#Y4IRT
Youth for Ifugao Rice Terraces
towards sustainable development

ECOSYSTEM SERVICES OF THE IFUGAO RICE TERRACES LANDSCAPE

BOOK 2

Youth Capacity Building and Exchange Program Towards Sustainable Development and Conservation of Ifugao Rice Terraces: #Y4IRT Tuwali

Series Authors: Inocencio E. Buot, Jr., Ph.D., Consuelo Dl. Habito, Ph.D, Marissa P. Bulong, Ph.D., Mark Anthony F. Rabena, Thaddeus P. Lawas, Ph.D., Elpidio Basilio, Jr., Ph.D., Romeo A. Gomez, Jr., Ph.D., Melanie S. Subilla, Aurora V. Lacaste, Francis Mark Dioscoro R. Fellizar, Eulalie D. Dulnuan, Joane V. Serrano, Ph.D., Sherry B. Marasigan, Ph.D. & Martina B. Labhat, Ph.D.

Series Translators: Florentina D. Dulnuan, Emilia B. Manglib, Julian P. Manglib & Josephine G. Pataueg

Faculty of Management and Development Studies
University of the Philippines Open University


Mayoyao Rice Terraces


Batad Rice Terraces


Nagacadan Rice Terraces


Banaue Rice Terraces


Hungduan Rice Terraces

Photos by #Y4IRT

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UPOU Headquarters
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Tel/Fax: (6349) 536 6010
Email: fmds@upou.edu.ph

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Editors	Primo G. Garcia, Ph.D. & Joane V. Serrano, Ph.D.
Associate Editor & Production Coordinator	Noreen Dianne S. Alazada
Contributors	Janele Ann C. Belegal, Jan Pauline Borce, Fulgencio Oliveros, Jr., Von Kevin Alag & Raynalyn Pepe
Photos	Christian C. Guevarra, Jan Pauline Borce, Fulgencio Oliveros, Jr. & Ellaisa Ruth B. Veluz
Book Cover Design	Noreen Dianne S. Alazada
Layout Artists	Noreen Dianne S. Alazada & Janele Ann C. Belegal

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Translator (Kiangan-Tuwali): Josephine G. Pataueg

BOOK 2
ECOSYSTEM SERVICES OF THE IFUGAO RICE TERRACES LANDSCAPE

CHAPTER 1: HAY STRUCTURE DI ECOSYSTEM

Hi kagibbuwan tuwen chapter ya kabaelan yu mo an:

1. Iesplicar di mipanggep nadah waday biyagna ya nadan maid biyagna nah ecosystem;
2. Kalyon hin nganney at'atton nadan waday biyagna ya nadan maid di biyagna hi oha't oha nah ecosystem;
3. Kalyon hin nganney nunhihinnatkonan di predation, herbivory, competition ya symbiosis.

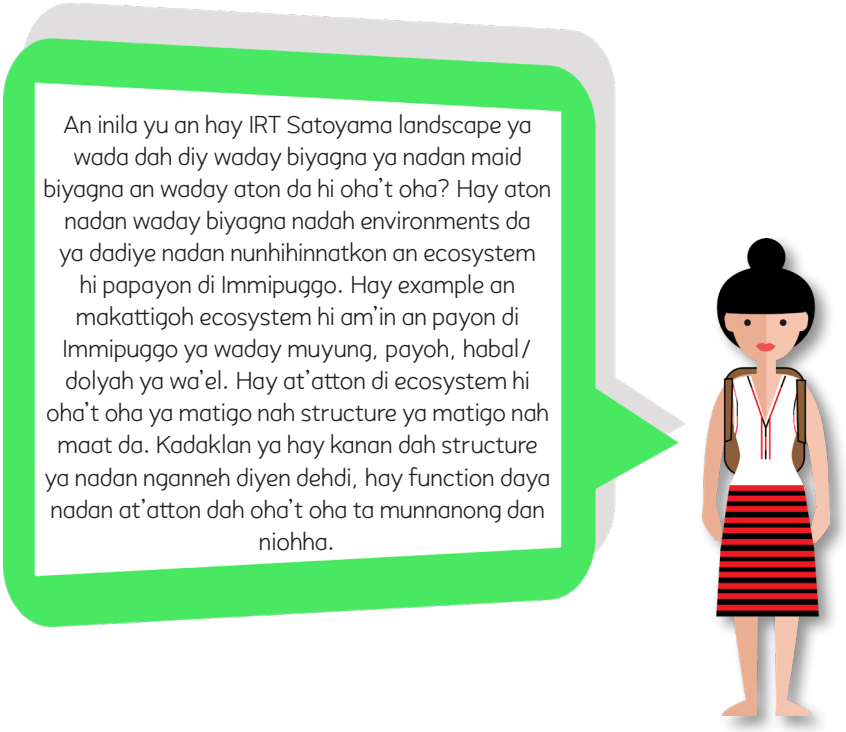
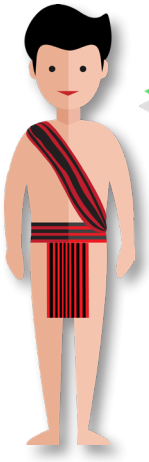


Figure 1. Hanadan nunhihinnatkon an ecosystem hi payon di Immipuggo.



Ya tapnu maat am'in di innun an mangipananong hi payon di Immipuggo ya importante an maawatan taku nadan nganneh diyen nunhihinnatkon an wadah ecosystem ya nadan functions da. Pinhod tuwen kalyon an aton taku nadan mangipananong bokon ya abu nan payo mu takon nadan muyung hi nunlinikkod, nadan habal/dolyah ya nadan wa'el. Datuwen ecosystem ya makahhapul ta siguradun munnanong di payon di Immipuggo.

Ketuwen chapter ya adalon takuy mipanggep hi ecosystem, an inila yu hin nganneh tuwe? Deket ugge yu inila, adi kayu madanagan. Inilaon taku ketuwen chapter hin nganney ecosystem, nganne innuna't makali an ecosystem di environment ya nganne day nunhihinnatkon an ecosystem.

Adalon taku pay ketuwen chapter nadan nunhihinnatkon an at'atton nadan nganneh diyen wadah ecosystem hi oha't oha. An pakappinhod yu inilaon datuwe? Aga ot ta irugi taku.

Topic 1: Hanadan waday Biyagna ya nadan maid Biyagna

Hidiyen latlatu nah tap-o ya ipatibona di ecosystem. Wadah din am'in nadan factors ta ahi mawaday ecosystem. An inila yu hin nganne datuwe? Deket ugge yu, aga't irugi taku nah mamangulun topic an mamangulun kalyon taku nan basic concept mipanggep hi ecosystem.

What is an Ecosystem?
https://bit.ly/32nGEv7

An ginibbu yun inang'ang nan video? Ot aga ta tibon takuy concept di structure di ecosystem. Hay nakali nah video ya hay ecosystem ya dehdi nadan waday biyagna yadan maid biyagna. Damanan tibon yuh tuwen video ta adalon yuy mipanggep ke datuwe.

Ecosystems and Biomes
https://bit.ly/2YqQn2g

Damanan ipidwa yun ang'angon nan video hin ugge yu nakaawwatan ta ahi taku ituluy. Muden deket naawatan yu ya ume taku nah nitun'ud an aton taku.

Pun'adalan 1

Aduwanin inadal takuy mipanggep hi ecosystem ya nadan nganneh diyen wadah di, etaku mun'obserbar nadah nunhihinatkon an ecosystem an wadah nunbobleyan yu. Damanan imbitaron yuy gagayyum yu. Ume kayu nadah ecosystems (muyung, payoh, habal/dolyah ya wa'el) mu ipakada yu ni'an nadah madutukan an aap'apu, man'uke ya ta maid di ad'adin maat ke dakayu. Ya nomnomon yun munbulwati kayuh nah nibagay nah panagyan yu ya nan eyu aton ya al'alan yuy camera an usaron yuh pundocument yu. Hanadan nih'up an ecosystem di pangayan yu ya deket dimmatong kayu ya latlatuwon yu nan producer, consumer ya decomposer.

Tandaanan yu datuwen descriptions: hay ngadan da, nan tinummolan da (e.g. tubu, luta, hapang/galuttigit, batu) ya na maid biyagna an mun'apektar ke dida. Iphod yun ulnuson nadan latlatu an hidiyey icaption yu.

Inila yu mo nadan waday biyagna ya maid biyagna an wada nah ecosystem, ya inadal yu kuma mo an datuwen components ya waday at'atton da hi ohat'oha. Aga mo't aton takuy panginilaan hin nganne innun di waday biyagna an maki'interact nah maid biyagna. Athidi bo nah madi biyagna nah wday biyagna.

Pun'adalan 2

Mamangulu, pakatibbon hantun latlatu.

Ke datuwen dehtu latlatu, inilaon hin ngane nan datin at'atton nan waday biyagna ya maid biyagna hi ohat'oha.

SELF ASSESSMENT QUESTIONS:
Itudok yu nan answer yu nah ugid:

1. Hay ecosystem ya diday _____ ya _____ hidi nah landscape an datuwen ya waday at'atton dah maphod hi ohat'oha.

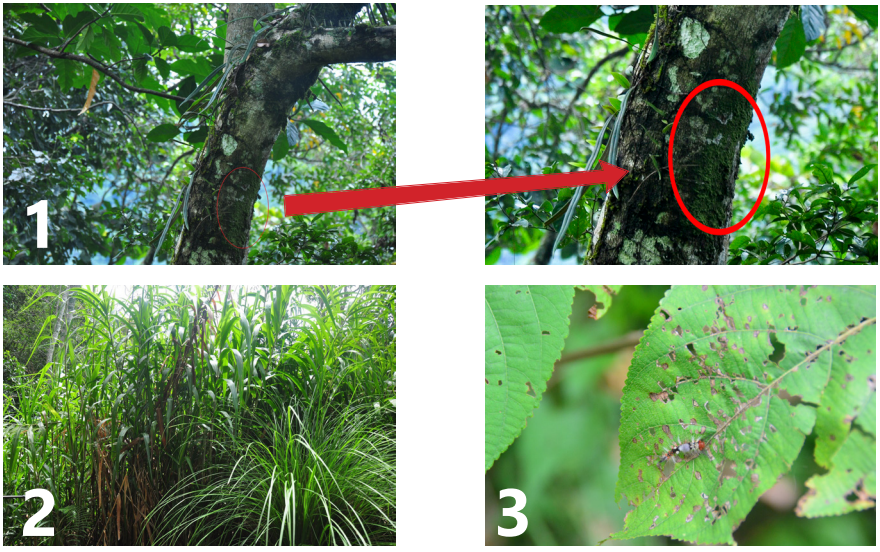
2. _____ ya dida nadan mangapya hi kanon da; ya nan maguddidi ya decomposer an diday mangusar hi naten tan'om ya animals.

Topic 2: Biotic Interactions

Aduwani, tibon taku hin nganne innun nadan waday biyagna an maki'interact hi ohat'oha. Tbon di video ta adalon.

Interactions between Populations
https://bit.ly/2ULUFiJ

An nagibbun inang'ang yu tun video? Pakatibbon yu mo hantudan latlatu hin nganney nikamangan da hi ohat'oha. Iexplain hin tipe.



Hay manguddidi, etaku pay mun'adventure!

Pun'adalan 3

Ang'angon yu nadan ecosystem hi kawad'an yu ya eyu pay tibon di udun an example di at'atton di waday biyagna hi ohat'oha. I'dokument yu nan at'atton da ho ohat'oha an usaron yuy camera or selpon yu. Ya iupload yu nan latlatu hi facebook group page ya iexplain yu nan latlatu an ibasar yu ke datuwen keypoints:

1. Daan di nun'obserbaran yu nah at'atton da hi ohat'oha. Ipainila hin ngannen klase an ecosystem;
2. Kalyon hi nganney ngadan nadan organisms;
3. Pakakkalyon nadan inobserbar yu an at'atton da hi ohat'oha.

SELF ASSESSMENT QUESTIONS:
Indicate the appropriate symbol to show how organism 1 interacts with organism 2. Write (+) for positive effect, otherwise, write (–) for negative effect.

Type of interaction	Organism 1	Organism 2
Predation	+	-
Herbivory		
Competition		
Mutualism	+	+
Parasitism		
Commensalism		

BOOK 2
ECOSYSTEM SERVICES OF THE IFUGAO RICE TERRACES LANDSCAPE

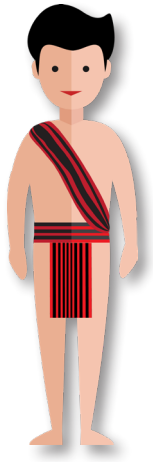
CHAPTER 2: ECOSYSTEM FUNCTIONS

Hi kagibbuwan tuwen chapter ya damana kuma mo an:

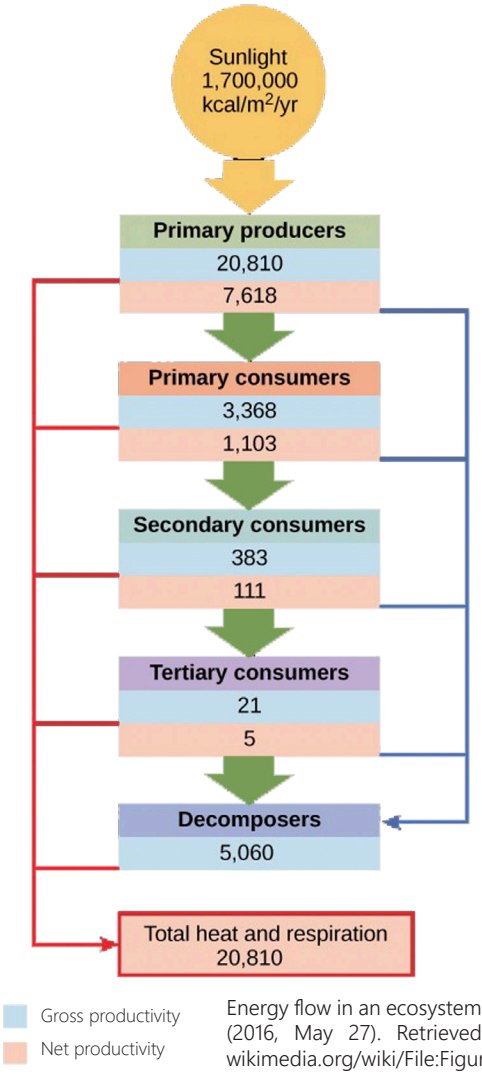
1. Iexplain hin nganne innun di energy an ume hi ecosystem;
2. Iexplain hin nganne innun di nutrients/sustansya (danum/liting, carbon, nitrogen) an mausar hi ecosystem.

Ka'adal taku nah nagibbun chapter di nganney mumbalin hi ecosystem, nganne nadan wadah ecosystem ya nadan nunhihinatkon an at'atton da hi ohat'oha an maobserbar? Ad uwani, ketuwen chapter, ya dalon taku in nganney function di ecosystem. Innilaon taki nadan importanten ma'ma'at hi kawad'an taku an adi pakatibbon di mata taku. Datuwen functions di ecosystem ya importanten adalon taku te maapektalan di biyab takuh kabigabigat. An iphod yun inilaon hin nganne datuwe? Deket athidi, aga mo't ume taku nah mitun'ud an topic.

Hanadan function di ecosystem ya datuwe nan interaction di components na. Datuwen interaction ya waday tulu an resulta na: 1) nan rate an umeyan di energy an dumalan nah waday biyagna an components, 2) nan rate di chemical umat nah phosphorus, carbon, ya nitrogen cycle hi ecosystem, an malpu nadan maai biyagna ya ime nah waday biagna ya nibangngad boh hinah maid di biyagna an components, 3) nan kakaat di ecosystem hin um'umme an olat. Ke tuwen chapter ya adalon taku nan mamangulun duwa an functional traits.



Topic 1: Flow of Energy



Energy flow in an ecosystem. Photo by CNX OpenStax. (2016, May 27). Retrieved from https://commons.wikimedia.org/wiki/File:Figure_46_01_07.png.

Matibo ke tuwen latlatu hi nganne innun di energey an ume hi ecosystem. Kon inila yuh tuwen topic? Oha pay, nomnomon yu hi daan di kalpuwan di energy? Ngannen energy di us'usaron di muyung? An hay punnomnoman yu ya mun'us'ussar kayu damdama hi energy? Tapnu inilaon yu tun topic ya humangon yu tudan questions. Ang'angon yu tun video ya tibon yu nan umanhan an kalpuwan di energy, nganne innun di energy an ume hi ecosystem ya nganne innun di energy an dumatong ke dakayu.

- Hay key points an nomnomon hi innun di energy an ume hi ecosystem ya, mamangulu, amin di waday biyagna ya mahapul day energy. Hay umanhan an kalpuwan di energy ya nan algo, an iabsorb nadan producers to produce the food through the process of photosynthesis.
- Hanadan herbivorus an animals an mangan hi plants ya malpuy energy da ke dadiyen kanon da ya nada damdaman carnovorse animals an mangan ke dida ya ume dida nan energy an malpu ke dadiyen kinan dan ibba dan animals. Hay manguddidin pangayan di energy ya nadan decomposers an mangan wenno mangitmog nadah naten plants ya animals.
- Hituwen flow di energy mipalpuh nadah producers inggana nah decomposers ya mipresents nah makali an food web weno food chain

Tapnu makaawwatan di inie'en di makali an food chain ya food web, ang'angon hituwen video:

Materials Cycle and Energy Flow
https://bit.ly/3j7SVKF

- Hay keypoints an nomnomon nah inang'ang hi video ya mamangulu, hay nunhihinatkon an organism ya nunhihinatkon an trophic level di kad'an da. Hay trophic level ya ipresent di numero an hay 1 di kababaan, ya 5 di katag'ayan. Hay mamagulun trophic level ya hidiyen nabilangan di producers hi ecosystem an dadiye ya nadan plants ya lumuy.

- Hay mikadwan trophic level ya hidiy nabilangan di mamangulun consumers. Dida nadan animals an mangan hi plants, umat hi baka, gulding, babbayung ya kulkulap'e.
- Hay mikatlun trophic level ya hidiy nibilangan di mikadwan consumers. Dida nan animals an kanon day ibba dan animals an kikkitay ya nakapkapuy, nabilang ke tuwen grupu di tagu, hay dolog hi wangwang, nadan kikkitay an hamuti ya nadan kikkitay ya o'ongal an animals. Hay mikap'at an trophic level ya dadiye di consumeras an kanon day ibba dan animals an nabibilang hi 2nd ya 3rd an trophic level.
- Hay manguddidi ya nan mikaliman trophic level an nabibilangan di apex predators weno nan kanan takun "namangulu nah food chain". Hanadan animals an nabibilang ketuwe ya sharks, tigers, lions, eagles ya nadan udun an o'ongal an animals. Datuwe predators ya maid di udum an animals an mangan ke dida, te diday nalnal'ot mu nadan udum an animals.
- Hanada ken decomposers ya mibilang da damdaman consumers, mu hay pangal'an dah energy da ya nah naten plants ya animals. Kinali adi da mabilang an predators wenno herbvores.
- Deket mumpataptop'o hi trophic level ya 10% ya abu di energy an mabati. Kaspangarigan, hanah food chain di holok, baka, tagu, ya bacteria, hi 1000 units an energy di plants ya 100 units ya abu di maalan di baka, 10 units ya abu di maalan di tagu, ya 1 unit ya abu di maalan di bacteria. Hanan nabati an energy ya natalak gapu atung.
- Hay food chain ya simple an linear presentation di immeyan di energy nah ecosystem, yaden hay food web is comprised of more representative di animals an hay ohn animal ya bokon oha ya abu di kalpuwan di kanona, muden bokon bo oha ya abun klase an animal di mangan ke hiya. Hay numbalinan nan diagram di food web ya kay tawang di kakawwa an dakol di nunhuhu'upan nadan linya an bokon ya abu oha. Ke dadiyen food chain ya food web ya maid di pangitib'an an hay apex predators ya hiyay kalpuwan di kanon di ibbanan animals, ya maid boy pangitib'an an hay producers ya waday udum an pangal'anah makan hin bokon nah algo ya abu.

Damana bon ang'angon yu tun figure tuh nundaul ta tibon yuy food web hi Ifugao Rice Terraces.

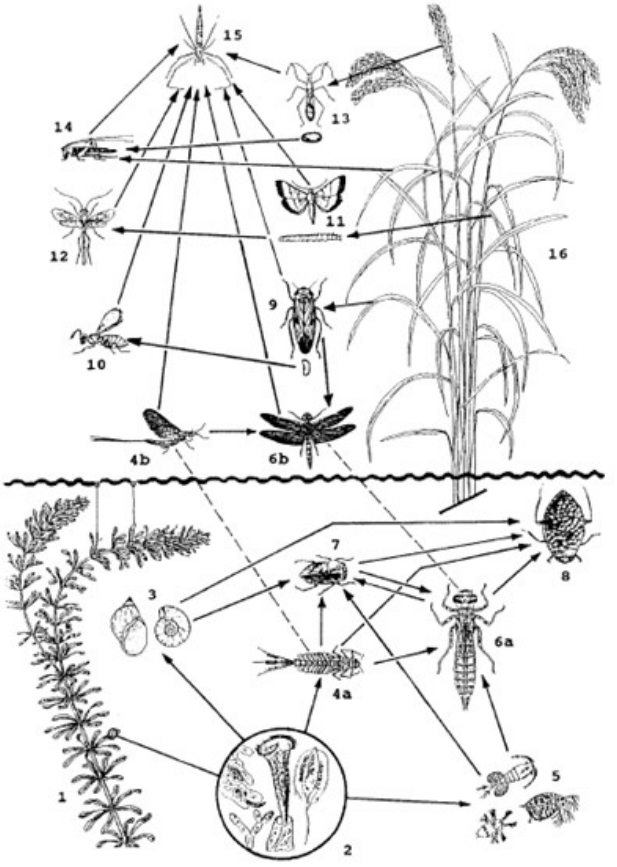


Figure 2.

Food web of an Ifugao agro-ecosystem (Setelle and Martin, 1998).

1 – Aquatic plant;
2 – algae, bacteria;
3 - snail;
4 – insect (a. larva, b. adult);
5 – zooplankton (microscopic floating algae);
6 – dragonfly (a. larva, b. adult);
7- aquatic bug;
8 – aquatic bug;
9 – leafhopper;
10 – insect (feeds on eggs);
11 – leaffolder larva and adult;
12 – insect (feeds on larva);
13 – rice bug;
14 – grasshopper;
15 – spider;
16- rice.

Pun'adalan 4

Hay food chain di nakasimleh pangitib'an hi innun di pangayan di energy. Hay ohan pangitib'an ya nan kanon nah biggatna. Mamamgulu ya nomnomomn hin nganne nadan kinan. Hay mitun'ud yay a aton di food chain ta mipatibo hin nganney innun nadan makan an dimmatong ke ditaku.

Pun'adalan 5

Umimbitar hi gagayyum ta aton do food web an usaron na dan nunhihinnatkon an waday biyagna nadah payo ad Ifugao. Hin'oh'a ke dakayu ya midatan nadah latlatun di waday biyagna an wadah nadah payoh. Eyu hanhanan handah mumpayo weno aamod ta kalion da hi nganney mangan ke dadiyen waday biyagna yah hin nganney mangan bo damdama ke dida. Nagibbu ke, maamung ayu bo ta aton yuy food chain an usaron yun am'in na dan waday biyagna nadah latlatun wadan dakayu.

SELF ASSESSMENT QUESTIONS:
Pili-on yu nan niptok/makkhop an hungbat.

1. Nan energy ya mawadah payoh gapu nah?
   a. Producers
   b. Consumers
   c. Herbivores
   d. Decomposers

2. Nan grupun di nunhuhu'up an food chain ya makali an:
   a. Pyramid of energy
   b. Complex food chain
   c. Food web
   d. Food cycle

3. Hinah ecosystem, nah energy ya mi'aldan malpu hi ohan organisms ya imme udum an organism an nganen energy?
   a. Electrical
   b. Mechanical
   c. Chemical
   d. Solar

4. On katnay mag'ah an solar energy nah tutubun di ka'iw nah muyung nu mi'convert hi chemical energy gapu photosynthesis?
   a. 1%
   b. 10%
   c. 30%
   d. 50%

5. Nan mikatlu an consumers hinan manguddidi an level nah food web ya?
   a. Immannung
   b. Agge Immannung

Topic 2: Flow of Matter

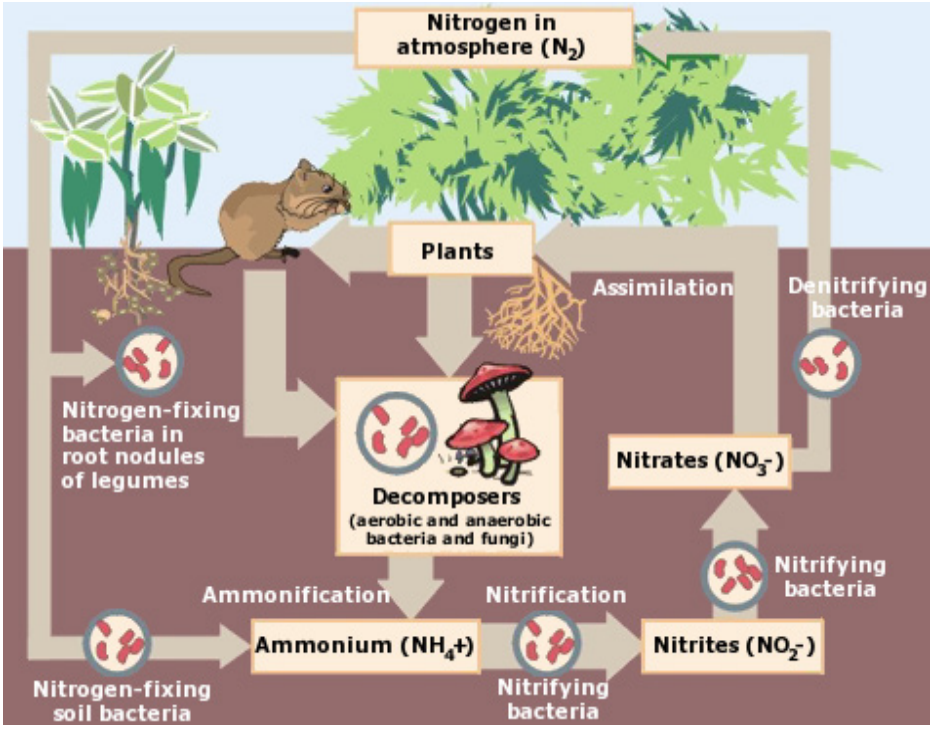
Bokon ya abu energy di ume nah ecosystem. Kon waday udum hi inila yu? Deket ma'id, ang'angon tun video ta inilaon.

Flow of Matter and Energy through Ecosystems
https://bit.ly/3lPeIZw

Ke tuwen video ya makalkali ya abu di general overview di ohat'uahn nutrients cycle. Ahi taku pakaadalon am'in di mipangep nadah cycles nah mitun'ud an adalon taku mu munquiz taku ni'an ta matibo hin waday inadal yu nah video:

1. Ohha'ohhaon an kalion nadan nutrients an nakali nadah video: _____
2. Nganne nan process an punbalinonay longa on di danum (water vapor) hi kulabut?
3. Nganne pangiusaran di plants nah energy an malpuh algo?

I. NITROGEN CYCLE



Nitrogen cycle [digital image]. Photo by US Environmental Agency (2003). Retrieved from https://upload.wikimedia.org/wikipedia/commons/f/fe/Nitrogen_Cycle.svg

Ke tuwen section, ya wada pay di udum an adalon taku mipanggep hi nitrogen cycle. Ya hay kinaimportante na hi biyag taku kabiga-bigat. Tibon hidiyen latlatun di diagram di nitrogen cycle.

Nitrogen Cycle
https://bit.ly/3huW1Z2

Idiscuss taku nadan importanten manomnom taku mipanggep hi nitrogen cycle. Mamangulu ya importante di nitrogen hi am'in an waday biyagn ate mahapul da hi pangipawadaan dah hi DNA, RNA ya protein.

78% nah angin hi atmosphere gapuh nah Nitrogen. Muden man ut hay kadakolan hi atmospheric gasses ya nitrogen mu adi diretso an usaron nadan waday biyag na di nitrogen in its gaseous form. Hanan nitrogenous compound an mawada gapuh nitrogen cycle ya hidiyey mausar nadan waday biyagna. Ya nan liman ine'en di nitrogen cycle ya ton nadan microorganism.

Handah luta an ma'id di nitrogenous compound ya usaron di industries di nitrogen –based fertilizers ta dumakdakol di nitrogenous compound nan luta. Mu den namahig ke bo di pun'usar kituwena abono ya adi maphod di atonah ecosystem te mawaday environmental hazard, umat hi luta ya danum an munbalin dah acidic, ya adi moh malinih nan danum ta ad'adi ot ya buy ma'at hi bimmoble.

SELF ASSESSMENT QUESTIONS:

Hungbatan yu nan damag an mipanggep hi Nitrogen Cycle.

1. Ngane diye an kinanayun an kaatan di nitrogen cycle?
   a. Kil'at (lightning)
   b. Fossil fuel combustion
   c. Nitrogen fixing bacteria
   d. Apuy nah mumuyung (forest fires)

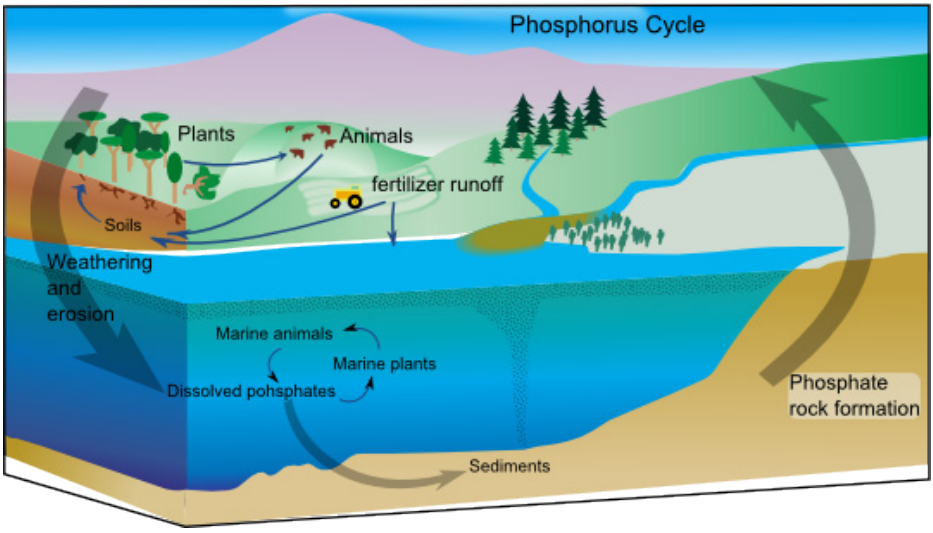
2. Nitrogenous waste compound nan nunkakaten nitanom ya ta'in di animals ya mibangngad hi nitrogenous compound an umat hi ammonium an dumalan hi proseson di _____?
   a. Nitrogen fixation
   b. Nitrification
   c. Decay
   d. Maid nah pumpilian

3. Nganen proseso di mun pabuddu hi nitrogen gas pabangngad nah atmosphere?
   a. Denitrification
   b. Nitrogen fixationd. Nitrification
   c. Decay

4. Once bacteria have fixed nitrogen, ya mablin an alan di tatanom ya animals an usaron dan munproduce hi _____.
   a. Nitrogen oxides
   b. Carbohydrates
   c. Proteins
   d. Energy

5. Synthetic fertilizers ya ikaddum nay _____ nah luta:
   a. Organic nitrogen
   b. Fixed nitrogen (ammonium)
   c. Nitrogen oxides
   d. Rhizobium bacteria

II. PHOSPHORUS CYCLE



Phosphorus cycle [digital image].
Photo retrieved from https://upload.wikimedia.org/wikipedia/commons/5/56/Phosphorus_cycle.png.

Hay mo mitun'ud an nutrients cycle an kalkaliyon taku ya phosphorus cycle. Hidiyen image/latlatu di pangitib'an hi general overview ke tuwen cycle. Ang'angon taku tun video ta pakaadalon takuy ine'e na.

Phosphorus Cycle
https://bit.ly/2CR3pyy

- Kalkaliyon taku nadan keypoints mipangep hi phosphorus cycle. Hay phosphorous cycle ya importante an nutrient hi yumaguwan nadan waday biyagna. Man'uke yamahapul nadan waday biyagna di phosphorus ta mawaday ATP ta hidiyey mahapul ta mun'addum di DNA ya RNA ya nan udum an critical compounds an mahapul ta nanongnan matagu nadan ewaday biyagna. Mahapul an maat di cycle hi phosphorus hi kaatnan reservoirs hi luta, ya nadah waday biyagna, yaden ma'ma'at di kaatnam chemical reactions ya munbaliwbaliw di ine'e na kadiyen cycle. Muden hi phosphorus cycle ya maid di significant gaseous phase na.
- Takon di naka'importantey phosphorous ya mahapil an nomnomon an adi halman di pun'usar hi phosphate an abono ya adi nalgom di pangipaeyan nah naaabono an danum te gumapu kadadagan di ecology.

SELF ASSESSMENT QUESTIONS:

1. Dahdiy palpuwan di Phosphorus?
   a. Atmosphere
   b. Danum/liting (water)
   c. Batu (rocks)
   d. Udan (rain)

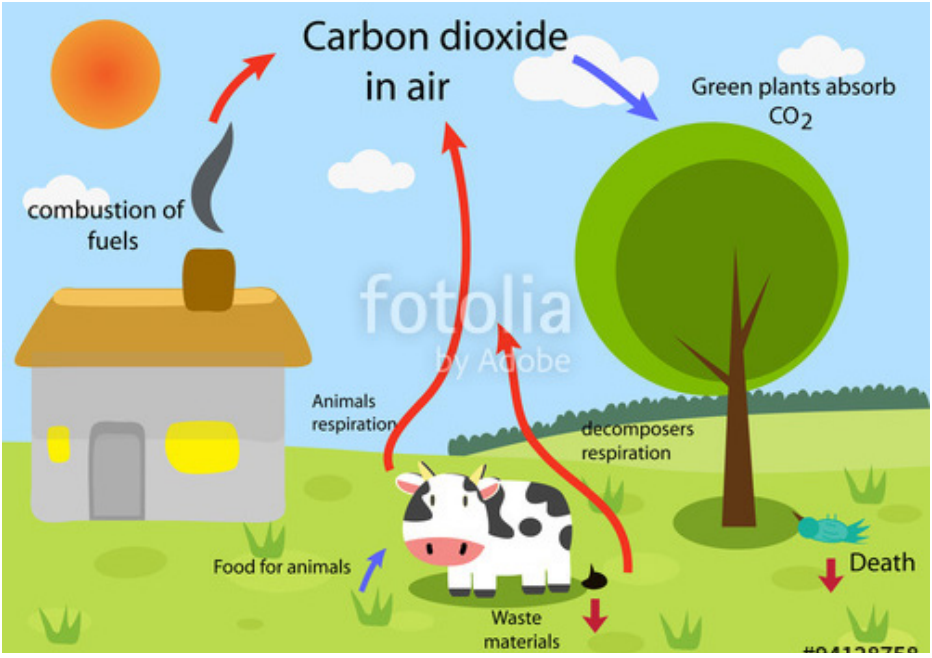
2. Nan tatagu ya makaala da hi phosphorus.
   a. Immannung
   b. Agge Immannung

3. Ngandiyey parten di tan'om an mun'absorb hi phosphorus?
   a. Tubu (leaves)
   b. Habung (flowers)
   c. Hap'ang (stem)
   d. Lamut (roots)

4. Kon makkaphod an dakdakkog di phosphorus mo nan kahapulan di ecosystem?
   a. Immannung
   b. Agge Immannung

5. Ngay Kali idiyen ka'sobra an nutrients an mahamak hinan ginawang an rason di oxygen depletion?
   a. Nutrient Pollution
   b. Eutrophication
   c. Oxygen degradation
   d. Ephemeralization

III. CARBON CYCLE



The carbon cycle [digital image]. Photo retrieved from https://co.fotolia.com/id/94128758.

Carbon Cycle
https://bit.ly/31o4SGg

Hay manguddidi ya hay kalkalyon taku mo ya mipanggep hi carbon cycle. Hidiyen latlatu ya ipatibonay general overview di carbon cycle. Ang'angon hituwen video ta mad'uman pay di inilaon mipangep ketuwen carbon cycle.

- Hay keypoints an nomnomon taku mipanggep hi carbon cycle ya mamangulu, hay carbon ya makahhapul nadan waday biyagna ta waday innun nadan matagu. Am'in nadan waday carbon nay a makali an organic molecules ya nan maid di carbon nay a makali an inorganic.
- Hay umanhan an mangusar hi carbon molecules an waday dibdib ya nadan plants ya nadan udum an producers. Usaron day carbon hi photosynthesis, ta waday innunan makapyay glucose, an mipasa damdama hi consumers, ya nah manguddidi an dadiye ya decomposers.
- Nan a'animals ya makaala dah carbon gapu nan panganan da hi tutubu (herbivores) ya, ngen nan udun ke umat nah apex predators ya maala da nah panganan da hi tan'om wenno nan paddung dan animals (carnivores). Mangipabuddu metlang nan animals hi carbon nah angin an hiya nan carbon dioxide.
- Datuwen decomposers ya diday ume weno diyay mihaad nah kadan di nunkakate an tan'om, animal, ya nan udum. Diday munpahawwang hinah carbon an nihaad nah nunkakate an animal wenno tutubu, an mibanggad metlang nah atmosphere an carbon dioxide ya hinan luta an carbon compound.
- Hanada ken consumers ya ibuddal day carbon an malpuh adol da through the process of respiration. Hin ugge yu pay ni'an inila, hay carbon ya makali an greenhouse gas gapuh kabaelanan muncontain/to hold heat. Ya gapuh pangat di tagu, an dadiayey nahlman an mun'apektar hi concentration di carbon hi atmosphere ya wada moy global warming. Hay gapun tuwe nimpe ya nan namahig an concentration di carbon dakkodakkol an livestocks di agriculture ya nadan udum an atoaton di tagu.

SELF ASSESSMENT QUESTIONS:
Immannung on Agge immannung :

1. Nan carbon ya makali an green gases gapu ta tumulung dah nan umonggngalan di tanom?

2. Nan carbon ya mak-trap hi pudut malpu nah potang?

3. Nan carbon gas di hiya an mikadwa nah dilag di algo ya nah kaimportante'anan munproduce hi makan?

4. Nan inorganic molecules ya datuwen nan compounds an waday carbon molecules na?

5. Nan tatan'n ya mun'aborb da hi carbon dioxide nu phostosysnthesis?

Inadal taku moy mipanggep hi energy flow ya biochemical cycles. Usaron taku dadiyen baru an inadal taku Aton taku boy oha.

Pun'adalan 6

Pilyon di oha nadah energy flow, nitrogen cycle, phosphorous cycle, ya carbon cycle. Mahapul an identify yu nadan o'ohan key components nan pinili yun topic an wadah numbobleyan yu, ne illustrate yu ya idiscuss yu nan pinili yun topic an usarobn dadiyen components. Mahapul an waday nikamangana nah pinili yun topic, umat ot him kinakudang di nitrogen nah luta ot humlun hi waday bitil; nahalman an pun'usar hi phosphorus an abonoh ot mungkakate day dolog nadah nih'up an lobong.

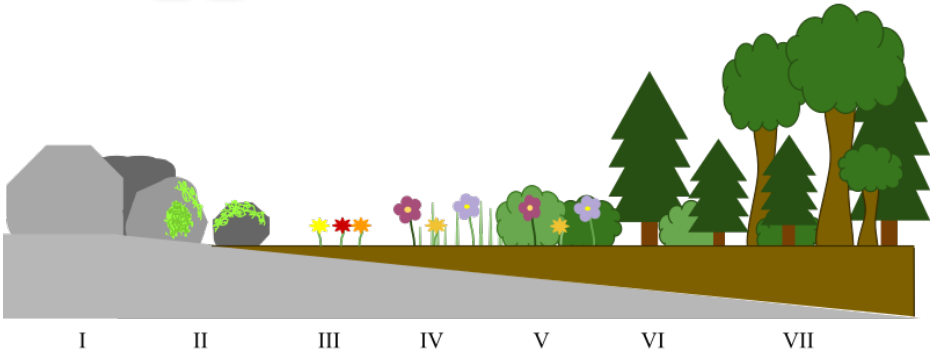
BOOK 2
ECOSYSTEM SERVICES OF THE IFUGAO RICE TERRACES LANDSCAPE

CHAPTER 3: ECOLOGICAL SUCCESSION

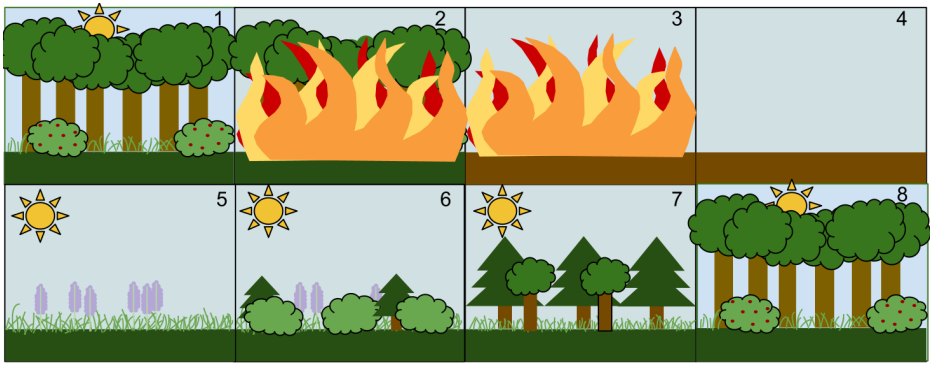
Hi kagibbuwan tuwen chapter ya damana kuma mo an:

1. Kalyon di nunhinnatkonan di duwan klasen ecological succession;
2. Kalyon di sucession nadan nunhihinnatkon an klassenn plant nah ohan lugar;
3. Mawaday punbalor/value hi kinaimportanten di ecological/ ecosystem succession an misapply hi management di IRT.

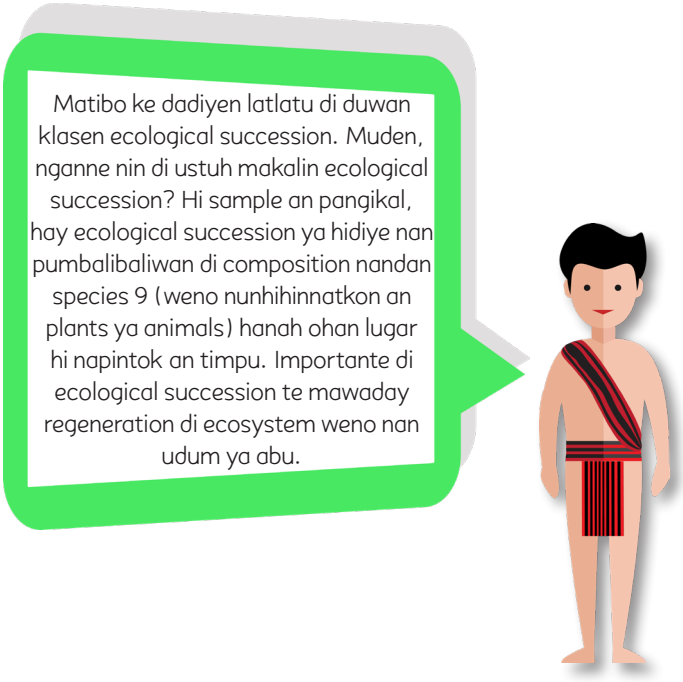
An inila yu hin ngananey ecological succession? Ang'angon yu hantudan latlatuh nundaul:



Primary ecological succession [digital image].
Photo retrieved from https://upload.wikimedia.org/wikipedia/commons/4/4d/Primary_Succession_Diagram.svg



Secondary ecological succession [digital image]. Photo by Katelyn Murphy. (2012, May 19).
Retrieved from https://upload.wikimedia.org/wikipedia/commons/4/47/Secondary_Succession.png



Ketuwen chapter ya obserbaron taku nan process di ecological succession hanadah plants.

Pun'adalan 7

Ang'angon tun video hi ecological succession.

Ecological Succession
https://bit.ly/2QnkBic

Siguraduwon an adalon di nunhinnatkonan di primary ya secondary succession. Kon mabalin an kalyon yu hin nganne dadiye?

Mamangulu Succession	*Mikadwa an Succession*

1. Ekayu mundaldallanan nah numbobleyan yu. Hay ohan aton yu ya tibon yu on ohan lugar nah habal an waday disturbance (nagabutan) dih nala'uy tulun linggu. Latlatuwon yuh diye, ifocus yuh ang'ang diyen lugar ya nadan klasen plants (species) hidi. Nala'u key 2 wenno 3 an linggu, latlatuwon yu boy a ilista yu nadan plants an inobserbar yu.

Week of observation	*Plants observed (common name)*
0-2 weeks	
After 2-3 weeks	
After another 2-3 weeks	

2. Hin ibasar yu nah inang 'ang yun video, ya na dan binidbid yuh internet ya nadah liblu hi libraries, nganney wadah nomnom yu hi kaimportante di ecological succession an ohan aton di ecosystem?

_____
_____
_____
_____

3. Mipuun hi inila yu ya naawatan yu, nganne innun di ecological succession an miaaply hi IRT landscape. Iexplain yu.

_____
_____
_____
_____

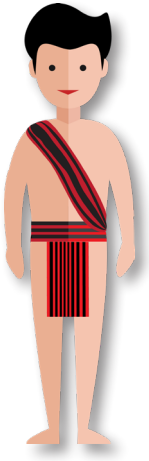
BOOK 2
ECOSYSTEM SERVICES OF THE IFUGAO RICE TERRACES LANDSCAPE

CHAPTER 4: ECOSYSTEM SERVICES

Hi kagibbuwan tuwen chapter ya damana kuma mo an:

1. Kalyon di key services di ecosystem an waday nikamangana hi ifugao Rice terraces landscape;
2. Kalyon di nunhihinatkon di maalan maphod mipuun nadah categories an nabilangan da.

Inadal taku moy mipanggep ho ecosystem ya nadan components na hin nganne nadan functions da yah in nganne innun datuwen naporma ot ingganad uwani ya nanongnan wada da. Ad uwani, ketuwen chapter ya adalon takuy mipanggep hi maala taku nah ecosystem, an sapay kuma ta nomnomon takuy kinaimpoatanten nadan ecosystem.



Inilaon taku ketuwe nan makali an "ecosystem services", an dadiye nadan maala taku nah ecosystem. Tulu di importanten ine'ena: direct services, indirect services ya aesthetic/ethical effects.

Ang'angon taku ni'an tun video ta ahi taku ume nah topic an ecosystem services.

Ecosystem Services
https://bit.ly/3IdoYLa

Hituwen video ya general overview di kakalyon taku, Adi taku pakakkalkalyon am'in. Muden mahapul an iha'ad takuh nomnom taku datuwe:

- Waday tulun rason hin tipe ta importante di biodiversity hi ecosystem, datuwe ya: 1) direct services, 2) indirect services, ya 3) aesthetic/ethical effects;
- Direct services ya dadiye nadan maala gapuh pakiinteraction taku hi ecostystem services, umat hi maala takun makan, hay kiha'adan, materials, aga, ya udum pay;
- Indirect services ya dadiye nadan maala taku an adi mahapul an makiineteract taku hi ecosystem. Umat hi (hin nih'up takuh baybay) ya maprotectaran taku hi dalluyun, dumakkol di dolog hi baybay hin wada day mangroves hi pingngit di baybay, waday malinin danum te deket initmog di luta ya nasagat di lungit nan danum, ya wada pay di udum;
- Aesthetic/ethical effects ya dadiye nadan mipaboltan nadah mitun'ud holag, ua nadan dakol an maala takun maphod hi ecosystem, umat hi linggop di nomnom hin hin'uddum on etaku maoh'ohha nah myung, hay ragsak hin ang'angon takuy nature, ya udum pay; ya
- Hay direct services ya nakalakkan balorantaku te detuwe ya objects. Muden wada damdamay balor di indirect services ya aesthetic/ethical effects mu maid di mapotok hi pumbalor. Muden hay ot importanten abu ke datuwe ya punnanongon weno iimprove pay di ecosystem ya ecosystem biodiversity hi numbobleyan taku.

Pun'adalan 8

Kalyon takuy kabalinan tuwen ecosystem services. Piliyon di ohan idiscuss hin direct services, indirect services weno aesthetic/ethical effects. Nagibbu ke, kalyon nadan maphod an maala hi Ifugao Rice Terraces an nabilang nah pinili yun topic. Ya kalyon yu hin tipet nomnomon yu an important eke dakayu nadan maala hi IRT.

_____
_____
_____
_____
_____
_____

SELF ASSESSMENT QUESTIONS:
Itudok yu nu ngay maala taku nah papaya takun immipugo.

Direct Services	*Indirect Services*	*Aesthetic/Ethical Effects*

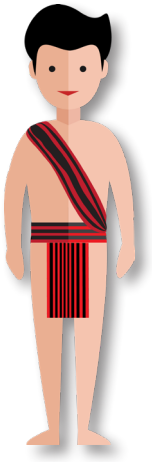
BOOK 2
ECOSYSTEM SERVICES OF THE IFUGAO RICE TERRACES LANDSCAPE

CHAPTER 5: IMPACTS OF HUMAN ACTIVITIES ON ECOSYSTEM SERVICES

Hi kagibbuwan tuwen chapter ya damana kuma mo an:

1. Kalyon nadan umanhan an at'atton di tagu hi IRT ya nganney epektona nadah nunhihinatkon an ecosystem hidi nah landscape;
2. I-explain hin nganne innunan naapektaran di ecological functions/ processes ya nan uppen ecosystem..

Nan mama'at an kipkiphodan ya mangidat hi maphod ya madi an ma'at hi environment/nan makattibo an ma'ma'at ya umat nah Agricultural Production ya udum an economic activities, forest management ya conservation, mass ecotourism ya hituwen urbanization an middum pay hi dumakdakolan di tatagu an mangdat pay hi immannung an ma'at hinah sustainability'n di papayon di Immipugo.



Nan udum an umatan di madi an epekto ya, umat nah umatungan di mumuyung ya nan kapakiyan di luluta gapu nah pumputuputulan dah hi kaka'iw ya nan kumitkittayan pay di biodiversity gapu nah urbanization. Wada boy maphod/mayat an epekton di kaka'at di tatagu, datuwe nan pangipaptok nah mumuyung kumat nah puntanoman di kaka'iw ta masukatan nadan daan ya nunkakate mon ka'iw. Ya oha bo nan profit hi tourism an ume nah pangipaptokan nah mumuyung hinan nunbobleyan.

Pun'adalan 9

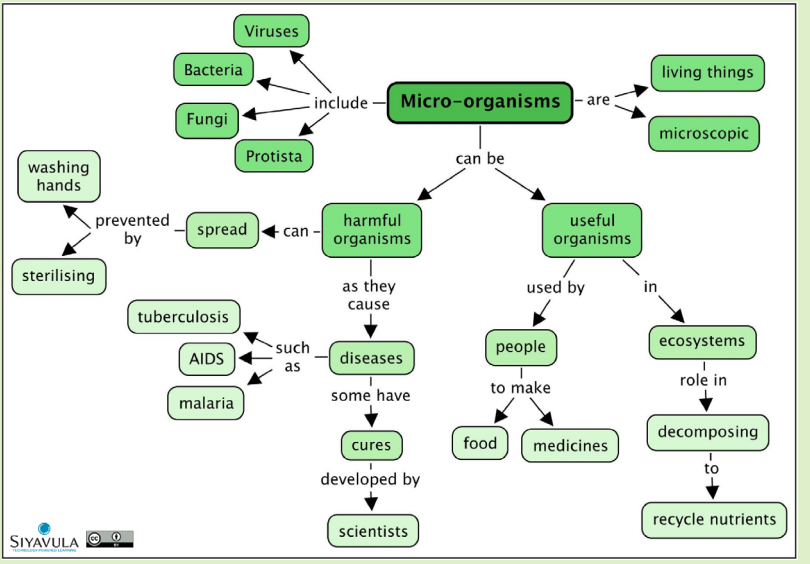
1. Naganasan kayun munbidbid nadah internet, newspapers ya udum pay mipanggep nadah ma'ma'at aduwani hi development status ya probleman di IRT. Tibon yu datuwen examples hi: "Contemporary Developments Problems in Ifugao Rice Terraces." Oha pay ya damanan tibon yu nadah linatlatu yu weno umipatibo kayu nadah latlatu an nipatiboy issues ya problema hi IRT ta mid'um nah pun'adalan yu.

Munhanhan kayu nadah pamilya yu hay gagayyum yu hi mipanggep ke tuwen topic. Idiscuss yu idida ta inilaon yuy punnomnom da, ya ahy punnomnom yu damdama. Ibasar yu nah discussion yu di itudok yu tuh table:

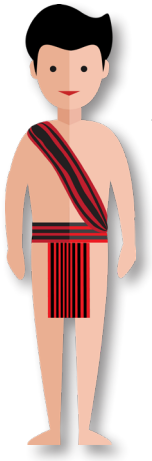
Activity	***Main ecosystem affected***	***Issue/ Problem***	***Ecosystem service affected***	***Effect (+, -, or neutral)***
Ex.: conversion into vegetable gardens	*payoh*	*Decreased area for traditional rice production*	*Provisioning function: decreased native rice production*	*(-)*

Pakanomnomon tau an ke tuwen Pun'adalan ya mangidat hi mayat/maphod ya madi an maat hi sorroundings/environment. Hituwey makali an 'trade-off'. An mabalin an punhuhumanganan yu nu ngay decision an maala ke tuwen information.

2. Tapnu mipatibon makulug an naawatan yu datuwen issues ya problem ya nan epekto da hi ecosystem services, mangapya kayu hi conceptual map an mipatiboy nikamangan nadan nunhihinnatkon an idea yu. Athitu, hay conceptual map ya diagram /illustration nadan ideas (key points on words) an wada nadah boxes, an mipatiboy nunkakamangan da nah ituddun di arrow/pana. Hituwey example/pangiun'unudan.



Conceptual map [digital image]. Photo by Siyavula Education. (2014, March 31). Retrieved from Flickr.



Ot nganneh, an ginibbu yu nadan at'atton yu? An hi punnomnom yu ya waday inadal yu? Sapay kumat ginanganas yuh tuwen Book ya sapay kuma ta usaron yuy inadal yu hi kabigabigat. Hituwey pogpog tuwen book, ya ahi bo nan mitun'ud.

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ABOUT THE BOOK AUTHORS

MARK ANTHONY F. RABENA

Assistant Professor Mark Anthony Rabena specializes in botany, general ecology, plant ecology, and environmental biology at the Institute of Biological Sciences (IBS), College of Arts and Sciences, University of the Philippines Los Baños (UPLB). In 2015, he started as an Affiliate Faculty of Landscape Ecology under the Master of Environment and Natural Resource Management program of the Faculty of Management and Development Studies, UP Open University (UPOU). As a young scientist, Asst. Prof. Rabena has two published articles in ISI journals and presented more than 10 oral and poster papers in the Philippines, Malaysia and Japan. He was a recipient of the UP Varons Undergraduate Thesis Grant Award, Commission on Higher Education (CHED) Masters' Thesis Grant Award, Department of Science and Technology-Science Education Institute Masters' Thesis Grant Award and the DA-BAR Graduate Thesis Grant for Organic Agriculture. At IBS, Asst. Prof. Rabena was recognized as one of the Outstanding Teachers in 2015.

THADDEUS P. LAWAS, Ph.D.

Dr. Thaddeus Lawas is a Science Communicator with research related to disaster risk reduction and management. His projects are focused in early warning systems and information, education and communication. He is the Production Editor of the Journal of Environmental Science and Management (JESAM), and Editor of UPLB's School of Environmental Science and Management (SESAM) bi-monthly newsletter, SESAM Updates and the SESAM Website.

ELPIDIO BASILIO, JR., Ph.D.

Dr. Elpidio Basilio Jr. finished his Bachelor of Science in Biology major in Genetics in UPLB. He pursued his Masters in Biology at Saint Mary's University in Nueva Vizcaya, and his Doctor of Philosophy in Genetics in UPLB. Currently, he is a Faculty of the College of Agriculture and Home Science in Ifugao State University, and is designated as the University Director for Research and Development.

ABOUT THE BOOK AUTHORS

ROMEO A. GOMEZ, JR., Ph.D.

Dr. Rome Gomez Jr. is a Professor in ecology, biology and environmental science, and is currently the Dean of the Graduate School and Director of the Open University of the Benguet State University (BSU). He passed the PASUC Accreditation Screening for University Professor in 2016. He obtained his Ph.D. in Environmental Science from SESAM, UPLB. As a Southeast Asian Regional Center for Graduate Study and Research in Agriculture Scholar, he also passed the Board Examination for Environmental Planners in June 2019. He received the Outstanding Researcher Award (BSU) in 2011, and the distinguished Alumnus Award for Academe awarded by SESAM-UPLB Alumni Association in 2013. He was the recipient for the Philippine Society fot the Study of Nature Service Award having served as its National President form 2013 to 2014. Dr. Gomez is a registered EIA/IEE Preparer and Reviewer. He has published over 20 articles in various refereed research journals including studies on the Ifugao Rice Terraces in the JESAM and in the Philippine Agricultural Scientist. He is presently a member of the Technical Committee for the Ifugao Satoyama Meister Training Program based in the Ifugao State University.

MELANIE S. SUBILLA

Associate Professor Melanie Subilla of the College of Forestry, Mountain Province State Polytechnic College (MPSPC) has been actively involved in environmental awareness programs through community immersion in Mountain Province since the start of her career. Her research and publications focused on water resources and biodiversity assessment and conservation. This includes mossy forest' floral assessment and identification towards propagation of endemic and endangered species with economic potentials. She is now currently exploring on the valuation of water resources and biodiversity. She was awarded Best Paper by Highland Agriculture Resources and Research and Development Consortium in 2012 on her study on the "Woody Plant Species Diversity of Mount Data National Park." Vertical to her Bachelor and Master's degrees (Bachelor of Science in Environmental Science from Benguet State University and Master in Environment and Natural Resources Management from the University of the Phillipines Open University), she is currently pursuing her Ph.D. in Resource Management in the Isabela State University as a grantee of the CHED K+12 Scholarship Program.

ABOUT THE TRANSLATOR

JOSEPHINE G. PATAUEG

Miss Josephine Pataueg took up a Bachelor's degree in Accountancy. She worked with the United States Peace Corps as a Language Instructor, and with the Japan International Cooperation Agency by teaching the Tuwali language to volunteers, assisted missionaries and researchers with Tuwali grammar and vocabulary. As a translator, Miss Pataueg has experience in translating learning and instructional materials, and in translating the Bible into two Ifugao languages—Tuwali and Keley-i. She also does translation consultations for Ayangan. Currently, Miss Pataueg still does translations from English to Ifugao local languages. Specifically, she is involved in translating English hymns into Tuwali and Yattuka. She also does Therapeutic Massage.

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