BAB 9

CONTOH PERTANIAN BERLANJUT: SISTEM PERTANIAN PADA BENTANG LAHAN

INTERAKSI ANTAR AGRO-EKOSISTEM , HUBUNGAN DIVERSITAS DALAM AGROFORESTRI DENGAN KUALITAS AIR

Oleh

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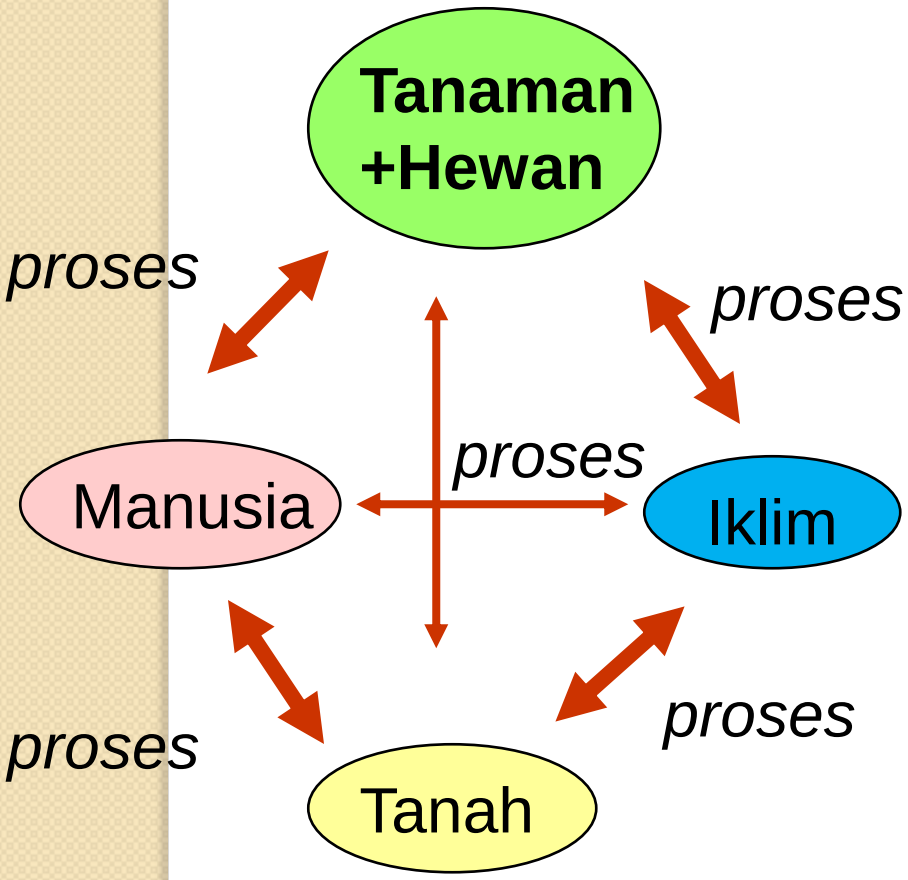
PTI 4208 Pertanian Berlanjut

Tujuan Instruksional

- Interaksi antar agroekosistem dan pengembangan lahan pertanian di lanskap.
- Pengelolaan Biodiversitas tanaman dalam agroforestri untuk mempertahankan kualitas dan kuantitas air

Ekosistem:

Suatu sistem kehidupan yang tersusun dari berbagai komponen yang saling berhubungan satu sama lain



Agro-Ekosistem

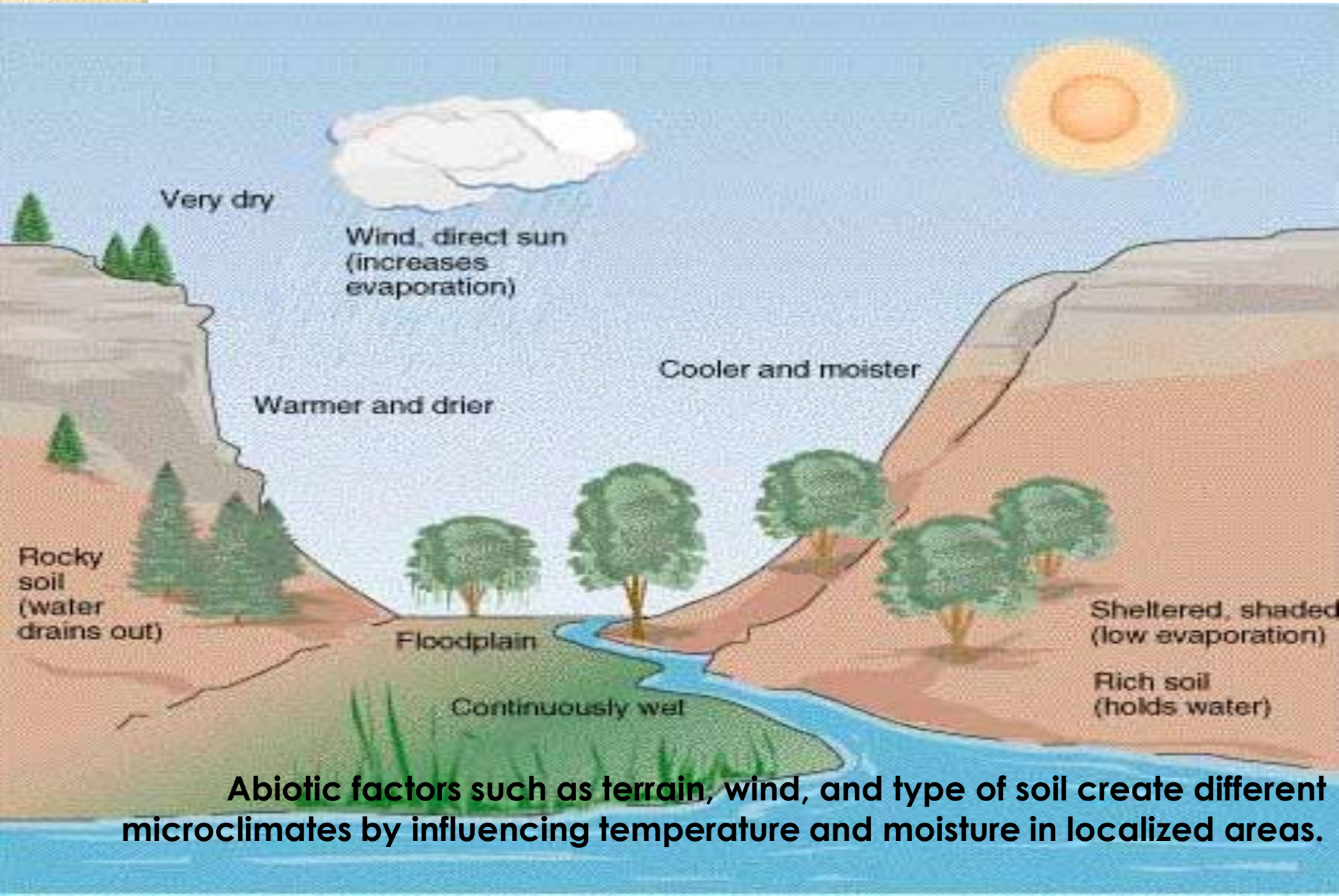
- Aspek bioteknik dan sosial ekonomi ~ tanah, iklim, pengelolaan, produksi, termasuk proses yang telibat di dalamnya
- Sangat bervariasi: spesifik lokal tgt dr kondisi setempat (tingkat dari kompleksitas)
- Contoh: Pertanian pangan, Agroforestri & hutan

Major Ecosystem Components

- **ABIOTIC**
  - Water, air, temperature, soil, light levels, precipitation, salinity
  - Sets tolerance limits for populations and communities
  - Some are limiting factors that structure the abundance of populations

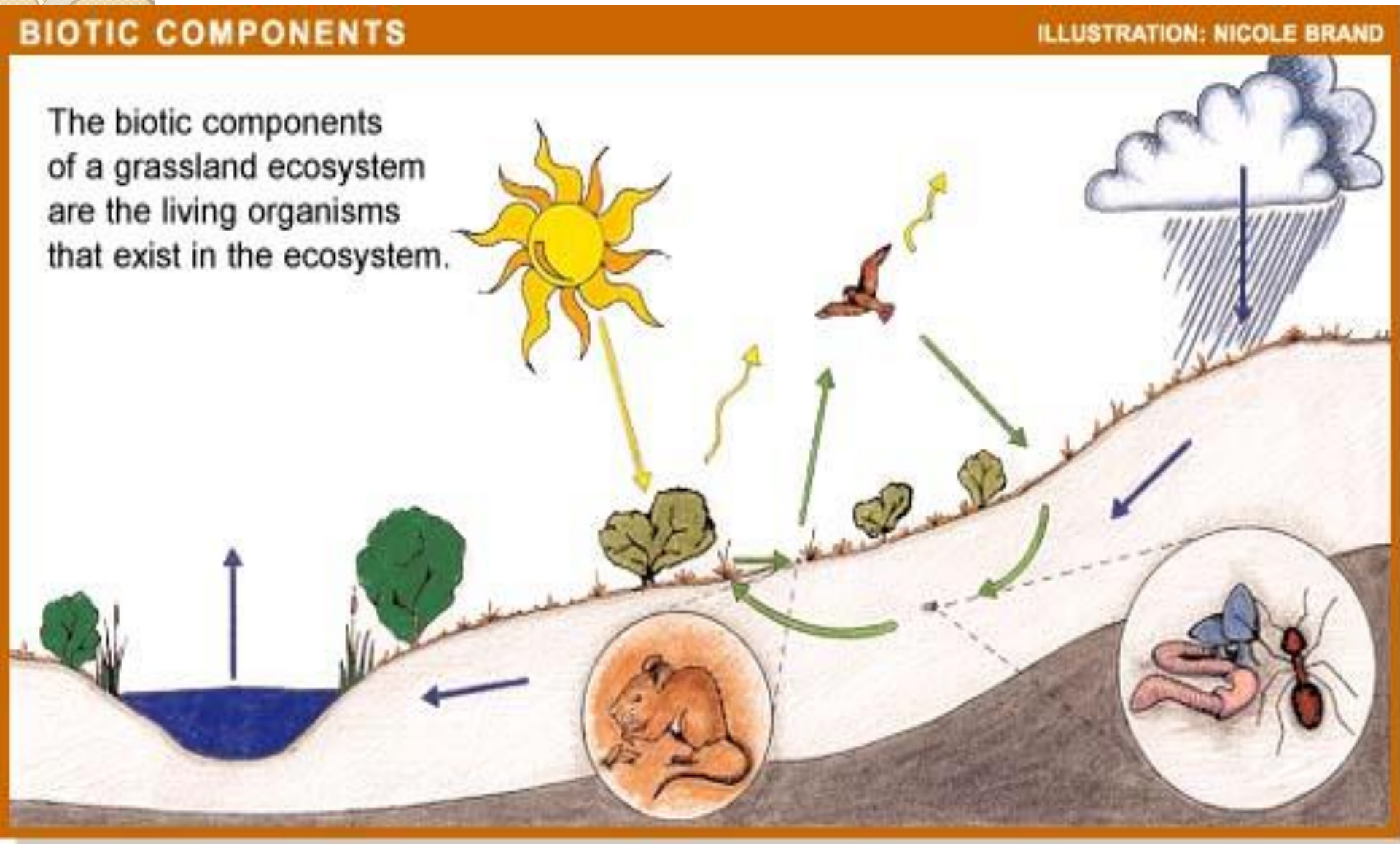
- **BIOTIC**
  - Producers, consumers, decomposers
  - Plants, animals, bacteria/fungi
  - Biotic interactions with biotic components include predation, competition, symbiosis, parasitism, commensalism etc.

Abiotic Factor



Abiotic factors such as terrain, wind, and type of soil create different microclimates by influencing temperature and moisture in localized areas.

Biotic Factor



Sustainable Agriculture apabila :

1. MANTAP SECARA EKOLOGI

2. BISA BERLANJUT SECARA EKONOMIS

3. ADIL

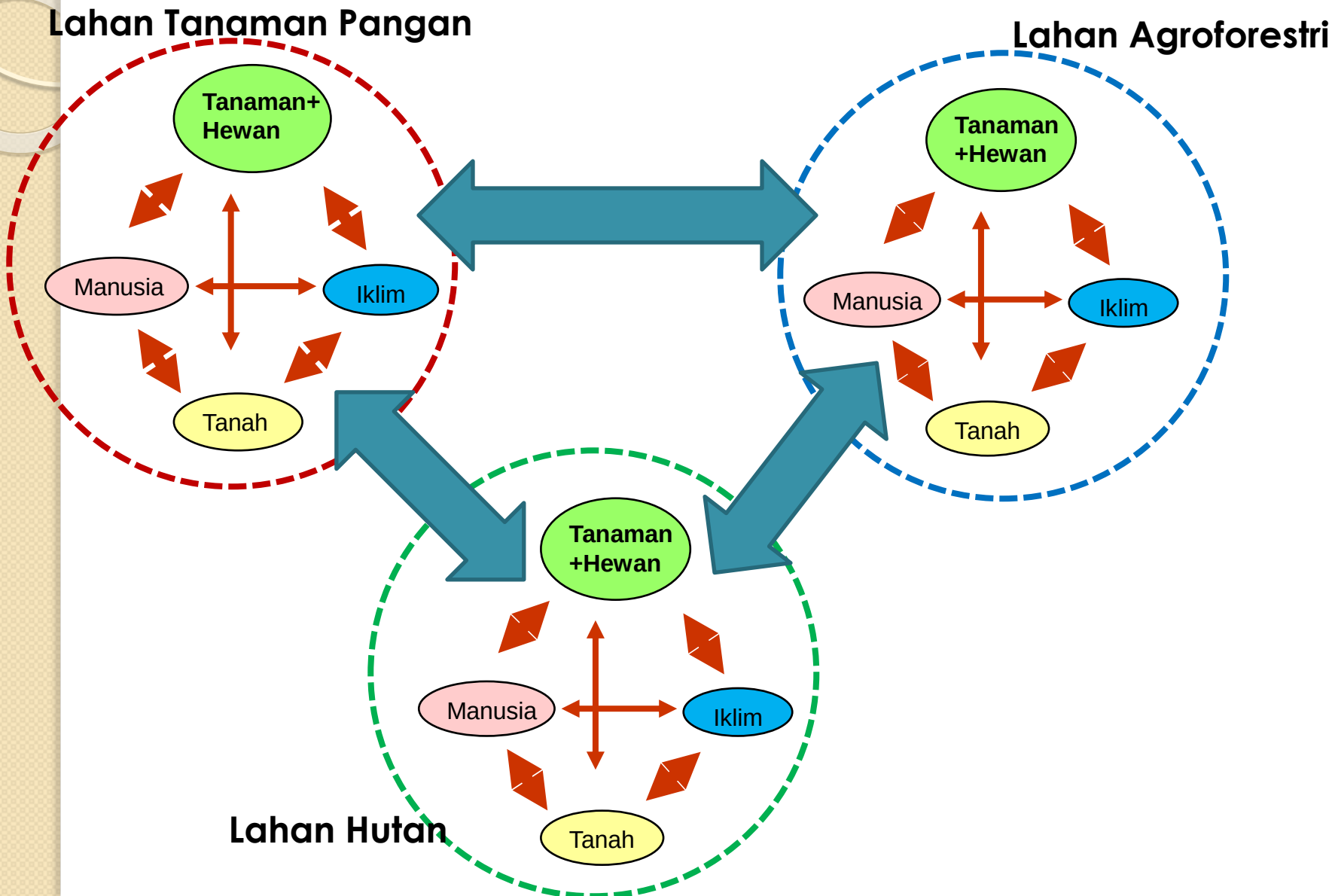
4. MANUSIAWI

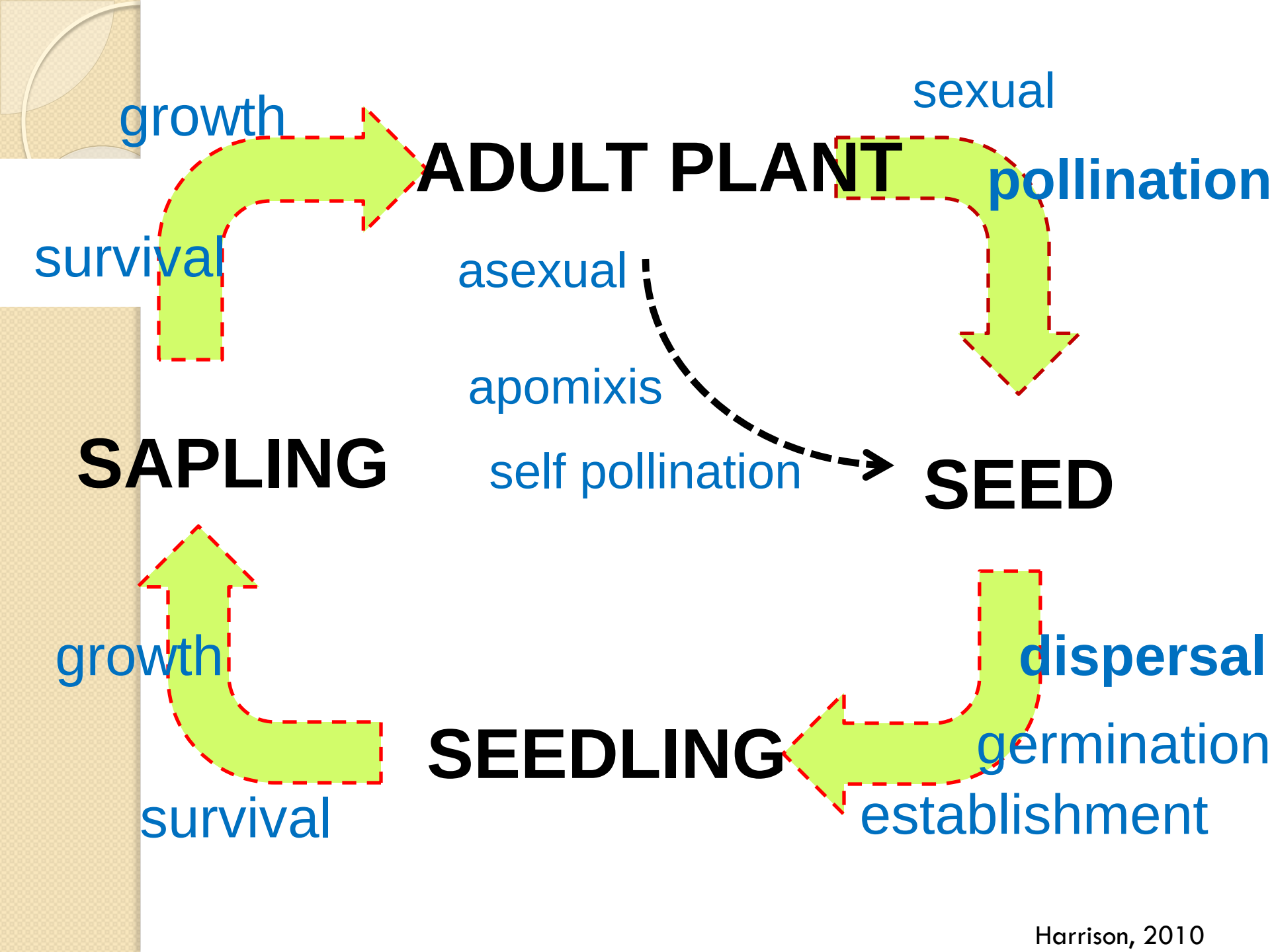
5. LUWES

Lanskap pertanian mempertahankan “Ruang Hijau”, tempat rekreasi, habitat sehat dan keindahan lanskap

(Foto: Meine van Noordwijk)

Interaksi Antar Agroekosistem





Harrison, 2010

Ecoagriculture vs Agroforestry

- Define based on *its objectives* ~ integration of biodiversity conservation, livelihoods, and productivity in agricultural landscapes

- Define based on *its methods* ~trees on farms & in agricultural landschapes

Contoh 2. Lanskap Pertanian Berlanjut

Lanskap Agroforestri

1. AF ~mengurangi konversi habitat alami (natural habitat)
2. AF ~ pengayaan spesies lahan pertanian (cultivated area)
3. AF ~ "corridor" antar habitat alami yang telah terpisah satu sama lain
4. AF ~ sumber pendapatan & konservasi biodiversitas & hidrologi (?)

Good agroforestry: putting the right tree at the right place

Trees for Products


fruit


firewood


medicine


income


sawn wood


fodder

Trees for Services

Environmental services


soil fertility


soil erosion


shade


watershed protection


biodiversity

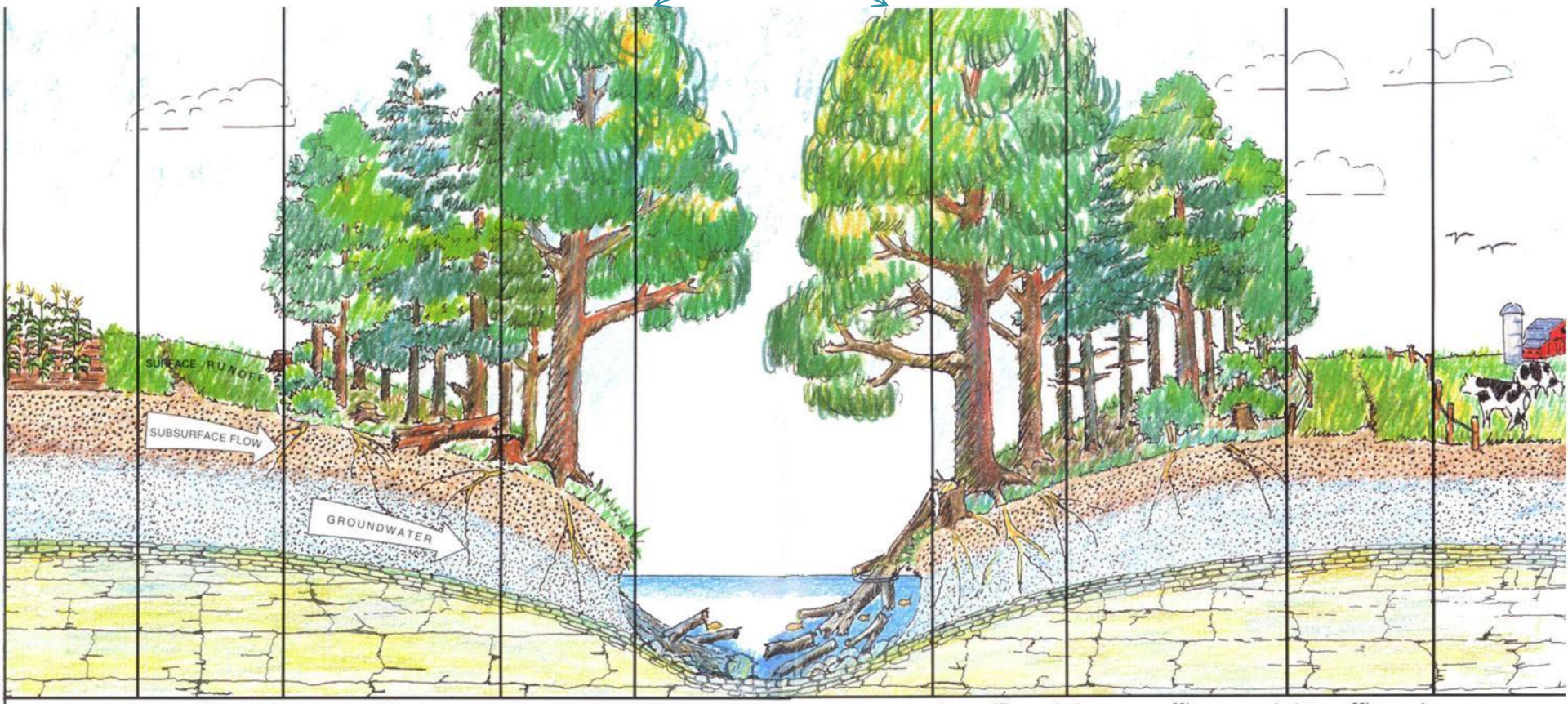

carbon sequestration

1. Agroforestri mengurangi konversi habitat alami (natural habitat)

KEBUNKARET

Hasil: Latex, timber dan non-timber, buah-buahan,
Jasa lingkungan: melindungi fungsi hidrologi & biodiversitas

Riparian Corridors



20'	60'	15'		15'	60'	20'
CROPLAND	**ZONE 3 RUNOFF CONTROL**	**ZONE 2 MANAGED FOREST**	**ZONE 1 UNDISTURBED FOREST**	**STREAM BOTTOM**	**ZONE 1 UNDISTURBED FOREST**	**ZONE 2 MANAGED FOREST**	**ZONE 3 RUNOFF CONTROL**	**PASTURE**
Sediment, fertilizer and pesticides are carefully managed.	Concentrated flows are converted to dispersed flows by water bars or spreaders, facilitating ground contact and infiltration.	Filtration, deposition, plant uptake, anaerobic denitrification and other natural processes remove sediment and nutrients from runoff and subsurface flows.	Maturing trees provide detritus to the stream and help maintain lower water temperature vital to fish habitat.	Debris dams hold de - t ritus for processing by aquatic fauna and provide cover and cooling shade for fish and other stream dwellers.	Tree removal is generally not permitted in this zone.	Periodic harvesting is necessary in Zone 2 to remove nutrients sequestered in tree stems and branches and to maintain nutrient uptake through vigorous tree growth.	Controlled grazing or haying can be permitted in Zone 3 under certain conditions.	Watering facilities and livestock are kept out of the Riparian Zone insofar as practicable.

http://www.cayugawatershed.org/Cayuga%20Lake/RPP/caywetrip.htm

(Foto: Atik Widayati)

Agroforestri sebagai sumber energi

(Foto: Kurniatun Hairiah)

Kincir air penggerak listrik desa Lubuk Beringin, Jambi
BERGANTUNG pada ketersediaan AIR SUNGAI

Riparian zones are the lands bordering surface waters; under natural conditions these zones represent a transition from aquatic to terrestrial ecosystems.

Tantangan:

- Ketersediaan modal
- Tenaga kerja
- Pemasaran
- Bila AF terlalu menguntungkan → deforestasi

KEBUN KOPI+KAKAO

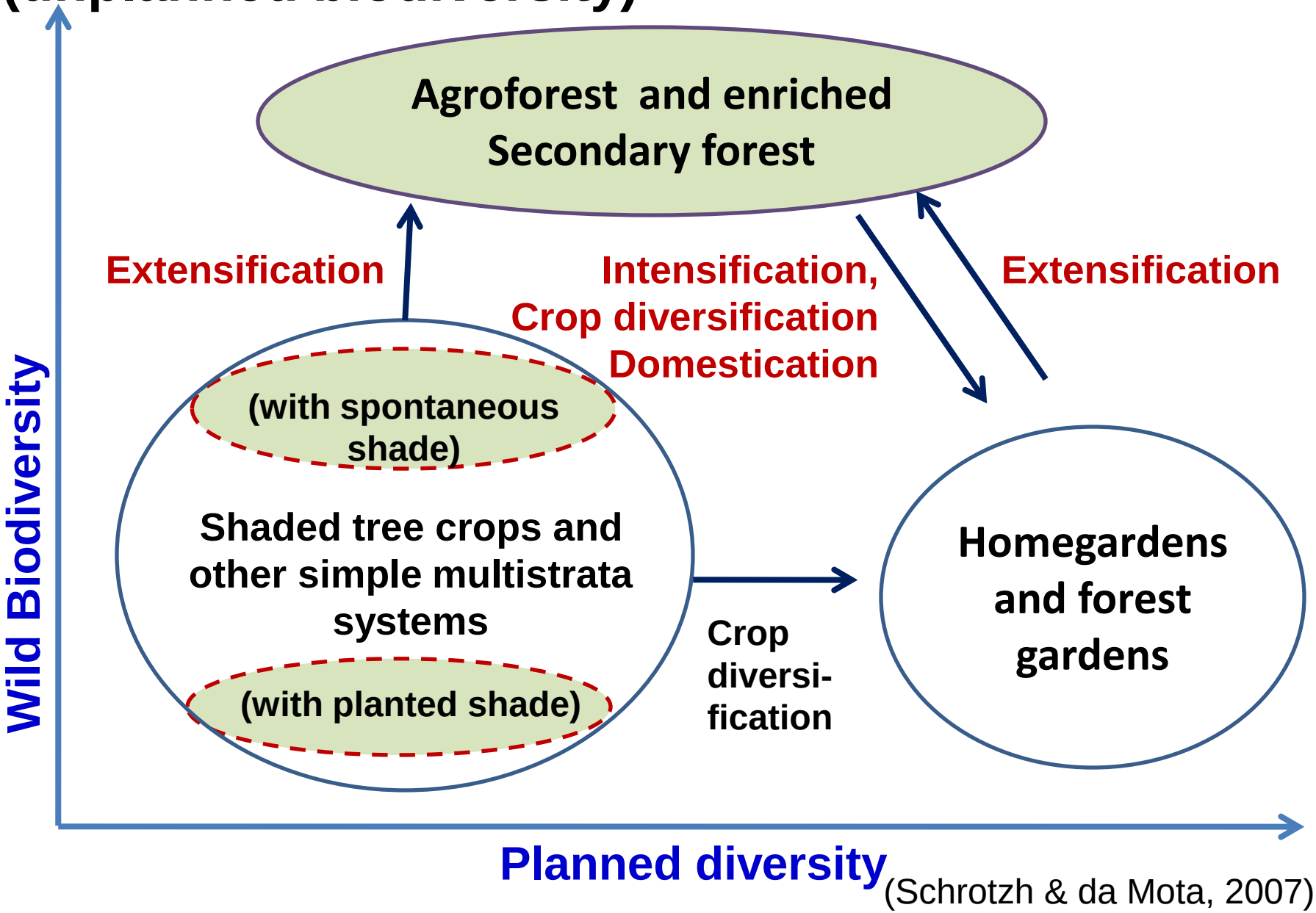
2. Agroforestri sebagai bentuk pengayaan spesies lahan pertanian (cultivated area)

Lanskap Ngantang
(Foto: Kurniatun Hairiah)

Lanskap pertanian: Hutan alami (puncak bukit), Agroforestri kopi+kakao, Perkebunan (hutan tanaman), padi sawah, sayuran, penghasil pakan

➔**Peningkatan jumlah spesies modern atas dasar keuntungan ekonomi**

Relationship between planned diversity and Wild (unplanned biodiversity)



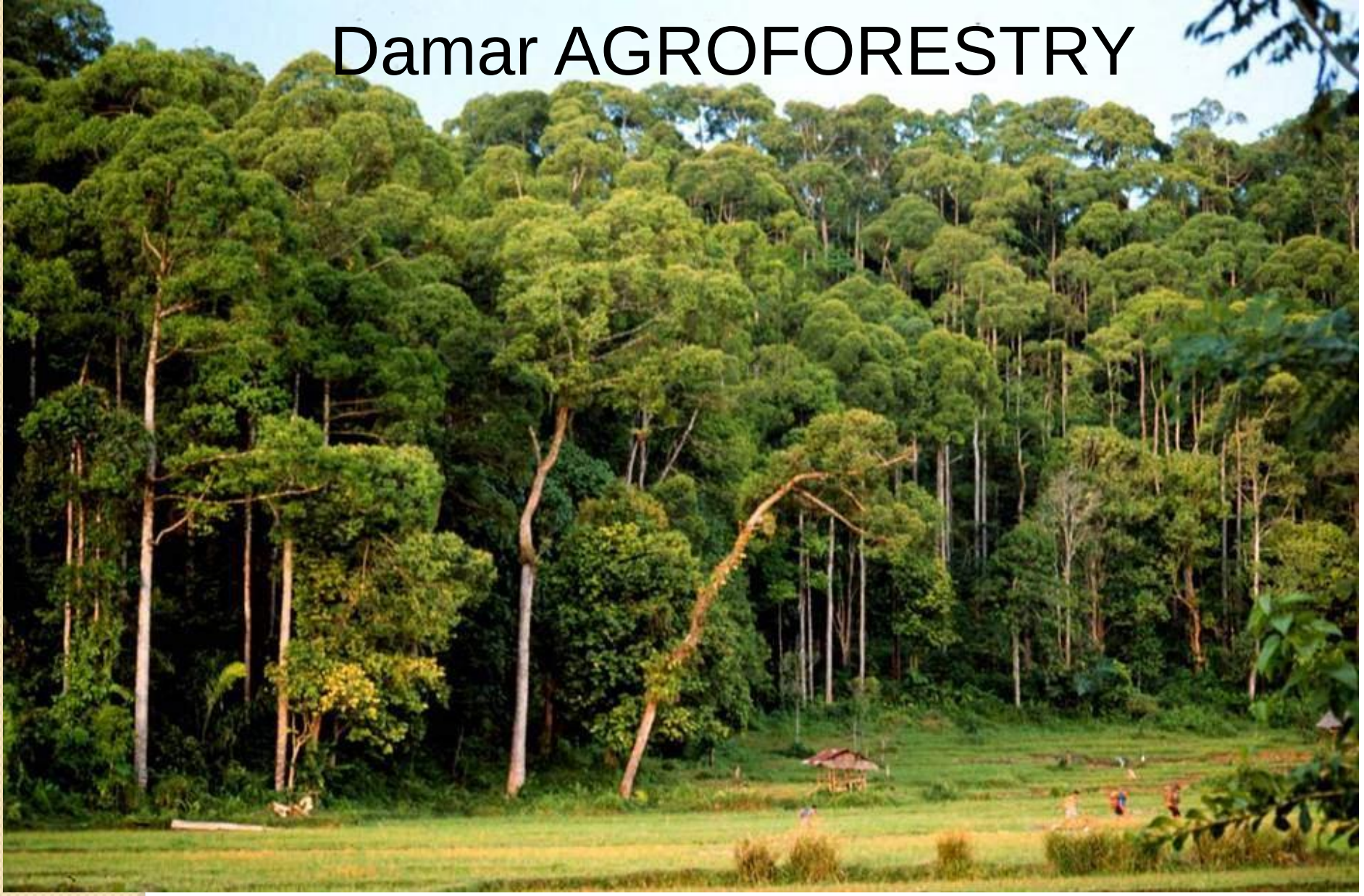
(Schrotzh & da Mota, 2007)

Enrichment tree species by planting more introduced “modern” species

Cash crop (coffee, cacao), fruit trees (durian, avocado, duku, rambuatan, jack fruit, petai), timber, fire wood

(Foto: Kurniatun Hairiah)

Damar AGROFORESTRY



DOMESTICATING FOREST. Farmer Enrich the secondary forest through planting tree crops originated from forest in Krui, West Lampung (de Foresta 1997)

(De Foresta, 1997)

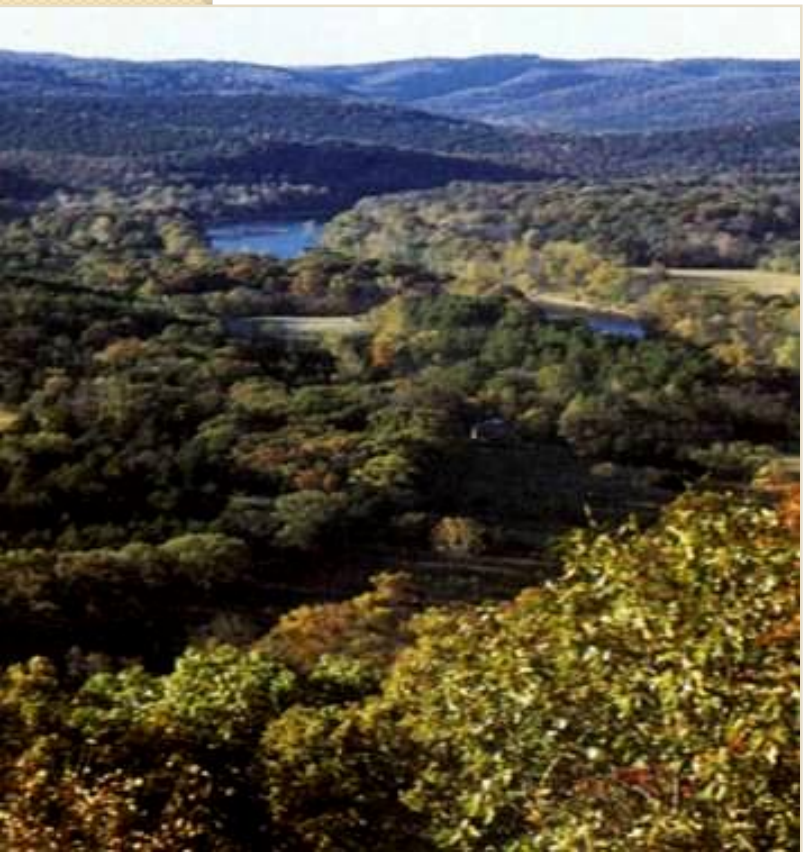
Species originated from natural forest

- Damar
- Durian
- Petai
- Timber etc

Damar AGROFORESTRY

Forest Farming

The **intentional** manipulation, **integration**, and **intensive** management of forested lands that capitalize on specific plant **interactions** to produce specific non-timber products.






Forest Farming

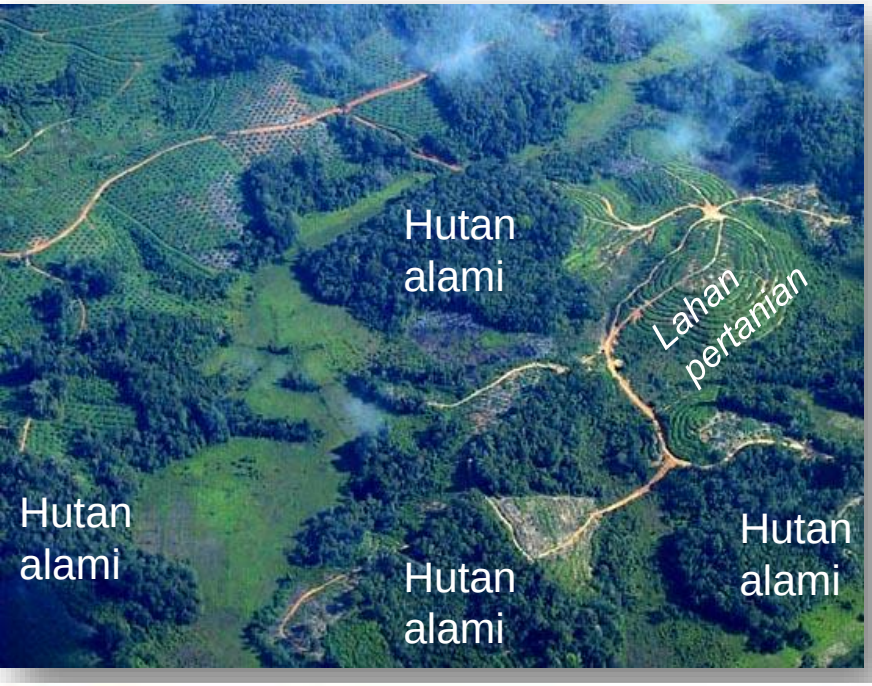
Benefits

By using the positive ecological and economic interactions between overstory and understory forest plants, we hope to:

- Optimize production of forest perennials
- Improve value of existing forests
- Increase household income

Forest Farming Products

3. Agroforestri sebagai “corridor” antar habitat alami



Fragmentasi hutan: Terjadi karena perluasan lahan pertanian

‘’**Corridor”** penting untuk konservasi biodiversitas:

- Perluasan habitat (iklim mikro & pakan)
- Perlindungan terhadap predator
- Perlindungan terhadap kondis ekstrem (kebakaran, banjir dsb)

Agroforestry as a means to improve the habitat value of Cultivated areas

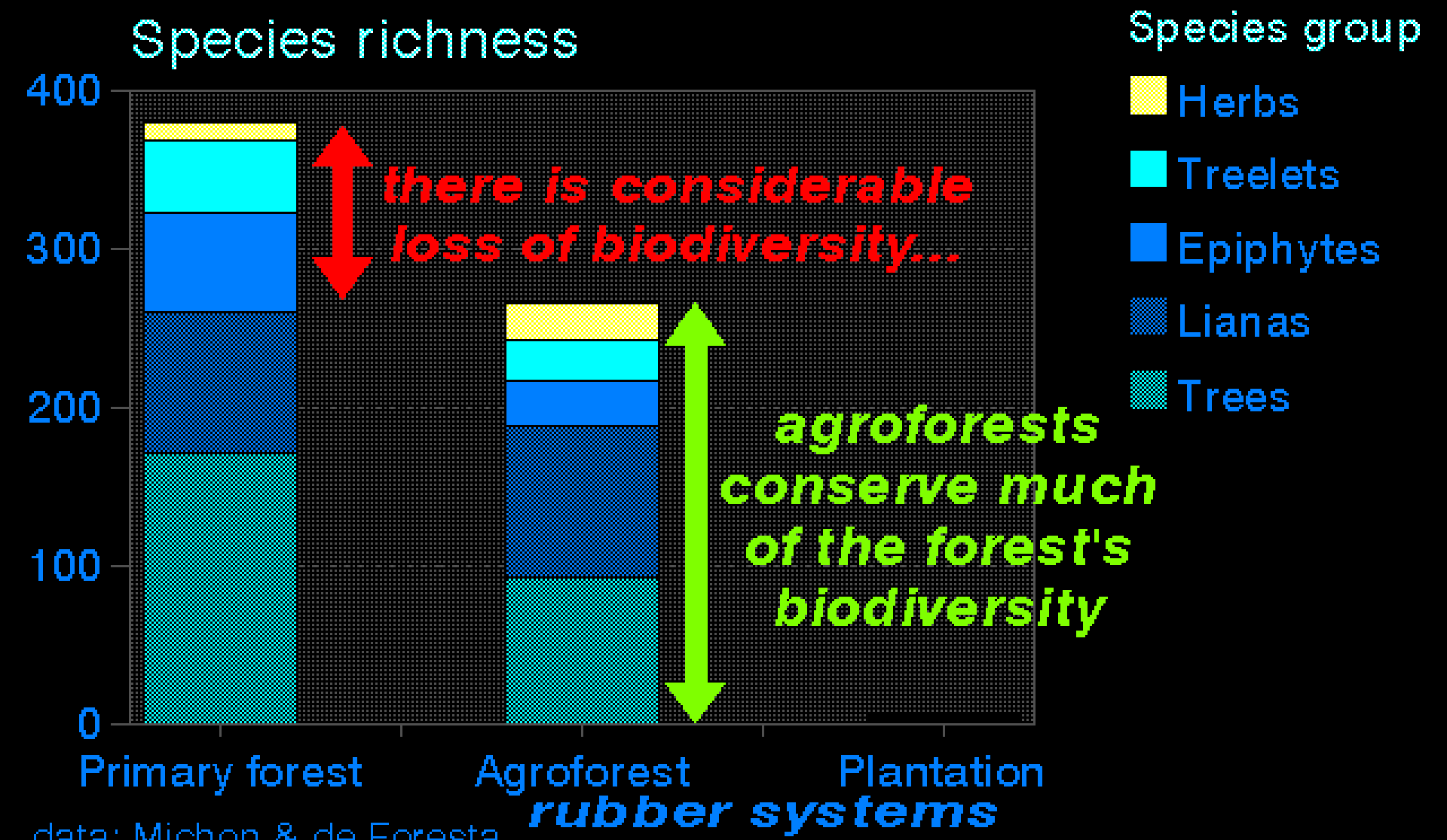
World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Sumber: Yumoto. 2000

Contoh studi kasus 1

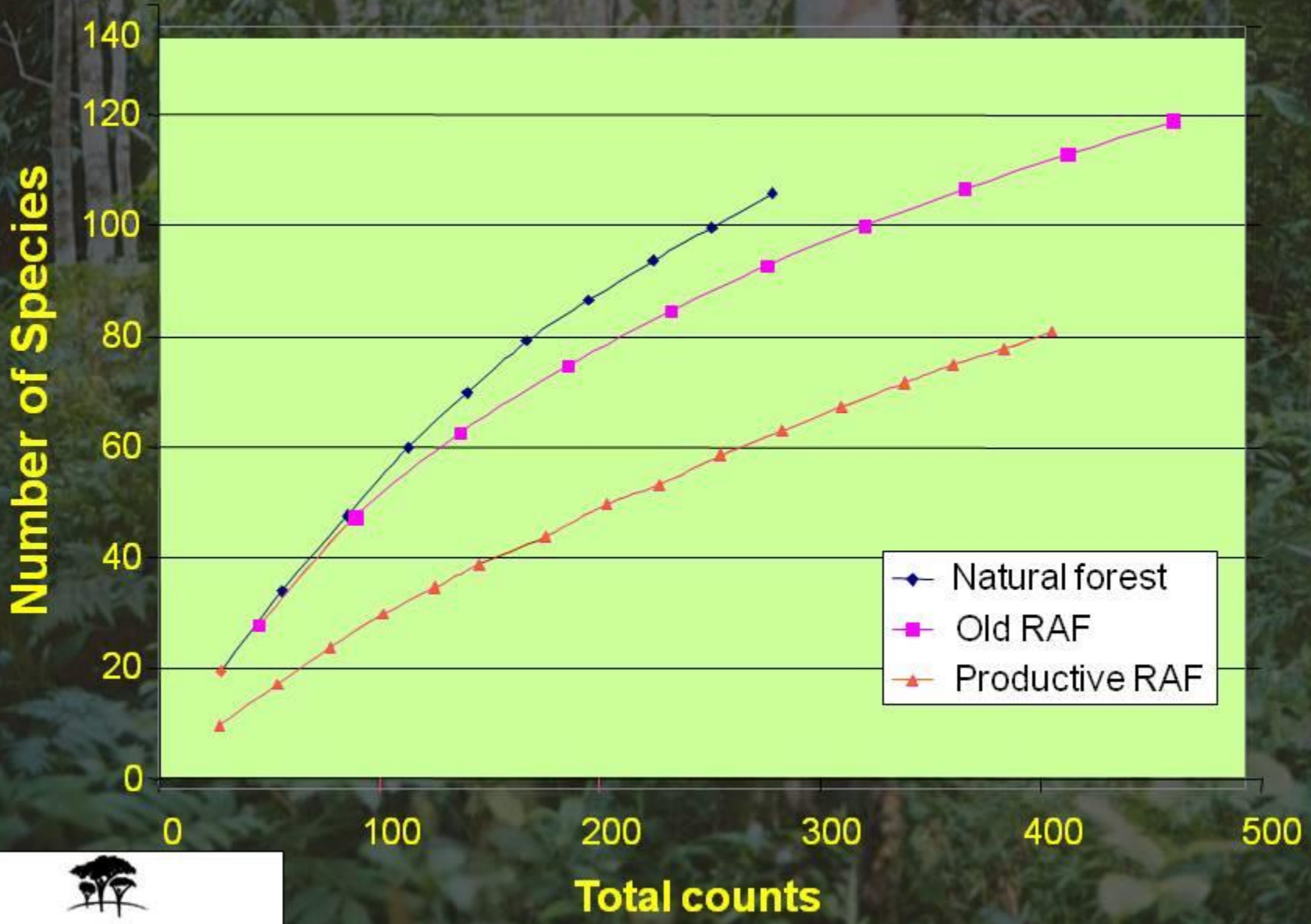
PERAN AGROFORESTRI DALAM KONSERVASI BIODIVERSITAS SPESIES ASAL HUTAN DI JAMBI

Two perspectives on higher plant biodiversity of agroforests



data: Michon & de Foresta

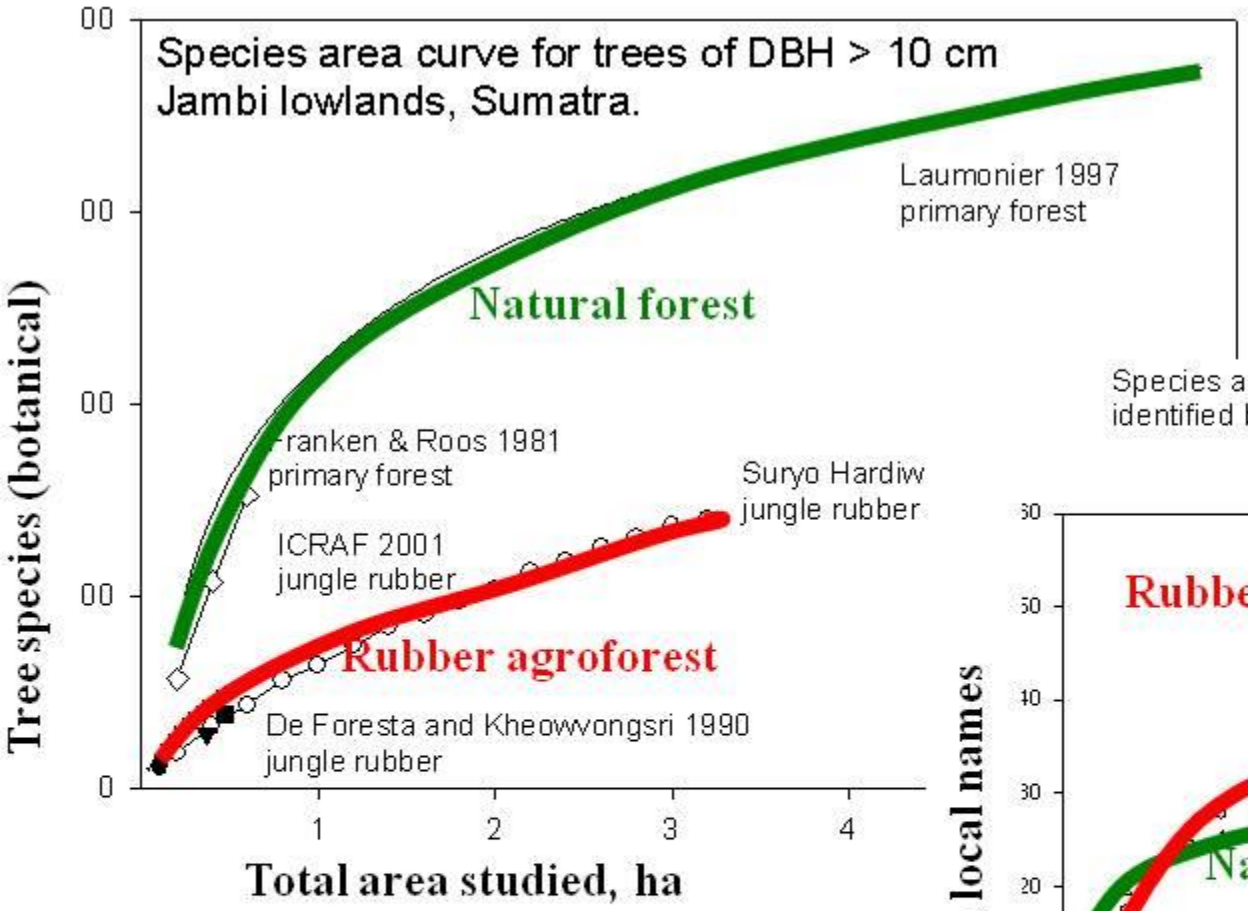
Understorey tree species (saplings) in Rubber Agroforest system (RAF) and natural forest



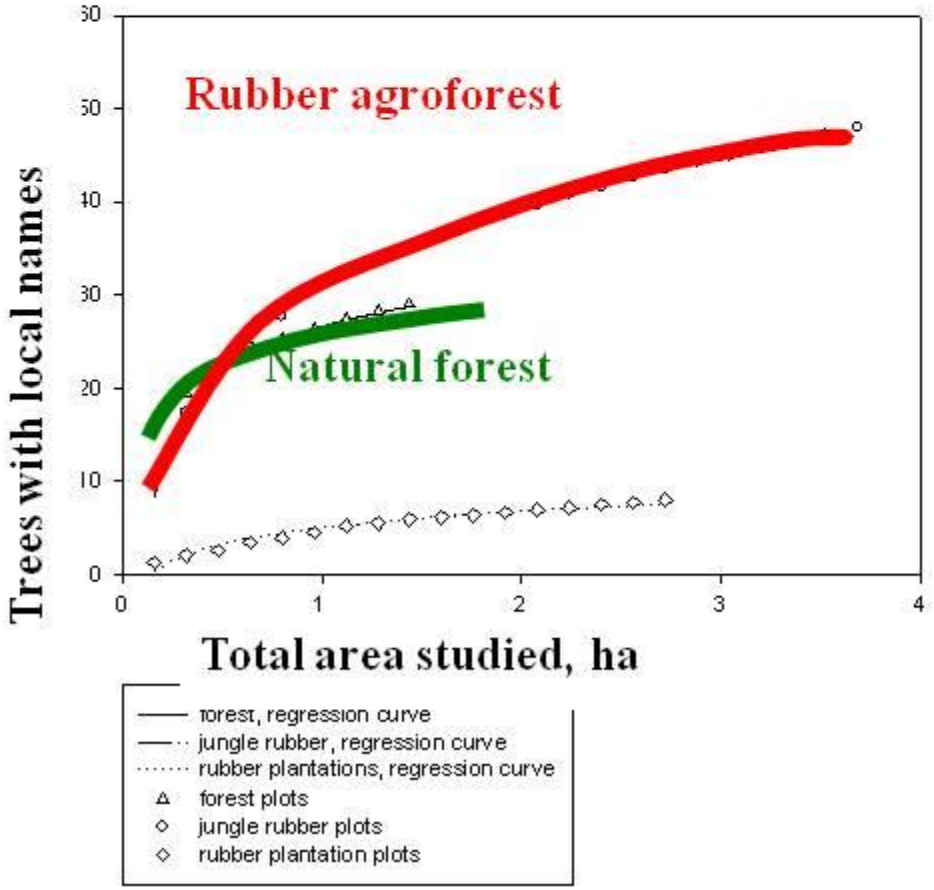
World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

Source: Saida Rasnovi, unpublished

TREE DIVERSITY: Scientific & Local knowledge

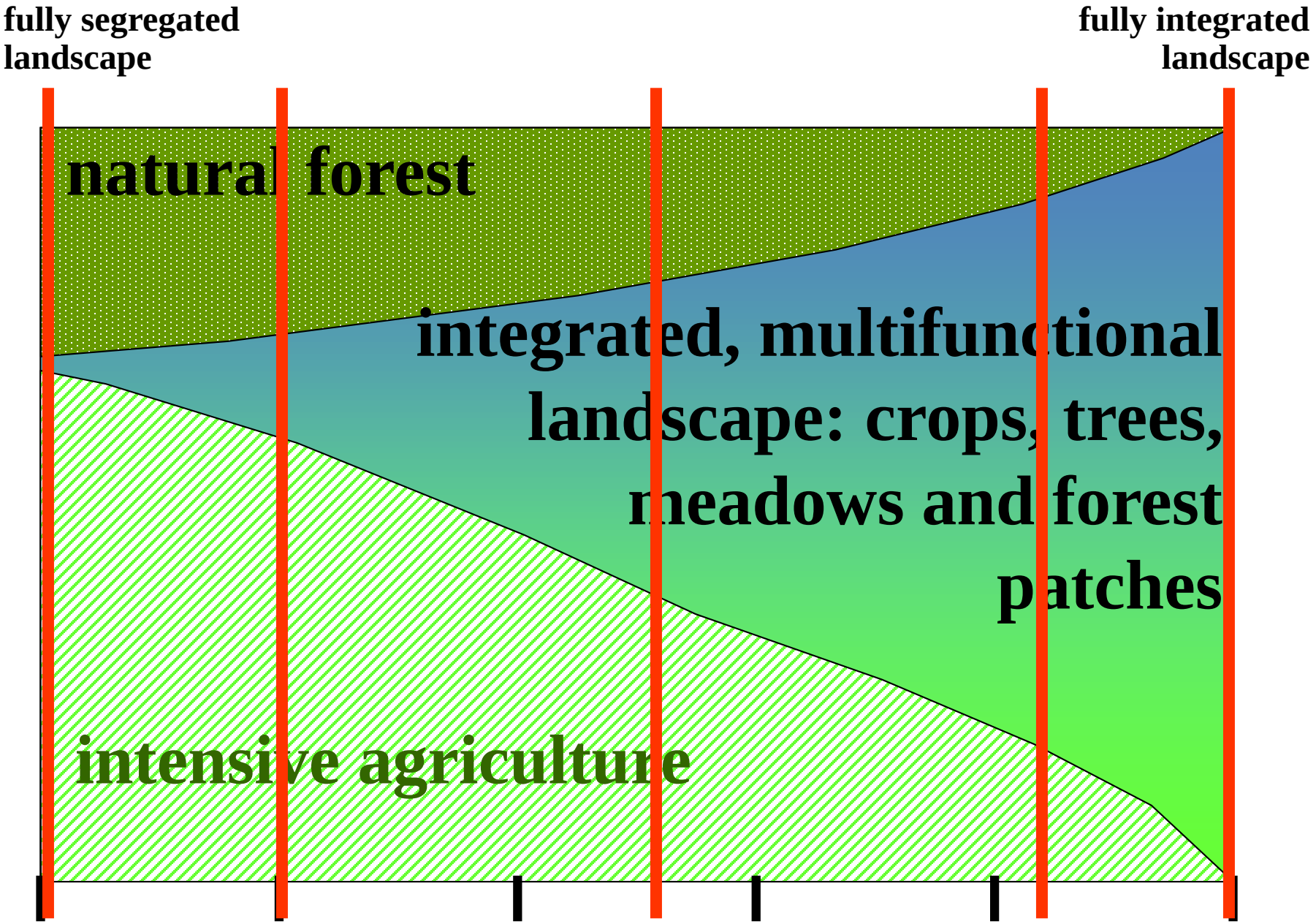


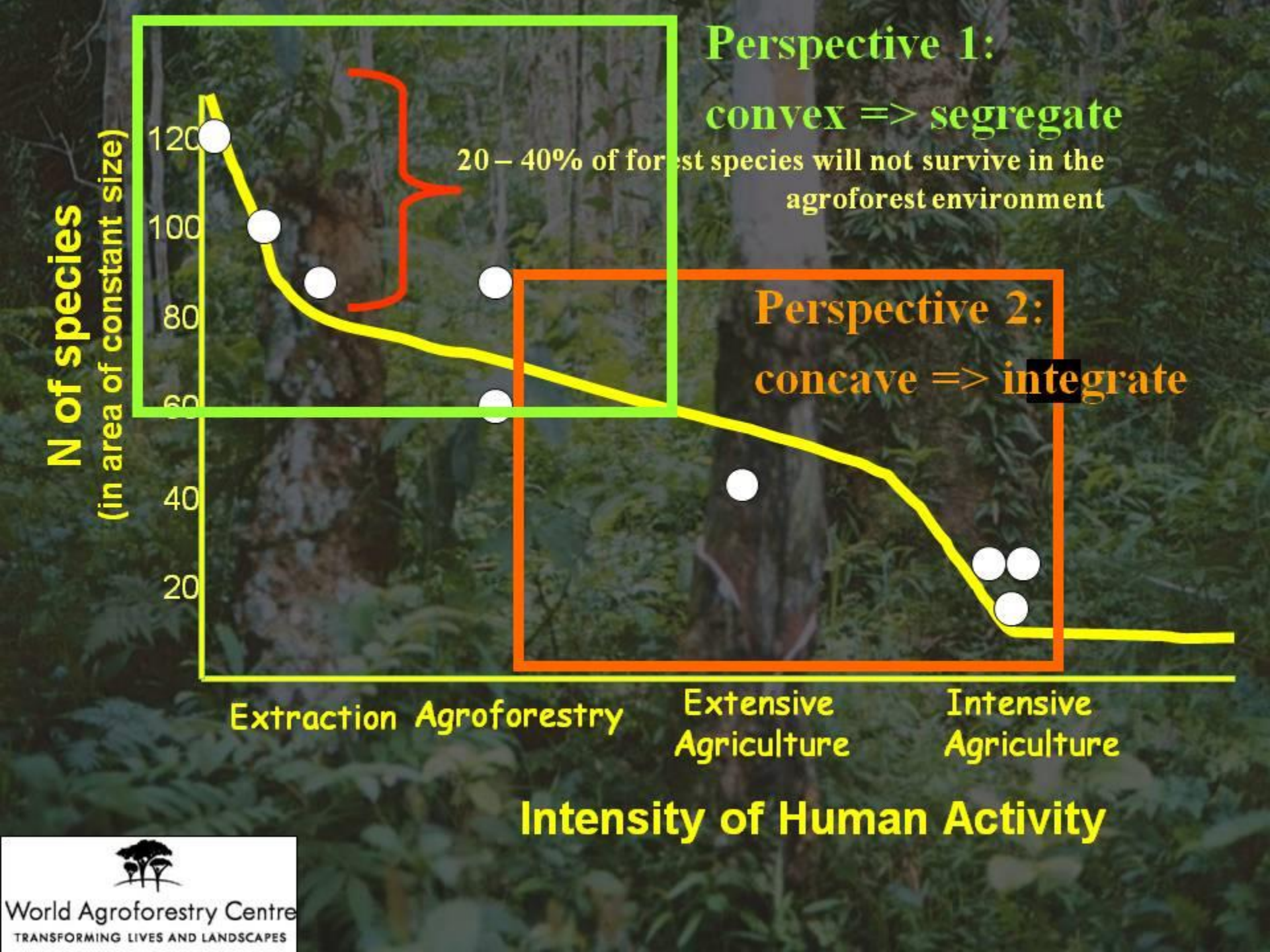
Species area curves for trees of DHB > 10 cm identified by local names, Jambi lowlands, Sumatra



Source: H.J. Beukema et al.

Pengaturannya di lanskap





World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

BUT...

NOT all Agroforestry are species-rich……

Tumpangsari pakan ternak dengan mahoni/pinus

Produksi pakan ternak

Ngantang, Kab Malang

(Foto: Kurniatun Hairiah)


Simple Agroforestry
• Ekonomi potensi menguntungkan
• Kontrol erosi ~ kualitas air
•Kesuburan tanah
• Cdangan karbon ~ berpotensi
• Biodiversitas spesies asal hutan ?
Karet x ubi kayu
(Foto: Kurniatun Hairiah)

Silvopasture

Combines timber and forage production. Trees provide longer-term returns, while livestock generate an annual income.

PENUTUP

Interaksi Agroekosistem Hutan & Lahan Pertanian perlu dipertahankan:

- Penyediaan sumber air/hidrologi dan siklus hara
- Polinasi/penyerbukan tanaman pertanian oleh fauna hutan
- Penyebaran biji (secara biotik & abiotik)
- Pengendalian hama dan penyakit
- Penunjang kehidupan musuh alami

Contoh 2. Lanskap Pertanian Berlanjut

SOCIOFORESTRY ORGANIC ASHITABA TRAWAS MOJOKERTO

Socioforestry Organic Ashitaba Trawas Mojokerto


KODE :04 P 18 1
NAMA :JUHRI
LUAS :0.3HA
TANAM:8-2 04


USAHA PENGGEMUKAN SAPI DI PONOROGO,
SEKALIGUS SUMBER BAHAN PUPUK KANDANG

Biaya usaha penggemukan sapi 100 ekor (120 hari) (X Juta Rp.)

A	Pengeluaran	Juta Rp.
1	Pembuatan kandang 300 m2 (Rp 400000/m2)	120
2	Penyiapan tandon air 1(2.5x2x2)m3 a Rp 2 juta/m3	20
3	Buat pengeboran air tanah Rp 100 juta	100
4	Buat tempat kotoran sapi 3(2.5x2x2)m3 a Rp 200000	6
5	Buat saluran pembuang 800 m a Rp 25000	20
6	Penanaman rumput gajah (Rp 10 jt/ha) untuk 2.5 ha	25
7	Pembelian sapi 100 ekor (a 400 kg) Rp 20000/kg	800
8	Pakan konsentrat (kg) 5 kg/ekor/hr a 1550 rp/kg	93
9	Suplemen (enzim, vitamin) (10 tablet/ek/hr) 50rp/tab	6
10	Angkutan 100 sapi ke kdg Rp200 000/sapi	20
11	Biaya adm dan muat Rp 10 000/sapi	1
12	Biaya karantina Rp 20 000/sapi	2
13	Tenaga lapang kdg 5 org a Rp25000/hr	15
14	Satpam 2 org a Rp 35000/hr	8.4
15	Staf adm 2 a Rp 30000/hr	7.2
16	Manajer 1 a Rp 50000/hr	6
17	Sarana perkantoran Rp 5 000 000/kws	5
18	Sarana lapang Rp 2 000 000/kws	2
	Jumlah	1256.6


Biaya penggemukan sapi periode 1
jumlah biaya dalam jutaan Rp
900
800
700
600
500
400
300
200
100
0
Pengeluaran
Pembuatan
Penyiapan
Buat
Buat tempat
Buat saluran
Penanaman
Pembelian
Pakan
Suplemen
Angkutan 100
Biaya adm
Biaya
Tenaga
Satpam 2 org
Staf adm 2 a
Manajer 1 a
Sarana
Sarana
A
1
2
3
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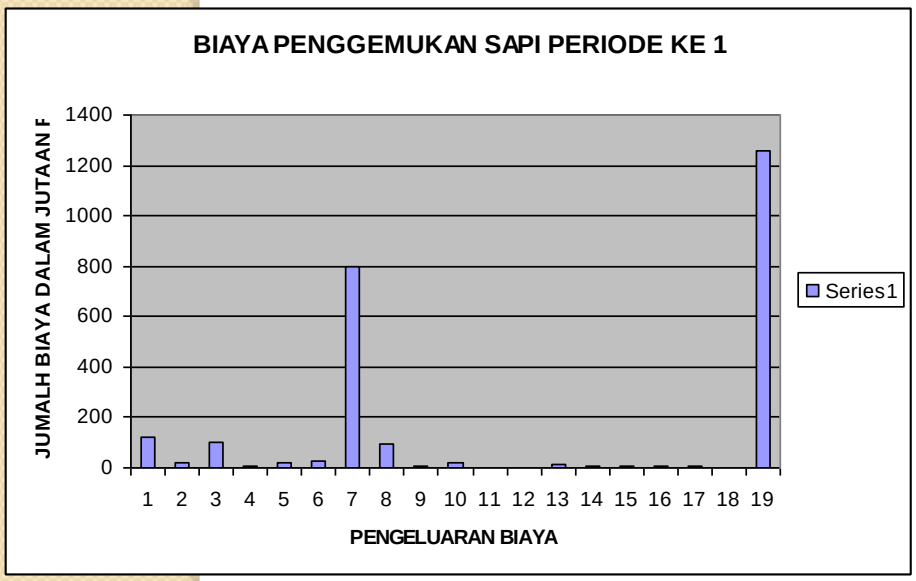
Macam kebutuhan
Series1


BIAYA PENGGEMUKAN SAPI PERIODE KE 1
JUMALH BIAYA DALAM JUTAAN R
1400
1200
1000
800
600
400
200
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
PENGELUARAN BIAYA
Series1


THE SUHARTOS
RESEARCH STATION II
AN INTEGRATED FARMING SYSTEM

Contoh kasus studi 3

PENGGUNAAN BIOKULTUR UNTUK PENGURANGAN DOSIS PEMUPUKAN


PERSIAPAN PEMBUATAN BIOKULTUR
SEBAGAI BAHAN PEMBERIAN ENZIM
DI LAHAN PERTANIAN

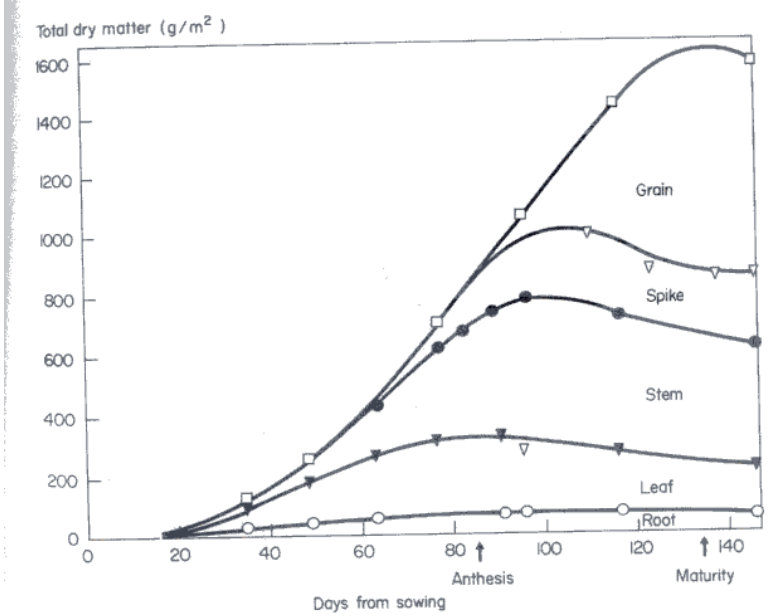
AKTIVITAS DEMOPLOT 2005/2006

BEBERAPA AKTIVITAS DISTRIBUSI BIOKULTUR, KETEMU PPL DAN SOSIALISASI DI LAPANGAN

APLIKASI BIOKULTUR POTONG TENGAH SAAT TANAMAN PADI BERUMUR 10 HST

KENDALA-KENDALA

- *PEMBUATAN BIO KULTUR*
- BAGAIMANA PROSES BENAR, PENCAMPURAN DENGAN BIOPESTISIDA, DOSIS YANG TEPAT DAN PENAMBAHAN PUPUK ANORGANIK SEPERTI UREA/ZA DAN DALAM JUMLAH BERAPA YANG EFEKTIF.)
- *PENDISTRIBUSIAN BIO KULTUR*
- TERBENTUR TRANSPORT DAN SARANA DI PIHAK PETANI APABILA SAWAH PETANI JAUH DARI INSTALASI
- *SOSIALISASI DAN PERSYARATAN UNTUK IKUT PROGRAM PENGGUNAAN BIO KULTUR*
- KOMUNIKASI DI TINGKAT PETANI PERLU DI JELASKAN BAHWA SAMPAI DENGAN HASIL YANG DIRENCANAKAN DAN TERCAPAI AKAN ADA PEMBAYARAN PEMAKAIAN BAHAN BIOKULTUR OLEH PETANI
- *PENERAPAN POLA PERLAKUAN BIO KULTUR DI LAHAN*
- PETANI MAU MENERAPKAN SEJAK AWAL TEKNOLOGI INI, DENGAN WAKTU DAN CARA YANG PRAKTIS (PEMBERIAN KALAU BISA DISATUKAN DENGAN PEMUPUKAN 2 ATAU 3 KALI SAJA, APAKAH MUNGKIN – PERLU PENELITIANDAN TUKAR MENUKAR PENGALAMAN)



2. Dry matter accumulation in crop parts. Same crop as Figure 1.

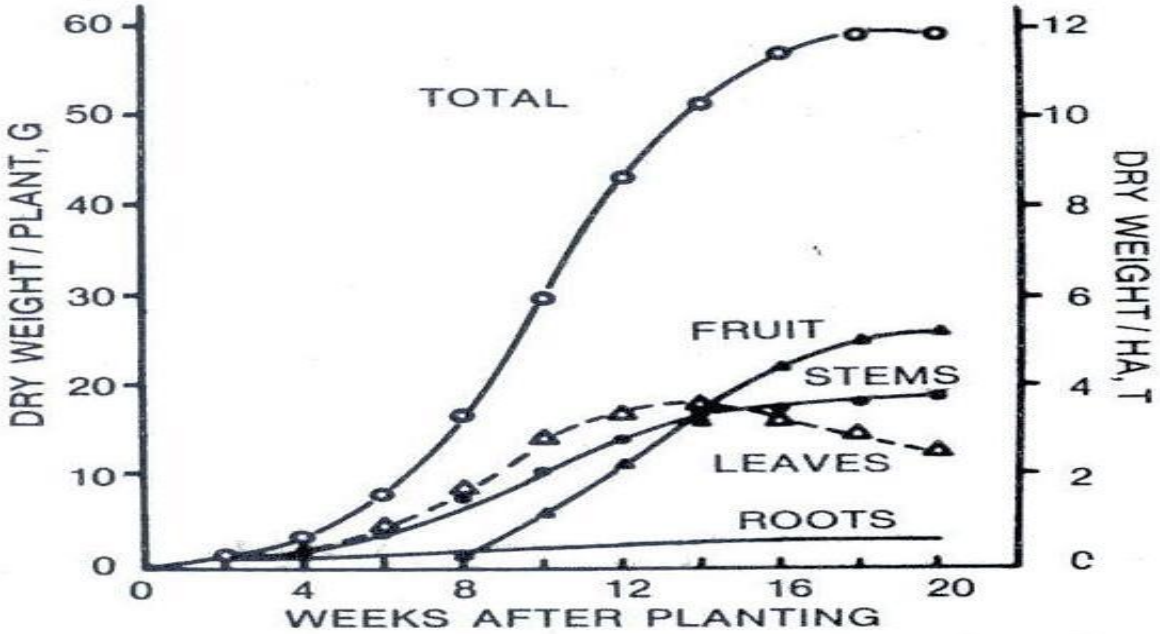


Fig. 6.1. Dry weight accumulation patterns for a hypothetical crop plant and its parts. The dry weights per unit of land area are for the same plants as the individual plant weights, but plant population is assumed to be 200 000 plants/ha. Plants mature at 18 to 20 weeks after planting.

APLIKASI BIOKULTUR PADA BERBAGAI TANAMAN




INDUKAN SAPI DAN SUMBER PUPUK KOTORAN SAPI USAHA PENDUDUK DI JAMBUWER, NGAJUM

CARA LAIN PENAMPUNGAN PUPUK KOTORAN SAPI DI JAMBUWER, NGAJUM

KEBUN JATI YANG DIALIRI LIMBAH KOTORAN SAPI DI JAMBUWER, NGAJUM. DIAMETER pohon 20 CM PADA UMUR 6 TAHUN