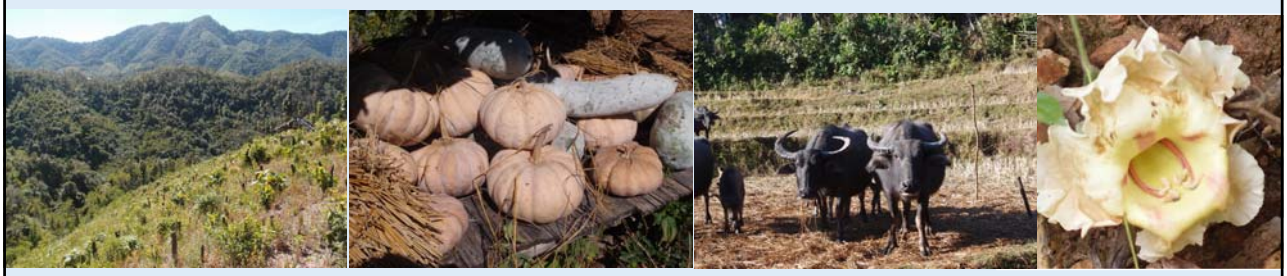

Assessment of the role of Karen's ecological knowledge to sustain biodiversity, ecosystems and ecosystem services in northern Thailand

Presented by Jintana KAWASAKI,
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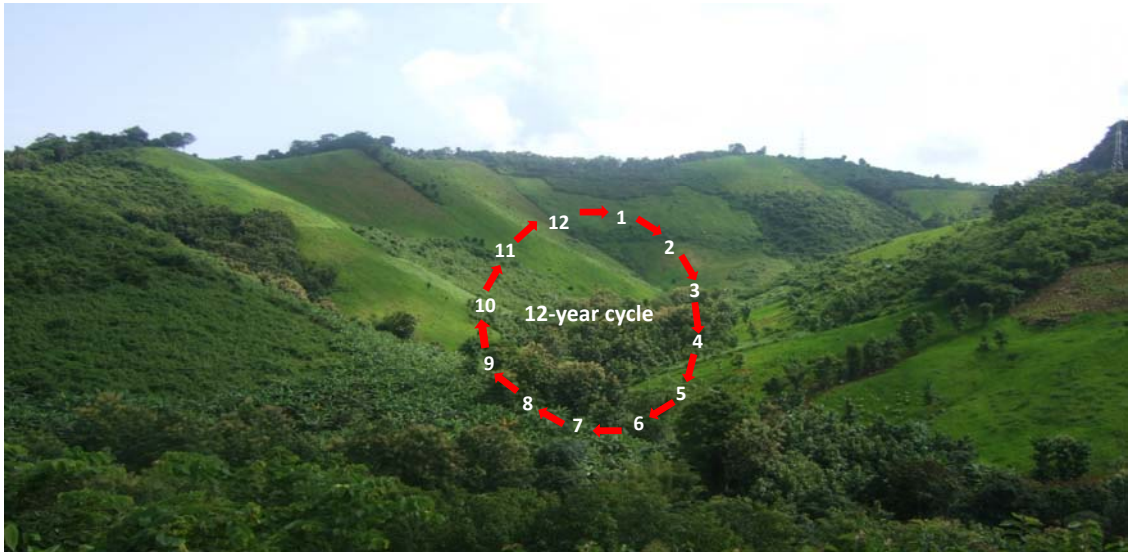
Natural Resources and Ecosystem Services Area,
Forest Conservation Group

IPBES Sub-regional workshop: ILK for the sub-regions of SE and NE Asia,
Chiang Mai, Thailand, 14-17 October 2016

Contents

- Land use patterns, ecosystems and biodiversity from different land use types
- Karen's traditional rotational farming and ILK for biodiversity, ecosystems and ecosystem services

Background of the study



A mixed agroecosystem centred on traditional rotational farming (RF)

The institute for Global Environmental Strategies (IGES), in partnership with the Indigenous Knowledge and People Foundation (IKAP) jointly conducted a study in 2015 to document the role of Karen's indigenous and local knowledge (ILK) in their management of the land and natural resources, with a view to enhance the policy recognition of the importance of Karen's ILK for the sustainability of biodiversity, ecosystem and cultural heritage of Karen people

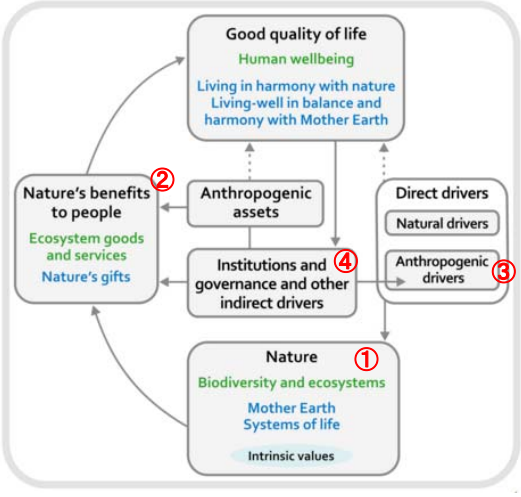
Objectives of the Study

. To understand land use patterns and ecosystem services under different land use types

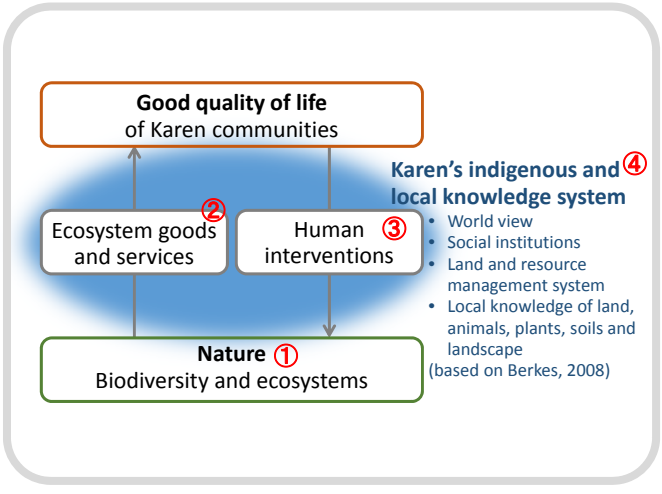
. To describe Karen's ILK and traditional rotational farming practices for biodiversity and ecosystem services



Analytical framework for this study, compared with the IPBES Conceptual Framework: Circled numbers 1-4 corresponds between the left and right figures respectively

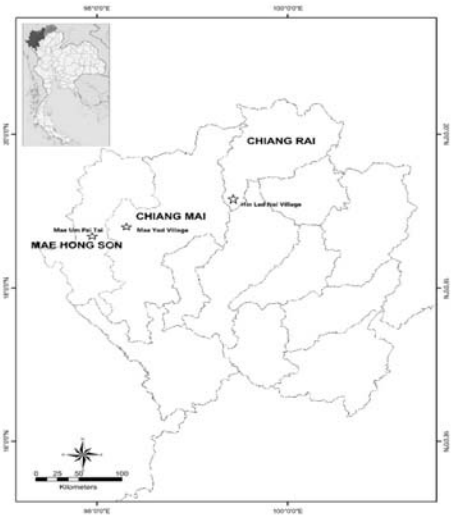


IPBES Conceptual Framework (extracted from Diaz et al., 2015)



Analytical framework for this study

I. Land use patterns, ecosystems and biodiversity



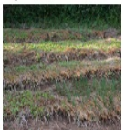
1 Conservation Forest and Head Water

2 Community Forest

3 Traditional Rotation Farming

4 Agroforestry includes wildtea, bamboo, mixed perrennial orchards

5 Residential Area



7 Paddy Fields

6 Vegetables

Traditional land use pattern

Conversion of traditional rotational farming to modern monocrop farming in other neighbour villages

1 Conservation Forest and Head Water

2 Community Forest

3 Conversion of Rotation Farming to Maize Production

4 Residential Area

5 Paddy Fields

Azuki bean and maize production

Trends of land use change over past 20 years in the study sites

Type of land use	Hin Lad Nai		Mae Um Pai Tai		Mae Yod	
	E	% R	E	% R	E	% R
1) Forest land						
1.1 Conservation forest and head water	5	100.00	5	93.10	3	89.47
1.2 Utility forest	5	88.89	4	93.10	3	94.74
1.3 Community forest	3	88.89	4	86.21	3	89.47
1.4 Cemetery forest	3	100.00	3	100.00	3	100.00
2) Agricultural land						
2.1 Rotational farming	2	77.78	2	96.55	2	78.95
2.2 Permanent fields	3	77.78	3	82.76	3	84.21
2.3 Paddy fields	4	66.67	3	86.21	none	

Note: E-Evaluation of trends of land use change by using scores of 1-5 if 5-subtantially increased, 4-increased, 3-not changed, 2-decreased, 1-substantially decreased; %R-Percent of total respondents

List of wildlife species and domesticated endemic plants disappeared or substantially reduced in the past 20 years

				Hin Lad Nai		Mae Um Pai Tai		Mae Yod	
Classification	Taxon		Species name	F	RF	F	RF	F	RF
Animal	Vertebrates	Mammal	Bear	●		●		●	
			Serow	●		●		●	
			Gibbon	●		●			
			Macaque	●				●	
			Colugo	●					○
			Tiger			●			
			Barking deer			○	○		
			Civet					●	
			Deer				●	●	
			Monkey				●		
			Boar				○		
			Pongolin						●
			Porcupine						○

Note:

● **Locally extinct**
○ **Substantially decreased**

		Avia	Great hornbill	●		●			
			Hornbill			●		●	
			Zebra dove	●				○	
			Green pigeon			○			
			Green peafowl	●					
			Yellow parrot	○			●		
			Asian barbet			○			
			Blue magpie			○			
			Brown prinia				●		
			Red junglefowl				○		
	Invertebrates		Cicada		●				
Plant	Vascular plants		Shallot		●				
			Taro		●				
			Black berry lily		●				
			Cassumunar ginger		●				
			Small ginger		●				
			Millet		●		●		
			Corn		●				
			Giant cucumber		●				
			Small cucumber		●				
			Tobacco		○				
			Black rice				●		
			Red rice				●		

Key ecosystem services from different land use types

Category of values (corresponding to '*instrumental*' type of value under IPBES classification)*		Ecosystem services from different land use types	
		Forest lands	Rotation farming (RF)
Nature's gifts, goods and services			
Provisioning	Food	• Wild birds and animals • Wild foods (i.e. mushroom, bamboo, insects, honey)	• Food for household consumption (mix cereals-rice, corn, bean, sesame; mix vegetables and fruits; wild edible plants; insects and wild animals) (confirmed by fie study)
	Medicines	• Local medicinal herbs	• Local medical herbs
	Wood and materials	• Timber • Cotton	
	Fuels	• Fuel wood	• Fuel from wood and crop residues from clearing fields
	Genetic resources	• Stocks of native plants and animal species and varieties	• Diverse local varieties of valuable plants (7 different species growing during the 3-4 years of the fallow cycle), mainly for food, fibre and medicine (confirmed by field stuc • Native rice species (both glutinous and nor glutinous rice)
Regulating	Climate regulation	• Increasing carbon stocks	• Increasing carbon stocks (confirmed by fie study) • (DS) Increasing GHG emissions from burnir the fields
	Air quality regulation	• Increasing fresh air and moistures	• Increasing fresh air and moistures from tre • (DS) Increasing air pollution from burning the field
	Water flow regulation	• Forest water retention • Increasing rainfall	• Farmland water retention (confirmed by field study)
	Water purification	• Clean water supply	• Better quality of surface water by putting charcoal from burnet fields into streams

Cultural	Aesthetic	• Beauty of natural forests		
	Spiritual	• Sacred groves for performing rituals • Cemetery forest for burying the dead and other respected objects • Navel (*sadur*) forest for putting the umbilical cord of an infant into a bamboo hollow stem and placing under large tree as the child's spirit (*khwan*) • *Khun huay* watershed forest		
	Inspiration	• Traditional festivals	• Providing inspiration for folksong (confirmed by field study)	• Traditional tea d ceremony
	Others			• Protecting forest from outside enc
Nature's ability to supply benefits				
Basis for benefits	Nutrient cycling	• Nutrient retention in forests and supply	• Increasing nutrients in the soil by using *Macaranga denticulate* as native tree species in the RF practice (confirmed by field study)	• Providing shade trees to keep th natural health c nutrient cycling
	Soil formation	• Increasing soil fertility	• Declining soil degradation and erosions • Declining damage to soil structure from rice planting and weeding only surface of soil	• Minimizing soil e • Preventing top s loss of sediment erosion

II. Karen's ILK and traditional rotational farming practices for biodiversity and ecosystem services

1. Agrobiodiversity-conservation of local varieties and wildlife relatives of valuable crop species

✓ The survey confirmed earlier observations of high plant species diversity in these system

More than 60 types of native plants were found in the RF systems, including 15 types of native rice (three glutinous and 12 non-glutinous), 15 varieties of bean, and more than 40 species/varieties of vegetables and herbs

Table Samples of native plant species in the rotational farming of study sites in year 2015

Type of plants	Species (Local names)	Total number
Glutinous rice	Pi Ai Su Bu Ru, Pi Ai Kor Kare, Pi Ai Su	3
Non-glutinous rice	Bue Ker, Bue Pho, Bue Pa Mae, Bue Kee, Bue Tho Pokee, Bue Kare Wa, Bue Bu Ru, Bue Ma Li Doi, Bue Pa Kor, Bue Lor, Bue Ka, Bue Su	12
Bean	Ser Bei Su, Ser Gor Bei Su, Ser Bei Ker, Bor Ba Sa, Per Ter Nor Ki, Per Ter Chi Mue, Ser Baw, Per Ba Per Chi, Per Ter Per Pue, Ser Ber, Per Ter Ker, Ser Ker Bei Wa, Ser Ker Na Ra, Ser Ker Ka, Ser Ke Pho	15
Chilli	Mu Sa Pa Bor, Mu Sa Ber, Mu Sa Pa Dor	3
Cucumber	De Wa, De Mue Wa, De Ge, De Pa Wa	4
Corn	Bue Ke Pho, Bue Ke Wa, Bue Ke Jor Wa	3
Burweed	Hor Ter Der	1
Tomato	Ser Kor Chi, Ser Kor Lue	2
Basil	Hor Wor, Hor Wor Sei, Por Kae, Ser Ker	4
Pak Choi	Ser Ba Wa, Ser Ba Yo,	2
Sesame	Nor, Nei Sor	2
Bitter melon	Sor Ka Sar	1
Loofah	Chi Pho Dei	1
Pumpkin	Lu Kei Gi	1
Ginger, Galanga	Ser Aei, Ser Aei Cha Kei	2
Millet	Sue, Per Sue	2
Herbs	Por Ker Vae, Nor Por, Cho Por, Chor Tum Mae, Tod Kad Wa	5
Taro	Kue Kor, Kue Wa, Kue Sue	3
Total		66

- ✓ Some of the native rice varieties are now difficult to find in the lowland
- ✓ Scientists of Chiang Mai University (Yimyam et al., 2012; Rerkasem et al., 2002) concluded that land under traditional Karen management can be viewed as one of Thailand's indigenous rice genetic centres

2. Forest conservation and high carbon stocks

- ✓ In preparation for opening-up fallow forests for seed sowing, trees and bamboos are cut at certain heights to allow stumps to sprout and quickly regenerate
- ✓ Before burning, fire breaks are created around the fallow area to avoid the spreading of the fires

Table Carbon stocks of the rotational farming for the 12-year fallow cycle and permanent fields in Mae Yod village in year 2015

Types of land use	Area (ha)		Carbon stocks	Total carbon stocks
			(ton/ha)	(ton)
1) Rotational farming		%		
Fallow year 1	3.28	0.18	96	314.88
Fallow year 2	184.51	9.95	95	17,528.03
Fallow year 3	108.83	5.87	104	11,318.36
Fallow year 4	170.61	9.20	105	17,913.67
Fallow year 5	203.09	10.96	96	19,497.06
Fallow year 6	145.48	7.85	93	13,529.34
Fallow year 7	235.63	12.71	106	24,976.31
Fallow year 8	144.23	7.78	121	17,452.27
Fallow year 9	163.56	8.82	137	22,407.06
Fallow year 10-12	494.43	26.67	152	75,153.18
Total	1,853.64	100.00		**220,090.17**
2) Permanent fields (Azuki bean, maize)	631.63		65	41,056.18
3) Paddy fields	2.04		49	100.04

3. Limited negative impacts on biodiversity and ecosystem services-no synthetic chemical inputs

- ✓ Small tree branches and leaves are scatted over the ground to encourage the burning and to produce a higher amount of charcoal and ash, which enhance soil nutrients
- ✓ Average yield of upland rice at patch level under the RF system (3.66 ton/ha) was higher than average yield of paddy rice (1.85 ton/ha)
- ✓ Apply organic pest methods using homemade bio-pesticide; Physical weeding methods such as gently piercing the soil surface

Tools for trapping rats and birds, which destroy rice gains in the rotational farming without using poisons

4. Sustainable land and resource management and biocultural diversity

- ✓ Traditional RF practices contribute to strong social cohesion among the communities members through frequent exchanges of food and labour sharing
- ✓ Songs and folktales are mediums for passing on knowledge from old to young on how the and land natural resources should be managed

"Do not prune all the branches, leave some for the fire birds to perch"

"If you get benefits from forests and rivers, you have to conserve the forests and rivers, if you eat fishes, you have to protect the fish species"

The ritual of feeding the spirit of fields in the study sites

The ritual of feeding the field was performed in the beginning of August to ask for blessings from the spirit of rice, and ask the spirit to help the rice plants well grow and produce high yields

Summary of the linkage between Karen's ILK and its implications for biodiversity and ecosystem services

Land use type	ILK	Implications for the elements of biodiversity and ecosystem services
RF	Community consensus on the identification and allocation of the RF plots for cultivation	Control overuse
	RF plots for cultivation cleared from bottom to top	Prevent disturbance of tree stands surrounding the plots to be cultivated
	Trees are cut at certain height	Retain root system and promote coppicing in the fallow period
	Plots for cultivation are burned right before the rain season comes; firebreaks are created along the cropping area boundary	Avoid spread of fire beyond the cropping area boundary
	Cut and scatter small branches and leaves to intensify burning within the boundary and to produce higher amount of charcoal and ash	Enrich soil nutrients
	Songs and folktales for passing knowledge from the old to the young	Transfer the knowledge for sustainable land and natural resource management; norms and taboos relating to natural resource use
Forests	Sacred groves for performing rituals and ancestor sanctuary; cemetery forest for burying the dead and other respect objects and traditional festival; navel forest; khun huay watershed forest	Forest protection

5. Ecosystem services trade-offs-traditional rotational farming vs. competing land use for intensified monocrop agriculture

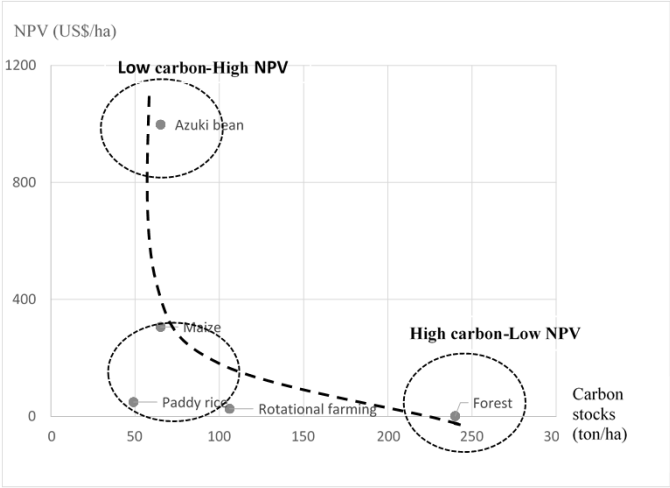
Table Annual costs and revenues of different land use in Mae Yod village in year 2015

Items	$RF_{upland\ rice}$		Paddy rice		Azuki bean		Maize	
1. Costs (US$ per ha)	714.26	%	459.20	%	742.74	%	758.73	%
1.1Seeds	70.76	10	55.10	12	120.94	16	8.51	1
1.2Fertilizers and pesticides	none		22.29	5	115.58	16	265.45	35
1.3 Labors	643.5	90	381.81	83	506.22	68	484.77	64
2. Revenues (US$ per ha)	1,060.31		537.37		2,344.0		1,250.08	
2.1 Selling price (US$ per kg)	0.29		0.29		1		0.16	
2.2 Yields (ton per ha)	3.656		1.853		2.344		7.813	
3. Profits (1-2)	346.05		78.17		1,601.26		491.35	

Cluster of land use by net present value (NPV) and carbon stocks in Mae Yod Village

Type of land use	NPV (US$/ha)	Carbon stock (ton/ha)
Rotational farming	26	106
Azuki bean	998	65
Maize	306	65
Paddy rice	49	49

"The profitability of the land was estimated in narrow local market with excluding the environmental costs and biodiversity loss from conversion of traditional rotational farming into intensive commercial farming"



Conclusion

- The study confirmed that ecosystems in forest and agricultural lands provided different and various benefits to the communities in the studied villages
- We perceived conservation forests and headwaters, and rotational farming fields particularly important for the sustainability of Karen people's life.
- Land use changes, in particular the clearance of forest to agriculture, have resulted in extirpation of wildlife species
- The study found the rotational farming provide high biodiversity with high carbon stocks, and contributes to conservation of biodiversity and ecosystem services.

References relevant to the study

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Our Karen ILK video can be viewed at https://youtu.be/DjY6BOE4_WI

Thank you very much for your attention