

Taiwan's Agricultural Development Policy

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Introduction

In Taiwan, the Council of Agriculture (COA) was established in 1984 as the competent authority under the Executive Yuan that is in charge of the agricultural, forestry, fishery, livestock and food policies on the island (COA, 2012). Presently, there are 14 departments or units established within COA and each is entrusted with specified responsibilities to assist COA in carrying out its functions (COA, 2014).

In 2012, Taiwan's total value of agricultural production amounted to NT\$477.9 billion (US\$14.3 billion), of which crops contributed the most with a corresponding share of 46.6%. This was followed by livestock (31.1%), fishery products (22.2%) and forestry products (0.1%) (AFA, 2014). According to the Agriculture and Food Agency (2014) and Council of Agriculture (2012), a total of 544,000 persons were employed in agriculture in 2012, mostly engaged in farming activities. In response to changing food consumption pattern and increased competition due to market liberalization after Taiwan's accession into the World Trade Organization in 2002, the agricultural sector has shifted from traditional farming of staple crops to production of high-value commodities in which Taiwan has comparative advantages.

Major agricultural industries in Taiwan

Crop farming

Rice is Taiwan's traditional crop with an annual production of about 1.2 million tons of rice from two main harvests on about 150,000 hectares of land (AFA, 2014). Consumption and production of this staple have declined over the past decade as a result of the change in dietary habits and increased import competition. In response, Taiwan's researchers have refined rice cultivation techniques and developed new high-quality varieties (e.g. organic rice) for domestic consumption and export. A number of policy measures have also been put in place by the Taiwanese government to help enhance the quality of rice production. These include the accreditation of agricultural products, food traceability system, and a grading system to phase out the production of inferior rice (COA, 2012 and COA, 2014).

Due to climate diversity, a variety of fruits and vegetables are also grown in Taiwan. In 2012, 2.7 million tonnes of fruit and 2.7 million tonnes of vegetables were harvested and the export value of which totaled US\$177.9 million (HK\$1.4 billion) and US\$167.1 million (HK\$1.3 billion) respectively (Directorate-General of Budget, Accounting and Statistics, Executive Yuan, 2013). The Taiwanese government has put great efforts into promoting exports, and local fruit growers have adjusted their cultivation and marketing methods against increased import competition. Meanwhile, some orchards have been transformed into agro-tourism destinations (AFA, 2014 and Ministry of Foreign Affairs, 2014).

Tea is another world-renowned agricultural product of Taiwan. In particular, the oolong

tea accounts for almost one-fifth of the world's production. However, Taiwan's tea exports have been on the decline in recent years: 14,902 tonnes of tea were harvested in 2012 and only 3,100 tonnes were exported (Directorate-General of Budget, Accounting and Statistics, Executive Yuan, 2013; AFA, 2014; COA, 2014). In response, tea growers have focused more on domestic market and authentication of their products through the traceability system and registration for certification trademarks. Some tea growers have also opened up their tea farms to tourists, offering tea sampling and guided tours showing various stages of tea production (AFA, 2014 and Agricultural Development Regulations, 2010).

Livestock farming

Taiwan's modernized livestock farming industry has grown steadily in recent years. It has become a mainstay of the agricultural sector, thanks to technical innovations (particularly in feeding and breeding skills) and increased demand for animal-protein foods. In 2012, the three major livestock products were hogs, chickens and eggs in terms of their total value of agricultural production (COA, 2012 and Livestock Research Institute, 2014).

The livestock industry has recently undergone restructuring to boost its product competitiveness through strategic business alliances, enhanced disease surveillance, meat hygiene monitoring systems, and development of brand names. A prominent example is the strategic business alliance established by the National Animal Industry Foundation to promote the brand "Taiwan Black Pig" (Livestock Research Institute, 2014 and Executive Yuan, 2013).

Fishery

Taiwan has over 1,100 kilometres of coastline. To the east, the world's second-strongest ocean current, the Kuroshio, brings abundant stocks of migrating fish through Taiwan's waters, while the continental shelf on the western coast provides good habitats and spawning grounds for a wide variety of sea life. More than half of Taiwan's seafood production was shipped abroad in 2012, contributing to US\$2.1 billion (HK\$16.3 billion) or 40% of the total value of agricultural exports (Fisheries Agency, 2014; COA, 2014; Ministry of Foreign Affairs, 2014).

Taiwan's fishery industry has shifted from small-scale coastal fisheries to aquaculture and deep-sea fisheries, thanks to its varied climate and advance in technology and breeding techniques. In 2012, aquaculture accounted for 27.7% of fishery production by volume and 37.3% by value. Taiwan is also a major supplier of groupers and tilapia in the world (AFA, 2014; COA, 2012; Fisheries Agency, 2014).

Major policy initiatives in agricultural development

In Taiwan, agricultural policy is primarily governed by the Agricultural Development Act which aims 'to ensure the sustainability of agricultural development, to address agricultural globalization and liberalization, to promote reasonable farmland uses, to stabilize agricultural production and sale, to increase farmers' income and enhance their well-being, and to raise the living standard of farmers' (Livestock Research Institute, 2014). To achieve the above statutory objectives, COA has in recent years launched a number of policy initiatives featuring the application of technology in agriculture, quality assurance programmes for agricultural products, sustainable agricultural development, measures to promote farming and secure food supply, and development of recreational agriculture (COA, 2014 and Pingtung Agricultural Biotechnology Park, 2014).

- I. **Technological innovations in agriculture:** Taiwan has established a competitive edge in agricultural science and technology resulting from years of investment by both the public and private sectors in agricultural research. In particular, COA supports the development of agricultural technology and promotes its application in upgrading the agricultural industries, stabilizing food supply and ensuring environmental sustainability (COA, 2018).
- II. **(ii) Research and development:** COA has established 16 research institutes for the development of innovative technologies in various domains of agricultural production, including crops, livestock, fishery, forestry, animal health and plant protection. These institutes have contributed to Taiwan's agricultural development through the transfer of technology to the private sector over the years (COA, 2014).

COA also implemented a five-year programme in 2009 to promote academia industry cooperation in agricultural biotechnology research in view of the importance of the private sector in the development and commercialization of agricultural products. By December 2012, the programme had funded 689 projects which attracted a total investment of NT\$383 million (US\$11.5 million) from 297 enterprises (AFA, 2014 and COA, 2014).
- III. **(iii) Science parks:** To foster the development of agricultural technology, COA has been promoting the development of science parks in a move to transform Taiwan into an Asia-Pacific centre for agricultural biotechnology and sub-tropical floriculture. Of particular importance is the establishment of the Pingtung Agricultural Biotechnology Park ('PABP') in 2003 (Pingtung Agricultural Biotechnology Park, 2014).

Application of Information Technology to Agriculture

Since its launch in 2004, Taiwan's satellite FORMOSAT-2 has been capturing images of the island's terrestrial and marine environment. The data collected have been incorporated into the Taiwan Agriculture Land Information Service to help the Taiwanese government with land planning and the development of precision farming. Farmers also assess farmland availability using data on soil properties, cropping suitability, irrigation facilities, land use zoning, and feasibility of farmland consolidation. (COA, 2018; AFA, 2014; COA, 2012).

Quality assurance of agricultural products

While price and quality remain important for consumer decisions, food safety has become a major consideration as well. As such, production and processing techniques used in growing of fruit/vegetables and rearing of livestock/fish are subject to greater scrutiny in Taiwan. Reflecting this, COA has introduced a number of food safety measures and regulations including the Certified Agricultural Standards, Good Agricultural Practices, Taiwan Agriculture and Food Traceability System, and Agricultural Production and Certification Act (AFA, 2014; COA, 2014; COA, 2012).

Sustainable agricultural development

Since Taiwan's accession into the World Trade Organization in 2002, the Taiwanese government has implemented policies to restructure the agricultural sector into a more competitive and modernized green industry. For example, COA has issued regulations to ensure that pesticides are not overused to the detriment of sustainable development of the agricultural sector. It has also mapped out a 'rational use of fertilizer' programme advising farmers on how to appropriately apply fertilizers and protect the environment for production

(COA, 2014 and Ministry of Foreign Affairs, 2014).

In addition, COA has implemented a number of measures to support organic farming as more and more farmers have adopted organic farming methods (AFA, 2014). These measures include setting up organic farming technical consulting teams, assisting farmers to apply for certification of organic products, promoting the use of 'Taiwan CAS organic' logo, establishing and enlarging the specialized organic production zones, holding educational classes for farmers, and guiding retail outlets to set up special counters for organic farming products (COA, 2018).

Adaptation strategy in response to climate change influence on agriculture

Adaptation to climate change is a high concern of the international community. Therefore, the Paris Agreement was passed by COP21 in 2015 which takes the pre-industrial period as benchmark and strives to keep the global temperature increase less than 2°C by the end of 21st century and had better pursued to limit temperature increase less than 1.5°C by reducing emission of greenhouse gases. Climate change adaptation objectives and regulations required all parties to enhance adaptation, resiliency (recovery) and reduce vulnerability (COA, 2018). National Adaptation Programmes of Action (NAPAs) were required to assess the impact of climate change, and take into consideration the vulnerability of Human, environment and ecosystem. It also needs to rank priority for each action and periodically reviews adaptation policy and program through monitoring and evaluation.

The Act of Greenhouse Gas Reduction and Management Act was promulgated in Taiwan in July, 2015. In addition to regulations on greenhouse gas reduction, adaptation to climate change was also included in the act to stay in line with international standpoint and norm. As the central authority of agriculture, COA continues to promote agricultural adaptation programs against climate change according to national and international situation and promote agricultural adaptation strategy in response to climate change in Taiwan (COA, 2018).

Agricultural production is a bio-industry that relies highly on water, land, biodiversity, and other natural resources, which is directly under the influence of climate. As the climate changes, increasing temperature, intensified typhoon, uneven seasonal precipitation, rising sea level, extreme weather are likely to occur more frequently and may decrease crop production, drop crop quality, jeopardize food security, damage ecological habitat, and threaten biodiversity.

Facing the challenge of climate change, COA proposed the Agricultural Production and Biodiversity Strategy under the Action Plan for adaptation to Climate Change in Taiwan (2013-2017) such as: Adaptation strategy for Agricultural production (COA, 2018).

Conclusion

In conclusion, Taiwan is compelled to face all kinds of severe impacts and serious challenges that global climate change delivers, particularly to agriculture. But nonetheless, the reason for climate change or extreme weather is not yet clear and fully understood. Therefore, appropriate assessment research and observation data are inadequate and necessitates further collection and analyses of data on climate change pattern. Agriculture depends on natural resources to produce the food that people need. However, due to the threat posed by climate change to agricultural production growth, it is essential to enthusiastically protect water and soil resources, change crop cultivation system, activate farmland production, and develop stress-resistance varieties with the help of technology to integrate agricultural resources and stabilize food supply so as to safeguard food security. Confidently, a sustainable agriculture

that is adaptive to climate risks can be established by implementing and reviewing adaptive policy to climate change.

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