

The *Satoyama* Agricultural Development Tool (SadT): A Model for Sustainable Agriculture Development in Rural and Indigenous Communities

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Abstract

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. The Japanese government is seeking to revitalize it locally and promote it internationally, receiving accreditation as United Nations Educational, Scientific and Cultural Organization (UNESCO) *Satoyama* Initiatives. With the objective of evaluating communities based on the *Satoyama* principle, a method was developed founded on the five perspectives identified by the International Partnership for the *Satoyama* Initiative (IPSI). To facilitate this method, data is utilized from available sources and key informants are selected using the purposive sampling technique. Results obtained allow for communities to be classified as *Satoyama* like, in transition or non compliant. The SADT acts as an orientation for professionals to determine the shortcomings, propose solutions on the basis of the Millennium Development Goals (MDGs), and the correct approach to assist the community in sustainable agricultural development premised on its local culture, belief systems and traditional knowledge. The tool could serve as a guide for determining the priority measures to achieve sustainability and can also be

possibly applied to quantify other qualitative concepts. The SADT has been successfully utilized in Gabon, Guyana, Indonesia, Japan, Malaysia, and Thailand with various degrees of success. Its use thus far proves that it can be applied by individual researchers in collaboration with local village leaders and villagers to facilitate inclusive decision making and development, as well as serve as an orientation for determining progress in projects already in motion.

Key words: Satoyama, agriculture, sustainable development, rural, indigenous

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 (Fig. 1). The agricultural component of *Satoyama* is integral since it provides air quality and climate regulation, water regulation, prevention of soil erosion, organic waste decomposition, among others in a manner distinct to that of forestry. This methodology seeks to evaluate communities on the basis of the *Satoyama* concept thus providing an orientation for professionals to function in any given community.



Fig. 1 Typical *Satoyama* Landscape in Lobesa, Bhutan.

The Japanese government is seeking to revitalize it locally and promote it internationally, receiving accreditation as UNESCO *Satoyama* Initiatives. With the objective of evaluating communities based on the *Satoyama* principle, a method was developed founded on the five perspectives identified by the IPSI (Fig. 2). These perspectives are: Cyclic use of Natural Resources; Resource Use based on Carrying Capacity and Resilience of Environment; Recognition of the Importance and Value of Local Cultures and Traditions; Collaborative Management of Natural Resources; and Contribution to Local Socio-Economies.

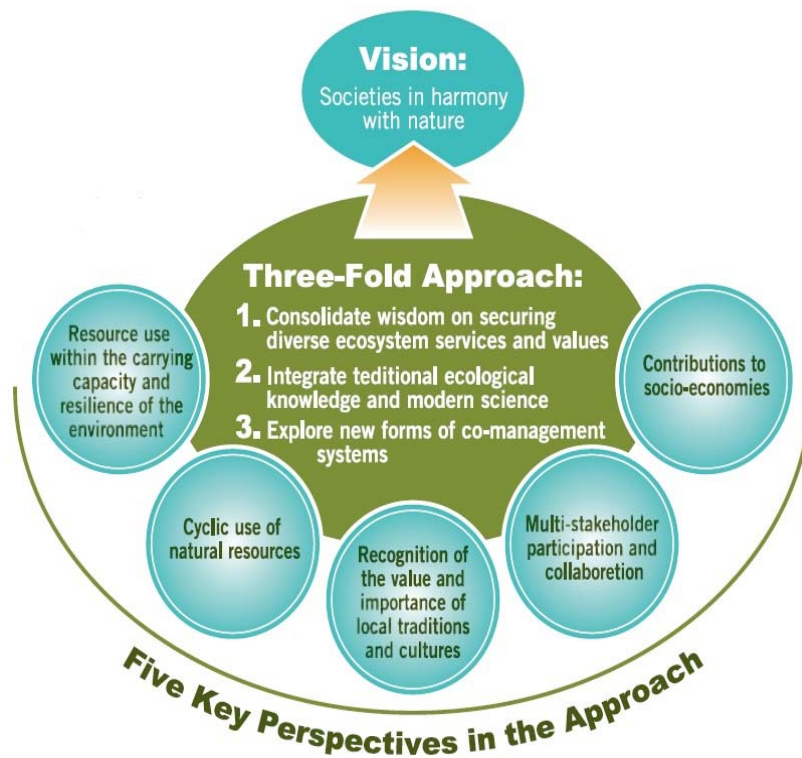


Fig. 2 The five elements that build and constitute *Satoyama* (IPSI, 2010).

Because *Satoyama* is largely agriculturally based, we believe that it is very useful for attaining sustainable development through agriculture especially if the community is mainly dependent on this sector. Agriculture, also called farming or husbandry, is the cultivation of animals, plants, fungi, and other life forms for food,

fiber, biofuel, drugs and other products used to sustain and enhance human life (ILO, 2010).

The SADT was advocated by Dublin and Tanaka (2014a) to estimate the criteria of the five perspectives, which comprises of a questionnaire, a definition of each community classification type and solutions for resolving problems encountered based on the MDGs. To facilitate this method, data is utilized from available sources and key informants are selected using the purposive sampling technique.

International Utility of *Satoyama*

The IPSI has promoted five points as shown in Fig. 2, that are essential for the realization of societies in harmony with nature (IPSI, 2010).

Japan has had fairly good successes in community based management of its resources and this is very notable in fishing villages and farming communities. In addition, the Japanese culture both historical and present day, is one that embraces the necessity of living in harmony and respect of nature which gave rise to the *Satoyama* principle. The Ministry of the Environment of Japan (MOE-J) in collaboration with the United Nations University-Institute of Advanced Studies (UNU-IAS), and co-organized by UNESCO, the United Nations Environment Programme (UNEP), and the Secretariat of the Convention on Biological Diversity (CBD) has resulted in a quest to see this principle globalized and the United Nations recognizing and ratifying this position in the “Paris Declaration” at the Headquarters of the UNESCO in Paris in January 2010.

Notwithstanding, the successful globalization of *Satoyama* is dependent on the perceptions and attitudes of the local residents to their respective environments (Duraiappah and Nakamura, 2012). It is this factor that makes it important to find a way to somehow evaluate and analyze the community in question so as to make the

right decisions and approaches in keeping with the local traditions and customs that are integral to the conservation of nature, the preservation of local knowledge and the sustainable development of the community in a holistic way.

Indigenous people largely settled in specific areas globally where they built a life that was unique to the geographic location, influenced by climatic conditions, flora and fauna, and access to natural resources resulting in a bond to the locality in question. They lived dependent on the fruits of nature such as fishing, hunting and gathering edible plants. They were migratory, leaving a location when the area is no longer sustainable, moving to another locality and continuing that trend until oftentimes returning to the earlier areas after rejuvenation. This way of life is no longer sustainable due to political decisions, the exploitation of natural resources, urbanization, modernization, and climate change among others (Food and Agriculture Organization [FAO], 2013). Thus, sustainability for indigenous communities the world over is heavily dependent on successful and sustainable agriculture.

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, 2014b). This has been recognized by the FAO when the *Satoyamas* of Noto were recognized as a Globally Important Agricultural Heritage Site (GIAHS) in 2011.

Basis of the SADT

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).

To do this, the very five perspectives as advanced by the IPSI in Fig. 2 were utilized and measured based on the criteria shown in Table 1.

To estimate the criteria mentioned, 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. To facilitate this procedure, a workbook was created using Microsoft Excel 2007.

Total Satoyama Points (TSP) can be calculated by the following equation:

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

where: $SP_{O1} \dots SP_{O5}$ = Satoyama points obtained for Perspectives 1...5

$SP_{P1} \dots SP_{P5}$ = 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.

Table 1: Evaluation of *Satoyama* based Agriculture

Perspectives	Criteria	Variables	Sub-Variables
Cyclic use of Natural Resources	Land Use Variation		
	Biodiversity	Microbial	
		Flora and Fauna	
	Human Agricultural Activities	Crops	
		Livestock	
Eutrophication			
Resource Use based on Carrying Capacity and Resilience of Environment	Land Size	Threats of Further Reduction	Anthropogenic
			Natural
	Resources	Water	
		Soil	
		Forestry	
	Environment		
Recognition of the Importance and Value of Local Cultures and Traditions	Heritage	Tangible	
		Intangible	
	Tourism	Visitors	
		Impacts	
Collaborative Management of Natural Resources	Organization		
	Decision Making Process		
	Conflict Resolution		
Contribution to Local Socio-Economies	Social	Health	
		Cost of Living	
		Public safety	
		Pathology	
		Education Level	
	Economic	Self-sufficiency	
		Employment Levels	

Data Source

The success of the tool is dependent on the data available to the person utilizing it. The tool is flexible since it allows for the use of any and all data available at the disposal of the user to arrive at a response that he/she feels comfortable with. For this purpose, official data from government sources can be utilized, Non-governmental Organizations (NGOs), as well as from the local people.

A good example can be found in India where the government publishes data based on the national census conducted and managed by the Office of the Registrar General and Census Commissioner of India under Ministry of Home Affairs. It is the largest single source of a variety of statistical information on different characteristics of the people of India. The census is conducted every 10 years and began since 1872. Scholars and researchers benefit tremendously from this fascinating source of data. It is possible to obtain a wide variety of data on any village in India which can assist anyone that wishes to evaluate the community (The Registrar General and Census Commissioner India, 2011).

It is necessary in most cases to rely on key informants from the community to arrive at a suitable answer to certain questions. It is recommended that purposive sampling be utilized in collaboration with local government and/or village leaders since this allows for the selection of ideal persons who are most capable of supplying the required information. This strengthens the methodology since the data obtained may be more accurate when coming from those perceived to be the most competent in the field in question (Tongco, 2007).

Community Evaluation

The communities after being categorized into one of the three categories (Non Compliant, In Transition, or *Satoyama* Like) are then defined on the basis of the Millennium Assessment framework which places human wellbeing at the center of its casual analysis and captures the dynamic relationship between ecosystem services and the different constituents of human wellbeing as shown in Table 2 (Millennium Ecosystem Assessment [MA], 2005).

Solutions and Recommendations

The way forward for the respective communities is dependent on the perspectives in which low points would have been obtained. The responses are multifaceted and adopted from the MA (2005). They include technological, legal, cognitive, social and behavioral, and economic aspects and were tried and tested in cases of *Satoyama* restoration in Japan as well as measures implemented to prevent *Satoyama* deterioration (Takahashi *et al.*, 2012). Details are outlined in Table 3. The extent of the impact of the responses are dependent on the players involved which can range from national governments, municipalities, international organizations, NGOs, business entities, universities, etc and can be on an international, national, regional, prefectural, municipal, local and/or individual level.

Table 2: Definition of Categories

a) Ecosystem Services

	Indicators	Categories		
		Non Compliant	In Transition	Satoyama Like
Provisioning	Crop yields	Low	Average	High
	Production yields (milk, meat, eggs, etc.)	Low	Average	High
	Marine catches	Low	Average	High
	Forestry production index	Low	Average	High
	Wildlife	Low	Average	High
	Grazing pasture	Inadequate	Average	Adequate
	Edible plants gathered	Low	Average	High
Regulating	Air quality	Low	Average	High
	Water quality	Low	Average	High
	Flood control	Low	Average	High
	Soil erosion	High	Average	Low
	Soil degradation	High	Average	Low
	Maintenance of keystone species	Low	Average	High
	Pest control	Low	Average	High
	Chemical fertilizer use	High	Average	Low
	Pesticide use	High	Average	Low
	Land use variation	Low	Average	High
	Soil contamination	High	Average	Low
	Waste management	Inadequate	Average	Adequate
	Incidence of abandoned agricultural land	High	Average	Low
	Incidence of disease	High	Average	Low
Cultural	No. of sacred groves and establishments	Low	Average	High
	No. and types of festivals, rituals and/or ceremonies	Low	Average	High
	No. of important landscapes and/or archeological sites	Low	Average	High
	Levels of environmental education	Low	Average	High
	Levels of green tourism	Low	Average	High
	No. of recognized local art, craft, objects, foods, etc.	Low	Average	High
	Production levels of recognized local art, craft, objects, foods, etc.	Low	Average	High
	No. of sacred plants	Low	Average	High
Supporting	Land cover	Low	Average	High
	Vegetation cover	Low	Average	High
	Primary production	Low	Average	High
	Eutrophication	High	Average	Low
	Incidences of modification to natural waterways	High	Average	Low

b) Human Well-being

	Indicators	Categories		
		Non Compliant	In Transition	Satoyama Like
Security	Personal safety	Low	Average	High
	Resource access	Low	Average	High
	Security from disasters	Low	Average	High
Basic Materials	Livelihoods	Insufficient	Average	Sufficient
	Nutritious food	Inadequate	Average	Adequate
	Shelter	Inadequate	Average	Adequate
	Access to goods	Inadequate	Average	Adequate
Health	Physical strength	Low	Average	High
	Feeling well	Low	Average	High
	Access to clean air	Inadequate	Average	Adequate
	Access to clean water	Inadequate	Average	Adequate
Social Relations	Social cohesion	Low	Average	High
	Mutual respect	Low	Average	High
	Ability to help others	Low	Average	High
Freedom of choice and action	Opportunity to achieve what an individual values doing and being	Low	Average	High

Table 3: Recommended *Modus Operandi*

a) Cyclic Use of Natural Resources

<i>Technological responses</i>	Recovery of ecosystem services by regeneration and recovery of natural environment
	Introduction of biopesticides and biological pest control
	Introduction of natural fertilizers
<i>Legal responses</i>	Enact rules to designate areas within the community for specific land use based on its suitability
<i>Cognitive responses</i>	Utilization of traditional knowledge to increase use of various resources in the environment
	Knowledge acquisition as it relates to environmentally friendly agricultural practices
<i>Social and Behavioral Responses</i>	Public education and awareness regarding the dangers of chemical fertilizers and pesticides
	Public education and awareness regarding the importance of keystone species
<i>Economic Responses</i>	Eco-labeling to encourage more favorable agricultural practices and increase profits
	Relocation payment to facilitate proper zoning and land use

b) Resource Use based on Carrying Capacity and Resilience of Environment

<i>Technological responses</i>	Introduction of crops and animals with higher yield and productivity
<i>Legal responses</i>	Facilitate legal demarcation of the community with customary rights
<i>Cognitive responses</i>	Knowledge acquisition as it relates to disaster preparedness and risk management
<i>Social and Behavioral Responses</i>	Public education and awareness regarding waste disposal
	Public education and awareness regarding the importance of forest and tree species conservation
	Public education and awareness regarding pollution
<i>Economic Responses</i>	Eco-labeling to encourage more sustainable fishing and hunting practices

c) Recognition of the Importance and Value of Local Cultures and Traditions

<i>Technological responses</i>	Restoration and rehabilitation of degraded cultural sites
	Conservation of heritage sites
	Reuse of neglected sites
	Inventorying of local cultural heritage
<i>Legal responses</i>	Customary laws that recognize the cultural importance of specific sites
<i>Cognitive responses</i>	Resuscitation of traditional and historical knowledge that might have been forgotten or ignored by younger generation
	Capacity building
<i>Social and Behavioral Responses</i>	Public education and awareness about the cultural value of specific objects and sites
	Empowerment women and youths who are crucial in the preservation of culture
<i>Economic Responses</i>	Green tourism which increases income while protecting the environment

d) Collaborative Management of Natural Resources

<i>Technological responses</i>	Sustainable use of natural resources
	Energy efficiency improvement
	Adequate use of by-products derived from exploitation of natural resources
<i>Legal responses</i>	Enactment of laws that protects the rights of community members
	Prior and informed consent in relation to the exploitation of resources within the community
<i>Cognitive responses</i>	Knowledge acquisition on the roles and rights of community members and how their voices and opinions could be heard
<i>Social and Behavioral Responses</i>	Public education and awareness or human rights and entitlements
	Empowerment of women, youths and any minority groups in the community
<i>Economic Responses</i>	Incentive based interventions for environmentally friendly exploitation of natural resources

e) Contribution to Local Socio-Economies

<i>Technological responses</i>	Increasing crop yields to make the community more self sufficient in food supply
<i>Legal responses</i>	Compulsory early education
<i>Cognitive responses</i>	Utilization of traditional knowledge in medicinal plants and local remedies
<i>Social and Behavioral Responses</i>	Population policies (Family planning)
	Public education and awareness on health, nutrition and hygiene
	Public education and awareness on substance abuse
<i>Economic Responses</i>	Incentive based interventions for the employment of women, youths and minority groups
	Eco-labeling of natural resources obtained sustainably and in an eco-friendly manner

Technological Responses

Universities and Research institutes the world over are dedicating significant resources to the promotion of sustainable human-nature interaction and conservation.

In Japan, public projects aimed at regeneration of ecosystems such as afforestation have been carried out successfully based on the Law for the Promotion of Nature Restoration. Non Profit Organizations (NPOs) usually spearhead these initiatives in collaboration with residents and individuals (Awaji *et al.*, 2006).

Legal Responses

Internationally, the United Nations Convention of the law of the Sea (UNCLOS) facilitates the protection and conservation of the marine environment, the Ramsar Convention promotes of World cultural and Natural Heritage, while the CBD promotes the protection of biodiversity. Nations and more local levels can fashion their legal policies on these international agreements (Isozaki, 2000).

Several laws were enacted and/or revised to reflect the spirit human-nature interaction and the protection of *Satoyama-Satoumi* in Japan (Oikawa, 2010). These include the River Act (revised 1997), the Coast Act (revised 1999), the Basic Law on Food, Agriculture and Rural Areas (enacted 1999), the Basic law for Forest and Forestry (revised 2001), the Fisheries Basic Act (enacted 2001), the Land Improvement Act (revised 2001), the Forest Law (revised 2004), and the Law for Protection of Cultural Properties (revised 2004).

Cognitive Responses

In this regard, the importance of the media cannot be underscored. In recent times, due to climate change, global warming, overfishing and other such topics being publicly debated, the international and local media is focusing more attention on conservation issues and the consequences of human-nature interactions.

In Japan, the Ministry of Environment has launched an aggressive campaign to share information with the public. The Kanazawa University has started a wide variety of programs to conserve *Satoyama* areas through public education and sensitization in the Hokuriku region. Because of the fact that *Satoyamas* are utilized in a shared manner as “commons”, Takeuchi (2001) proposed public regional management entities to make people driven conservation a reality.

Social and Behavioral Responses

Internationally, organizations such as Conservation International (CI) and World Wildlife Fund (WWF) play an important role in creating awareness of the importance of nature conservation, thus shaping and improving the social behavior of citizens. Multi and Transnational companies such as Coca Cola also contribute to this aspect through their Corporate Social Responsibility (CSR) programs.

In Japan, there are several initiatives of note that successfully promote the conservation of *Satoyama* areas through education and awareness programs such as the Satoyama Initiative of the United Nations University (UNU) and the Chiba Prefecture Biodiversity Strategy.

Economic Responses

Internationally there has been an attempt to integrate principles of human-nature interaction and conservation issues into the world trade scene. These include the Marine Stewardship Council (MSC) and the Forest Stewardship Council (FSC). Japan has mirrored these locally with the Marine Eco-Label (MEL) and the Sustainable Green Ecosystem Council (SGEC) respectively.

Japan has effectively developed interesting and sustainable ways to maintain *Satoyama* areas. Electric companies support these areas by purchasing biomass energy based on thinning woods of *Satoyama*. This contributes to the maintenance and conservation of secondary forests. In addition, urban areas make payments to *Satoyama* areas for their work in maintaining and preserving secondary nature and cultural services of *Satoyama* (Yamaji, 2006). Another example is where communities located downstream makes payments to those located uphill for maintaining the integrity of the water source.

Applications

The tool is currently available in English, Japanese, Spanish and Thai. It has been utilized in Gabon, Guyana, Indonesia, Japan, and Malaysia by independent researchers where a statistical comparison was conducted among the villages studied using the five scores obtained for the perspectives and the ANOVA test was applied and were found to be statistically different ($p=0.0209$). This indicates that while the villages

may have obtained similar ratings in a general sense, their weaknesses and strengths differ in relation to the perspectives under which they were evaluated. It further illustrates the need for developing strategies that is directly relevant to the community in question since there is no “one size fit all” strategy.

In Thailand, officers and villagers utilized the tool to evaluate the communities in which they work and dwell respectively. A striking similarity was found between evaluations conducted by both villagers and officers of the villages studied indicating that there exists a common understanding between stakeholders in relation to the problems, needs and solutions that needs to be considered for the continued sustainable development of the respective villages.

Results obtained allow for communities to be classified as *Satoyama* like, in transition, or non compliant, and has demonstrated reliability, feasibility and utility in decision making. This acts as an orientation for professionals to determine the shortcomings and the correct approach to assist the community in sustainable agricultural development premised on its local culture and characteristics. The tool could serve as a guide for determining the priority measures to achieve sustainability and can also be possibly applied to quantify other qualitative concepts.

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