

Sustainable Bioproduction and Ecosystems Management (SBEM) - 2019

As of 28 June 2019

Dr. Osamu SAITO, Dr. Keiko Hori, and Maiko Nishi

Objective:

This course is to overview global consequences of ecosystem changes and drivers of these changes including international trade on global ecosystem services. The course also introduces sustainable approaches to land and ecosystem management at different levels. The students will be familiarized with the key concepts and practical methods of ecosystem assessment and landscape ecology including the techniques of accounting various ecosystem services, and be able to choose appropriate analysis tools and management options for sustainable society living in harmony with nature.

Learning Outcomes:

- Understand the key concepts and practical methods of landscape ecology and ecosystem assessment including accounting tools and market-based policy instruments to address negative and positive externalities,
- Learn sustainable ecosystems management approaches to integrate bioproduction, biodiversity, and associated ecosystem services at different scales
- Learn how to develop case studies on sustainable bioproduction and ecosystems management through group work, and collectively develop an integrated final course report

Course Outline and Schedule:

Course Unit	Date	Topic/Activity	Instructor
1	4 Oct(Fri), 11:00-12:30	Introduction and overview of the course Conceptual Framework of Biodiversity and Ecosystem Services, and current research activities at UNU-IAS	Dr. Osamu Saito
2	11 Oct (Fri), 11:00-12:30	Ecosystem Assessments (I): Inventory accounting, material flow analysis, evaluation methods and case studies	Dr. Osamu Saito
3	18 Oct (Fri), 11:00-12:30	Ecosystem Assessments (II): Mapping natural capital and ecosystem services, methods and case studies	Dr. Osamu Saito
4	25 Oct (Fri), 11:00-12:30	Ecosystem Assessments (III): Global trade of natural resources; tradeoff analysis and multi-criteria analysis	Dr. Osamu Saito
5	25 Oct (Fri), 14:00-15:30	Vegetation, GHG inventory system and biomass measurement	Dr. Osamu Saito
6	TBD 2 Nov (Sat), 13:00-16:30	Field Trip 1: Institute for Nature Study in Meguro, Tokyo	Dr. Osamu Saito
7	8 Nov (Fri), 11:00-12:30	Mid-term group presentation	
8, 9	15 Nov (Fri), 11:00-12:30, 14:00-15:30	Processes and approaches for ecosystem service assessments (TBD)	Dr. Maiko Nishi
10	22 Nov (Fri), 11:00-12:30	Alumni session: Case studies of food security and ES assessment in Ghana, Ethiopia, and Zimbabwe	Rodolfo Dam Lam Thelma Mahachi
11	22 Nov (Fri), 14:00-15:30	Modeling and designing sustainable utilization of local renewable energy	Dr. Keiko Hori
12	29 Nov (Fri), 11:00-12:30	Bio-energy production and ecosystem services	Dr. Alexandros Gasparatos
13	TBD (30 Nov(Sat) pm, 1 Dec(Sun)	Field Trip 2: Visit to Nerima (urban agriculture)	Dr. Osamu Saito
14, 15	13 Dec (Fri), 11:00-12:30, 14:00-15:30	Final Group Presentation Session Wrap-up Session	Saito Student Presentation
Extra	28 Jan. (Tue), 11:00-12:30	Feedback session	All students

Assessment:

- Class Participation: 30%
- Final Group Presentation: 30%
- Final Individual Report: 40%

Readings:**1: Introduction and overview of the course**

- Dı'az et al. (2015) The IPBES Conceptual Framework — connecting nature and people, *Current Opinion in Environmental Sustainability*, 14:1–16.
- Anantha Kumar Duraiappah, Stanley Tanyi Asah, Eduardo S Brondizio, Nicolas Kosoy, Patrick J O'Farrell, Anne-Helene Prieur-Richard, Suneetha M Subramanian and Kazuhiko Takeuchi (2014) Managing the mismatches to provide ecosystem services for human well-being: a conceptual framework for understanding the New Commons, *Current Opinion in Environmental Sustainability*, 7:94–100
- Saito, O. and Ichikawa, K. (2014) Socio-ecological systems in paddy-dominated landscapes in Asian Monsoon. In Miyashita, N., Nishikawa, U. et al. (ed.) *Social-Ecological Restoration*, Springer.
- Eduardo S. Brondizio, Nathan D. Vogt, Andressa V. Mansur, Edward J. Anthony, Sandra Costa, Scott Hetrick (2016) A conceptual framework for analyzing deltas as coupled social–ecological systems: an example from the Amazon River Delta, *Sustainability Science* ,11: 591. doi:10.1007/s11625-016-0368-2

2:Ecosystem Assessments (I): Inventory accounting, material flow analysis, evaluation methods and case studies

- INTERNATIONAL STANDARD ISO 14040 (Second edition, 2006-07-01): Environmental management — Life cycle assessment — Principles and framework
- INTERNATIONAL STANDARD ISO 14044 (First edition, 2006-07-01): Environmental management — Life cycle assessment — Requirements and guidelines
- Saito, O. (2013) Resource Use and Waste Generation by the Tourism Industry in the Big Island of Hawaii, *Journal of Industrial Ecology*, 17(4): 578–589.
- Jasaw, G.S., Saito, O., and Takeuchi, K. (2015) Shea (*Vitellaria paradoxa*) Butter Production and Resource Use by Urban and Rural Processors in Northern Ghana, *Sustainability*, 7: 3592-3614. Doi:10.3390/su7043592.
- Jasaw, G.S., Saito, O., Gasparatos, A., Shoyama, K., Boafo, Y.A., Takeuchi, K. (2017) Ecosystem services trade-offs from high fuelwood use for traditional shea butter processing in semi-arid Ghana, *Ecosystem Services*, 27:127-138.

3: Ecosystem Assessments (II): Mapping natural capital and ecosystem services, methods and case studies

- Peter Kareiva, Heather Tallis, Taylor H. Ricketts, Gretchen C. Daily, Stephen Polasky (2011) *Natural Capital: Theory & Practice of Mapping Ecosystem Services*, Oxford Univ Pr. 365pp.
- Hashimoto, S., Nakamura, S., Saito, O., Kohsaka, R., Kamiyama, C., Tomiyoshi, M. and Kishioka, T. (2015) Mapping and characterizing ecosystem services of social-ecological production landscapes: Case study of Noto, Japan, *Sustainability Science*, 10(2): 257-273. DOI: 10.1007/s11625-014-0285-1.
- Havas, J., Saito, O., Hanaki, K., and Tanaka, T. (2016): Perceived Landscape Values in the Ogasawara Islands, *Ecosystem Services*, 18: 130-140.
- Landreth, N. and Saito, O. (2014) An Ecosystem Services Approach to Sustainable Livelihoods in the

Homegardens of Kandy, Sri Lanka, *Australian Geographer*, 45(3): 355-373.

- Kamiyama, C., Hashimoto, S., Kohsaka, R., and Saito, O. (2016) : Non-market food provisioning services via homegardens and communal sharing in satoyama socio-ecological production landscapes on Japan's Noto peninsula, *Ecosystem Services*, 17:185-196.

4. Ecosystem Assessments (III): Global trade of natural resources, tradeoff analysis and multi-criteria analysis

- Thomas Koellner (edt) (2011) *Ecosystem Services and Global Trade of Natural Resources: Ecology, economics and policies*, Routledge, 286pp.
- Stoorvogel et al. (2004) The tradeoff analysis model: integrated bio-physical and economic modeling of agricultural production systems, *Agricultural Systems*, 80: 43-66.
- Wirsenius, S., Azar, C., and Berndes, G. (2010) How much land is needed for global food production under scenarios of dietary changes and livestock productivity increase in 2030, *Agricultural Systems*, 103: 621-638.
- Alexander, P., Rounsevell, M., Dislich, C., Dodson, J.R., Engstrom, K., and Moran, D. (2015) Drivers for global agricultural land use change: The nexus of diet, population, yield and bioenergy, *Global Environmental Change*, 35: 138-147.
- Alexander, P., Brown, C., Arneith, A., Finnigan, J., and Rounsevell, M. (2016) Human appropriation of land for food: The role of diet, *Global Environmental Change*, 41: 88-98.

5. Vegetation, GHG inventory system and biomass measurement

- Aulay Mackenzie, Andy S. Ball & Sonia R. Virdee, 1998. *Instant Notes in Ecology*, Bios Scientific Publishers, 321pp.
- Martin Kent & Paddy Coker, 1992. *Vegetation Description and Analysis*, John Wiley & Sons, 363pp.
- Rattan Lal, Klaus Lorenz, Reinhard F. Huettl, Bernd Uwe Schneider, Joachim von Braun (2013) *Ecosystem Services and Carbon Sequestration in the Biosphere*, Springer, 464pp.

8, 9: Processes and approaches for ecosystem service assessments (TBD)

- Peter Kareiva, Heather Tallis, Taylor H. Ricketts, Gretchen C. Daily, Stephen Polasky (2011) *Natural Capital: Theory & Practice of Mapping Ecosystem Services*, Oxford Univ Pr. 365pp.

To be informed more

10. Almuni session: Case studies of food security and ES assessment in Ghana, Ethiopia, Zimbabwe, and Phillipine

- Dam Lam, R., Bofo, Y.A., Degefa, S., Gasparatos, A., and Saito, O. (2017) Assessing the food security outcomes of industrial crop expansion in smallholder settings: Insights from cotton production in Northern Ghana and sugarcane production in Central Ethiopia, *Sustainability Science*, 12: 677-693. DOI: 10.1007/s11625-017-0449-x.

11: Modeling and designing sustainable utilization of local renewable energy

To be informed more

12: Bio-energy production and ecosystem services

- Carla Romeu-Dalmau, Alexandros Gasparatos, Graham von Maltitz, Alastair Graham, Jacob Almagro-Garcia, Beccy Wilebore, Katherine J. Willis (2016) Impacts of land use change due to biofuel crops on climate regulation services: Five case studies in Malawi, Mozambique and Swaziland, *Biomass and Bioenergy*, 1-11.

- Shakespear Mudombi, Graham Paul Von Maltitz, Alexandros Gasparatos, Carla Romeu-Dalmau, Francis X. Johnson, Charles Jumbe, Caroline Ochieng, Davies Luhanga, Paulo Lopes, Boubacar Siddighi Balde, Katherine J. Willis (2016) Multi-dimensional poverty effects around operational biofuel projects in Malawi, Mozambique and Swaziland, *Biomass and Bioenergy*, 1-14.
- Alexandros Gasparatos, Lisa Y. Lee, Graham P. von Maltitz, Manu V. Mathai, Jose A. Puppim de Oliveira, Katherine J. Willis (2012) Biofuels in Africa Impacts on Ecosystem Services, Biodiversity and Human Well-being, UNU-IAS Policy Report.
- Von Maltitz, G. P., A. Gasparatos, C. Fabricius, A. Morris, and K. J. Willis. (2016) Jatropha cultivation in Malawi and Mozambique: impact on ecosystem services, local human well-being, and poverty alleviation. *Ecology and Society* 21(3):3. <http://dx.doi.org/10.5751/ES-08554-210303>
- Markus A. Meyer, Tanzila Chand, Joerg A. Priess (2015) Comparing Bioenergy Production Sites in the Southeastern US Regarding Ecosystem Service Supply and Demand, *PLoS ONE* 10(3): e0116336. doi:10.1371/journal.pone.0116336

Field Trip 1: Institute for Nature Study (自然教育園) in Meguro, Tokyo

The Institute for Nature Study, Shizen kyoiku en in Japanese, is a branch of the National Science Museum, Tokyo. It occupies a 200,000 square meter area with various original habitats of the Tokyo area, such as forest, marsh and ponds. Because the Institute's garden has been an isolated natural habitat in the urban area and has remained well conserved for many years, it is a valuable place where rich biota are maintained. At the Institute, the museum staff conduct original research on ecology and education.

Access:

7 minutes' walk from the east exit of Meguro Station on the JR Yamanote Line.

4 minutes' walk from exit 1 of Shirokanedai Station on the Tokyo Metro Namboku Line

Address:

5-21-5 Shirokanedai, Minato-ku, Tokyo 108-0071

Tel: 03-3441-7176 Fax: 03-3441-7012 Email: ins@kahaku.go.jp

Meeting Place:

JR Meguro Station(目黒駅)

Central Exit(中央改札口) ※Attention: There are two exits at the station. Come to the central exit!!

Belongings:

writing materials, drinks, camera, handout

Contact:

Osamu SAITO: 080-3155-5873

