# Satoyama Agricultural Development Tool (SADT): A Method for Evaluating and Guiding Indigenous and Rural Communities to Achieve Sustainable Development

**Devon Dublin[*] and Noriyuki Tanaka[**]**

## Abstract

In 2010, the International Partnership for Satoyama Initiative (IPSI) was launched to revitalize the concept of Satoyama in Japan and promote it internationally. However, no mechanism exists in which it can be thoroughly evaluated. Due to this lack, the Satoyama Agriculture Development Tool (SADT) was created based on the five perspectives identified by the IPSI. The SADT allows communities to be classified as Satoyama Like (SL), In Transition (IT), or Non Compliant (NC). The utility of the SADT was tested in the Ogasawara Islands and Samani town in Japan as a precursor for its use in other parts of the world. The Ogasawara Islands prior to 1968 was evaluated as an area that is "Non Compliant" and as "Satoyama Like" in 2014. Samani Town was evaluated as "In Transition". Results demonstrated that the tool could serve as a guide for determining the priority measures to achieve sustainability as was demonstrated in case studies undertaken in the Ogasawara Islands and Samani town of Japan. The results indicate that the SADT can act as an orientation for professionals to determine the shortcomings present; the correct approach needed to assist the community; and serve as a guide for determining the priority measures to achieve sustainable

* Conservation International Japan 6-7-22-451, Shinjuku, Tokyo, 160-0022, JAPAN.
E-mail: devdub@yahoo.com

** Sanriku Fisheries Research Center, 3-75-1 Heita, Kamaishi, Iwate, 026-0001, JAPAN.
E-mail: norit22999@hotmail.com

development. Results also prove that it could be suitably designed for future use by members of the indigenous communities.

**Keywords:** Agriculture, Sustainable Development, Satoyama, Indigenous People, Ogasawara Islands, Samani

# เครื่องมือในการพัฒนาการเกษตรตามแนวคิดแบบซาโตยามะ (SADT): วิธีที่ใช้ในการประเมินและแนวทางที่จะทำให้ชุมชนของชนพื้นเมืองและชุมชนของชาวชนบทประสบความสำเร็จในการพัฒนาอย่างยั่งยืน

**เดวอน ดับลิน* และ โนริยูคิ ทานากะ****


## บทคัดย่อ

ในปี ค.ศ. 2010 หน่วยงานความร่วมมือระหว่างประเทศเพื่อริเริ่มแนวคิดแบบซาโตยามะ ได้ถูกก่อตั้งขึ้นเพื่อฟื้นฟูแนวคิดในการพัฒนาการเกษตรตามแบบซาโตยามะ (Satoyama) ในประเทศญี่ปุ่น อีกทั้งส่งเสริมแนวความคิดดังกล่าวให้เป็นที่รู้จักในระดับนานาชาติ อย่างไรก็ตาม ในปัจจุบันยังไม่มีวิธีการใด ๆ ที่ใช้ในการประเมินสภาพของชุมชนตามแนวคิดแบบซาโตยามะได้อย่างละเอียดและครบถ้วน จากข้อจำกัดดังกล่าวเครื่องมือในการพัฒนาการเกษตรตามแนวคิดแบบซาโตยามะ (SADT) จึงถูกพัฒนาขึ้นบนพื้นฐานของวิสัยทัศน์ทั้ง 5 ด้านที่หน่วยงานความร่วมมือระหว่างประเทศเพื่อริเริ่มแนวคิดแบบซาโตยามะได้กำหนดขึ้น เครื่องมือในการพัฒนาการเกษตรตามแนวคิดแบบซาโตยามะได้จำแนกประเภทของชุมชนในลักษณะต่าง ๆ คือ ชุมชนที่มีสภาพสอดคล้องตามแนวคิดแบบซาโตยามะ ชุมชนที่อยู่ในช่วงของการเปลี่ยนผ่าน และชุมชนที่ไม่มีสภาพสอดคล้องตามแนวคิดแบบซาโตยามะ เครื่องมือได้ถูกนำมาทดสอบกับชุมชนบนเกาะโอกาซาวาระ (Ogasawara) และชุมชนในเมืองซามานิ (Samani) ในประเทศญี่ปุ่น โดยชุมชนดังกล่าวจะใช้เป็นต้นแบบในการนำเครื่องมือมาใช้กับชุมชนอื่น ๆ ทั่วโลก ชุมชนบนเกาะโอกาซาวาระในช่วงก่อนปี ค.ศ. 1968 ถูกประเมินให้เป็นชุมชนที่ไม่มีสภาพสอดคล้องตามแนวคิดแบบซาโตยามะ แต่สามารถเปลี่ยนเป็นชุมชนที่มีสภาพสอดคล้องตามแนวคิดแบบซาโตยามะได้ในปี ค.ศ. 2014 ส่วนชุมชนในเมืองซามานิถูกประเมินให้เป็นชุมชนที่อยู่ในช่วงของการเปลี่ยนผ่าน ผลการทดลองแสดงให้เห็นว่าเครื่องมือ



* Conservation International Japan 6-7-22-451, Shinjuku, Tokyo, 160-0022, JAPAN.
E-mail: devdub@yahoo.com

** Sanriku Fisheries Research Center, 3-75-1 Heita, Kamaishi, Iwate, 026-0001, JAPAN.
E-mail: norit22999@hotmail.com

สามารถใช้เป็นแนวทางในการระบุมาตรการที่สำคัญในการนำไปสู่ความยั่งยืนของชุมชนดังที่ได้แสดงให้เห็นจากกรณีศึกษาที่เกิดขึ้นกับชุมชนบนเกาะโอกาซาวาระและชุมชนในเมืองซามานิในประเทศญี่ปุ่น ผลการทดลองสามารถบ่งชี้ได้ว่าเครื่องมือสามารถใช้กำหนดทิศทางให้กับผู้เชี่ยวชาญในการตรวจสอบเพื่อหาข้อบกพร่องของชุมชน วิธีการแก้ไขข้อบกพร่องที่จำเป็นในการช่วยเหลือชุมชน ตลอดจนเป็นแนวทางในการระบุมาตรการสำคัญในการนำไปสู่การพัฒนาชุมชนอย่างยั่งยืน นอกจากนี้ ผลการทดลองยังพิสูจน์ให้เห็นว่าเครื่องมือดังกล่าวสามารถออกแบบมาให้มีความเหมาะสมในการใช้งานในอนาคตได้โดยสมาชิกภายในชุมชนของชนพื้นเมือง

**คำสำคัญ:** การเกษตร การพัฒนาอย่างยั่งยืน ซาโตยามะ ชนพื้นเมือง เกาะโอกาซาวาระ ซามานิ

## Introduction

Satoyama is a Japanese term for landscapes that comprise a mosaic of different ecosystems which include forests, agricultural lands, grassland irrigation ponds and human settlements aimed at promoting viable human nature interaction (Duraiappah and Nakamura, 2012).

It began as a result of a combination of factors with the four aspects that were predominant being remoteness, limited natural resources, natural disasters, and a difficult life. The Satoyama culture evolved over time as a direct response to the factors that were responsible for its origin. These were self sufficiency, sustainable use of natural resources, resilience, and camaraderie (Figure 1). As a result of the remoteness of the area, residents were forced to be self-sufficient and live primarily based on what was available at their disposal. Their diet, building material, fuel, and medicines therefore, were exclusively obtained and produced locally. The needs of the citizens resulted in a dominant suit of desired species relating to the ecosystem functions and ecosystem services, thus giving rise to the Satoyama landscape processes. This was achieved by living sustainably and productively with their natural surroundings. Therefore, these factors together determined the intensity and direction of the human-nature interaction in the community and hence the shape and intensity of the Satoyama process. The way in which the planning and management machinery is organized and implemented, the available resources, the political will and the existing cultural values together, in turn, influence the impact that the Satoyama process has on the environment. That is, these factors have implications both for the environment's capacity to support human life and serve other human needs, as well as the sustainability of its ecological support systems (Dublin and Tanaka, 2014a to 2014b are listed based on alphabetic order of the title in the reference section and not based on it's appearance in the text.).

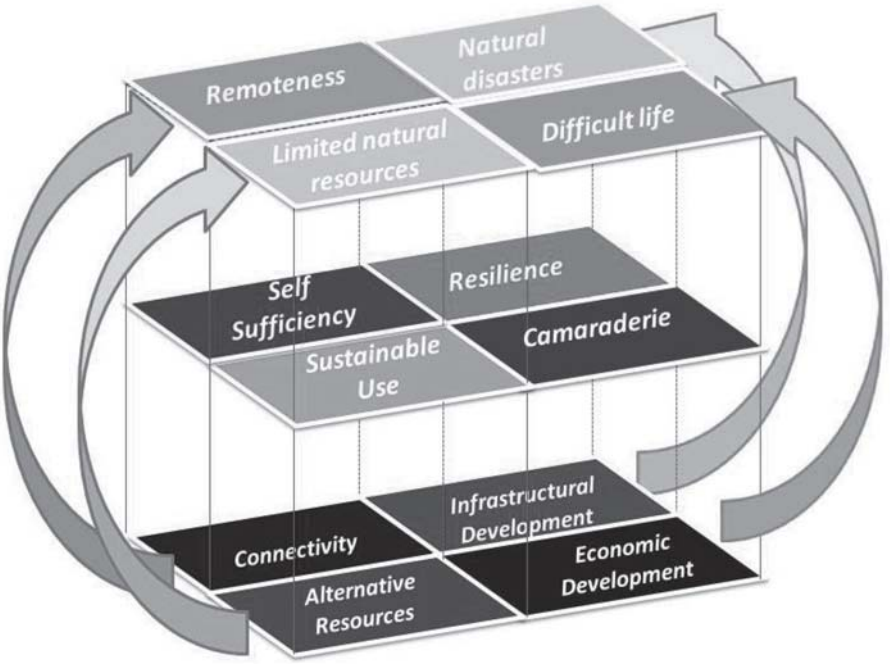


**Figure 1: Relationship between the Origin, Evolution, and Problems Affecting Satoyama (This figure was created by the authors)**

The factors that affected the continuity of Satoyama reversed the predisposing conditions cited as the contributors of the origin and evolution of Satoyama. Problems related to the Satoyama culture occurred as a result of resolving the issues which gave rise to it in the first place. These are connectivity, alternative resources, infrastructural development, and economic development (Figure 1). These factors also intensified the effect of each other in various ways (Dublin and Tanaka, 2014).

Due to large-scale developments such as residential areas and resorts, natural environments disappeared as the lands were developed. Until that happened, people took for granted the presence of Satoyama and did not fully appreciate their worth. It was only after these landscapes were lost as a result of development that people began to understand their value for the first time. Satoyama evoked feelings of nostalgia and entered into people's consciousness which resulted in a longing by society to have natural environments in close proximity (Takeuchi, 2011).

The Satoyama Initiative has been successfully launched under the auspices of the Japanese government to revitalize it locally and promote it internationally. In Japan, measures taken include the 2004 revision of Japan's Cultural Properties Law, based on which Satoyama can be designated as a cultural property, and the 2008 implementation of the Satoyama Initiative, which aims to promote biodiversity and the sustainable use of Satoyama in Japan and beyond. As a result of such measures, public awareness of the social, ecological, and cultural importance of Satoyama has increased, and the concept of Satoyama as the socio-ecological production landscapes of Japan has taken root (Fukamachi and Morimoto, 2011).

Indigenous communities the world over have normally been located in isolated areas primarily due to the historic quest to escape colonization and exploitation. In addition, they have always had to live off of the natural environment in their surroundings and therefore had to do so sustainably to maintain their livelihood. They are usually more susceptible to natural disasters than the rest of the population due to their closeness to nature and are hardly ever the affluent citizens of any nation. Therefore, because the factors that gave rise to the Satoyama culture are realities of indigenous communities in general, further strengthens our assertion that the Satoyama concept could be utilized to develop a suitable management model for their sustainable development.

Satoyama is nonexistent without agriculture and as such any developmental model based on Satoyama should be an agricultural based developmental one. Therefore this inseparable connection between Satoyama and agriculture should be explored in a structured and scientific way (Dublin and Tanaka, 2014). This has been recognized by the Food and Agriculture Organization (FAO) when the Satoyamas of Noto were recognized as a Globally Important Agricultural Heritage Site (GIAHS) in 2011. Satoyama agriculture development is capable of being evaluated because the necessary indicators are those that are readily available and can be done using a system of survey analysis (Mekush, 2012). This should include the management of landscape ecology, conservation of natural heritage, and the connection and integration of all components rather than treating them separately (Adams, 2003).

The Satoyama Index (SI) developed by Kadoya and Washitani (2011) which is the only known attempt to evaluate Satoyama thus far, is deficient,

because while it may determine the levels of biodiversity present in a given area, it in no way guarantees that it directly reflects economic, social, and cultural sustainability as well. It is against this background that the SADT was developed and this paper seeks to outline its mechanism and utility.

## Materials and Methods

The five perspectives as advanced by the IPSI in Figure 2 were utilized and measured based on the criteria proposed by Dublin and Tanaka (2014b). Harmonized questions were developed to which responses were based on a Likert scale from one to five with one being the lowest and five being the highest or vice versa, namely, Strongly Agree; Agree; Neither Agree nor Disagree; Disagree; Strongly Disagree (Dublin and Tanaka, 2014c).

Total *Satoyama* Points (TSP) were calculated by the following equation:

$$TSP = \frac{\left(SP_{O1}/SP_{P1}\right)+\left(SP_{O2}/SP_{P2}\right)+\left(SP_{O3}/SP_{P3}\right)+\left(SP_{O4}/SP_{P4}\right)+\left(SP_{O5}/SP_{P5}\right)}{nP}$$

where: $SP_{O1}$ … $SP_{O5}$: *Satoyama* points obtained for Perspectives 1…5
$SP_{P1}$ … $SP_{P5}$: *Satoyama* points possible for Perspectives 1…5
nP: the number of perspectives

The individual perspectives were evaluated as high, medium and low if 80-100%, 60-79% and 0-59% respectively of the total possible score was achieved. An average of the percentage obtained for the 5 perspectives was then taken to obtain the total **Satoyama** points. The community was then determined to be either **Satoyama** like, in transition or non compliant if the total **Satoyama** points fell within the ranges of 0.8 - 1, 0.6 - 0.79 and 0 - 0.59 respectively (Dublin and Tanaka, 2014b).

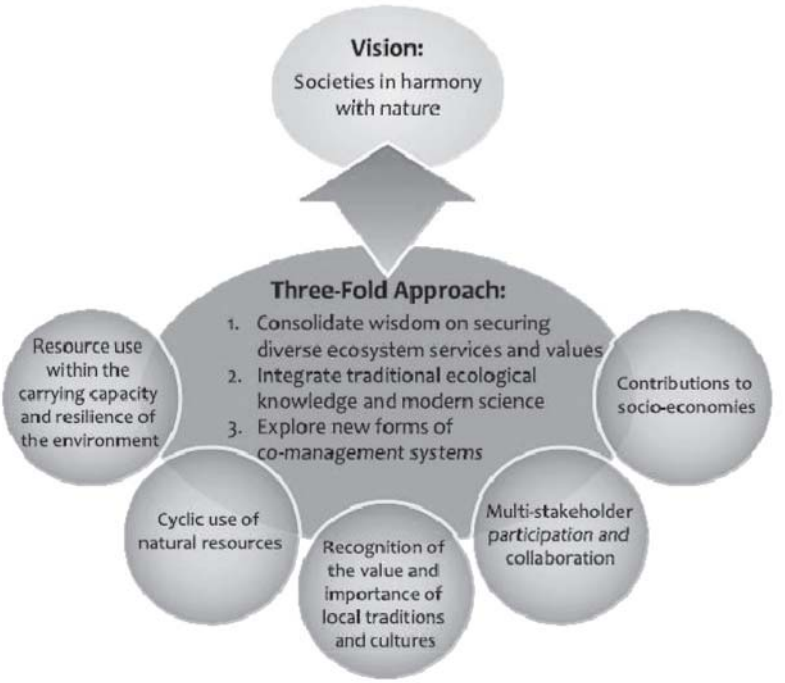


**Figure 2: The Five Elements that Build and Constitute Satoyama (IPSI 2010)**

To test the effectiveness of the tool, the Ogasawara Islands because of the uniqueness of the historical transition, and Samani Town because of the high percentage of inhabitants of Ainu (indigenous people of Northern Japan) decent in this location were chosen to be evaluated. Data for the evaluation of the Ogasawara islands was obtained from officially published data, while for Samani, direct observations, interaction with the local people and queries from local offices were done. The information gathered was then used to answer the questions in the tool and arrive at the Satoyama evaluation.

## Location and Profile

The Ogasawara Islands are located in the northwestern Pacific Ocean roughly 1,000 km south of the main Japanese Archipelago. They cover approximately 63.6 $km^2$ of land 15.8 $km^2$ of sea giving a total of 79.4 $km^2$. The population is approximately 3000. The Ogasawara islands consist of four island groups, namely Mukojima, Chichijima, Hahajima, Kazan, and several isolated islands (Figure 3). They are unique because they are the only subaerial place

in the world that records an early stage of the formation of an oceanic island in response to the beginning of subduction of an oceanic plate (Pacific plate). The islands are almost 10 times older than Hawaii or the Galapagos Islands, thus Earth's history from about 48 million years ago can be observed there.

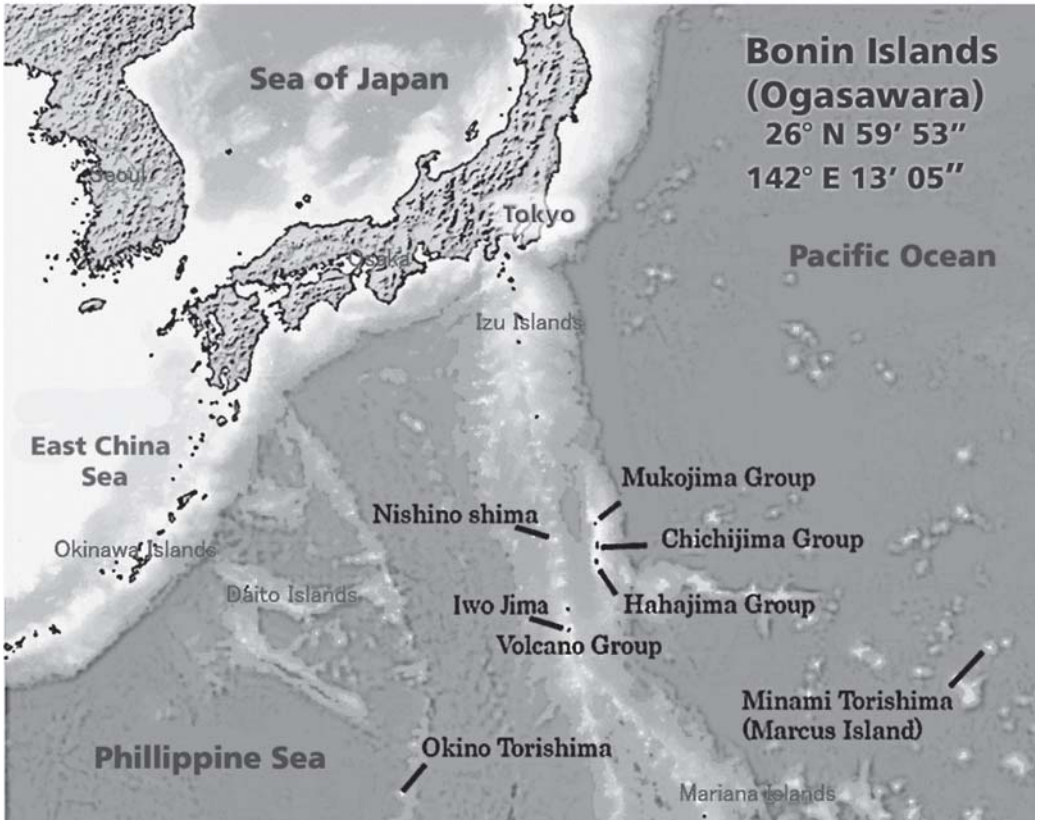


**Figure 3: The Ogasawara Islands (Eve de Alberich, 2007)**

Samani town is located in the Hidaka Subprefectural Bureau of Hokkaido. The town's name is said to come from the Ainu term *sanmauni*, which means "place of withering trees" (Mt. Apoi Geopark Promotion Council, 2013). It is part of the Hidaka region and is found between Urakawa and Erimo (Figure 4). There is apparently another meaning "place of the otter" which suggests that otters may have populated the area in the past and then became extinct. It has an area of 364.33 km$^2$ and a current population of 5,029 as of March 31$^{st}$, 2012 (Japan Autonomous Academy, 2012).


**Figure 4: Location of Samani Town (Hokkaido Government, 2013)**

## Results and Discussions

The Ogasawara Islands prior to 1968 was evaluated as an area that is "Non Compliant" and as "Satoyama Like" in 2014. Samani Town was evaluated as "In Transition". Results are shown in Table 1 and Figure 5. The rationale surrounding the evaluation received is developed hereafter under each of the five categories.

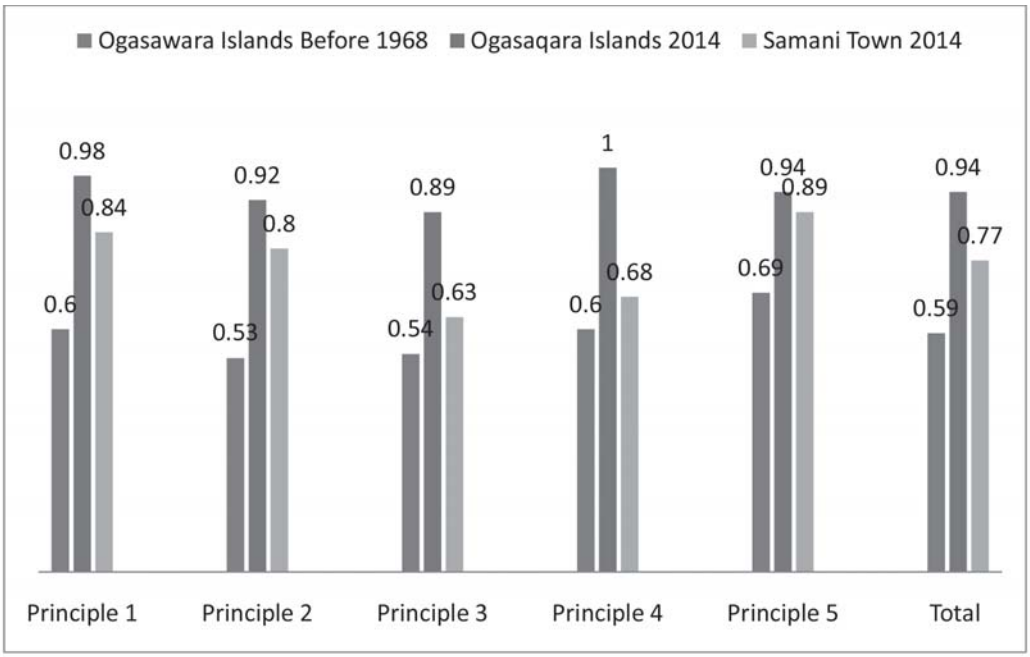


**Figure 5: Results of Satoyama Evaluation of the Ogasawara Islands and Samani Town**

## Cyclic Use of Natural Resources

The Ogasawara Islands were evaluated as Medium and High for the period before 1968 and in 2014 respectively. Land use variation was minimal historically in the Ogasawara Islands largely due to being inhabited by very few persons. However, currently there is a plethora of activities which ranges from fishing, agriculture and forestry. Samani town which received an evaluation of high is very similar to these islands, in that although it is not completely surrounded by water, it possesses an extended coastline which provides a livelihood to most of its inhabitants. Land use is varied and well mapped out by the municipality and land use change can only be realized if and when so decided by the authorities even when such land is owned privately. Land use include agriculture, horse breeding, hunting, and mining of the peridotite rocks that are found in the Apoi Mountains and its surrounding areas.

Biodiversity in the region of the Ogasawara Islands has always been rich, largely due to its isolation. There are many endemic species in the Japanese Ogasawara Islands. However, as Yoshimura and Okochi

(2005) predicted, many of these endemic species became threatened as a result of a reduction of habitats and the introduction of exotic species. The Secretariat of the Scientific Council of Ogasawara armed with the "Ogasawara Islands Management Plan", currently has measures in place to prevent the introduction of any species that are not native to the islands. On the other hand, Samani town is home to several endemic alpine plants and flowers found on the Apoi mountain range in spite of its relatively low height of 810.2 meters (Mt. Apoi Geopark Promotion Council, 2013). In addition, there are a wide variety of birds, butterflies, mammals and snails. The Samani Board of Education publishes brochures for the protection of biodiversity in the town.

**Table 1: Results of *Satoyama* Evaluation of the Ogasawara Islands and Samani**

| Principle | Total Possible Answer Points | Answer Points Obtained | | | Percentage of Answers | | | Rating | | | Final Points Obtained | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OB | OA | ST | OB | OA | ST | OB | OA | ST | OB | OA | ST |
| Cyclic Use of Natural Resources | 45 | 27 | 44 | 38 | 60% | 97.8% | 84.4% | M | H | H | 0.60 | 0.98 | 0.84 |
| Resource Use based on Carrying Capacity and Resilience of Environment | 60 | 32 | 55 | 48 | 53.3% | 91.7% | 80% | L | H | H | 0.53 | 0.92 | 0.8 |
| Recognition of the Importance and Value of Local Cultures and Traditions | 35 | 19 | 31 | 22 | 54.3% | 88.6% | 62.9% | L | H | M | 0.54 | 0.89 | 0.63 |
| Collaborative Management of Natural Resources | 25 | 15 | 25 | 17 | 60% | 100% | 68% | M | H | M | 0.60 | 1 | 0.68 |
| Contribution to Local Socio-Economies | 35 | 24 | 33 | 31 | 68.6% | 94.3% | 88.6% | M | H | H | 0.69 | 0.94 | 0.89 |
| Total | | | | | | | | | | | 0.59 | 0.94 | 0.77 |
| Final Evaluation | | | | | | | | | | | NC | SL | IT |

**Key**: OB – Ogasawara Islands before 1968, OA – Ogasawara Islands in 2014, ST – Samani Town, H – High, L – Low, M – Medium

In almost two centuries of human settlement, the Ogasawara Islands have been subjected to two different waves of development, the first lasting from 1826 to 1945, and the second beginning in1968 and continuing today. With the arrival of the Japanese settlers in 1876, about two to three thousand turtles were removed from the islands to be consumed and albatross soon disappeared after massive slaughter in the quest for their feathers and eggs. This was accompanied by a timber and sugar boom in 1880s. In only a decade, half of the islands' forests disappeared (Guo, 2007). Meanwhile, human activities in Samani began with the Ainu people who had a hunter-gatherer way of life, this was then transformed to a more agriculture oriented type of settlement following the Japanese colonization and subsequent development of what is modern day Hokkaido.

## Resource Use based on Carrying Capacity and Resilience of Environment

Because of the low population in the Ogasawara Islands, carrying capacity was not a cause for concern since only the sustenance of the residence was necessary. However, due to supplying the Japanese market specifically the Tokyo district, this contributed to the overuse of resources and an evaluation of Low before 1968. At present 11.9 ha on Chichijima and 22.7 ha on Hahajima is being farmed (TMG, 2009). Fishing currently targets swordfish, bigeye tuna and other fish that migrate over large areas. There is a Japanese market for lobsters, Japanese Spanish mackerel caught with trolling, and mackerel scads caught with hand-held dip-nets. However, due to organized fishing practices it is evaluated as High. In Samani, the important fisheries products are carefully managed such as kelp and whelks so as to assure sustainable harvesting and was largely the reason for being evaluated as High. Deer is currently causing overgrazing in many areas and during the winter the tree barks are targeted. This is because the number of hunters is inadequate to manage the deer population. Farms are often targeted and huge investments are made for fencing as a result.

## Recognition of the Importance and Value of Local Cultures and Traditions

Five colonizations occurred historically in the Ogasawaras (Conventional, Old, New and New New Islanders, and the 'Shimakko'). Each of these waves of people added in various ways to the cultural heritage.

However, during this time the exact value of the cultural contributions were not quite recognized and thus obtained an evaluation of Medium. However, it now has an evaluation of High due to the flourishing of tourism which is endowed with rich natural resources and a subtropical climate (Ichiki, 2002). Samani continues to be home to a large population of descendents of the Ainu. According to a 1999 census, the Hidaka region in which Samani is found accounts for 37.7% of the Ainu of Hokkaido; the largest in comparison with any other region on the island. This heritage however, is not fully showcased by the town, since tourism is mainly focused on the geological peculiarity of the area and is reflected in its quest to being recognized as a global geopark and as a result obtained an evaluation of Medium.

## Collaborative Management of Natural Resources

Management of the natural resources existed prior to 1968 but was not fully collaborative in nature and was thus evaluated as Medium. However, in June 2002, the 'Committee for Promoting Eco-tourism in Ogasawara' was established and the site is designated and protected as a National Park, Wilderness & Wildlife Protection Area; a Forest Ecosystem Preservation Area; a Nationally Designated Natural Monument and a Nationally Designated Important Bird Area. In addition, an Ecosystem Conservation Action Plan and an Ogasawara Islands Management Plan exist which includes roles for all stakeholders. These aspects contributed to an evaluation on 2014 of High. On the other hand, in Samani, collaborative management of the natural may be implied by the fact that residents generally work together and support the Mt. Apoi Geopark initiatives resulting in an evaluation of Medium. Research reported on by Dublin et al. (2013) produced results that reflect almost completely the feelings and sentiments of the citizens about town development and indicates therefore that the people of Samani are capable of determining what they want for the future, where they want to go and how to get there realizing their own pros and cons without the influence of outsiders.

## Contribution to Local Socio-Economies

Largely due to the low population in the Ogasawara islands, prior to 1968 socio-economic stability was low and therefore obtained an evaluation of Medium. Although challenges exist for the Ogasawara islands largely due to the small population and their remoteness, medical care, communication,

education and disaster preparedness are have improved especially after being included under the jurisdiction of the City of Tokyo and therefore obtained an evaluation of High. In the case of Samani town, the reality is very similar to the average rural community in Japan with rural-urban migration, depopulation, low fertility and aged society Currently Samani only has an average of 20 births annually and 70 deaths per year (Samani Government, 2011). Many vacancies are being filled by persons from the nearby towns of Urakawa and Erimo. Currently many middle-aged persons return to take care of their aged parents and oversee their businesses (Dublin et al., 2013). In spite of these challenges, there continues to be a vibrant economy and the needs of the community are met by the municipality and therefore obtained an evaluation of High.

## Conclusions

The evaluation of the Ogasawara islands demonstrated the practical use of the tool based on published and official data while that of Samani Town illustrates this on the basis of direct observation and investigation. This shows the flexible approach of the tool which can use diverse sources of information, further showing its applicability in parts of the world where credible, official and actualized data may be absent. As was shown in the case of the Ogasawara Islands, it is possible to evaluate progress of a community over time thus demonstrating its utility to make informed decisions. The case of Samani shows that we can streamline a community in conformity with the perspectives of Satoyama providing that the political will, stakeholder participation, and general awareness exists.

While Kadoya and Washitani (2011) designed a Satoyama Index based on biodiversity, our tool provides for a holistic analysis integrating the three pillars of sustainability, that is, environment, social, and economic. This is the first known attempt to do this. We posit that this approach would allow us to evaluate the extent to which the perspectives of Satoyama are met in any given community. This would be diagnostic in nature and would set the stage for the orientation of the systematic and scientific approach that should be employed to advance sustainable agricultural development in the community in question.

The tool is currently available in English, Japanese, Spanish and Thai (Dublin 2013a, b, c, and d). It has been utilized in Gabon, Guyana, Indonesia, Japan, Malaysia and Thailand. Feedback obtained from users of the SADT

so far (n=41) indicates that 90.24% consider it user-friendly; 92.68% found the terms used in the SADT to be familiar and are willing to use and/or modify it for their professional life; 63.41% found the information required to answer the questions easy to acquire indicating that data availability is the most crucial; 85.37% believed that persons who worked in a community for an extended period of time were more capable of using the SADT better (Figure 6). It has been used in conjunction with happiness survey in Malaysia by Suzuki et al. (2015) with significant success further demonstrating its utility in the analysis of communities globally.

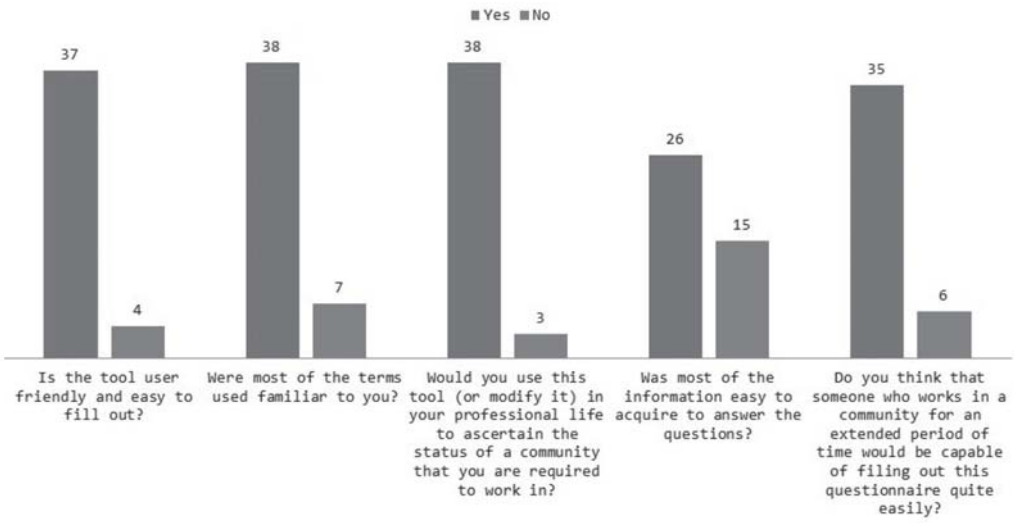


**Figure 6: SADT User Feedback (n=41)**

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