



Local Practice of Intelligent Innovation and Sustainable Development of Environmental in NCUT of Taiwan

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Abstract. The purpose of this project is to assist local fruit farmers to increase output value through innovative development, build a distribution network for agricultural products, and increase farmers' income. In the technology of increasing agricultural output value, NCUT's professional team applies smart agricultural technology to monitor fruit trees to prevent pests and diseases, maintain the healthy growth and yield of fruit trees, and solve the problem of lack of labor in farmland. The NCUT team practices strategic marketing and business models to guide fruit farmers to promote local creation and enhance local cultural characteristics. This project assists in the implementation of new quality-guaranteed and value-added technologies, promotes high-quality agricultural products across the country and improves local tourism marketing, and activates agricultural product promotion activities to achieve mutual support between industry and academia. In addition, in response to the 50th anniversary of the World Earth Day, NCUT held a tree planting to save the earth to implement the concept of sustainable environmental development. President Chen, faculty and students planted 500 Cinnamomum camphor seedlings on the NCUT campus in response to the UN Climate Change Framework Convention.

Keyword:

Environmental Protection, Local Practice, Intelligent Innovation, Intelligent Agricultural Technology, Sustainable Development

1. Introduction

From 2019 to 2021 year, the college of management of NCUT got the Ministry of Education of Taiwan promotion of University Social Responsibility (USR) project - Local Practice of Intelligent Innovation and Sustainable Development of Environmental: Litchi fruit. It is a warm fruit in the subtropical region of Taiwan, as the transformation of localization, promotion, practice, intelligence, network marketing, and agricultural digital

innovation etc. This project can assist fruit farmer in producing areas to develop new cultivation and monitoring methods. Because litchi accounts for 40% of Taiwan total in Central Taiwan (Taichung City, Nantou County, and Changhua County), the NCUT is located in Taiping District of Taichung city. It is a concentrated origin of litchi, which is quite suitable for USA project to promote service and fruit farmer innovation and transformation. This project aims to build a distribution network of agricultural products, to improve farmer income, to apply intelligent agricultural technology, to solve the problem of farmer lack of work, to promote the internationalization of high-quality agricultural products through strategic marketing and business model guidance, and drive local tourism marketing. It is jointly implemented by teachers and students, local governments, and industry institutions. The promotion objectives are local cultural promotion, characteristic agricultural product marketing intelligent agricultural transformation, promotion of local innovation, quality and price creation technology, and minimally invasive dried fruit production. Finally, the results are presented in combination with the promotion of production, government, academic, and research activities and seminars.

Joas et al. [1] studied that the average hourly water loss of litchi peel was 0.8% when litchi pulp was stored at 23 °C. After storage at 10 °C for 13 days, the peel water loss rate was 46% ± 3%, and the average hourly water loss was 0.14%. Generally, the weight loss of litchi fruit is 3% to 5%, and the water loss rate of pericarp is more than 20%. The fruit browning occurs and loses the value of agricultural products. Because the loss of water in the peel will gradually increase the pH value of the peel and the gradually increased pH value will affect the essence of anthocyanins and lose color. Underhill et al. [2, 3] and Mitra [4] research shows that the pH value of litchi fruit peel increases to 4.52 after 2 days at 25 °C and 60% relative humidity. The anthocyanin in the cell vacuole is the bright red epidermal pigment of litchi. The molecular structure of anthocyanin is affected by the change of pH value. When the pH value is greater than 4.0, the anthocyanin structure will change into colorless alcohols, Enzymatic browning is the main reaction causing fruit browning, because polyphenols are catalyzed by oxidative enzymes, resulting in the accumulation of brown pigment substances. Chang et al. [5] discussed the current situation and future prospects of litchi breeding in Taiwan. Liang et al. [6] published the postharvest preservation technology of litchi and the layout of litchi industry in Taiwan. Tseng [7] explained the current situation and guidance measures of litchi industry in Taiwan. Chen [8] studies on pigments and browning-related enzymes during growth and storage of litchi (*litchi chinensis* sonn.) fruits. Chang et al. [9] described performance of new litchi varieties. The Nobel Peace Prize 2004 was awarded to Wangari Muta Maathai said “Sustainable development, democracy, and peace - protecting forests against desertification is a vital factor in the struggle to strengthen the living environment of our common Earth.” With the global climate change, problems such as heat island effect, extreme climate drought and storm, sea level rise. In the climate risk index released by the United Nations Climate Conference (COP23) in 2017 year, Taiwan ranks seventh in the world, and attention should be gazed to the challenge of climate [10]. The Durban Declaration of the 2015 year [11] world forestry conference affirmed that forests are not only the gathering place of trees, but also the basis for food security and improving livelihoods. Therefore, the world needs to gaze attention to green forest, which has become an important antidote to climate change adjustment and mitigation. Since 2015 year, Taiwan green space has gradually decreased. The forest coverage rate of Taiwan 3.6 million hectares accounts for only 58%, while that of Japan is 64% and South Korea is 61%. Taiwan forest coverage rate is relatively low. It is necessary to strengthen afforestation to

improve the ecological environment [12].

2. Methods and Results

2.1. Teaching Innovation and Curriculum Development

The implementation of this project is combined with the curriculum planning and framework concept to train students to have practical experience, give full play to what they have learned when entering the workplace in the future, improve their own standard technology, use their expertise to develop innovative technologies, and increase students competitiveness in the workplace. The professional application microcredit course is offered by the interdisciplinary courses. Through the course, students can go deep into the field to understand the current difficulties and find solutions. It can not only cultivate students diversified problem-solving ability in the efforts of agricultural products and cultural tourism promotion, intelligent agricultural transformation, agricultural products drying technology, and local sustainable development, make students deeply feel the connection between themselves and local society, and jointly shape local highlights. Therefore, special courses, microcredit courses, required courses, and other practical application studies are offered. Students learn cloud media integration and practical application, practical operation of digital marketing in leisure industry, project analysis and discussion, and cultivate student professional skills and creative thinking in combination with practical cases, as shown in Figure 1. Pay an in-depth visit to the challenges of small farmer business mode and marketing in Taiwan. Teachers and students can assist in agricultural product packaging design, image building, video shooting, and brand building, as shown in Figure 2. To learn the concept of crop management, let students collect crops, shoot real scenes of commodities, build marketing platform commodities, make videos, write articles and operate practical platforms in orchards, and cultivate local entrepreneurial talents, as shown in Figure 3. The processing and preservation technology of fruits and vegetables can add value and economic benefits to rich or unsalable agricultural products. In order to promote the production and marketing resume certification of agricultural products, laser engraving technology is directly applied to the production and marketing resume certification and QR code branding packaging, so that consumers can scan information when purchasing fruits and vegetables, as shown in Figure 4. To combine with the Green Hope Spring Ltd. a cooperative manufacturer of industry and University, to restore Taiwan Cinnamomum camphor trees with an innovative business model. Teachers and students care about local characteristics, learn to use science and technology to solve social problems, and practice planting, cultivating and protecting trees to solve the problems of global warming and air pollution, as shown in Figure 5.



Figure 1. Microcredit Course - Cloud Technology Combined with Leisure Industry Planning and Market Integration



Figure 2. Microcredit Course - Local Culture Application Practice



Figure 3. Microcredit Course - Farmer Marketing Platform Operation and Farm Implementation



Figure 4. Microcredit Course - Application of Vegetable and Fruit Value-added Method and Production and Marketing Resume Technology



Figure 5. Microcredit Course - Planting Cinnamomum Camphor Trees

2.2. Green Tree Planting - Cinnamomum Camphora

Prof. M. J. Teng team uses the United Nations to promote the global sustainable development goals. Sustainable cities, climate action, and terrestrial ecology are all related to forests. Therefore, to implement the USR for a long time, with the theme of taking action in response to climate change and paying attention to the sustainable development of the environment, cultivate the seedlings of Cinnamomum camphor trees in Taiwan, transplant

them to the hillside of the NCUT for sustainable preservation in Taiwan, plant trees of hope for Taiwan, and contribute to Taiwan ecological environment, so as to deeply rooted in Taiwan and set future goals. Forests have become the antidote to climate change adjustment and mitigation. At present, the promotion of tree planting in Taiwan, in addition to the efforts of the Bureau Affairs of Forest and the environmental quality protection association to plant trees, protect the earth and benefit future generations. Prof. Teng protected Taiwan by planting Cinnamomum camphora trees in Taiwan through charity, and cooperated with the Green Hope Spring Ltd. to launch the “one person, one thousand trees” afforestation and earth saving program, so that teachers and students can work together to participate in the conservation of Taiwan environment, make good use of idle land and protect Taiwan ecological environment. The 50th anniversary of the world earth day, president W. Y. Chen of the NCUT lead teachers and students to plant 500 Cinnamomum camphora saplings cultivated by students on the NCUT campus to take specific tree planting activities to save the earth in response to climate change and environmental sustainability of the United Nations, as shown in Figure 6.



Figure 6. Cinnamomum Camphora in NCUT of Taiwan

2.3. Intelligent Technology Agriculture - UAV

Combined with UAV technology, the pesticide spraying operation technology is extended to local fruit farmers to solve the problems of labor aging and lack of work, promote the symposium on the application and handling of intelligent agricultural innovative technology, let the participants understand the pesticide spraying process of UAV, reduce the labor-consuming operation mode, and UAV can solve the heavy spraying workload and health of litchi with different height. UAV pesticide spraying technology is the latest method at present. At the same time, aerial photography and photography are carried out to separate the obstacles in the park first, and then spray the path and scope. For the majority of litchi orchards, UAV can be used to reduce the human load, which is suitable for popularizing fruit farmers. After discussion, UAV pilot operation, the first UAV spraying and the second UAV spraying, the transformation of intelligent technology agriculture innovation is completed, as shown in Figures 7 to 9.



Figure 7. UAV Pesticide Spraying Technology Discussion



Figure 8. First Pesticide Spraying by UAV



Figure 9. Second Pesticide Spraying by UAV

2.4. Network Platform Construction - Local Characteristic Agricultural Products Marketing

For farmers with limited marketing channel resources, if they are sold through medium-sized merchants, farmer profits will be reduced. Therefore, teachers and students set up an online marketing platform let the photographed goods are a platform for free agricultural products on the shelves, and expand the online marketing channels of agricultural products. Teachers and students conduct on-the-spot interviews to understand the orchards and farmers themselves, record farm stories and image videos of the picking process, conduct marketing on the curriculum vitae of agricultural products, solve today's food safety doubts, and make consumers feel at ease to buy, so as to improve the popularity and brand development of local agricultural products in Taiping District, Taichung City, and let the international know Taiwan local agricultural products. Then handle the creative activities of agricultural product marketing and market sales to increase the income of fruit farmers, as shown in Figures 10 to 12.



Figure 10. On-site Assistance for Agricultural Products



Figure 11. Image Video Production and Network Marketing



Figure 12. Marketing of Agricultural Products in Small Farmers Markets

2.5. Quality and Price Creation Technology - Freezing Preservation and Minimally Invasive Dried Fruit Production

A. Litchi

Properties and nutrients: subtropical fruit and warm pulp. Nutrients: 20% of pulp sugar, protein, citric acid, pectin, vitamin C (30-70mg/100g), folic acid, fat, calcium, phosphorus, iron, potassium, and anthocyanin, which are important substances for skin fitness and ruddy complexion, as shown in Figure 13.



Figure 13. Local of Litchi in Taichung City (Taiping District) of Taiwan

B. Economic Value

Litchi dried fruit is like a general healthy nut health product fruit. It is convenient to eat at any time. It is also suitable for warming and tonifying ingredients in winter. The health tea bag is warm to drink. It is suitable for filling pulp, sweet soup, ice cream, and ice products in cakes. Litchi juice can be made and filled in glass cans to preserve the pulp. With natural fructose, it can be filled in botte bottles for drinks, Tetra Pak drinks, hand shake drinks, and concentrated juice. It can be used to make health vinegar, fruit vinegar, and comprehensive fruit jam of litchi fruit vinegar/jam.

For wine production, litchi wine, champagne, cocktail, beer, and fruit wine with low concentration of alcohol can be developed. For warming and tonifying materials, they have the effects of eliminating swelling and pain, tonifying the spleen and liver, relieving cough and nourishing the heart, toxifying blood, generating fluid, treating vexation and thirst, clearing the heart and reducing fire, headache, sore throat, toothache, skin fitness, beauty, and ruddy complexion.

C. Dried Fruit Making

Dried fruit production this plan aims to research and develop the minimally invasive dried litchi fruit, introduce technology to fruit farmers to make dried fruit for fruits in peak production period, and improve the economic added value of fruit farmers. During the R&D period, to invite experts in food processing and food production to guide the drying, preservation, transportation, and storage methods of fruit and agricultural products, and to do discussion, guidance, technical experience exchange, and symposium to realize the refined technology of fruit. At ordinary times, teachers lead students to develop experiments on the added value of dried fruit, and look for additional business opportunities for minimally invasive fruit farmers, so that students can experience their own business process, as shown in Figures 14 to 16.



Figure 14. Litchi Fruit Processing Speech



Figure 15. Drying of Litchi Harvest



Figure 16. Minimally Invasive Dried Fruit Production

3. Conclusions

Teachers and students of this project have successfully carried out USR activities in-depth through teaching and research, so as to build an agricultural product marketing network platform, improve farmers production and marketing exposure and increase fruit farmers income. Intelligent agricultural technology is applied to unmanned aircraft for drug spraying, which can timely and effectively solve the problem of lack of manpower, and also properly prevent and control insect pests derived from litchi fruit. Then, through strategic marketing and business model guidance, promote high-quality agricultural products to the whole country, drive local culture and tourism marketing, and promote the marketing of characteristic agricultural products of local culture through relevant achievement exhibitions, symposiums and on-site interactive discussions jointly held by teachers and

students, local governments and non-governmental organizations. Let fruit farmers know that the innovation and transformation of intelligent agriculture can promote local creation, derive technology for quality and price creation, and improve the added value of minimally invasive dried fruit production. Finally, the results are presented in combination with the promotion of production, government, academic, and industry research activities and seminars.

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