully transferred into those cultivars by using *Agrobacterium*. The transformants which harboring a GUS gene could be recognized by blue staining. Tomato cultivar Hualien ASVEG 5 was successfully transformed by using *Agrobacterium*. When using plasmid PBI1121 as a transformation vector, the number of adventitious buds lies between 1.8 and 3.4. Explants cultured on MSG1 medium had shown higher regeneration ratio, and parts of the explants have had GUS expression. Flower gene transformation research on lilies was conducted, and there were two genes including DFR1AGUS and F3H1AGUS were transferred into LA2 and LG41 callus lines through particle bombardment. The transient GUS expression could be detected on the transformed calli.

On plant protection: The major pests and diseases of bird's nest fern and Chinese yam have been identified. The most effective pesticide on bird's nest fern leaf nematode is oxamy1. Tribasic copper sulfate and dimethomorph are effective for control of gummosis on kumquat. For the control of *Phytophthora* disease, using the tribasic-copper-sulfate mixed calcium substance sprayed on the trunk of Kumquat is also effective. Experiments on non-pesticide control of bulb mites of leek shows that the best control material is tobacco extract, its controlling rate is from 59.6% to 77.2%. Application of 81.3% Kasugamycin+Copper oxychloride or 58% humic acid after harvest period can control bacterial wilt of water convolvulus. PBCAB had the highest controlling effect on *Phytophthora* disease of tomato. The antagonist rhizobacteria PBCAB is screened from pomelo compost and grown best when cultured in castor cake substance. Air temperature is the main limiting factor of leek rust development, and air temperature above 25°C inhibits leek rust. Rainfall is closely related with incidences of leek root mites. CR compost decreased the incidences of the cucumber *Phytophthora* blight from 62.4% to 25.2%, especially CR compost was mixed with castor cake had significantly decreased the incidences from 25.2% to 12.3%. Spraying clove oil 2,500ppm and ferric chloride 5,000ppm were effective on rice leaf blast. The phosphorous acid solution 667ppm had stable effect on bakanae disease of rice seedlings. Application of the improved formula of *Bacillus amyloiquefaciens* B190 can inhibit the powdery mildew of muskmelon. The cooperative control conducted whole area decreased the incidences up to 60% of oriental fruit fly, and the incidences of beet army worm decreased 50%. The monitoring on *Rattus exulans* and field mouse reveals that long-term poison trapping gives a control rate of 89.4 percent. The control rate of field mouse is 87.3%. For timing of major pests of rice and other crops, 12 forecasts and 19 warning have been announced. The data of monitor stations for statutory quarantine pests shows that there are no quarantine pests found at Hualien area. The service of diagnosis and control consultation identified 206 cases on 60 crops. The consultation on good agricultural product (GAP) was held with 81 farmers' classes and pesticide safety area in Hualien and Ilan covered 1200 ha.

On soil and fertilizer: The highest yield 16,260 kg/ha of wild bitter gourd was found in the treatment which applied with organic fertilizer 10 tons/ha and chemical fertilizers nitrogen: phosphorus pentoxide: potassium oxide=300:75:225 kg/ha. For the compost tea, the rice hull compost soaked in water at the compost/water ratio 1/20, the extractor could be used as liquid fertilizer, and the solid residue could also be used as a suitable nursery medium for vegetables. The yields of cucumber and tomato grown on the pseudo-composted rice hull medium were not significantly different from those grown on the peat moss medium. Besides, the pseudo-composted rice hull medium has benefits of long-term availability, low salinity, well aeration and low cost, so it can replace the imported peat moss medium. By vacuum compressing, the compost bulk density could be enhanced 2.2 times by granulation and compost bulk volume could be decreased 15%. It can not only decreased the cost of transportation and storage but also increased the efficiency of applying fertilizer. For forcing culture of the *Chaenomeles sanenesis* Kahn, the branching percentage were between 83.9~88.7%, and the best treatment was that shoots were pruned at 5 cm high and fertilized with high dose of nitrogen. For the soil survey data, the homepage of soil information system has been accomplished. This system includes the theme display of soil fertility and inquires system of grid survey data. The user can search data simply and easily by using the function of move, zoom in, zoom out, drag, or selection by point. In 2003, there were 2,068 samples of soil and plant tissues were analyzed. It included 1,082 samples of plant tissue, 905 samples of soil, and 81 samples of organic materials. Those data were used to make recommendation of soil fertility and plant nutrition for farmers.

On agricultural machine: To combine operations of vegetable seeding, fertilizer applying and ridge making, and integrated machine which loaded by tractor has been developed. It could reduce seed usage, operation time and man labor. The working capacity of this machine was average 2 to 3 hours per hectare. Wentan pomelo fruit peeling machine has been developed, and an air compressor has been used as the power source. It only needs 3.76 seconds to peel a Wentan pomelo. About 4.5 tons of Wentan pomelo fruits will be processed a day. This year, three fertilizer-spreading machines have been released. There are 147 organic manure spreading machine has been generalized, and 486 multi-functional manure spreading machine has been generalized. To combine the advantage of organic manure spreading machine and multi-functional manure spreading machine, the third type of fertilizer-spreading machine has been developed, and 8 machines were sold in the market. Besides, the carried vegetable seeding machine has conferred the national patent in 2003. And the small carrier, which the height and wheel width could be adjusted, has conferred the national patent in 2003.