GLOBAL INFORMATION SOCIETY WATCH 2020

Technology, the environment and a sustainable world: Responses from the global South

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TAIWAN

CAN OPEN DATA BE AN ALTERNATIVE SOLUTION FOR SUSTAINABLE AGRICULTURE?

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Introduction

Agriculture can have a significant impact on the environment. It can either have a positive impact by trapping greenhouse gases within crops and soils and mitigating flood risks, or cause pollution and degradation of soil, water and air, depending on the farming practices. Unfortunately, the cost of changing to a farming practice that is designed to comply with ecological principles could be unbearable for smallholder farmers. This challenge has hindered the development of sustainable agriculture in Taiwan for years, since its farmland is mainly made up of smallholders.

The situation began to change when the concept of open data was introduced in the country in 2012, and small farmers have been able to explore alternative farming practices in diverse ways ever since.[1]

This report aims to share the observations of how open data was used to promote alternative farming practices in Taiwan, and how it has impacted the environment positively. Two examples will be given in this report. The first example illustrates how the open data policy which aimed to boost agritourism eventually promoted sustainable agriculture. The second example demonstrates how open data ensures small farmers' access to information, affordable technology and public resources in their transition of farming practice.

The island of small farmers

As a mountainous island located in the subtropical zone, resting below the southwestern Pacific Ocean, Taiwan is uniquely blessed with a wide range of climatic zones from tropical to temperate, which makes it an agricultural paradise. The country's agriculture has been characterised by small-scale, traditional Chinese farming styles

since the settlement of farmers on this island, and the number of small farmers continued to increase after the land reform programme conducted by the Taiwan government during the 1950s to 1960s.[2] By the end of 2015, according to census data, about 81% of Taiwan's farms were less than one hectare in size, while less than 1% were more than five hectares in size.[3]

The agricultural production of small farms has suffered increasing pressure from rapid economic development and soaring labour costs in recent decades, especially after Taiwan joined the World Trade Organization (WTO) in 2002. As Taiwan opened its markets and eliminated protective trade measures, small farmers were forced to join the global price competition; for instance, the average wholesale price of rice fell 12.1% in 2003, compared with the same period in 2001.[4] The decreased profit also led to the loss of the labour force, especially young people, in the industry. As a result, the agriculture industry is facing an increasingly aging workforce. The average age of farmers is 63.52 years old, and 52.19% of the farmers are over 65 years old, according to a survey conducted in 2015.[5]

In such a challenging situation, small farmers are reluctant to pay the extra costs of transitioning their farming approach to an alternative one. Conventional farming relies heavily on chemical fertilisers, pesticides, heavy irrigation and intensive tillage, whereas alternative farming usually requires different equipment and other costly up-front investments, more labour input and specific knowledge. The transition period to alternative farming itself can also be a money-losing proposition, since farmers need to keep their land

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1   In this report, I use "alternative farming" as a broad definition referring to all farming practice that is an alternative to conventional farming when it comes to human health and environmental sustainability.

2   Lee, H.-J. (2013, 26 September). Agriculture Land Policies of Taiwan. *FFTC Agricultural Policy Platform (FFTC-AP)*. https://ap.fftc.org.tw/article/519

3   https://www.stat.gov.tw/public/data/dgbas04/bc1/2015census/AIH01.html

4   Liao, C. (2004, September). 《加入WTO後進口農產品量值化及其對國內價格之影響》(Quantification of imported agricultural products after WTO entry and its effect on domestic prices). *Council of Agriculture, Executive Yuan*. https://www.coa.gov.tw/ws.php?id=7660

5   Lin, S. (2019, 29 March). 《農業人力斷層問題之研析》(Analysis of agriculture labor force in Taiwan). *Legislative Yuan, Republic of China (Taiwan)*. https://www.ly.gov.tw/Pages/Detail.aspx?nodeid=6590&pid=181634

free of most chemicals for a certain period of time before they can start new farming practices on the same farmland. If the farmers want to be certified as organic farmers, they need to invest further time and money to meet the complex standards that most small farmers in Taiwan cannot afford.

As a result, the farming environment in Taiwan has witnessed the consequences of severe soil erosion and contaminated drinking water, while its biodiversity is under threat.[6]

Case I: A country obsessed with agritourism

Decision makers adopted the concept of open data in Taiwan in 2012, encouraged by the global Open Government Partnership (OGP) launched in 2011, which aimed to promote accountable, responsive and inclusive governance. The Executive Yuan, the central government that oversees all the ministries in Taiwan led by the Premier, established a crucial resolution for promoting open data in the country, "Resolution of the 3322nd Executive Yuan Meeting". According to this resolution, all ministries should promote open data in steps to achieve three goals, which are: to ensure access of both individuals and private sectors to government data, to provide free government data with some exceptional payment circumstances, and to make the release and exchange of government data on scale, automatically and systematically.[7]

As a department of the Executive Yuan, the Council of Agriculture (COA) introduced open data in their work in 2013, and agritourism was a priority on their agenda. On the COA's open data platform,[8] all the information tourists may need along their journey was shared, including tourist sites, souvenirs and local delicacies in rural areas. At the same time, the COA launched its agritourism e-map in 4,800 convenience stores across Taiwan. The e-map was made based on the data provided by the COA, integrating the existing data that the convenience stores had. Any individual can download this e-map through an interactive kiosk called Ibon in Taiwan, found at any neighbourhood 7-Eleven, and Ibon will customise the content of the e-map based on the actual location, listing all agritourism sites within 15 miles together with a set of coupons that could be used at these sites.[9]

Agritourism has been regarded by many governments in East Asia, including Taiwan, as a solution to promote the economic well-being of small farms, since research shows that agritourism can increase farm income and create job opportunities, and does not require small farmers to invest a large amount of money.[10] In the past decade, agritourism in Taiwan developed remarkably. In 2019 alone, the visits to rural areas were 27 million, comparing to the 0.17 million visits in 2011, and the net output is TWD 10.9 billion (USD 0.36 billion).[11]

The supportive policies and public resources related to agritourism attracted small farmers to change their farming practices and encouraged social enterprises to work on these issues in innovative ways, such as Taiwan BlueMagpie Tea.[12]

Taiwan BlueMagpie Tea, a company started in 2012, aims to restore the polluted river sources in northern Taiwan. They have been trying to persuade the tea farms located at the upper reaches of the Feicui Dam to adopt alternative farming methods by offering them a competitive purchasing price, as their conventional approaches to farming on the hills have resulted in chemical contaminants entering the water source. On the one hand, the company helps the tea farmers to diversify their income by exploring agritourism opportunities, helping them overcome the difficult period of transition from conventional farming to alternative farming. On the other hand, the company has been promoting transparency in tea production by building its own ecological database. The database aims to use artificial intelligence (AI) to identify the specific factors that may influence the taste of tea, including climatic factors and edaphic (soil-related) factors, based on open data, and to establish precise traceability cards for its tea products on the basis of cloud computing.

6   Liu, Y.-H., Chen, W., Anh, N. K., & Wattanasetpong, J. (2018). Comparing watershed soil erosion of Taiwan and Thailand. *MATEC Web of Conferences, 192*(2): 02041. https://www.researchgate. net/publication/327025347_Comparing_watershed_soil_erosion_ of_Taiwan_and_Thailand

7   Executive Yuan. (2012, 8 November). Resolution of the 3322nd Executive Yuan Meeting. https://www.ey.gov.tw/ Page/4EC2394BE4EE9DD0/1cd200d2-f113-4932-a993- 8811bbc3d6fd

8   https://data.coa.gov.tw

9   A news story about the establishment of the e-map published by the COA on its website is available here: https://www.coa.gov.tw/ theme_data.php?theme=news&sub_theme=agri&id=4642

10   Chang, H.-H., Mishra, A. K., & Lee, T.-H. (2019). A supply-side analysis of agritourism: Evidence from farm-level agriculture census data in Taiwan. *The Australian Journal of Agricultural and Resource Economics, 63*(3), 521-548. https://onlinelibrary.wiley. com/doi/abs/10.1111/1467-8489.12304

11   Data for 2011 cited from Liao, L. (2017). 《我國農業旅遊拓展國際市場成果與展望》 (The achievements and outlook of Taiwan agritourism in international market). *Agriculture Policy & Review*. https://www.coa.gov.tw/ws.php?id=2506962; data for 2019 cited from the Council of Agriculture. (2020). 《推動特色休閒農業旅遊》 (Promoting characteristic agritourism). https://www.coa.gov. tw/ws.php?id=2504015

12   https://www.bluemagpietea.com

In five years, Taiwan BlueMagpie has built its partnership with 25 farms in the region of the Feicui Dam, which means 25 farms have successfully changed their farming approach, and more than thee hectares of water area have been restored.

Case II: An island committed to being open

In 2015, the Taiwanese government further intensified its efforts to promote open data. In order to provide more concrete guidelines for all ministries about open data practice, the National Development Council published the ide@Taiwan 2020 Policy White Paper.[13] The white paper addressed the issue of food security as an urgent issue and suggested all relevant ministries take advantage of open data to complete the country's food traceability system. The paper also brought up two new priorities related to agriculture, including how to build inclusive e-commerce platforms for small farmers and how to promote environmental monitoring with citizen participation.

The policies that were later launched by the COA showed the direct influence of the white paper. In 2016, the COA initiated the concept of "smart agriculture". Smart agriculture expects farmers to make production and marketing plans in response to the market, to adopt a more efficient farm management model with the support of advanced cross-field technologies, using information and communications technology (ICT), including the potential of the internet of things (IoT) and big data analysis, and to develop traceable agricultural products.[14]

The COA increased its support by enriching the data on its open platform and initiating grants for open data-based agricultural technologies. It launched another information platform on agriculture,[15] which integrates all information systems in the COA with collected external data, in areas such as climate, soil, pests, diseases, markets and news. The aim is to help farmers make more strategic management plans and decisions by utilising this wide variety of data, increasing their overall agricultural production efficiency. Any third party can access and use the data on the platform with authorisation.

At the same time, a community that focuses on promoting the transparency of government information through citizen participation and open data, known as a civic tech community, arose in

Taiwan in 2012. Aiming to explore alternative possibilities in public-private partnerships through open data technologies, the community soon started a resource platform, held hackathons,[16] and incubated initiatives addressing public issues based on open data technologies by providing resources, including expertise, information, access to networks, and grants.

A couple of projects that focus on promoting sustainable agriculture with open data were initiated during the hackathons, and one that achieved substantive results is AgriWeather.

AgriWeather was developed in 2017 by a group of members with backgrounds in software and hardware engineering, data analysis, agricultural research, plant pests and diseases, and visual design and communication. Its original goal was to help small farmers make better decisions with their farming by creating an affordable tool based on open data.

The project has developed into a company,[17] which provides comprehensive services for small farmers to ensure their access to open data and help them make better decisions with customised data analysis. The company offers three kinds of services: field microclimate sensing devices, the AgriNote app for recording farming activities, and recommendations based on its analysis of agricultural data. Farmers can access real-time monitoring of the environment in their fields through the field microclimate sensing devices, and use AgriNote to organise the data, and record their producing activities in the field. The company will analyse all the collected data and provide recommendations to their customers, such as warnings about plant diseases and insect pests, and on the precise application of fertiliser. All these recommendations help farmers lower their production costs, improve product quality and reduce the use of chemicals, moving towards precision agriculture, which is more sustainable and environmentally friendly.

Conclusion

Open data has become an essential issue on the agenda of the Taiwanese government in the past decade. It is being used to examine government operations and to improve public services, and has had a positive impact on transparency and public accountability.[18] By introducing open data to the agriculture industry, the COA was able to take

13   https://www.ndc.gov.tw/Content_List.
aspx?n=CE8524192720696F&upn=FFBA69B8D9791D2D

14   Council of Agriculture. (2016). *Moving towards agriculture 4.0 in Taiwan with smart technology.* https://eng.coa.gov.tw/ws.php?id=2505331&print=Y

15   https://agriinfo.tari.gov.tw

16   https://jothon.gov.tw

17   https://agriweather.beehivedt.com

18   Open Culture Foundation. (2017). *Taiwan Open Government Report 2014-2016.* https://opengovreport.ocf.tw/assets/pdf/report-en.pdf

advantage of its data, improve its public service, and promote agritourism and the development of open data-based technologies. It is interesting to see that all these policies ultimately promoted a transition of farming methods and raised public participation in environmental monitoring in the country.

It is also noticeable that the civic tech community and innovative social enterprises have played a vital role in promoting alternative farming practices and developing accessible technologies. As the beneficiaries of open data policies, civic tech and social enterprise communities could access free data, develop affordable technologies and provide complementary services for small farmers, investing resources in raising public awareness on public issues, such as environmental sustainability. They also benefit from the rising public concern on environmental issues, such as food security, water quality and air quality, stimulated by open data advocacy related to the environment by civil society.

However, it is premature to say if this sort of public-private partnership is a successful attempt to promote sustainable agriculture, as there are many other issues to be addressed.

First, environmental sustainability has never been the primary purpose of open data policies related to agriculture. It is evident that the policies established by the COA were motivated by economic interests regarding agritourism and open data-based technologies as part of the data economy, and the positive impact on the environment was an entirely unexpected result.

Second, there is a lack of analysis with detailed data about how agritourism and precision agriculture have impacted the local environment. Most current research and reports are qualitative, and more reliable evidence is required for further advocacy.

Third, it takes time to verify if these innovative business models based on open data are sustainable. The social enterprises mentioned in the report are able to provide affordable services because they are enjoying diverse resources, including the essential free support provided by volunteers from the civic tech community, and the grants from the government for open data technologies. Can these social enterprises sustain their operations should the public funding be withdrawn? Moreover, will they be able to keep their services affordable for small farmers? These are some of the challenges that will take time to explore.

Action steps

Three lessons can be drawn from the Taiwan experience:

- First, the government should take full responsibility for ensuring equal access to data when promoting open data by providing comprehensive resources tailored to the needs of different communities. Factors such as unequal access to information, the technology access gap, and the digital divide in education, all need to be taken into account.

- Second, the potential impact on the environment should be recognised as an essential index when examining the effect of open data policy in the agriculture industry, and accurate data should be collected for further analysis.

- Third, a governing mechanisms such as a data sharing agreement and privacy impact assessment should be developed to ensure the sustainability and trustworthiness of the data as well as information platforms when it comes to private-public partnerships, so that accountability of the responsible party can be upheld should a breach ever occur.

Technology, the environment and a sustainable world: Responses from the global South

The world is facing an unprecedented climate and environmental emergency. Scientists have identified human activity as primarily responsible for the climate crisis, which together with rampant environmental pollution, and the unbridled activities of the extractive and agricultural industries, pose a direct threat to the sustainability of life on this planet.

This edition of Global Information Society Watch (GISWatch) seeks to understand the constructive role that technology can play in confronting the crises. It disrupts the normative understanding of technology being an easy panacea to the planet's environmental challenges and suggests that a nuanced and contextual use of technology is necessary for real sustainability to be achieved. A series of thematic reports frame different aspects of the relationship between digital technology and environmental sustainability from a human rights and social justice perspective, while 46 country and regional reports explore the diverse frontiers where technology meets the needs of both the environment and communities, and where technology itself becomes a challenge to a sustainable future.

APC

Sida