

RURAL DEVELOPMENT OF GUIMARAS ISLAND, PHILIPPINES: HOW DOES CLIMATE CHANGE THREATEN LOCAL MANGO-DRIVEN DEVELOPMENT?*

T. Hrušovský^{1, 3}, T. Lošák¹, R. J. D. Flora²

¹*Department of Environmentalistics and Natural Resources, Faculty of Regional Development and International Studies, Mendel University in Brno, Brno, Czech Republic*

²*Baterna Campus, Guimaras State University, San Lorenzo, Philippines*

³*Faculty of Horticulture, Mendel University in Brno, Lednice; Czech Republic*

Guimaras Island, Philippines, has built its brand around a specific variety of mangoes (Carabao mango), a vital economic contributor to rural development incorporated throughout all sectors. With climate change (e.g., 'La Nina'), farmers have difficulties inducing the trees. With the first link of mango production (cultivation) threatened, the question arises: How may climate change affect the rural development of Guimaras Island? Data were collected through 15 semi-structured interviews with local farmers, producers, and scientific institutions on Guimaras Island in February and March 2023. Thematic analysis was conducted in the Atlas.ti software. Statistical information was gathered through the Provincial Office for Agricultural Sciences. Local farmers and producers are already witnessing the effects of climate change and are not able to produce mangoes as they used to before climate change effects. Farmers, producers, and service providers need to adapt to different cultivation periods for mangoes and diversify their fruit production.

sustainable development; Carabao mango; climate change, Guimaras Island, Philippines

doi: 10.7160/sab.2024.550103

Received for publication on September 19, 2023

Accepted for publication on March 4, 2024

INTRODUCTION

The definition of development as a complex term is usually viewed as a process towards set goals in time and space or as a process of constant change, which if we focus it on the exact region or community, are processes within that region that are in a relationship with economic, social, and environmental factors, aiming for qualitative or quantitative improvement (Miškolci, 2013; Ježek et al., 2014; UNWTO, UNDP, 2017; Pandey, Muhammad, 2022). Sustainable development has to fulfil several goals to be successful. It consists of three dimensions: economic, environmental, and social. In order to be successful, all of the mentioned dimensions must complement each other (Mensah, Ricart Casadevall, 2019; Andersson et al., 2022; Sachs et al., 2022).

Guimaras Island is a part of the developing country Philippines, it has problems with agricultural produc-

tivity, as showed by Yamagishi et al. (2021) in their study, the rating for the Philippines is lower than other ASEAN member states, found its way to improve local growth over the years by incorporating two of the most important sectors of the Island: agriculture and tourism. Known throughout the Philippines for its sweet mangoes, the Island can attract tourists to experience either fresh mangoes or a variety of dishes made from it. Their ability to enhance tourism based on the marketing of the sweetest mangoes in the world boosted the development of the Island (Sacramento, Cuizon, 2020).

Guimaras mangoes have specific properties in terms of cultivation and quality of the fruit itself. This variety of mango is called Carabao mango (*Magnifera indica* L. cv. 'Carabao'). This variety is known for its sweet taste but has a difficult process of cultivation. Farmers must induce trees with expensive fertilisers to obtain fruit. The NPK mixture is sprayed 2 to 3 times on the

* This research was funded by MENDEL UNIVERSITY IN BRNO, grant number: IGA-FRRMS-23-019.

mango tree leaves with an average cost of 4000 PHP (Philippine peso; 1 PHP = 0,018 USD) per spraying session. After a successful harvest, every single fruit will be bagged in either handmade bags from newspapers or, with a more costly option, waxed bags to withstand weather conditions and pest attacks. Since one mature mango tree can hold up to 2000 pieces of fruit that have to be manually wrapped. Such a technique is labour-intensive and requires substantial financial resources. After 90 days of ripening, farmers are obliged to take samples for testing to the local agricultural office of their province (they are testing residue and sugar contents), which will issue a certificate allowing them to start the harvest alongside Geographical Indication (GI) Mark. This mark provides proof that farmers were following the standardised and certified process and that production is fulfilling the qualitative standards of Guimaras mangoes. Consequently, certified mangoes have a local price tag that is 3-4 times higher than those that are not certified. This process has the potential to increase profits for farmers and other stakeholders throughout the Carabao mango value chain (Wang et al., 2019; Furumo et al., 2020). This process is done at the beginning of the dry season, usually in January, when the amount of rainfall is much lower than in the rainy season (from August to December). Less rainfall is crucial for higher efficiency of induction, lowering the potential loss of fertilizer investments (Code of Practice, 2017).

Nevertheless, the Philippines has been recently experiencing the negative effects of climate change, with a rise in typhoon frequency and prolonged rainy seasons. This adversely affects small-scale farmers who lack the necessary resources, knowledge or adaptation capacities to cope with the changes. (Blanc, Strobl, 2016; Ducusin et al., 2019). While other regions in Southeast Asia and Africa have tendencies to shift their focus from crop production to, for example, much more profitable cattle production (considering rising demand for beef), Guimaras cannot transit that easily from mangoes as they built whole development and marketing strategy around them (Jones, Thornton, 2009; Devendra, 2012; Makuvaro et al., 2018).

With these restraints, the question arises: How does climate change affect local farmers involved in mango-driven development? This article documents the major concerns of the local stakeholders involved in the mango business on Guimaras Island, Philippines.

MATERIALS AND METHODS

The documents obtained from the Guimaras Island Provincial Office of Agricultural Services (POAS) contained mainly statistical information from the agricultural sector of Guimaras Island, such as the

number of planted mango trees, the number of mango farmers, the annual yield of different years in kilograms (2019, 2020, 2021, 2022), to see the possible impact of the climate change in those statistics. A collaboration with the Guimaras State University facilitated a successful qualitative study. The study consisted of a series of semi-structured interviews held with a range of stakeholders involved in mango value chains, as well as local authorities. Fifteen semi-structured interviews were collected in February and March 2023 (dry season – application of fertilisation on mango trees) during a visit to Guimaras Island. Semi-structured interviews were anonymized, and participants signed an agreement, allowing for the interviews to be recorded (signed agreements are accessible by contacting authors). The selection of the participants was consulted with Baterna Campus of Guimaras State University (agricultural faculty) under the following criteria: farmers officially registered at the POAS, previous association with mangoes, mango business stakeholders (meaning involvement in education and decision making on the level of local government). The authors are aware of the fewer participants in the interviews, as the period of time spent in the field was insufficient to cover more participants. In total fifteen interviews were transcribed, and thematic analysis was conducted with the software ATLAS.ti, using AI (artificial intelligence). AI function was used for sorting and coding (the authors conducted the actual analysis). Thematic analysis was chosen for this article, analysing three code groups: agricultural practices, future opportunities and tourism. All cited documents and transcripts are available by requesting the corresponding author.

For a better understanding of the topic and the importance of the mango for the region, geographical and socio-cultural inclusion of Guimaras Island is needed. Guimaras Island is part of the archipelago Western Visayas in the Philippines, surrounded by two bigger islands of Panay and Negros. With a total area of 604 km², Guimaras was always focused on the agricultural sector, considering perfect natural conditions for growing mangoes. Up to 93 % of its area is considered agricultural land, with the vast majority being highly suitable for mango cultivation (Code of Practice, 2017).

Guimaras Gravely Loam soil and climate conditions resulted in more than 250,000 bearing mango trees (Code of Practice, 2017). The importance of this is highlighted by the presence of the mango research institute, National Mango Research and Development Centre.

RESULTS AND DISCUSSION

The locals realised the uniqueness of mangoes and began to use their potential in the agricultural/horti-

cultural sector and tourism. They have been attracting tourists since 1993, mainly through the Manggahan festival, which still takes place every year, for two weeks in May (the peak of mango season) (Gillespie, 2019). In 2023, after the COVID-19 restrictions were lifted, Guimaras Police Provincial Office data suggested an inflow of more than 53,000 tourists during the duration of the festival (Herrera, 2023).

Climate change and agricultural challenges

With such a number of tourists, locals must be prepared to provide enough fresh and processed mangoes to fulfil the demand, which was a problem this year (2023). *‘There are a lot of factors affecting mango productivity. With the current change in our climatic conditions, we need to also adjust the production calendar.’* (mango farmer) The key to having enough supply of mangoes for this number of tourists in a relatively short period (usually Manggahan festival lasts for two weeks, except in the year 2023 as a result of COVID-19 restrictions happening in previous years), is to have a proper production calendar setting (induction in January/February and harvest in March/April with enough time for processing). Yegbeme et al. (2014), in their case study in West Africa, suggested that the best option for adaptation of the farmers (in this case, Maize farmers) to the changing climate patterns is extensive education of the farmers, as they usually do not have access to accurate climate predictions. Guimaras Island, with a research institution, focused directly on mangoes, possesses resources for this kind of education for the farmers, yet they are still focusing on other factors concerning mango production: *‘We have training in our facility for farmers focusing on product quality, fertilization, pest and disease management.’* (staff of the agricultural learning facility)

Mango-tourism challenges and forecasting

The same pattern falls towards the management of tourist arrival. Once farmers do not have their production calendars lined up with the event, when demand is at its peak, the need of the market is not met during the festival, forcing higher prices of the available mango products and surpluses after the event (considering later induction and harvest). *‘In previous years 2020 and 2022, we were not successful because of the weather and this year (2023) is not looking good either. In June and July, production goes down. So, during April and May, we try to make as much as possible so we can survive the whole year. During the festival, we sell around five to ten tons of fresh mangoes alone. We do not have sufficient supply for export for example, because we need to satisfy tourists on the Island, and they will not go home without dried mangoes.’* (mango products producer)

Forecasting of the tourism demand is especially needed in the situation of change, to keep the development of the region on its path of improvement. As mentioned in a book by Frechling (2001) people are inseparable from the production-consumption process, meaning the tourism products must line up with available supply and its consumption. Applying it to the case of Guimaras Island, if climate change shifts the pattern of the mango production calendar and mango business stakeholders or tourism event planners do not adapt to this rearrangement, tourists might lose interest in it.

Diversification of high-value crops

Guimaras is reliant on its mangoes which are affecting nearly every sector on the Island. With climate change and the difficult process of mango production, there is a question of diversification in agriculture. A case study from Fiji by Singh (2020) shows how a lucrative cash crop (sugar cane) became less profitable and attractive over time. The answer to save local farmers was diversification to other crops (exotic fruits, vegetables). Some of the farmers from Guimaras are already shifting from mangoes to other attractive crops such as Pitahaya (*Selenicereus undatus*, commonly known as dragon fruit). They are using knowledge from the mango value chain and are applying it to Pitahayas, which are less difficult to produce and finance, harvest is possible over a span of 3 to 6 months, and natural conditions are as favourable as they are with mangoes (Mercado-Silva, 2018). *‘I know that dragon fruit field is an emerging market, but still, we have a lot of work.’* (former mango farmer) *‘At the moment the national fruit is mango. That’s our national fruit. In May, we have a mango festival, then in July, and in August, we have the Dragon Fruit Festival. We are the only province here in the Philippines with a Dragon Fruit Festival.’* (mango farmer). This form of diversification, while still preserving the original crop as a main commodity for production and as an attraction while having another possibility ready if needed, is a good strategy. If they can successfully add another crop (Pitahaya), there is space for more diversification in the future if problems with climate change and the mango business persist. Diversification, which is slowly happening towards other high-value crops, will not threaten the local development of Guimaras Island if it can adapt to these changes.

CONCLUSIONS

With agricultural and tourism sectors focused on mangoes, local stakeholders in the mango business on Guimaras Island, Philippines, are experiencing new challenges with climate change. The main challenge now is to adjust the farming calendar of the already

difficult process of producing mangoes and lining it up with an inflow of tourists during the yearly Manggahan festival, to ensure enough supply to satisfy the needs of the consumers. Another possible long-term goal should be the diversification of high-value crops, such as Pitahaya, that could attract even more tourists even after the main mango season (Evahelda et al., 2021; González et al., 2021; Ambalegin et al., 2022). These short-term, such as adjustment of the agricultural calendar, and long-term adaptation strategies, such as diversification of high-value crops, should prevent threats represented by climate change towards the mango-driven development of Guimaras Island.

AUTHOR CONTRIBUTIONS:

Conceptualization, T.H. and T.L.; methodology, T.H., T.L. and R.J.D.F.; software, T.H.; validation, T.H. and T.L.; formal analysis, T.H.; investigation, T.H. and R.J.D.F.; resources, T.H. and R.J.D.F.; data curation, T.H. and R.J.D.F.; writing—original draft preparation, T.H.; writing—review and editing, T.L.; visualization, T.H.; supervision, T.L.; project administration, T.L.; funding acquisition, T.H. and T.L. All authors have read and agreed to the published version of the manuscript.

ACKNOWLEDGMENTS:

This research is funded by the Faculty of Regional Development and International Studies, Mendel University in Brno, which supported the IGA-FRRMS-23-019 project, and without their help, the project could not have been realized. Special gratitude to Guimaras State University, Philippines, who prepared perfect conditions for data collection, especially direct contact with interviewed target groups.

CONFLICTS OF INTEREST:

The authors declare no conflict of interest. The funders had no role in the study's design; in the collection, analyses, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

REFERENCES

- Ambalegin, A., Arianto, T., Handayani, N. D., Mubarak, Z. H., 2022. An English Speaking Training For The Dragon Fruit Plantation Workers In Rempang Island, Batam: Agro-Tourism Base. *PUAN INDONESIA*, 3 (2), 255-264. <https://doi.org/10.37296/jpi.v3i2.75>.
- Andersson, S., Svensson, G., Molina-Castillo, F. -J., Otero-Neira, C., Lindgren, J., Karlsson, N. P. E., Laurell, H., 2022. Sustainable development—Direct and indirect effects between economic, social, and environmental dimensions in business practices. *Corporate Social Responsibility and Environmental Management*, 29(5), 1158-1172. <https://doi.org/10.1002/csr.2261>
- Blanc, E., Strobl, E., 2016. Assessing the Impact of Typhoons on Rice Production in the Philippines. *Journal of Applied Meteorology and Climatology*, 55(4), 993-1007. <https://doi.org/10.1175/JAMC-D-15-0214.1>
- Code of Practice, 2017. GUIMARAS MANGO GROWERS AND PRODUCERS DEVELOPMENT COOPERATIVE. Guimaras, Philippines, 1-54.
- Devendra, C., 2012. Rainfed Areas and Animal Agriculture in Asia: The Wanting Agenda for Transforming Productivity Growth and Rural Poverty. *Asian-Australasian Journal of Animal Sciences*, 25(1), 122-142. <https://doi.org/10.5713/ajas.2011.r.09>
- Ducusin, R. J. C., Espaldon, M. V. O., Rebancos, C. M., De Guzman, L. E. P., 2019. Vulnerability Assessment Of Climate Change Impacts On A Globally Important Agricultural Heritage System (Giah) In The Philippines: The Case Of Batad Rice Terraces, Banaue, Ifugao, Philippines. *Climatic Change*. 153 (3), 395-421. <https://doi.org/10.1007/s10584-019-02397-7>.
- Evahelda, E., Purwasih, R., Siregar, P., 2021. Consumer Perceptions To The Agro-Tourism Of Red Dragon Fruit Palopat Maria. *SOCA: Jurnal Sosial, Ekonomi Pertanian*, 15 (1), 189-201. <https://doi.org/10.24843/SOCA.2021.v15.i01.p17>.
- Frechtling, D., 2001. *Forecasting Tourism Demand: Methods and Strategies*. Butterworth-Heinemann, 1-275. ISBN 0-7506-5170-9
- Furumo, P. R., Rueda, X., Rodríguez, J. S., Parés Ramos, I. K., 2020. Field Evidence For Positive Certification Outcomes On Oil Palm Smallholder Management Practices In Colombia. *Journal of Cleaner Production*. 245. <https://doi.org/10.1016/j.jclepro.2019.118891>.
- Gillespie, S., 2019. This Philippine Island Has Mangoes so Delicious, They Have Their Own Festival. *Matador Network*. Retrieved September 12, 2023, from <https://matadornetwork.com/read/mango-festival-philippines-island/>
- González, G., Barrera, E. P. A., Josué, K., 2021. Design Of A Dragon Fruit Tourist Route In The Palora Canton, Province Of Morona Santiago. Diploma thesis, Ecuador. <https://dspace.uniandes.edu.ec/handle/123456789/12380>.
- Herrera, J. N. E., 2023. 'SWEETEST RETURN': Manggahan Festival's tourist arrival back to pre-pandemic level. *Guardian Daily*. Retrieved September 12, 2023, from <https://dailyguardian.com.ph/sweetest-return-manggahan-festivals-tourist-arrival-back-to-pre-pandemic-level/>
- Ježek, J., Dokoupil, J., Kaňka, L., Matušková, A., Šlehoferová, M., 2014. *Regional Development*. Pilsen: University of West Bohemia. ISBN 978-80-261-0462-9.
- Jones, P. G., Thornton, P. K., 2009. Croppers to livestock keepers: livelihood transitions to 2050 in Africa due to climate change. *Environmental Science & Policy*, 12(4), 427-437. <https://doi.org/10.1016/j.envsci.2008.08.006>

- Makuvaro, V., Walker, S., Masere, T. P., Dimes, J., 2018. Smallholder Farmer Perceived Effects Of Climate Change On Agricultural Productivity And Adaptation Strategies. *Journal of Arid Environments*. 152, 75-82. <https://doi.org/10.1016/j.jaridenv.2018.01.016>.
- Mensah, J., Ricart Casadevall, S., 2019. Sustainable development: Meaning, history, principles, pillars, and implications for human action. *Cogent Social Sciences*, 5(1). <https://doi.org/10.1080/23311886.2019.1653531>
- Mercado-Silva, E. M., 2018. Pitaya— *Hylocereus undatus* (Haw). In *Exotic Fruits*, Elsevier, 339-349. <https://doi.org/10.1016/B978-0-12-803138-4.00045-9>
- Miškolci, S., 2013. Environmental policy in regional development: theoretical background, concepts and tools. Brno: Mendel University in Brno. ISBN 978-807375-880-6.
- Pandey, A., Muhammad A., 2022. Assessment of energy and environmental sustainability in South Asia in the perspective of the Sustainable Development Goals. *Renewable and Sustainable Energy Reviews*. 165. ISSN 13640321. <https://doi.org/10.1016/j.rser.2022.112492>
- Sachs, J., Kroll, C., Lafortune, G., Fuller, G., Woelm, F., 2022. Sustainable Development Report 2022. Cambridge University Press. <https://doi.org/10.1017/9781009210058>
- Sacramento, N. J. J. E., Cuizon, A. C. B. D., 2020. The Philippine Mango Industry Governance, Prospects, and Recommendations: The Case of Guimaras Province. *Thammasat review*. 23(2), 232-260. ISSN 2630-0303.
- Singh, A., 2020. Benefits of crop diversification in Fiji's sugarcane farming. *Asia & the Pacific Policy Studies*, 7(1), 65-80. <https://doi.org/10.1002/app5.291>
- UNWTO; UNDP. 2017. Tourism and the Sustainable Development Goals - Journey to 2030. Madrid.
- Wang, B., Cheng, P. -Y., Lee, B., Sun, L. -C., Chang, H. -H., 2019. Does Participation In Agricultural Cooperatives Affect Farm Sustainability? Empirical Evidence From Taiwan. *Sustainability*, 11 (18). <https://doi.org/10.3390/su11184987>.
- Yamagishi, K., Gantalao, C., Ocampo, L., 2021. The Future Of Farm Tourism In The Philippines: Challenges, Strategies And Insights. *Journal of Tourism Futures*. <https://doi.org/10.1108/JTF-06-2020-0101>.
- Yegbemey, R. N., Kabir, H., Awoye, O. H. R., Yabi, J. A., Paraíso, A. A., 2014. Managing the agricultural calendar as coping mechanism to climate variability: A case study of maize farming in northern Benin, West Africa. *Climate Risk Management*, 3, 13-23. <https://doi.org/10.1016/j.crm.2014.04.001>

Corresponding Author:

Tadeáš Hrušový, Department of Environmentalistic and Natural Resources, Faculty of Regional Development and International Studies, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic, ; e-mail:tadeas.hrusovsky@mendelu.cz
