

Summary

In 2007, 49 research projects, 21 demonstration plans and 21 commissioned projects from other organizations had been performed. The results were summarized as follow:

On rice: A promising rice breeding line HKY99 had been selected from advanced yield trial and will take part in the regional yield trail in 2008. The yields of all varieties in rice yield forecasting trial were less than last years. In the rice physiological index experiment for high quality product, the average accumulative temperature and accumulative radiation from transplanting to harvest were 1764.6°C-day and 1620.6 MJ/m² respectively in the first crop. To establish the local standard operating process, the results showed that the trial with 160g seeding rate, and 30cm×30cm of density in the first crop would get low-cost, optimum-yield and high-quality production. New rice varieties TY3, TY4, TNG74 and TNG75 were demonstrated in Hualien and Yilan Counties for promotion. To promote organic rice production, a total of 598 and 73 hectares were grown in Hualien and Yilan Counties, respectively. A total of 2,088 hectares of good quality rice were guided and established in seven rice producing districts.

On upland and special crops: Two peanut breeding lines Nan-Kai-Si 176 and Nung-Yu 56 in the spring crop and Nung-Yu 55 in the fall crop had performed high yield potential in the regional yield trails. In the improvement for cultural practice of taro-like sweet potato, the yields of fresh leaf-stem and root tuber of TLSP-024 were 19,000 and 6,000 kg/ha respectively in the spring crop. In the development of landscape green manure, the flax was suitable to sow in fall and winter seasons, and the seed sowing quantity was 6 kg/ha. In development and utilization of energy crop soybean, the results showed that the mechanical farming could reduce production cost by 11%. The fresh ear yield of organic sweet corn, applying 8,000 kg/ha of organic fertilizer, had performed higher yield potential. On the research of special crops in eastern area, roots of *Salvia miltiorrhiza* cultivated in Jian area had the highest active intergradient

tanshinones IIA. In comparison of the root weight of *Angelicaacutiloba* and *Scutellaria baicalensis*, the highest yield was got from plants cultivated in Jian area. Adding the extraction solution from special crop into the medium could increase the growth rate and fermentation products of *Antrodia camphorate*. And the *Antrodia camphorate* fermentation product had the inhibitive effect on the melanin formation.

On vegetables: The new bitter gourd line WB15 was awarded a plant variety right and registered in November 10, 2007 as a new variety 'Hualien No. 3'. The optimum plant spacing was 5m x 2m for bitter gourd breeding line WB33, and 80cm x 80cm for nest fern breeding line HA178. For tomato breeding, the regional trial of tomato with resistance to tomato leaf curl virus had been conducted, and line FMTT1176 had the highest yield and better fruit quality than others. On green onion breeding, line HAF10484 had good performance with higher yield and long blanched stem in summer season. On the study of green onion production and marketing system in summer season, the variety 'Fu-tsun' grew best in green house, and green onion packaged with plastic-film bag could keep better quality under low temperature storage simulated in supermarket condition.

On flower crops: In lily breeding, the best line with superior performance is FLME2-5. On post-harvest trial with adding aromatic herbs extracts for three oriental lily varieties, the vase life was maintained between 5.0 to 9.1 days in room temperature. Some essential oils, extracted from aromatic herbs, had been chosen for cosmetic products. This year the Station had sent researchers to Agriculture and Agri-Food Canada Research Centers for visiting and learning. The major topics were aromatic herbs germplasm, health food processing techniques, and cosmetic products manufacture. One superior daylily hybrid progeny OH005 had been selected. OH005 is characterized with earlier flowering, longer flowering period, with multiple flower stems, and leaf rust tolerant. To diversify the visual landscape in leisure agriculture, one garden had been designed by mixing bulbous flowers and aromatic herbs together, and a year round flowering model had been established. In the study of tea tree, the model of organic culture for tea tree was established, three-year-old plants had the highest

production of shoots and essential oil, and the essential oil content was 16.6 ml per plant. For common *Melastoma* (white flower and red flower), the results showed that the leaf of common *Melastoma* contained much more rutin than quercetin, and the quercetin content in white flower was higher than red flower. The leaf of white flower possessed higher capacity to quench DPPH ($\alpha\alpha$ -diphenyl- β -picrylhydrazyl) than red flower. In pot culture of Cat-tail Willow experiment, pruning could increase branches, and pruning 5 times treatment had 35.1 branches. In flower-quince study, the seed germination percentage could be increased outstandingly with 5°C low-temperature stratification over 12 weeks in humid media. The survival rate of *Ardisia pusilla* and *Clerodendrum chinense* cuttings are 100% and 59.8% respectively. Both of them only took 3~4 months to achieve bonsai stage. Purple waffle plants' cuttings from shoot apexes cultivated in July to September grew apparently faster and became salable in 3 weeks. The plantlets of creeping burhead cultivated in May to September grew apparently faster. The survival rates of purple waffle plant and creeping burhead in every cultivated month were 100%. Purple waffle plant can endure the dark aquarium environment for more than 3 months without losing apparent performance. A plant height-control technique was developed, which could be used to control the purple waffle plants with compact and high quality appearance.

On fruit tree: Bagging treatment could increase the fruit weight of *Minneola tangelo* significantly. Bagging with plastic bag could decrease total soluble solid content and acidity, and bagging with single layer white paper bag could increase the red color of fruit appearance. The treatment of decreasing nitrogen and increasing potassium fertilizers could significantly decrease the acidity, and increase the sugar acid ratio of the fruit of *Minneola tangelo*. For Wentan pomelo, spraying with humic acid during the fruit development stage could increase the sugar/acid ratio of fruit. Dipping pear flower buds in 100°C melted-paraffin wax before top-grafting could improve the rate of fruit-setting and increase the yield. By attaching a miniature umbrella to each of the grafted buds, the rate of fruit-setting and yield were significantly increased. The storage life of Feng-shui pears could be extended to 7 weeks while storing at 1-2°C after harvest.

Within the healthy bud-lines of kumquats, HF-1-12 and HF-1-8 produced the largest single fruit that exceeds 19 grams. With respect to techniques of propagating high quality wax apple seedlings, the best result was found to cut the green shoot-tips at early December, and the survival rate reached a satisfactory 92%.

On processing of agricultural product: *Litsea cubeba* was a peculiar plant in the eastern Taiwan and had unique and fragrant flavor to stimulate appetite. Application of its specific character was used to process the sausage and cured meat as peculiar domestic meat products, which were liked by consumers and accord with the standard of national hygiene.

On biotechnology: Two genes Cry1 IC and Cry1 AC were transferred to tomato by *Agrobacterium* mediated method. The Cry1 IC gene proved to be expressed in 6 transgenic lines, which was confirmed by PCR and RTPCR assays. The bioassay results indicated that 4 tomato transgenic lines were more resistant to insects. Eight chrysanthemum cultivars were chosen for regenerating medium tests. There were 4 combinations of medium suitable for regenerating chrysanthemum. A PCR based technique was established for detecting genetic modified (GM) papaya, rice, tomato, soybean and potato. The GM and non-GM plants could be distinguished easily by this technique. The results of *in vitro* germination test for *Bletilla formosana* showed that 12 weeks after pollination could get the highest germination. The fittest medium was low salt-base strength with organic compounds. In *Spiranthes sinensis*, medium with middle concentration of BA and low concentration of NAA could induce 7 adventitious shoots, which was the highest in all treatments. For shoot formation of *Cymbidium* rhizome in liquid culture, the treatment of low concentration of BA, NAA and adding coconut milk could induce 14 adventitious shoots, which was higher than other treatments.

On plant protection: The integrated and non-chemical controlling, and safety using of chemicals in crops were conducted in this year. Low pear rust infection was observed when the distance between juniper and pear was longer than 1 km after alternately spraying chemicals. The severity of new disease in common cosmos could be decreased by applying seeds with triflumizole. The downy mildew of crowndaisy chrysanthemum

and white rust disease of water convolvulus could be controlled by foliar spraying with phosphoric acid. The damping-off disease of crowndaisy chrysanthemum and amaranth could be prevented by applying *Trichoderma* sp. on seed. In organic rice study, single tiller rice transplanting had the best control efficiency in rice leaf blast disease control. Integrated using tobacco leaf residue extract and plastic net could decrease the most damage of striped flea beetle on Chinese cabbage. The highest effect for controlling the damping-off disease of cabbage was found in which medium mixed with castor cake, shrimp crab shell powder, organic compost and perlite combined with antagonists. The pathogenicity of entomopathogenic fungus of *Bemisia argentifolii* was investigated, both adult and nymph mortality were high, but hatching rate of egg was not suppressed. Melon fly trapping was easily affected by the speed and direction of the winds, and related to the distance between melon fly and the attractant. The wax apple field was the main effective factor of density of oriental fruit fly. Evaluating co-control efficacy on sweet potato weevil showed sex pheromone got great control efficacy. The density of beet armyworm on green onion was 0.51/trap. The *Psylla* spp. was not detected in Ilan County pear orchards in 2007. The population of wild mouse and Brumese mouse were down to 20.9 and 4.6/ha respectively after baiting. 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, news release and meteorological information were issued 5, 28, and 34 times, respectively. There was no quarantine pest after surveying. More than 6 samples of suspected red imported fire ant were identified and control guidance was recommended. There were 249 cases of diagnosis and prescription conducted among 50 kinds of crops. There were 66 training courses held in Hualien and Yilan Counties for controlling crop pests and safety use of pesticides. The chemical residue qualified rate was 99.77% in 2007.

On soil and fertilizer: By comparing the cation absorbability and desirability, the pseudo-composted rice hull medium was not better than peat moss in nutrient solution culture. However, using auto-control machine to increase the fertilizer supply frequency could raise the efficiency of fertilizer and overcome the defects. In the study of

producing suitable compost by origin management for organic agriculture, the result showed that adding proteinase and cellulose enzyme into fodder was better than adding heavy metal for enhancing the chicken growth rate and the feed change ratio. On development of new material using charcoalization technology for rice culture, there were no significant differences on rice yield, quality and other factors by spreading the 100 times diluted rice hull vinegar over rice leaves. In the research of weed control by natural material in organic culture, the results showed that the effects for weed control by burying was better than mulching, especially for broad-leaved weed control. In 2007, 2,516 plant nutrition diagnosis and soil fertility analysis had been made, 451 farmers had been served.

On agricultural machine: A green manure seeding machine had been developed to alleviate the hard work of sowing, and improve the degree of sowing uniformity. A ridge making and holing machine for green onion had been developed, and it combined concurrently the holing, ridge making and fertilizer applying all at once. The anti-typhoon's facility with simple net had been designed to meet the growth of houseleek. This anti-typhoon's facility, which uses movable parts to fabricate, was easy to take apart and rebuild. The black shading nets were covered on outside of the rigid frame. In summer the nets could resist the storms, prevent flooding, allow ventilation, and adjust the sunlight. In winter the nets could keep warm and prevent frost attack. A fold joint pillar had been developed based on the original regular type pillar. The fold joint pillar included two parts. The upper part could be laid down before typhoon coming, which let plants attach the ground surface and could reduce typhoon damage.

On agricultural education and training: Twenty-eight courses of the agricultural extension education and training activities had been held in 2007 with 809 participants. To encourage the youth to undergo agricultural experience and input new agricultural manpower, 8 teams of the Wander-vogue camp had been carried out with 160 participants, and one team of the advance Wander-vogue camp with 24 participants. Three classes of Gardener Project had also been conducted with 90 participants. Two sets of digital teaching material of organic cultivation had been made. The 4-H clubs of

10 focus farmers' associations in I-lan and of 7 focus farmers' associations in Hualien were assisted to carry out extensional and educational activities.

On agriculture management: To promote organization training and guidance, 397 agricultural production and marketing teams had been integrated. To develop the Loshan organic village, counsel and training of organization and management had been provided to build Loshan organic village as a platform which integrated production, living and ecology aspects. To promote pomelo industry's competitiveness, the activities of the Pomelo Strategic Alliance had been pushed continuously. The pomelo flower season and the sales promotion activities had also been held to prolong the marketing period and to create the add-value of pomelo. Sanshin Farmers' Association, been appointed as a core organism in the program of Center-Satellite Network System, had been assisted to set up an industry value chain to enhance the quality of agricultural products, and to subscribe the quality control procedure and marketing strategy of both satellite and central plants. A total of 290 farmers with 387.53 ha in Hualien and Ilan counties had been assisted to acquire the certification of traceability of agricultural products.

On improvement of rural life: To conduct the project of the rural healthy life and the production supporting system, the farmers' associations had been assisted and guided, and 227 classes had been accomplished. Also, home economics improvement clubs had been counseled to create the rural employment opportunity, and increased the rural household income. To diversify the usage of Tang Kuei, a competition "Creative Cuisine of Tang Kuei" had been conducted. And a book "The Creative Healthy and Nutritious Ingredient Recipes of Tang Kuei" had been published. To construct a good environment of rural life, the farmers' associations had been guided and assisted to apply and execute the project of integrated rural community and organism, and there were 4 communities in Hualien and 8 communities in Ilan took part in this project. "The forum of development on rural women in 2007" were held at Aug. 31, 2007, with 178 participants came from industry, official, and different academic fields to share their

experience and knowledge, and to provide newer and broader vision and potential development in the future.

On agricultural information distribution: The information about the recent research achievements, and the production and marketing promotion activities were offered to the media for broadcasting. In this year, one press conference had been held in Council of Agriculture. In total there were 16 items of research achievement, 27 items of TV marketing news and 53 agriculture news had been released. The media had adopted and issued 125 times of the news. Agricultural extension magazines had been published including 4 issues of “Hualien District Agricultural Special Proceedings”, 12 issues of “Hualien District Agriculture Monthly” and 2 issues of “Hualien District Agricultural Technique Pamphlet”. To expand the service and promote the computerization application of agricultural information, “Hualien District Agricultural Research and Extension Station Worldwide Web (www.hdais.gov.tw)” had been set up, this year two new special columns “publication of government information” and “web accessibility service” had been set in.

On serve for the people: To strengthen the service for the habitants and farmers, a one-stop information counter service system had been set up. The Station had received 23 themes of visiting and 1,141 people this year. One “Open Day” activity had been held in 1st, Sep. to show the achievements to the public. There were 5,000 people attended this activity.