



Community-based rapid biodiversity assessment: A preliminary study identifying potential natural resources in Kota Agung Utara Social Forestry, Tanggamus

Elly Lestari Rustiati^{1*}, I Gede Swibawa³, Jani Master¹, Alvin Wiwiet Susanto², Rendi Hasarudin⁴, Joko Suprianto⁴, Supriyadi⁴, Edi⁴, Tugino⁴, Andi Aryandinata⁴, Dian Neli Pratiwi², Indra Kurniawan⁵, Okta Saputra⁵, Intan Diani Fardinatri⁵, Mariman⁵

¹ Department of Biology, Faculty of Mathematics and Natural Sciences, University of Lampung, Lampung 35141, Indonesia

² Akar Lestari Indonesia

³ Department of Plant Protection, Faculty of Agriculture, University of Lampung, Lampung 35141, Indonesia

⁴ Gapoktanhut Lestari Sejahtera

⁵ Rainforest Alliance

*Corresponding author

E-mail address: ely_jazdzyk@yahoo.com (Elly Lestari Rustiati)

Peer review under responsibility of Biology Department Sriwijaya University

Abstract

Community-based rapid biodiversity assessment has been done initially with Gapoktanhut Lestari Sejahtera, a group of coffee farmers practises social forestry in protected forest, Sedayu, Semaka, Tanggamus, under supervision of KPH Kotaagung Utara, Tanggamus. Its aim is to identify potential natural resources in Kotaagung Utara protected forest, Tanggamus, under Kaidenren Nature Conservation Fund, in collaboration with University of Lampung and Rainforest Alliance program. Direct survey and observation were done, kobotoolbox was applied to collect the biodiversity information, the direct and indirect data of plants, animals as well as landscapes. Of 480 data input has been done by transect line from November, 2021 to February, 2022 covering 15 observed areas. The data consists of direct and indirect data of plants, animals as well as landscapes. The finding done is by local names included plants (n=78) mostly understory plant species, orchids, and ferns, small animals (n=40) include amphibians, reptiles, birds, and arthropods, indirect signs (n=11) of food remains, footprints, voices, scraps, wallowing ponds, scratches, nests, insects body remains, eggs and animals' trail, some fungi, and landscapes. The findings shows that local community is potential citizen research resources, supporting social forestry practice and the initial building of Kota Agung Utara Forest Management Unit database

Keywords: Rapid biodiversity assessment, Gapoktanhut Lestari Sejahtera, Kotaagung, Tanggamus

Received: February 03, 2023, Accepted: July 21, 2023

1. Introduction

An area that is important for biodiversity conservation, can provide significant benefits or ecosystem services to humans. Changing the designation of this area can therefore affect the functionality and distribution of the ecosystem [1]. The role of ecosystems in supporting human welfare is increasingly recognized both in terms of conservation and development. Conservation efforts toward an ecosystem that can provide resources for humans

depend on the availability, distribution, and location for which data are still limited [2].

Community/social forestry is a form of restoring degraded forests [3]. While practicing agroforestry, supporting the existence of its protected area including its biodiversity is crucial. Understanding and sharing similar perceptions on the importance of human beings and biodiversity mutual interaction are needed for its sustainability [4]. Therefore, the involvement of the farmer community is one of the success pillars.

Tanggamus, Lampung is one of the largest Robusta coffee-producing areas in Indonesia. More than 50% of the residents of Tanggamus have permits to plant and harvest coffee grown in the social forestry area. Around 35% of coffee plantations are on degraded land, which presents a high level of risk to biodiversity, water resources, and soil erosion. There are 38 villages in Tanggamus Regency which are directly adjacent to the Bukit Barisan Selatan National Park (BBSNP). The BBSNP area has high diversity [5] and is a natural habitat for various rare plant species, such as the Rafflesia flower (*Rafflesia arnoldii*) and endangered animals including sumatran elephant (*Elephas maximus sumatranus*) [6]. Tens of thousands of species, including mammals and birds, are threatened with extinction as a result of human activities, land clearing, and habitat fragmentation [7]. Low-income level is one of the main causes of encroachment whilst the local people's main livelihood is highly dependent on the natural resources in the forest. Lack of community knowledge regarding the important role of forests, biodiversity, and sustainable agricultural practices exacerbates pressures on already degraded and vulnerable land, land degradation, forest loss, and leads to a decline in biodiversity. Monro *et al.* [8] stated that taxonomic capacity can result in economic and environmental sustainability in coffee plantations in El Salvador and loss of biodiversity can put the function of the ecosystem at risk. Building taxonomic capacity requires monitoring and inventorying biodiversity as well as obtaining its economic impact for a sustainable coffee plantation.

Kotaagung is one of the Forest Management Units (KPH) in Tanggamus Regency, Lampung Province, with an area of 56,000 hectares where most of the coffee plantation lands intersect with wildlife, some in critical status, corridors. Sustainability is still an important issue [9]. Unsustainable agricultural practices can pressure already degraded and vulnerable land, encourage farmers to expand into forests, and lead to increased incidents of human-elephant conflict. Rainforest Alliance [10] found only 40% of farmers reported human-wildlife interactions and most farmers used risky methods to prevent animals from entering their farms. One of the efforts made by the government is to give social forestry permits to communities living in the buffer zone of BBSNP to improve their livelihoods, reducing human-wildlife conflicts and forest deforestation. A collective of several farmer groups have joined forces and work together to increase economies of scale and business efficiency [11] has been granted a social forestry permit under a sustainable management plan. One of them is the association of farmers and forestry (Gapoktanhut) Lestari Sejahtera, Pekon Sedayu, Semaka,

Tanggamus, Lampung consisting of 600 households. Collectively, they can carry out the management, development, and use parts of forests, with the obligation to protect the environment and biodiversity.

The challenge faced by the community in implementing social forestry commitments is understanding the value of biodiversity, and limited resources. For a strategy that combines environmental education, natural resource management, and livelihood improvement, it is necessary to provide assistance to community management in the area. Together with Rainforest Alliance, the University of Lampung held to initiate the mentoring for the management of the Gapoktan Lestari Sejahtera, Sedayu, Tanggamus area aimed at helping the exploration of natural potential, supporting and improving local community management as well as protecting the environment and biodiversity. Rainforest Alliance is an international, non-governmental organization, bridging between agriculture, forestry and businesses with the aim of improving the welfare of forest communities, protecting forests, upholding human rights, helping mitigate and adapt to the climate crisis [11]. Therefore; initial survey was done supporting the governance of the Gapoktan Lestari Sejahtera, Sedayu, Tanggamus.

Monitoring the effectiveness of the management of a protected area system is an essential step in biodiversity conservation efforts [12]. Community-based rapid biodiversity assessment is a qualitative research method carried out in groups to get an initial understanding from the perspective of the implementing community. In carrying out a quick search or rapid assessment, the process includes determining the topic of the survey, developing questions/types of data to be obtained, determining the survey method, training the group that will conduct the survey and interpreting the results obtained. Understanding biodiversity in plantation areas can provide an understanding of plant and animal biodiversity, practices carried out by farmers in management and use in their plantations [13]. Birch *et al.* [14] stated that although not simultaneously, the impacts of social forestry practices provide benefits in both ecosystem services and biodiversity interests in the area.

Participatory environmental monitoring (PEM) refers to a part of approaches involving local people in the structured gathering of information about the environment where they live [15]. This technique involves basic inventory by observing biodiversity in general, specific species assessment, changes assessment to determine the impacts of human activities and natural disturbances on ecology and biodiversity integrity related with certain areas. Assessment on indicators, community diversity and species showed environmental conditions and resources assess-

ment to determine potential sustainable use of natural resources in certain areas. Environmental economics and ecological economics have both recognized, in different ways, the complexity and multidimensional nature of the notion of value [16][17].

Lawrence [18] stated the challenge for community-based rapid assessment biodiversity is to find easily measured indicators that are meaningful to the participants, and inform them about the aspects of biodiversity that they value and communicate effectively with other stakeholders. Different stakeholders can have different objectives, knowledge, information needs, cultures and power relations, as well as methods for collecting and sharing information; but these different positions and needs can be accommodated through partnerships that can provide distinct but complementary and mutually rewarding outcomes.

Another type of approach, which has emerged more recently, focuses on assessment and action on behavior, and emphasizes the role of information. This approach, which relates to Dewey's philosophy [19] and the principles of "nudges" [20], focuses on information, training, learning and promotion of norms. Its aim is to raise awareness among the population and coordinate behavior using shared social models and the acceptance of bounded rationality. This includes new disciplines such as behavioral economics, environmental psychology as well as information and education sciences, and thus involves additional decision-making tools. Information and training needs must be identified as well as sources of conflict and support for the co-construction of shared norms and their conservation. Support for decision-making revolves around the appropriation of certain values that encourage citizens to promote pro-environmental behavior and individual and collective implementation of voluntary measures.

2. Materials and Methods

The biodiversity research was done by line transect participatory rapid assessment by Gapoktanhut Lestari Sejahtera team for area management, under Rainforest Alliance program, in collaboration with University of Lampung. The assessment was done in 13 KTH (forest farmer group area), Gapoktanhut Lestari Sejahtera and 2 protected blocks, using 6 main transect lines with 10 m interval observation points, and 11 observation lines outside the transect lines (Figure 1). The KTH include Mancingan Atas, Kuyung Jejer 1, Kuyung Jejer 2, Bumi Mulyo, Murah Rejeki 1, Murah Rejeki 2, Sido Makmur 1, Sido Makmur 2, Sido Makmur 3, Mandiri Jaya, Sepakat Hati, Subur Makmur 1 dan Subur Makmur 2. The pro-

ected areas include Blok Lindung 1 and Blok Lindung 2. Observations targeted on wildlife (animals, plants), types of encounters (direct, indirect signs), and location of the findings (GPS coordinates). Dates and observers were recorded.

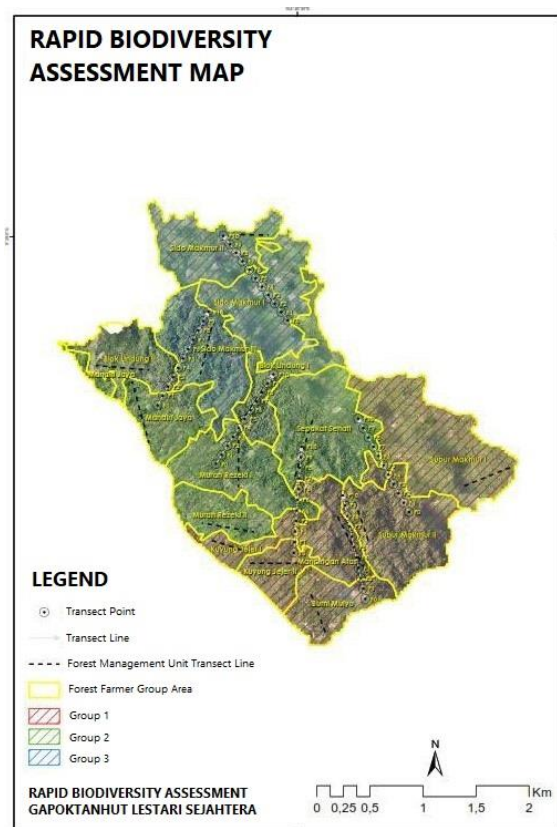


Figure 1. Areas covering rapid biodiversity assessment of Gapoktanhut Lestari Sejahtera in Semaka, Tanggamus, Lampung

Data collection was conducted by Kobocollect application, on the transect line from November 2021 to February 2022. The data collection form was uploaded to the kobotoolbox server and accessed by observers through the kobocollect application, facilitating them in collecting data. The data collected was downloaded through kobotoolbox in two formats, namely excel (xlsx.) for the recapitulation research data and compressed (rar.) for additional picture files. Data analysis was wrapped up descriptively. Data was filtered and grouped based on KTH and types of findings (animals, plants, indirect signs) using Microsoft Excel and Microsoft PowerPoint and analyzed descriptively.

3. Results and Discussion

Information updates of flora, fauna, and their natural habitats, especially those with high conservation status, importance and uniqueness values become a priority

and the community involvement plays significant contribution [4]. Using Kobotoolbox, Total 480 data (Table 1) has been collected by transect line from November 2021 to February 2022 covering 15 areas. It consists of direct (n = 407) and indirect data (n = 72) of plants, animals as well as landscapes.

Table 1. Total Findings in 15 areas, Semaka, Tanggamus

No.	KTH	Number of findings
1.	Mancingan Atas (MA)	75
2.	Bumi Mulyo (BM)	9
3.	Kuyung Jejer 1 (KJ1)	34
4.	Kuyung Jejer 2 (KJ2)	12
5.	Murah Rezeki 1 (MR1)	34
6.	Murah Rezeki 2 (MR2)	26
7.	Sido Makmur 1 (SM1)	45
8.	Sido Makmur 2 (SM2)	19
9.	Sido Makmur 3 (SM3)	16
10.	Mandiri Jaya (MJ)	5
11.	Sepakat Sehati (SH)	72
12.	Subur Makmur 1 (SBM1)	0
13.	Subur Makmur 2 (SBM2)	72
14.	Blok Lindung 1 (BL1)	6
15.	Blok Lindung 2 (BL2)	15
16.	Incomplete information	40
	Total	480

No data can be collected in Subur Makmur 1. The finding (Figure 2) by local names included plants (n = 78) mostly understory plant species, orchids, and ferns, small animals (n = 40) include amphibians, reptiles, birds, and arthropods, indirect signs (n = 11) of food remains, footprints, voices, scraps, wallowing ponds, scratches, nests, insects body remains, eggs and animals' trail, some fungi, and landscapes (Figure 3).

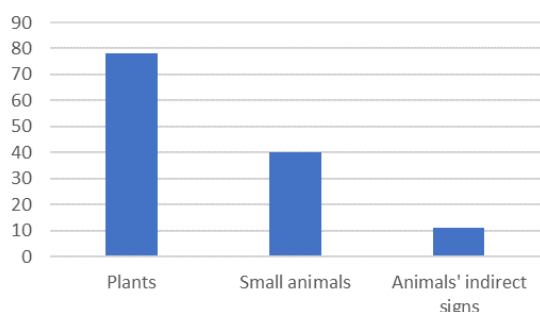


Figure 2. The data collection (N = 480) covering 15 areas by Gapoktanhut Lestari Sejahtera, Semaka, Tanggamus, Lampung

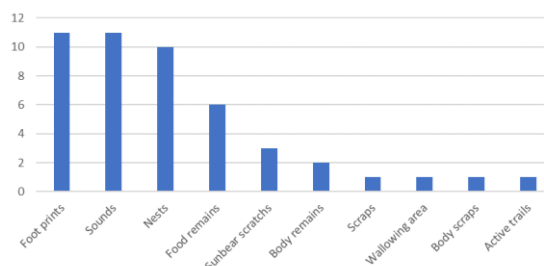


Figure 3. Animal indirect signs collected in Semaka, Tanggamus

Plants species by local names include lantana (found in BM, KJ 1, SM 1, SBM 2), tapak leman (BM, SM 1), pakis (KJ 2, KJ 1, SM 3, MA, SM 2, SBM 2, SS, MR 1), pakis gemblong (SBM 2), galendra (KJ 1), benikan (KJ 1), benalu (KJ 1), talas (MR 2, KJ 1, BL 2, SM 1, KJ 2, MA, SS), trepus (MA, MR 2, SM 2, SBM 2), kuping kancil (MA, BL 2, SM 2), walloh (MA), rotan (MA, BL 1, SBM 2), julali (MA), anggrek (KJ 1, MR 1, SM 1, SM 2, MR 2, SM 3, MA, SBM 2, SS), anggrek Bulan (SM 2), kunyit (KJ 2, SM 1), mangsian (KJ 1, MR 2), markisah (MA), lancuran (MA), ketepeng (MR 1, MA), sintrong (KJ 1, MR 2), cepoka (MR 2), jambu (MA), kencur (KJ 1), kaliandra (KJ 1, MR 2, SM 3), sisik naga (KJ 1), jereng (KJ 1), cabe (MR 1, MR 2), kapulaga (MR 1), suruhan, kemadoh, bengkoang, bawang (BL 1), kasapan (BL 1), jeruk (MR 2), alas (BL 2), jamaika (SM 1), menjangan (SM 1), kembang gaceng (SM 1), jahe (SM 1), aren (SM 1, MA, SBM 2), bambu (SM 1, SM 2), buah naga (SM 1), luwangan (SM 1, SM 2), temulawak (SM 1), bunga korona (SM 1), labu (SM 1), sereh (SM 1), kucai (SM 1), genjer (SM 1), anggur-angguran (SM 2), sente (SM 2), paku – pakuan (KJ 2, SS), wedusan (MR 2, SM 3, MA), pandan (SM 3, SBM 2), pisang (SM 3, SM 2, SBM 2), krokot (MA), pohon asem (MA), janda bolong (MA), pala (MA), simbar (MA, SBM 2), buah kumis (MA), cengkeh (MA), ara (MA, SS, MR 1), gandum (SM 2, SBM 2), bodeh (SBM 2), pinang (SBM 2), pecokak (SBM 2), srengganen (SS), terong hutan (SS), ceri hutan (SS), Selaginella sp. (SS), rafflesia, bolong (SS), senganen (MR 1), ekor monyet (SBM 2), kemiri (SBM 2), begagan (SBM 2), bapak pucong (SBM 2), jeruk (SBM 2) and fungus (SM2, SBM2, SS).

Small animals found are katak batu (found in MR 1), katak (SM 1), bunglon (MR 1, MA), capung (KJ 2, MA, SM 1, SM 2, MR 2, SBM 2, SS, MR 1), capung jarum (SBM 2), anggung-anggung (MA), butterflies (MA, KJ 1, SM 1, SM 3, SM 2, SBM 2, SS), spiders (MA, MR 2, SM 3, MR 1, SM 2, SBM 2, SS), bees (KJ 1, SM 1, MA, SBM 2, SS), kumbang bee (MR 2), honey bees (SS), millipedes (MR 2, BL 2), belalang (MA, MR 2, SM 1, SM 3,

SBM 2, SS), mantis (MR 1, SS), crickets (SBM 2, SS), flies (SM 1, SS, SBM 2), ants (MA, SM 2, SBM 2), rangrang ants (SS), black ants (SS), red ants (SS), birds (SM 1), kutilang (KJ 1, KJ 2), cocit birds (KJ 2, MR 2), eagle (BL 2), cetor birds (MR 2), trocok bird (MA), black eagle (MA), tehengkek birds (SBM 2), wawong (SM 2), squirrel (MR 2), mbok Cung (MA), catterpillars (MA, SS, SM 1), rangkok/rangkong (MA), turtle (MR 1), goreng (SM 1, SBM 2, SS), garang gati (SM 2, SBM 2), bapak pucung hitam (SBM 2), kaper (SBM 2), pundung (SBM 2), samber lilin (SBM 2), keong (SBM 2), snail (MR 1), walang sangit (SBM 2), katu (SBM 2), kumbang hitam (SS), kumbang kayu (BM), kumbang tanah/engkek (MR 1), earth worm (MR 1), mosquitoes (SS), lizard (SM 1) and tawon bees (SS).

Assessment is often a one-off exercise that helps to establish the extent and condition of a resource. If it is a participatory assessment, it may also include an element of evaluation, in that different stakeholders will value different parts of the resource in different ways. Monitoring is a way of tracking change in the environment or resource. It is often based on a simpler form of data collection than is assessment, and is therefore more likely to rely on indicators. From the initial collection it showed the local wisdom and richness of the coffee farmers in identifying the species' local names. The ability to identify biodiversity surrounding their coffee plants is a great resource. The existence of Gapoktanhut Lestari Sejahtera is part of citizen research. Further study needed for species confirmation scientifically including the conservation status. The willingness as well as high knowledge of Gapoktanhut Lestari Sejahtera team need to be followed up for building a biodiversity database in KPH Kotaagung Utara, Tanggamus. Participatory methods seem to be working and can be updated by scientific identification.

4. Conclusion

A preliminary study identifying potential natural resources in Kota Agung Utara Social Forestry found high biodiversity and significant role of local communities knowledge. Community-based rapid biodiversity assessment may be one of the great methods for biodiversity monitoring while practicing social forestry.

5. Acknowledgement

Our gratitude to Kaidanren Nature Conservation Fund, Dinas Kehutanan Lampung, KPH Kotaagung Utara, Tanggamus for support and companionship.

References

- [1] Peh, K. S.-H., Balmford, A., Bradbury, R. B., Brown, C., Butchart, S.H.M., Hughes, F.M.R., Stattersfield, A., Thomas, D.H.L., Walpole, M., Bayliss, J., Gowing, D., Jones, J.P.G., Lewis, S.L., Mulligan, M., Pandeya, B., Stratford, C., Thompson, J.R., Turner, K., Vira, B., Willcock, S., and Birch, J. C. (2013). TESSA: A toolkit for rapid assessment of ecosystem services at sites of biodiversity conservation importance. *Ecosystem Services* 5: 51-57.
- [2] Neugarten, R.A., Honzák, M., Carret, P., Koenig, K., Andriamaro, L., Cano, C.A., Grantham, H.S., Hole, D., Juhn, D., McKinnon, M., Rasolohery, A., Steininger, M., Wright, T.M., and Turner, W.R. 2016. Rapid Assessment of Ecosystem Service Co-Benefits of Biodiversity Priority Areas in Madagascar. *PLoS ONE* 11(12): e0168575. doi:10.1371/journal.pone.0168575.
- [3] Wulandari, C., Bakri, S., Riniarti, M., & Supriadi. (2021). Fostering the sustainability of community forestry program: case study in Lampung-Sumatra. *FORESTRY IDEAS* 27(1): 210–232.
- [4] Rustiati, E.L., Kurniawan, I., Susanto, A.W., Pra wi, D.N., Master, J., Swibawa, I.G., Supriyadi, Tugino, Edi, Suprianto, J., Aryandinata, A., dan Saputra, O. 2022. *Biodiversity of Register 31, KPH Kotaagung Utara: Participatory Rapid Assessment with Gapoktanhut Lestari Sejahtera* [in Indonesia]. First Edition. Bandar Lampung: Anugerah Utama Raharja.
- [5] Malik, A.A., Prayuda, J., Anggreany, R., Sari, M.S., Walid, A. 2020. Keragaman Hayati Flora dan Fauna di Kawasan Taman Nasional Bukit Barisan Selatan (TNBBS) Resort Merpas Bintuhan Kabupaten Kaur. *DIKSAINS: Jurnal Ilmiah Pendidikan Sains* 1(1): 35-42.
- [6] Balai Besar Taman Nasional Bukit Barisan Selatan. 2021. *Keanekaragaman Flora dan Fauna di TNBBS*. <https://programs.wcs.org/btnbbs/BeritaTerbaru/articleType/ArticleView/articleId/6877/KEANEKARAGAMAN-FLORA-DAN-FAUNA-DI-TNBBS.aspx>. Accessed on 12th September 2021 at 08.07 PM.
- [7] Tilman, D., Clark, M., Williams, D.R., Kimmel, K., Polasky, S. and Packer, C. 2017. Future threats to biodiversity and pathways to their prevention. *Nature* 546: 73-81.
- [8] Monro, A.K., Jones, D.T., Araujo P., M.E. 2006. Taxonomic capacity can improve environmental and economic sustainability in biodiversity-rich shade coffee farms in El Salvador. *Systematics and Biodiversity* 4(1): 1-8.

- [9] Gleditsch, N. P. (2021). This time is different! Or is it? NeoMalthusians and environmental optimists in the age of climate change. *Journal of Peace Research* 58(1): 177-185
- [10] Rainforest Alliance, 2021. *About The Rainforest Alliance*. <https://www.rainforest-alliance.org/about/>. Accessed on 12th September 2021 at 09.13 PM.
- [11] Desa Balibangsal. 2021. *Pengertian dan Fungsi Gapoktan*. <https://balingasal.kecupadureso.kebumenkab.go.id/index.php/web/artikel/142/201>. Accessed on 12th September 2021 at 08.27 PM.
- [12] Ervin, J. 2003. Rapid Assessment of Protected Area Management Effectiveness in Four Countries. *Bio-Science* 53(9): 822-841.
- [13] Méndez, V.E., Bacon, C.M., Olson, M., Morris, K.S., and Shattuck, A. 2010. Agrobiodiversity and Shade Coffee Smallholder Livelihoods: A Review and Synthesis of Ten Years of Research in Central America. *The Professional Geographer* 62(3): 357-376.
- [14] Birch, J.C., Thapa, I., Balmford, A., Bradbury, R.B., Brown, C., Butchart, S.H.M., Gurung, H., Hughes, F.M.R., Mulligan, M., Pandeya, B., Peh, K.S.-H., Stattersfield, A.J., Walpole, M., and Thomas, D.H.L. 2014. What benefits do community forests provide, and to whom? A rapid assessment of ecosystem services from a Himalayan forest, Nepal. *Ecosystem Services* 8: 118-127.
- [15] Abbot, J., and I. Guijt. 1998. Changing views on change: Participatory approaches to monitoring the environment. SARL Discussion Paper No. 2. IIED, London, UK.
- [16] Maitre D’hotel, E., Pelegrin, F., 2012. Les valeurs de la biodiversité: un état des lieux de la recherche française. Fondation pour la recherche sur la biodiversité, Paris, p. 52.
- [17] Kenter, J.O., O’Brien, L., Hockley, N., Ravenscroft, N., Fazey, I., Irvine, K.N., Reed, M.S., Christie, M., Brady, E., Bryce, R. 2015. What are shared and social values of ecosystems? *Ecol. Econ.* 111, 86–99.
- [18] Lawrence, A. 2017. *Taking Stock of Nature: Participatory Biodiversity Assessment for Policy, Planning and Practice*. Cambridge University Press. Cambridge, UK.
- [19] Dewey, J. and Boydston, J.A. 2008. *The Later Works of John Dewey, 1925-1953: 1938-1939, Experience and Education, Freedom and Culture, Theory of Valuation, and Essays*. Southern Illinois University Press. Illinois, USA.
- [20] Thaler, R. H., and Sunstein, C.R. 2008. *Nudge: Improving Decisions About Health, Wealth, and Happiness*. Yale University Press. New Haven, USA.