CHAPTER 4
CURRENT AGRICULTURE SITUATION

Yin Yin Nwe, Ryo Suzuki, Hajime Sugimura

Traditional agriculture

As mentioned at the Chapter 2, Palau's traditional agriculture is a multi-story agroforestry system, where tree crops provided a protective canopy for the intensive production of over 40 plant varieties. Under the traditional system, every Palauan woman had a garden (or gardens). Women produced agricultural products together with the community harvested marine and forest products provided a self-sufficient food system with in-built security against natural disaster, pest intrusion, and old age. Today, the traditional system still remains, although less than 3% of land is now under agroforestry production. The taro gardens most closely resemble the traditional agroforestry system although contemporary gardens are less intensively cultivated than those of the past (Bishop 2001). Traditional agriculture is worth pursuing for the community value, healthy food supply and environmental conservation too. The research results show that taro patches can absorb up to 90 percent of sediment even in today and thus protect Palau's coral reefs (Koshiba et al. 2014).

Historically, root crops play a major role in Palauan diet and culture; taro, cassava, and sweet potato are common to all the local farms. There were vast germplasm conservations related to taro in Palau. The three main types of taro grown in Palau are *Colocasia esculenta* (L.) Schott. (taro, dait), *Cyrtosperma merkusii* (Hassk.) Schott. (giant taro, brak) and *Xanthosoma*. The number of *Colocasia* varieties currently present in Palau is estimated at about 100 (Bishop 2003). Root crop germplasm conservation in vitro and in situ is an active ongoing project in Cooperative research and extension belongs to Palau Community College (PCC-CRE). Currently 28 varieties of taro are in the laboratory for in vitro conservation and in the field for *in situ* conservation.

Current Agriculture Activity

At present, agriculture does not constitute a large portion of the commercial market economy. Agriculture in Palau was mainly for subsistence and customary purposes, although sales of products such as vegetables, root crops, fruits and betel nuts were common. There is no significant change today in the types and diversity of food products. Women mainly work at farms and produce commodities such as taro, sweet potato, cassava, and some fruits. According to the workload survey in 2019-2020 with 40 participants of women, 27% of them employ foreign labor to assist in the production of taro which is an important crop culturally and economically, as well as for subsistence purposes (Nwe et al., unpublished data).

However, there has been a changing trend in the increased consumption of food products which could be attributed to increase in population, the promotion of the use of local, nutritious food, the increase in demand for local produce by the hotels and restaurants, and the dramatic increase in price of imported food items. There is less wetland taro cultivation today than in the past (Hunter-Anderson 1984). Reasons for the abandonment of wetland taro include higher labor and time costs of production, altered consumption patterns (in particular, the increasing dependence on imported starches), typhoon and pest damage to taro, government encouragement of cassava and sweet potatoes production to alleviate the shortage of Colocasia (McCutcheon 1981), the time and labor constraints associated with an urban lifestyle (Hunter-Anderson 1984), and the attractive of the modernization.

The situation of current agricultural production in Palau is, thus, below the self-sufficiency line (FAO, 2008). Palau imports 85% of food products consumed. Palau is a popular sightseeing destination and rich in culture. Because of focus on tourism and its dependence on imports, potential complications will arise if global markets collapse. Share of the domestic food production decreased significantly and that has been worried for more than 20 years. Palau is trying to increase domestic food products such as taro. Palau households were least reliant on subsistence farming, with only 9% of households reporting this as their main livelihood resource and lowest compared to other island nations in the Pacific (Fig. 28). If the shipping that sends imported food products stops, Palau will have a food shortage. Self-sufficiency in the agricultural sector is the challenge for food security.

In Palau, the agricultural farms mainly exit along the coastal areas where the soil is rich originally (Fig. 29). Most of the farms are run by family labor. According to area wide, fruit production occupies 3.12 km^2 followed by betel nut (2.15 km^2), banana (2.01 km^2), cassava (1.21 km^2), taro (1.16 km^2), and vegetables (1.15 km^2).

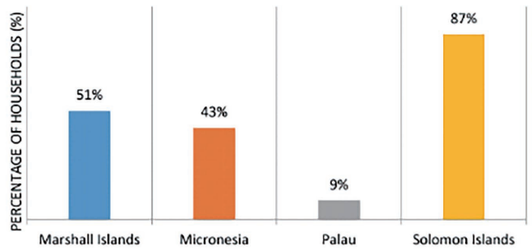

Fig. 28. Sustainable farming households in Palau (UNFAO & PAIR survey, 2017)

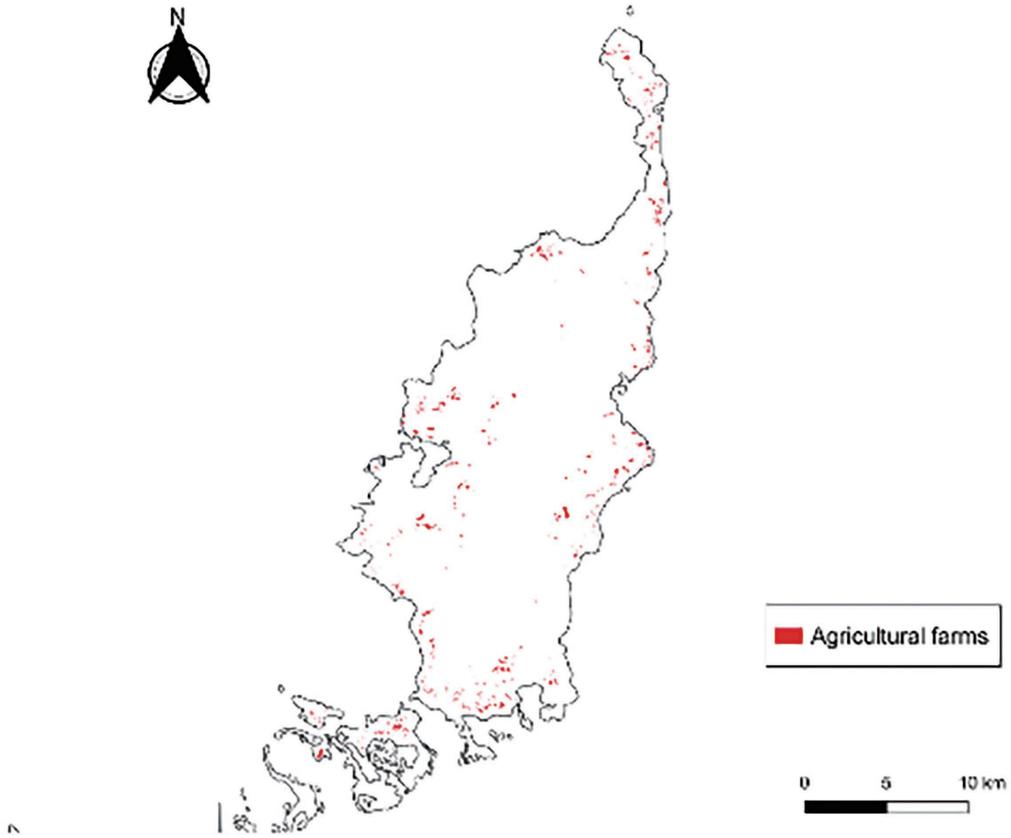

Fig. 29. Agricultural farms around Babeldaob island (Kitalong, C. unpublished data)

Agroforestry

Results of the survey on the spatial structure and landscape of traditional villages and living habitats of the village people indicated that the traditional structure and lifestyles remain in villages of Babeldaob Island (Iida, 2011). The spatial structure of the villages consists of a sub-stream watershed-based topography. Mulch agroforestry farms in combination with diverse agriculture and livestock are still active at several areas of the villages with adjusting the micro-topography. A total of 36 useful plant species are routinely collected from the nearby agroforests and used by 60% of the villagers among 50 species of plants that were surveyed. Knowledge of medical plants and their uses have evolved over millenniums. Traditionally medical uses were secret knowledge to be closely guarded and passed through family lines (National review on the SDGs, 2019).

Livestock production

Pig

Palauan people traditionally use pork for siukang (traditional events) like funerals and baby showers. At the event, it is critically important for hosts to prepare pork for guests. More than ten pigs are often prepared at a funeral of a politically important person.

Because of this cultural background, Palauan people have bred pigs for a long time. Breeding scale in Palau is considerably small; most farmers breed around five pigs in the backyard and there are only two professional farmers raising more than fifty pigs in Palau. A common breeding style is an individual breeding with a washing pigsty, while some farmers have introduced a dry-litter pigsty as Taiwan Technical Mission (TTM) has promoted production of composts made from pig manures.

According to a survey conducted by the Bureau of Agriculture in 2019, 40 farmers raise 500-600 pigs in Palau (Table 4). As most people in Palau live in Koror State, they used to raise many pigs in Koror. After Koror State introduced an Act which prohibits pig raising in the State, pigs are now mainly raised in Babeldaob, Carp, Peleliu and Angaur islands as well as southwest islands, Tobi and Sonsrol.

In terms of a breed, many pigs are crossbreds of wild black bores that were introduced for livestock production in the past and went wild. The origin of these bores is not clear; some researchers claim that they were introduced from Spain or Portuguese, while other studies imply they might have been brought from Southeast Asian countries by canoes.

Livestock production in Palau has been radically changed since 2013, when Taiwan started the Animal Production Project (APP) in Palau. In 2013, a piggery farm was built in Nekken and three breeds, Yorkshire, Duroc, and Landrace were introduced. Palau community college's (PCC) dry litter piggery and PCC's Multispecies hatchery located in Ngeremlengui state are also helping the community by providing breeded piglets and mangrove crablets, rabbit fish Fingerlings for increased livestock production. Recently, artificial insemination (AI) using semen imported from Taiwan contributes to prevent inbreeding. Before APP started, frequent inbreeding in wild boars led to spread of small pigs that have less than 100kg even when they are fully matured. Introduction of pure breeds has enlarged the size of pigs and some female pigs for reproduction have nearly 300kg. Piglets of these pure breeds are produced in Nekken and sold at 65 US dollars per head. Regarding feed, the main source of pigs' feed used to be food leftovers that are easily available from many hotels and restaurants in Palau, where tourism is the main industry. After Taiwan built a feed mixing station in Ngechesar State in 2014, high-

Fig. 30. Feed mixing station in Ngechesar

nutritious mixed feed became available, which resulted in significant improvement of meat quality (Fig. 30).

Mixed feed is sold in the office of Bureau of Agriculture in Ngechesar at 30 US dollars per a 30kg sack and its sales are increasing.

Fig. 31. Slaughterhouse in Ngechesar

Palauan people have slaughtered pigs for many years in their backyard, so many Palauan males are familiar with how to slaughter pigs efficiently. In this area, Taiwan also supported Palau to build a new slaughterhouse in Ngechesar (Fig. 31). This modern facility complies with HACCP of effective zoning and enough spaces, which is only one in Micronesia. More than 90% of pigs slaughtered in this house are for traditional funerals, so farmers sometimes request a Palauan-style cut, which is suitable for funerals. The number of slaughtered pigs has consistently increased since the open of the slaughterhouse in 2018 (Table 4).

Table 4. Changes of pig population in Palau

Year	Number of Pig farms	Number of Pigs	Number of Slaughtered Pigs
2017	32	687	-
2018	37	652	147
2019	40	497	153
2020	-	-	230

(Source: 2019 Bureau of Agriculture, 2020 APP)

Chicken

Wild chicken can be seen in many places in Palau. The origin of this wild breed has remained unclear. In 2013, APP started commercial chicken breeding and built a breeding house in Nekken next to a pig-breeding house. The introduced breed is suitable for both meat and egg; roosters are for meat production and hens are for egg laying. Chicks are produced by AI and sold at 1 US dollar per head when they get 3-4 weeks old. Egg-laying chickens are usually raised in battery cages introduced by APP, while meat-production chickens are usually raised in indoor husbandries. In Palau, 2000-3000 chickens are supposed to be raised, while the number of chicken farmers is unclear (Table 5). The average number of chickens per a farmer is 50- 100 at maximum.

Like pigs, mixed feed for egg-laying or meat-producing chickens are available at the same price of pig feed 30$/30kg in the office of Bureau of Agriculture. The number of sold feed sacks has increased since 2015 (Table 5).

Table 5. Changes of Livestock population in Palau

Year	Number of Sold Piglets	Number of Sold Chicks	Number of Sold Pig Feed Sacks	Number of Sold Egg-laying Chicken Feed Sacks	Number of Sold Meat-producing Chicken Feed Sacks
2015	36	44	764	10	10
2016	34	128	596	30	40
2017	164	831	1184	150	147
2018	143	710	1120	448	300
2019	89	1367	1450	579	387
2020	65	1653	1183	828	355

(Source: 2020 APP)

Other livestock

The most popular livestock except for pigs are chickens and ducks. Duck meat and eggs are both considerably popular in Palau. Some farmers breed duck in Babeldaob, while little information on duck production is available. Some goats, cows and horses are also raised in Palau for pets. Twenty cows were bred in 20 years ago, but there are only a few cows bred in Ngiwal State.

Climate change

Climate change increasingly impacts food security. On average 6 percent of taro production is lost each year due to saltwater intrusion (Del Rosario and Esguerra, 2015). OERC reports that local food production declined by 5% during the severe drought of 1997-1998 (OERC, 2008). Despite efforts to rehabilitate taro patches and promote salt and drought resistant crops, climate change continues to pose challenges to food security (NEPC, 2019).

Support to Agriculture

The average size of private farms in Palau is 0.25 acre or less. PCC Research and Development (R&D) station is providing the community with root crop planting materials including 28 varieties of taro, 3 varieties of cassava, 3 varieties of sweet potato. In addition, vegetable seeds and seedlings, and fruit tree planting materials are also available for the community to increase local crop production. Technical support by the extension agent and other staff of PCC-Cooperative research and extension (CRE) is available for conservation agriculture techniques. Palau farmer's association has been recently organized through the assistance of the Bureau of Agriculture and Taiwan Technical Mission. The Association's primary goal is obtaining planting materials that are shared or sold among and between farmers. Vegetable seeds are mainly imported by local retailers from the US, Taiwan or the Philippines.

Impact of Agricultural Activities on Coral Reefs

According to the report by Golbuu et al (2011), coral cover, coral richness, and coral colony density increased with increasing distance from the mouth of the bay. There was a negative relationship between coral cover and mean suspended solids concentration. There was a negative relationship between terrigenous sedimentation rates and the richness of adult and juvenile corals. Land development very often leads to increases in river runoff and suspended solids concentrations that reduce coral cover and coral diversity on adjacent reefs.

Glossary

Agroforestry: A multistory cropping system consisting of food-producing plants, such as bananas, breadfruit etc., mixed with trees that do not produce food

Index of Genera and Species

Scientific	Common	Palauan
Colocasia esculenta	true taro	dait, kukau
Cyrtosperma merkusii (Hassk.) Schott	giant taro	brak
Xanthosoma		

References

Bishop, R. V. 2001. Draft strategy for national Agricultural Development: Horizon 2010, World Food Summit Following-up. Republic of Palau Oct. 2001.

Bishop, R. 2003. Taro Production and Value adding in Palau. Third Taro Symposium in 2003 at SPC-Fiji. [Online]: https://chm.cbd.int/api/v2013/documents/9A9CE38C-FA3A-4CCB-F77D-EB22E815335B/attachments/TaroProduction-andValueAdding-Robert%20Bishop%20-%20Palau.pdf.

Del Rosario, A. Esguerra, 2015. Crop profile for Colocasia taro in the republic of Palau. PCC-CRE Publication 27/03 (3.0C).p.26.

Food and Agriculture Organization of the United Nations (FAO). 2008. FAO country report, State of plant genetic resources for food and agriculture 2008. FAO (Rome) pp. 22. [online] http://www.fao.org/3/i1500e/Palau.pdf

1st voluntary national review on the SDGs. 2019. Pathway to 2030 -Progressing with our past toward a resilient, sustainable, and equitable future- Republic of Palau. pp. 1-101. [online]https://sustainabledevelopment.un.org/content/documents/23606VNR_FINAL_21June2019_UN_Version.pdf

Golbuu, Y., R. v. Woesik , , R. H. Richmond, P. Harrison, and K. E. Fabricius 2011. River discharge reduces reef coral diversity in Palau. Mar Pollut Bull. 62(4): 824-831.

Koshiba, S., M. Besebes, K. Soaladaob, M. Ngiraingas, A. L. Isechal, S. Vitor, and Y. Golbuu 2014. 2000 years of sustainable use of watersheds and coral reefs in pacific islands: A review for Palau. Estuarine, Coastal and Shelf Science. 144: 19-26.

Hunter-Anderson, R. 1984. Notes on a comparative study of traditional horticulture in five island groups in Western Micronesia: Palau, Yap, Truk, Ponape, and Kosrae. Micronesian Area Research Center, University of Guam, Mangilao, Guam. Unpublished paper.

Iida, A. 2011. A study on landscape planning based on watershed zone of tropical islands, Republic of Palau. p. 344.McCutcheon, M. S. 1981. Resource exploitation and the tenure of land and sea in Palau. PhD. Dissertation in Anthropology. Tucson, AR: University of Arizona,

National Environmental Protection Council (NEPC) 2019. State of the Environment Report. Republic of Palau. p.99.

[Online]: http://climatechange.palaugov.pw/sites/default/files/documents/2019-Palau-StateOfEnvironment_lowresolution%20%282%29.pdf

Office of Technology Assessment (OTA). 1987. Integrated renewable resource management for U.S. insular areas. Congress of the United States, (Washington, D. C.)

Office of Environmental Response and Coordination (OERC) 2008. Pacific Adaptation to Climate Change Palau Project Proposal. p.36. [Online]:https://www.sprep.org/att/publication/000674_Palau_NationalPACCReport_Final.pdf