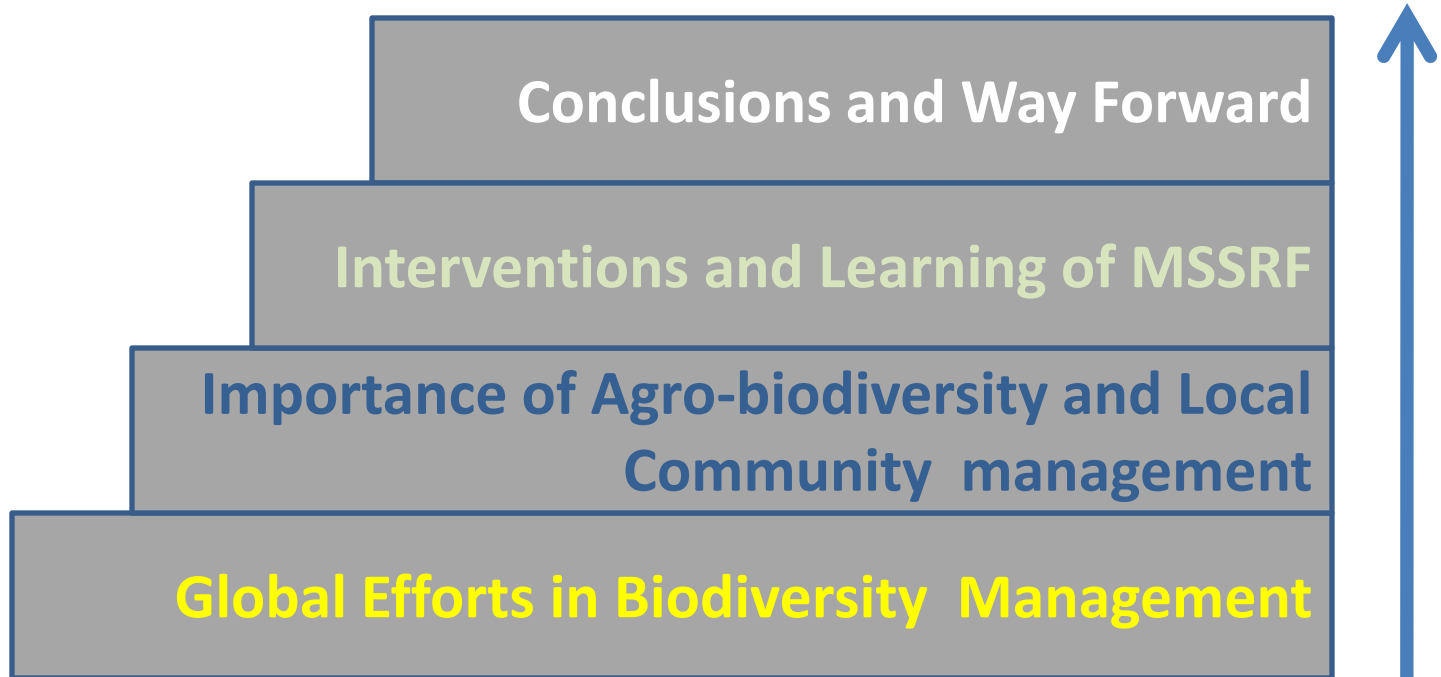


# Community Management of Agro-biodiversity for Food and Agriculture



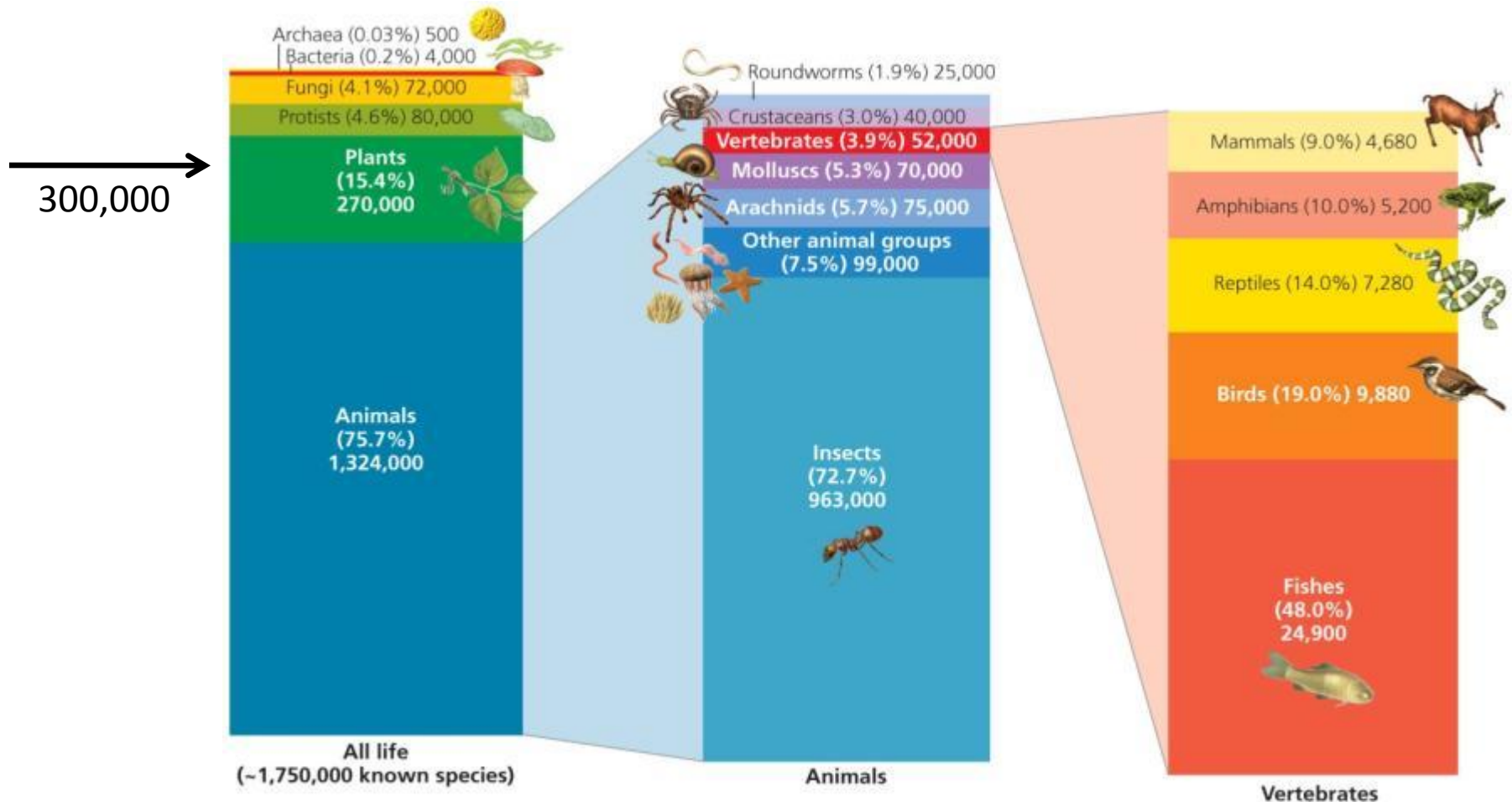
1. Palchembu
2. Koorka
3. Thamarakannan
4. Manjakoova
5. Kasthurimanjal
6. Makalae potti vella
7. Neela koova
8. Thondi chembu
9. Kattuchena
10. Mala manjal
11. Manjal
12. Sathavari
13. Makalae potti chuvappu
14. Manga inji
15. Madura chembu
16. Cheruchembu
17. Malayinji
18. Packichembu vella
19. Vella koova
20. Packi chembu chuvappu

# Outline of the Talk



# How much Biodiversity?

- ✓ 1.7—2.0 million species
- ✓ Estimates to 100 million



# Time line of modern attempts in managing Biodiversity and the 2020 Aichi Biodiversity Mission

Specific measures are available to take action



**CBD Strategic Vision**  
Living in Harmony with Nature

**Aichi Targets Year**



1972

Stockholm conference

1971: Ramsar Convention; 1973:CITES; 1979: CMS

1983

UN Independent commission on E&D

1992

UN ED Earth Summit

2002

Johannesberg Summit or WSSD

2012

Rio plus 20 WSSD

CoP 11 Hyderabad

2020

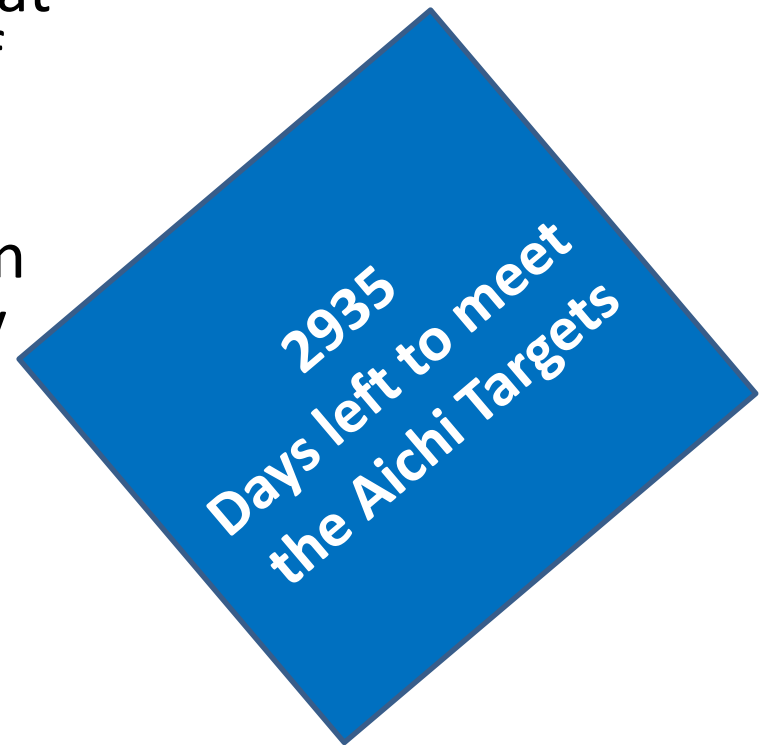
2050

1987: Brundtland Report **Our Common Future**

Agenda 21 The Action Programme for SD

# 2010 Biodiversity Targets Failed!

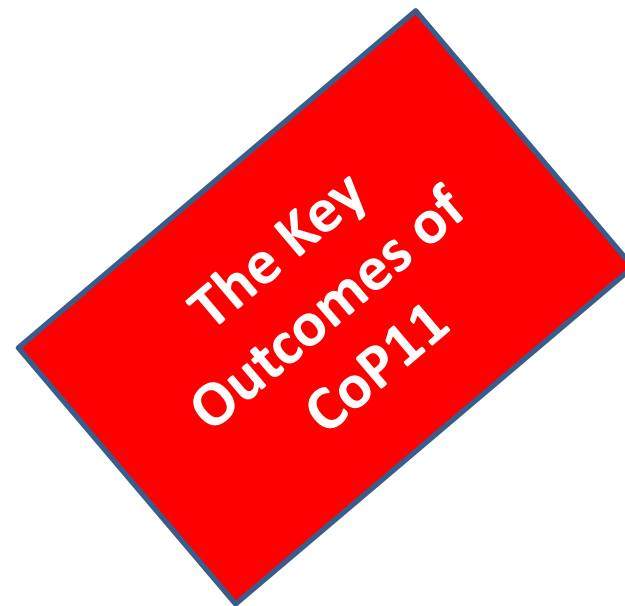
- The 2010 biodiversity target has not been achieved, at least not at the global level. The diversity of genes, species and ecosystems continues to decline, as the pressures on biodiversity remain constant or increase in intensity mainly as a result of human actions.



2935  
Days left to meet  
the Aichi Targets

## Mobilizing Funds to achieve the 2020 Aichi Targets

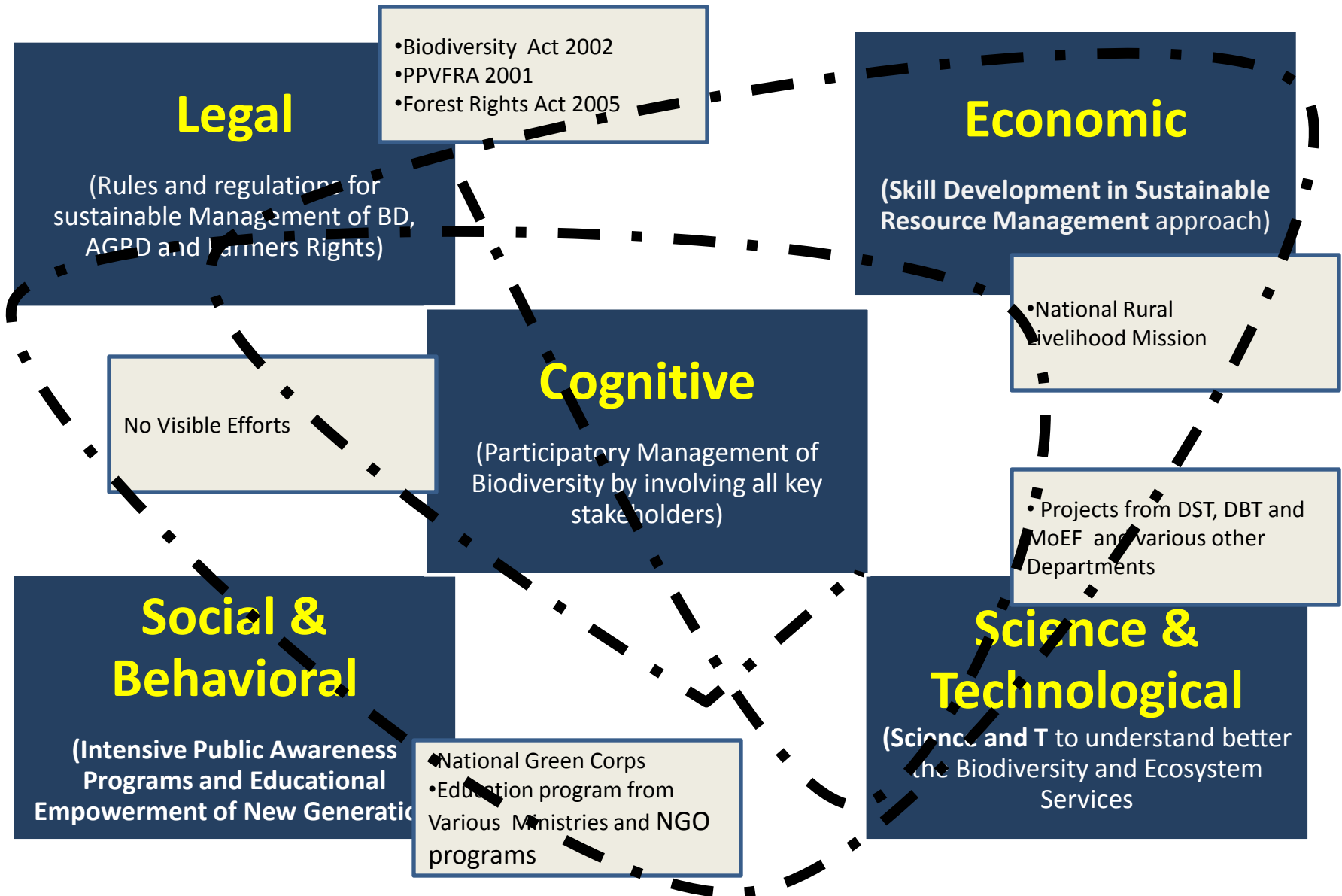
- Developed countries would double their annual spending on Biodiversity by 2015
- Several African countries pledged additional funding for their biodiversity
- Govt of India committed \$50 million for the country's Biodiversity programme



### Focus on Integrated NBSAPS with National BD Targets and 2020 Targets

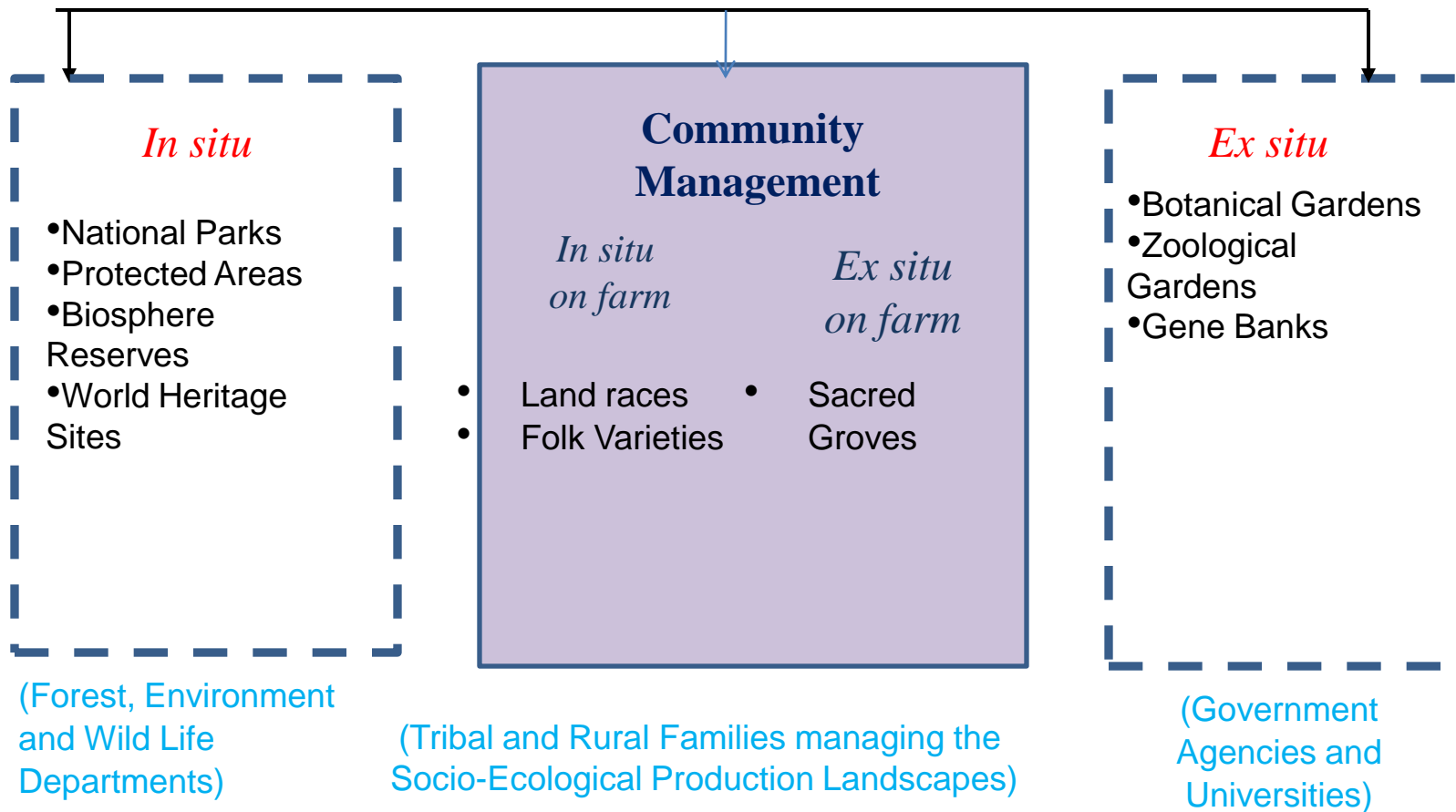
Focus of much of the Cop11 Negotiations was on achieving NBSAPS and the 2020 Aichi Biodiversity Targets: Launched NBSAP Forum; Developed new work in support of achieving Aichi Target 15 which calls for understanding ecosystem resilience and restoration of 15% of degraded ecosystems with support of UNFCC and UNCCD

# Biodiversity Management: National Efforts of INDIA



# Community Management of Agro-biodiversity for Food and Agriculture

## Integrated Gene Management





## Agro-biodiversity : in two categories

Genetic Resources for  
Food and Agriculture  
(GRFA)

- the harvested components that provide food and other essential products from domesticated crops and animals including fish and other managed aquatic diversity, crop wild relatives, algal, fungal and microbial genetic diversity: **Vital for human food and nutrition security**

AgESS-Agro-Ecosystem Services that contribute and sustain agricultural productivity by provisioning supporting and regulating ecosystem services. This includes the soil-microbiota, pollinators and the antagonists of pests and diseases, the regulating services like water cycle management: **Vital for maintaining the Agro-ecosystem resilience**

Agro-Ecosystem  
Services  
(AgES)

## Agro-Ecosystem are very complex and diverse.

Attribute	Crops	Livestock breeds	Crop wild relatives and gathered food	Soil biota	Pollinators	Diseases, pests and their antagonists
Uniqueness in agric. Systems	yes	yes	partial	no	no	partial
Principal contribution to ecosystem services	Provisioning food & agricultural products	Provisioning food & agricultural products	Food & agricultural products	Supporting soil formation, & nutrient cycling	food	Regulating pests and diseases
Relevance of intra-specific diversity to delivery of ecosystem services	high	high	high	low	low	high
Threats to intra-specific diversity	high	high	Intermediate to high	low	?	?
Species richness	intermediate	low	high	very high	high	intermediate
Importance of <i>ex situ</i> conservation	high	high	high	low	low	low
Importance of <i>in situ</i> on farm management	high	high	high	intermediate	high	high

# Aichi Biodiversity Target 13

- **By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.**

# Food Insecurity

- There are currently an estimated **925 million people suffering food and nutrition insecurity** (FAO 2010a)
- In addition to those who are hungry, there are **also 195 million children under five years of age who are stunted in their growth** (UNICEF 2009) and of those children, 90% live in just 36 countries (Black et al. 2008).
- Micronutrient deficiencies, known as hidden hunger, undermine the growth and development, **health and productivity of over two billion people** (Micronutrient Initiative 2009).
- At the same time, an estimated **one billion people are overweight** and **another 300 million are obese** in both the developed and developing world (WHO 2006), which contributes to the risk of non-communicable diseases such as diabetes and heart disease.

# How many Commercially important Food Plant Species?

- FAO (2010b) estimates that of a total of 300,000 plant species, **10,000 have been used for human food since the origin of agriculture.** Out of these, only 150-200 species have been commercially cultivated of **which only four—rice, wheat, maize and potatoes—supply 50% of the world's Dietary energy needs, while 30 crops provide 90% of the world's caloric intake.**

## How much Food Plant Diversity?

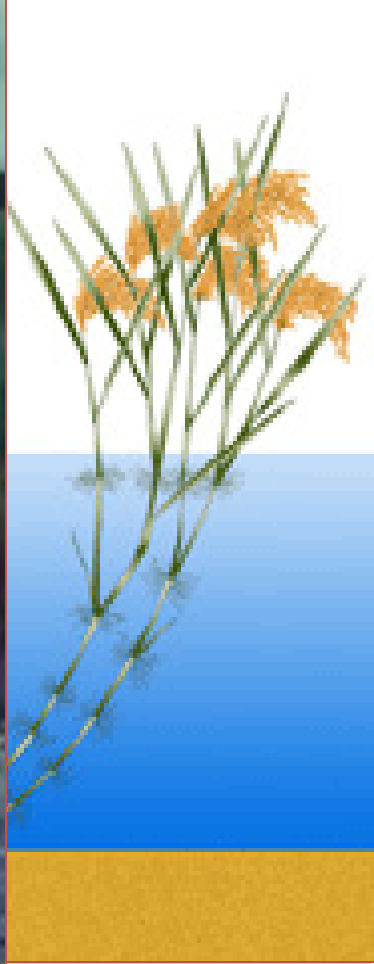
<b>Nr. species known in total (approx)</b>	<b>Nr. species domesticated (approx)</b>	<b>Most important to global-level food supply</b>	<b>Nr. domestic varieties &amp; breeds</b>	<b>Nr. domestic varieties &amp; breeds at risk</b>	<b>Nr. domestic breeds &amp; varieties extinct</b>
<b>Plants</b>					
<b>300,000</b>	<b>200</b>	<b>Bananas/plantains, beans, cassava, maize, millet, potatoes, rice, sorghum, soybean, sugar cane, sweet potatoes, wheat</b>	<b>Many thousands</b>	<b>1000's</b>	<b>Not known</b>
<b>Mammals</b>					
5,000	20	cattle, pigs	> 3000	>500	238
<b>Birds</b>					
10,000	10	chickens	>860	>370	

FAO (2010b) estimates at least 10,000 plant species have been used for human food since the origin of agriculture.



## Neglected Crops: Genes for Coping with Climate Change

- Time-Tested production and income stability under marginal and high-risk farming
- Many crops are nutritionally rich to redress 'hidden hunger'
- Neglect leading to loss of genetic diversity and associated traditional knowledge
- Opportunity to enhance sustainable income, food and nutritional security



## Facing the challenge of Floods

**Deepwater (floating) rice** has three special adaptations:

- i. ability to elongate with the rise of water levels;
- ii. develop nodal tillers and roots from the upper nodes in the water
- iii. the upward bending of the terminal part of the plant called 'kneeing' that keeps the reproductive parts above the water as flood water subsides.







Conservation Agriculture  
with *Faidherbia albida* –  
Pathway to Sustainable  
Maize Production in Central  
and Southern Africa

60 years of research shows  
on each hectare, mature  
trees supply the equivalent  
of 300kg of complete  
fertilizer and 250kg of lime.  
This can sustain a maize  
yield of 4 tons/ha



**Photo-insensitive  
Mutant of  
*Sesbania rostrata***

**Fixes nitrogen both in  
stem and roots**

# Mitigating Climate Change : Role of Terrestrial Carbon Banks

- Global net primary productivity (NPP) = 120 Gt/c/year
- Most of it is returned to the atmosphere through plant and soil respiration
- If 10% of NPP is retained in the terrestrial biosphere (ie, soil, plants, wetlands, mangrove ecosystems) , 12 Gt/c/year can become part of a terrestrial carbon bank
- Increasing soil C pool by 1 ton c/ha/year in the root zone can increase food production by 30 to 50 million tonnes



## Local community follow FOUR Integrated Activities in PGR Management

- **Resource Maintenance**

(the nurturing, preserving and enhancing the genetic resource that form the basis for **food and agriculture**)

- **Production**

(the conversion of genetic resources into usable products, which may be either **goods or services**- the products such as crops, timber trees, food plants, medicinal plants, fibres, spices, oils, dyes and so on of agricultural landscapes)

- **Distribution**

(the sharing of products and resources among people through **Exchange and Transfer**)

- **Consumption**

(the process by which goods and services are, at last, put to final use by people)

## How much diversity preserved/nurtured in India?

<b>Nr. species known in total (approx)</b>	<b>Nr. species domesticated (approx)</b>	<b>Most important to global-level food supply</b>	<b>Nr. domestic breeds &amp; varieties</b>	<b>Nr. domestic breeds &amp; varieties at risk</b>	<b>Nr. domestic breeds &amp; varieties extinct</b>
<b>PLANTS</b> 17,000  <b>320 species of wild relatives of crop plants</b>	44	Rice and, kodo millet, black gram, green gram and spices such as black pepper, turmeric, cardamom and ginger, and fruits such as, jack fruit and mango	<b>Many thousands</b> Rice: 50,000 Sorghum: 5000 Mango:1000 Pepper: 500	1000's	Not known
<b>MAMMALS</b> 372	12	cattle, pigs	26 breeds of cattle, 40 of sheep, 20 of goats, 8 of camels, 6 of horses,8 buffalo	>500	Not known
<b>BIRDS</b> 1228	10	chickens	18 of poultry	>370	Not known

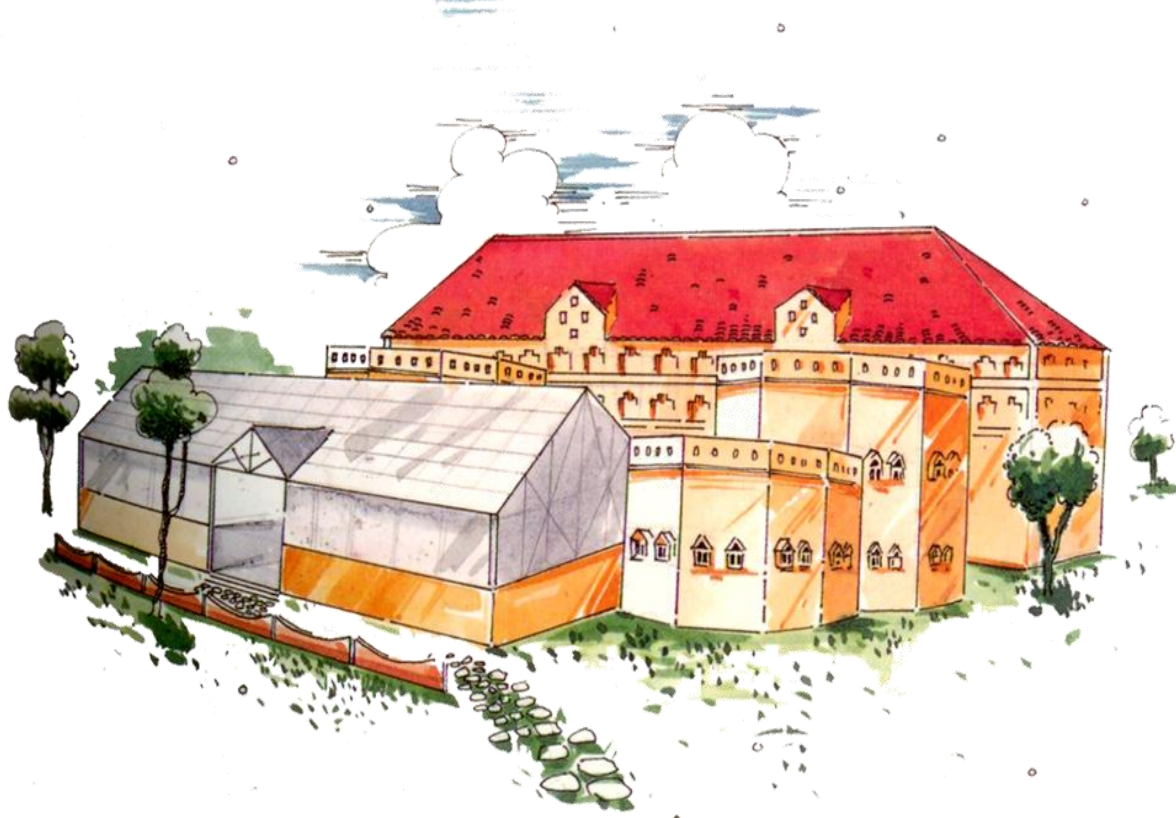
Source: (Kothari 1999).

# GLOBAL BIODIVERSITY HOTSPOTS



# Perspectives, Science Practices and Implementations of

**M.S.SWAMINATHAN RESEARCH FOUNDATION**

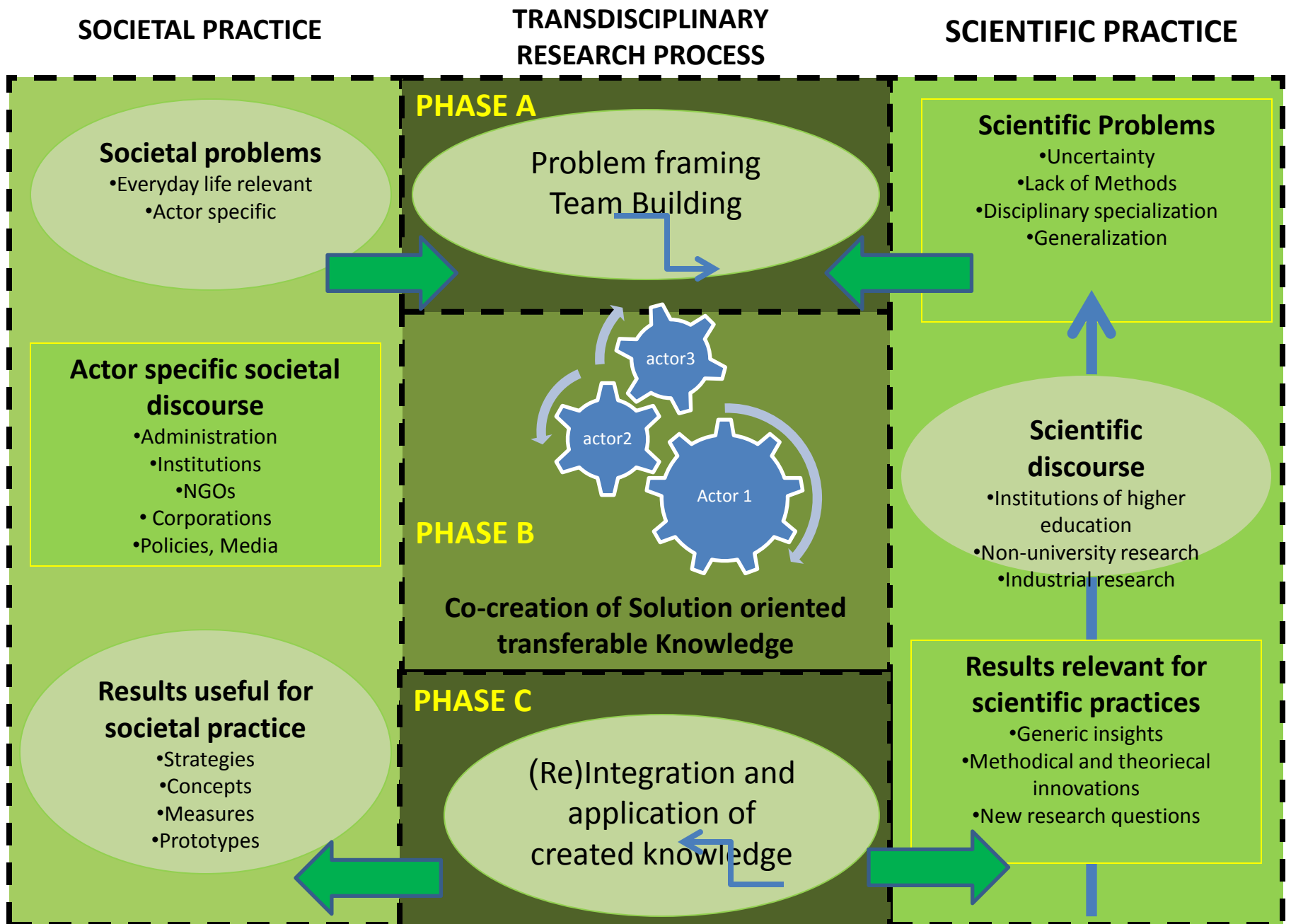


**Centre for Research on Sustainable  
Agricultural and Rural Development**

# Community Agrobiodiversity Centre FOR REVITALISATION OF COMMUNITY CONSERVATION SYSTEMS







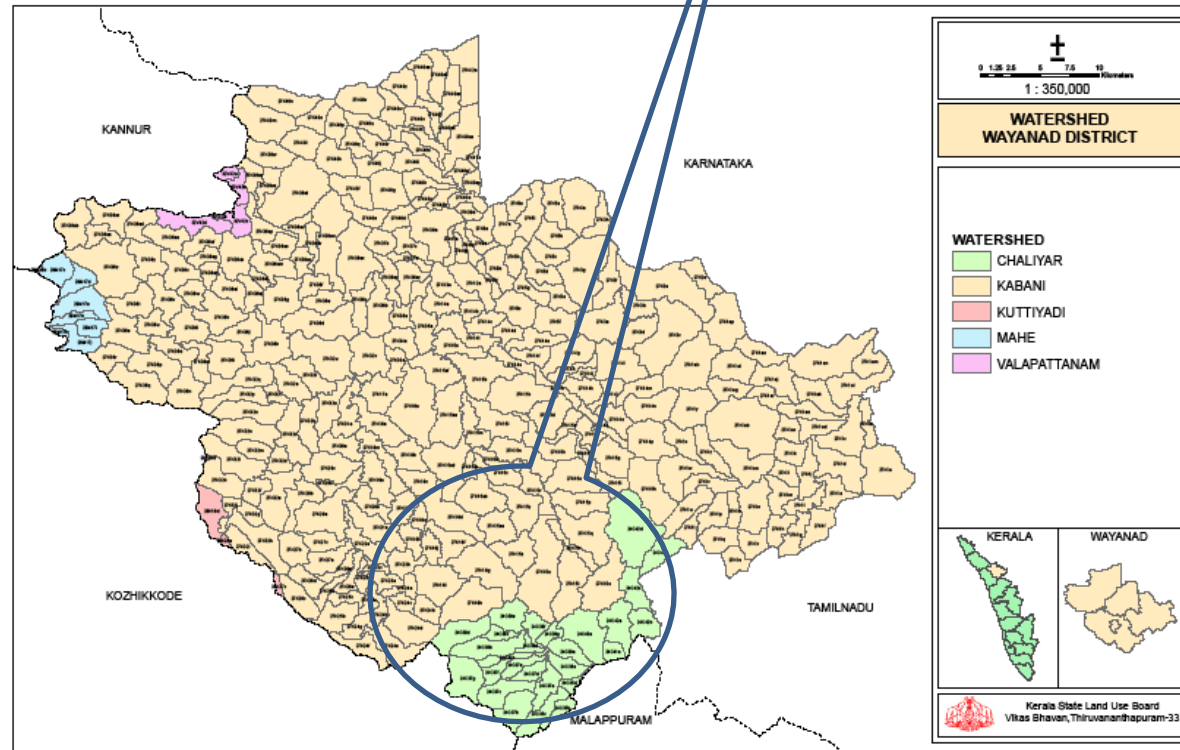
Conceptual Model: Lang et al 2012

**EXAMPLE**  
**1**



## Food Plant Diversity Study and Promotion

Intervention site:  
Western Ghats- Kerala-  
Wayanad district-  
Chaliyar and Kabani  
Watershed areas (500 km<sup>2</sup>)



## Some Key Research Questions asked by Us

- **How does on-farm and wild food plant diversity contribute to household consumption and to dietary diversity and quality?**
- **How can we link food plant diversity to improved nutrition and health outcomes?**
- **Can food plant diversity be scaled for commercial use while maintaining biodiversity and ecosystems and improving human health?**

## 7 HIGH VAUE“SEPL” ELEMENTS with reference to Food Production

Socio-Ecological Production Landscape Elements	Functions and Functional Status	Changes in place
<p><i>Vayals</i> <b>Rice Paddies</b></p>	<p>Food Production, Water Management, Biodiversity Conservation</p> <p style="text-align: right;">↓</p>	<p><b>Alternate Land Use:</b> Banana, Areca Conversion for Non Agri purposes</p>
<p><i>Kappi thottam</i> <b>Shade Coffee Groves</b></p>	<p>Crop production, Livelihood, Biodiversity conservation Local climate control</p> <p style="text-align: right;">↓</p>	<p><b>Changing to SUN COFEE</b> by removing all shade trees</p>
<p><i>Purayidam</i> <b>Home Gardens</b></p>	<p>Food production, Nutrition, Livelihoods, Biodiversity conservation</p> <p style="text-align: right;">↓</p>	<p><b>Complete Disappearance</b> as no people at home to maintain them</p>
<p><i>Purambokku</i> <b>Common property area</b></p>	<p>Biodiversity conservation, medicinal plants, wild food plants/wild fruits</p> <p style="text-align: right;">↓</p>	<p>Fast Development and no more such places</p>
<p><i>Kavu/Thara</i> <b>Sacred Groves</b></p>	<p>Cultural heritage, biodiversity conservation, mushrooms, leafy greens</p> <p style="text-align: right;">↓</p>	<p><b>Highly Degraded</b> and Fast Disappearing</p>
<p><i>Thalakkulam</i> <b>Head Ponds</b></p>	<p>Water conservation and Purification</p> <p style="text-align: right;">↓</p>	<p><b>Complete Change/reduced water</b> flow to such swamps because of destruction of the catchment areas</p>
<p><i>Puzha, Thodu</i> <b>Small Streams and Canals</b></p>	<p>Irrigation, Water management, biodiversity conservation, wild foods</p> <p style="text-align: right;">↓</p>	<p><b>Appear only during Monsoons.</b> Highly polluted</p>

**Number of wild species used as food by  
different local communities in Wayanad**

<b>Wild Food</b>	<b>No. of species /kinds known to different socio-cultural groups</b>						
	<b>Paniya</b>	<b>Kattuna ikka</b>	<b>Kuruma</b>	<b>Others</b>			
				<b>Hindu</b>	<b>Musli m</b>	<b>Christi an</b>	<b>WayanadC hetty</b>
<b>Leafy vegetable</b>	<b>83</b>	<b>43</b>	<b>21</b>	<b>8</b>	<b>12</b>	<b>12</b>	<b>14</b>
<b>Tubers</b>	<b>19</b>	<b>25</b>	<b>12</b>	<b>2</b>	<b>4</b>	<b>6</b>	<b>7</b>
<b>Mushrooms</b>	<b>25</b>	<b>3</b>	<b>14</b>	<b>3</b>	<b>8</b>	<b>6</b>	<b>12</b>
<b>Fruits and Seeds</b>	<b>50</b>	<b>37</b>	<b>15</b>	<b>10</b>	<b>10</b>	<b>11</b>	<b>8</b>
<b>Crabs</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>
<b>Honey</b>	<b>4</b>	<b>5</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>
<b>Fish</b>	<b>36</b>	<b>30</b>	<b>25</b>	<b>12</b>	<b>12</b>	<b>14</b>	<b>15</b>
<b>Total</b>	<b>222</b>	<b>177</b>	<b>88</b>	<b>39</b>	<b>50</b>	<b>53</b>	<b>61</b>

## MEDICINAL RICE VARIETIES OF KERALA

(All are very rare in cultivation)

Name	Duration (days)	Place of Cultivation	Remarks
1. <b>Erumakkari</b>	120-130	Ernakulam-Thrissur	Upland rice. Used to cultivate in coconut gardens.
2. <b>Jaatthi Suggi</b>	120	Kasaragode-Karnaka border	II season crop. Highly preferred variety for consumption as well as medicinal purposes.
3. <b>Jeeraka Chembavu</b>	120	Thiruvananthapuram	Very small and slender grains; kernel white. Highly preferred for consumption.
4. <b>Kamaal</b>	120	Kannur	Crop of I season (virippu). Cultivate only for medicinal requirements.
5. <b>Karutha Chembavu</b>	120	Thiruvananthapuram	Entire grain is black in colour, including husk, bran and kernel. Use in place of Navara
6. <b>Kolaran</b>	85-90	Kasaragode	Dark purple grains. Use in place of Navara if it is not available.
7. <b>Kunji Nellu</b>	120	Kannur	Upland rice; scented, highly preferred for consumption especially during sick condition.
8. <b>Nalla Chennellu</b> (5-6 strains)	120	Kannur	Kernel red. Rice flakes are medicinal
9. <b>Naron</b>	60	Kannur	Upland rice. Use in place of Navara.
10. <b>Navara</b> (purple & golden)	60-90	In plains and midlands of Kerala	All season crop. Upland and medium -lowland. Widely known as medicinal. Employed in Ayurveda.
11. <b>Vadakkan</b>	85-90	Kannur	Upland rice. Grains purple.
12 <b>Vatton</b> (purple & golden)	90	Thrissur, Palghat and Malappuram	Very similar to Navara but grains are slightly bolder. Use in place of Navara.

**19 vars of Yam in 4 species were in  
Cultivation in Wayanad (as of 2006)**

**The Genetic  
Diversity of  
Food Plants**

***Dioscorea alata***

1. Inchikachil I & II
2. Kuzhikavithu I
3. Kuzhikavithu II
4. Quintalkachil I
5. Quintalkachil II
6. Anakomban
7. Kaduvakkayyan
8. Urulan kachil
9. Kuppathottikizhangu
10. Elivalankachil
11. Neendi/Veetukizhangu
12. Vella kachil I & II
13. Chorakachil/cherakachil/chuvappukachil/ Neela kachil I, II & III

***Dioscorea esculenta***

14. Nanakizhangu
15. Vella Enchi kachil
16. Mullan Kachil

***Dioscorea rotundata***

17. Africankachil
18. Thoonankachi

***Dioscorea bulbifera***

19. Erachikachil/Adathappu



# CULTIVATED YAMS



1. Quintal kachil
2. Kolli kachil
3. African kachil
4. Karadikalan kachil
5. Erachi kachil
6. Kuzhikavathu
7. Kaduvakaiyyan kachil
8. Inji kachil valuthu
9. Mullan kachil
10. Kaippan kachil
11. Neendi kachil
12. Neela kachil
13. Cheru kizhangu
14. Thoonan kachil
15. Urulan kachil
16. Vella kachil
17. Vazhavadakkan kachil
18. Chuvappu kachil
19. Parichayakodan kachil
20. Inji kachil cheruthu



# WILD YAMS



1. *Dioscorea* sp. (Mooda venni)
2. *Dioscorea pentaphylla* var. *rheedii*
3. *Dioscorea oppositifolia*
4. *Dioscorea belophylla*
5. *Dioscorea wallichii*
6. *Dioscorea pentaphylla*
7. *Dioscorea bulbifera*
8. *Dioscorea hamiltoni*
9. *Dioscorea pentaphylla* var. *linnaei*
10. *Dioscorea pubera*
11. *Dioscorea kalkapershadii*
12. *Dioscorea intermedia*
13. *Dioscorea hispida*
14. *Dioscorea tomentosa*
15. *Dioscorea pentaphylla* var.
16. *Dioscorea pentaphylla* var. (Manal korana)
17. *Dioscorea pentaphylla* var. *jacquemontii*
18. *Dioscorea pentaphylla* var. *communis*
19. *Dioscorea spicata*
20. *Dioscorea* sp. (Era kalasu)

# WILD TUBEROUS ROOTED EDIBLES



1. Palchembu
2. Koorka
3. Thamarakannan
4. Manjakoova
5. Kasthurimanjal
6. Makalae potti vella
7. Neela koova
8. Thondi chembu
9. Kattuchena
10. Mala manjal
11. Manjal
12. Sathavari
13. Makalae potti chuvappu
14. Manga inji
15. Madura chembu
16. Cheruchembu
17. Malayinji
18. Packichembu vella
19. Vella koova
20. Packi chembu chuvappu

# CULTIVATED RICE



1. Marathondi
2. Kodaku vellyan
3. Vellyan
4. Poothadi kayama
5. Kalladiyaran
6. Kayama
7. Mullanchanna
8. Oonavattan
9. Jeerakasala
10. Gandhakasala
11. Chomala
12. Chetu vellyan
13. Chenthadi
14. Adukkann
15. Chenellu
16. Velumbala
17. Uruni kayama
18. Thondi
19. Thoncoran thondi
20. Mullanpuncha

# CULTIVATED LEGUMES



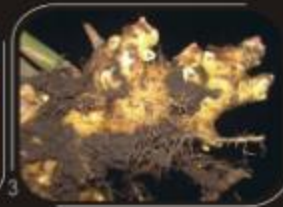
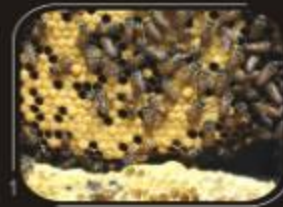
1. Kuruthola Payar -brown
2. Kathi Payar
3. Kuruthola Payar -black
4. Chathura Payar
5. Kutti Payar -black
6. Kutti Payar -ash
7. Valli Payar -pulli
8. Mochakotta -black
9. Kutti Payar -dark brown
10. Valli Payar -yellow
11. Kutti Payar -brown
12. Kutti Payar -pulli
13. Mochakotta -yellow
14. Mochakotta -pulli
15. Kutti Payar -ash small
16. Mochakotta -brown
17. Amara -black large
18. Amara -black small
19. Amara -brown
20. Kutti Payar -yellow

# CULTIVATED MUSA VARS



1. Pooja kadali
2. Nadan poovan
3. Njali poovan
4. Chara poovan
5. Charapadachi
6. Monthan
7. Vannan
8. Chenkadali
9. Njali poovan ceruthu
10. Moris
11. Ceru chenkathali
12. Kalluvazha
13. Mezhukuthiri kalan
14. Gudalur nendran
15. Vettan
16. Palayankodan
17. Robusta
18. Mysore poovan
19. Pachakaali
20. Wayanadan nendran

# NON WOOD FOREST PRODUCTS



1. Honey
2. Entada
3. Ginger
4. Abrus
5. Helectrus
6. Wild Arrowroot
7. Hydnocarpus
8. Log Lichen
9. Turmeric
10. Bala
11. Costus
12. Bamboo grain
13. Embella
14. Shikkakai
15. Sarcostigma
16. Wild Solanum
17. Cyclea
18. Black Musali
19. Mahabala
20. Bee Wax

# CROP WILD RELATIVES



1. *Garcinia morella*
2. *Amomum pterocarpum*
3. *Manihot carthaginensis*
4. *Arisaema tortuosum*
5. *Amorphophallus commutatus*
6. *Piper mullesua*
7. *Psilanthus travancorensis*
8. *Zingiber zerumbet*
9. *Solanum torvum*
10. *Dioscorea pentaphylla*
11. *Myristica beddomei*
12. *Piper trichostachyon*
13. *Cinnamomum malabattrum*
14. *Myristica magnifica*
15. *Oryza rufipogon*
16. *Curcuma aurantiaca*
17. *Curcuma zedoaria*
18. *Phyllanthus indofischeri*
19. *Phoenix loureiroi* var.
20. *Amorphophallus paeoniifolius*

# WILD MUSHROOMS



1. Kachikalanavae
2. Vennajalanavae
3. Undakumman
4. Karadianavae
5. Chorakkalanavae
6. Kattanavae
7. Kothananavae
8. Kozhikalanavae
9. Thorathalanavae
10. Amlukooman
11. Cheriavellikkumman
12. Mookanavae
13. Kathukkumman
14. Jalanavae
15. Nattanavae
16. Chullianavae
17. Kothananavae
18. Huthanavae
19. Arisnakalanave
20. Vellanavae

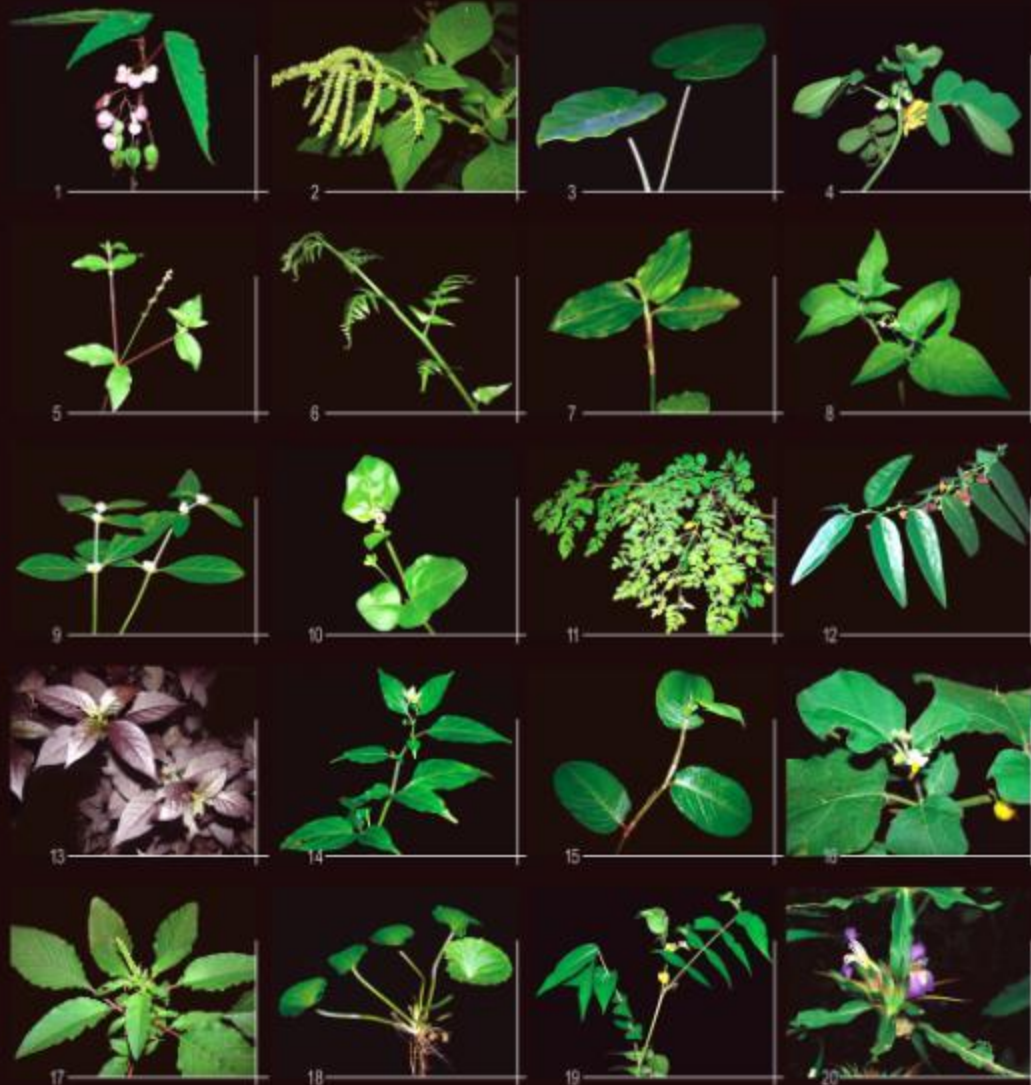


# WILD FODDER GRASSES & SEDGES



1. *Brachiaria miliiformis*
2. *Cyperus tenuispica*
3. *Setaria pumila*
4. *Eragrostis tenuifolia*
5. *Chrysopogon aciculatus*
6. *Coix lacryma-jobi*
7. *Scirpus stylis*
8. *Echinochloa stagnina*
9. *Cynodon dactylon*
10. *Kyllinga brevifolia*
11. *Cyrtococcum trigonum*
12. *Eleusine indica*
13. *Kyllinga nemoralis*
14. *Oplismenus burmannii*
15. *Paspalum scrobiculatum*
16. *Eragrostis unioloides*
17. *Alloteropsis cimicina*
18. *Sacciolepis indica*
19. *Themeda triandra*
20. *Isachne miliacea*

# WILD EDIBLE GREENS



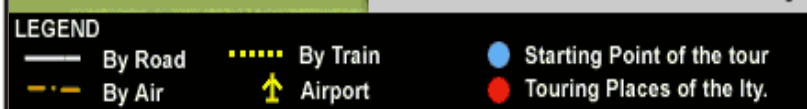
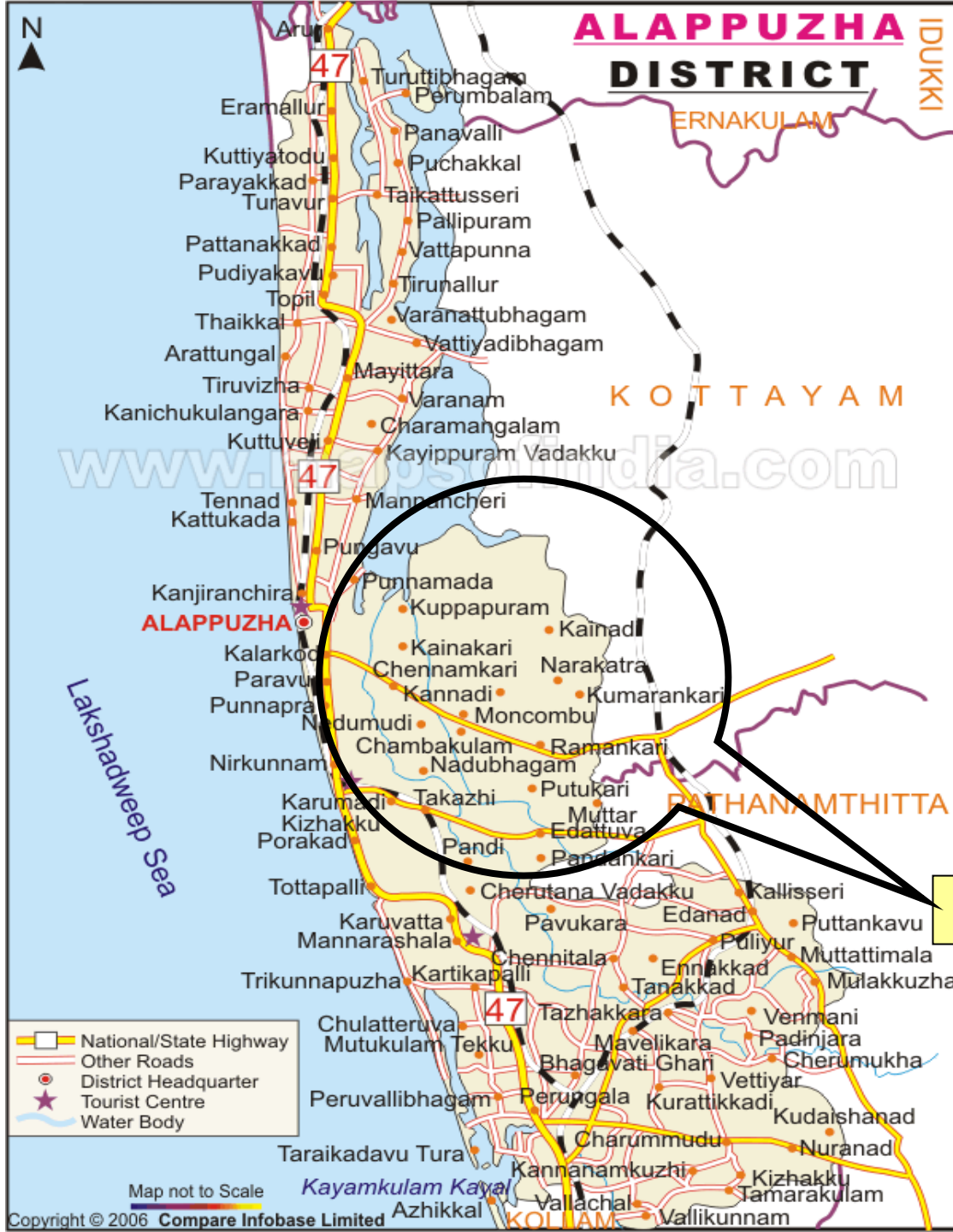
1. *Begonia malabarica*
2. *Amaranthus viridis.*
3. *Colocasia esculenta*
4. *Senna tora*
5. *Achyranthes aspera*
6. *Diplazium esculentum*
7. *Commelina benghalensis*
8. *Solanum americanum*
9. *Alternanthera bettzickiana*
10. *Boerhavia diffusa*
11. *Moringa oleifera*
12. *Sauropus androgynus*
13. *Alternanthera brasiliana*
14. *Capsicum frutescens*
15. *Persicaria chinensis*
16. *Solanum indicum*
17. *Amaranthus spinosus*
18. *Centella asiatica*
19. *Senna occidentalis*
20. *Hydrophila schulli*

# Kuttanad Below–Sea Level Farming System

*The only system in India that favours rice cultivation below sea level*

EXAMPLE  
2






**KUTTANAD REGION**

Kuttanad region 'the man made land in God's own country' spreads in over 100,000 hectares with more than 40% of reclaimed land from the backwaters and the Vembanad deep water Lake

# A Complex Mosaic of Fragmented Agricultural Landscape

- Coastal backwaters
- Rivers
- Paddy fields,
- Marshes
- Ponds,
- Garden lands
- Edges
- Corridors and
- WATER WAYS





**the largest wetland use system in the west coast of Indian peninsula and perhaps the largest below sea level cultivation of Paddy in the world!**



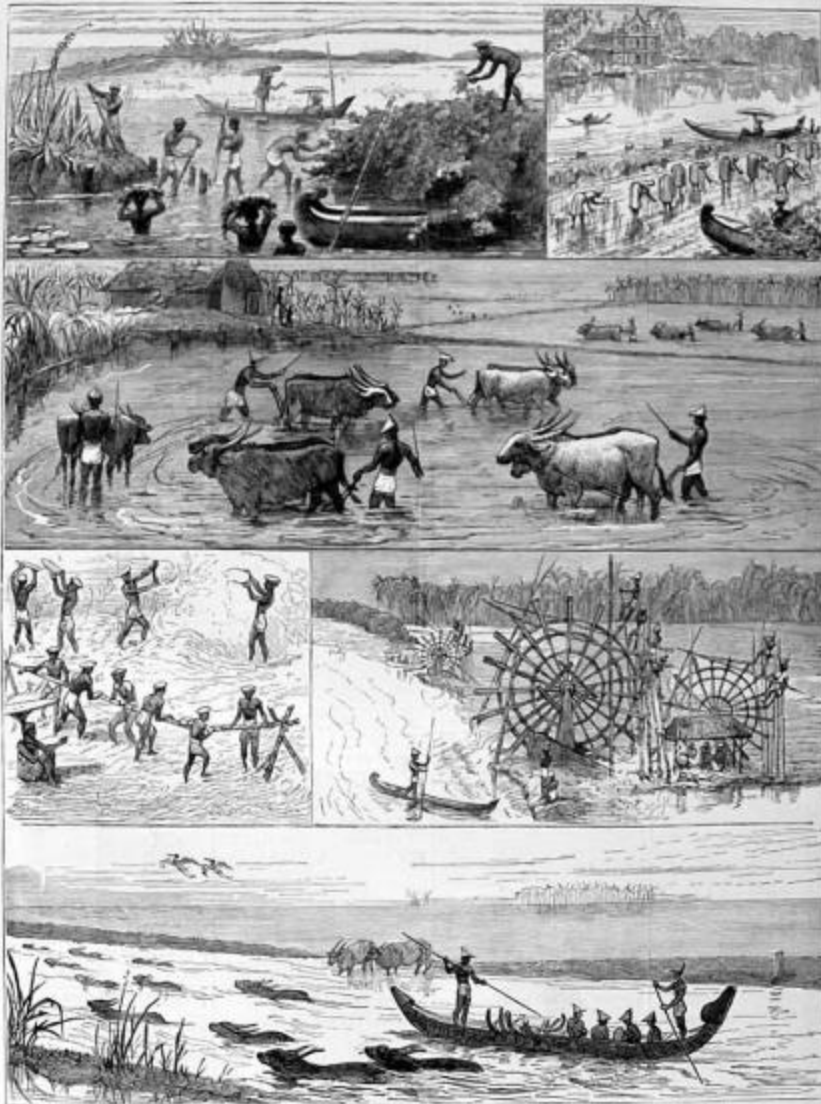
**the largest wetland use system in the west coast of Indian peninsula and perhaps the largest below sea level cultivation of Paddy in the world!**



## PUNJA VAYAL

Large contiguous flat patches of rice fields that range between few ha to 1000 ha in size and abundant sediments and dead vegetation





1. Rising the banks of Paddy Fields.—2. Reaping.—3. Bull-ploughing.—4. Threshing and Winnowing.—5. Water Wheels.—6. Flungoes raising them.  
THE FAMINE IN INDIA—PADDY CULTIVATION IN TRAVANCORE

## Reclamations

- Smaller scale reclamations existed since early 18<sup>th</sup> century
- The idea of large scale reclamation of *Kayal* lands was envisaged during the reign of *H.H. Sree Ayilliam Thirunal Rama Varma* (1860 to 1880).
- In the year 1903, *Travancore Kingdom* banned reclamations from *Vemabanad Lake*. This has put an end to old reclamations.
- Around 5500 Acres of *Kayal* land by this time.
- *Venad Kayal, Madathil Kayal,*
- *Cherukara Kayal and Pallithanam Kayal*
- *Mathi Kayal & Rajapuram Kayal.*

## ***Construction of Polders and Land reclamation***

- Identification of the shallow regions in the vast stretches of Vembanad Lake
- Marking the boundaries
- The bund construction and maintenance are the most skilful tasks, for which an array of long and stout coconut poles would be hammered deep enough into the lake bed in two rows, normally in 1.5 m to 2-5 m width enveloping the entire area and fenced with bamboo mats on either side.
- The channels of the bund then would be filled to the desired height, first with sand, followed by twigs, sedges interspersed with high quality clay that dug from 20-25 m deep bottom of lakes.



# Agricultural Biodiversity and Associated Biodiversity

- **Mixed agro-ecosystems** such as backwaters, rivers, vast stretches of paddy fields, marshes, ponds, garden lands, edges, corridors and water ways-the characteristic feature of Kuttanad Wetland Agricultural Landscape.
- **Plant and animal germplasm** (of food and medicinal value like several edible wild greens and healing herbs) The delicacy like meat of turtle, frogs and different species of birds is still available though it is legally controlled)
- **Insects, pests and fungi** (Enormous diversity available now after the practice of high intensive farming!)
- **Soil biodiversity, microbes** (not much known)



## Livestock

A traditional breed of  
Buffalo still thrives

## Crop species and varieties

Largely of Rice  
the Released  
varieties- *Jyothi*  
and *Uma*. In the  
past puthari  
champavu and  
jeeraka champavu



## Ethnic Uses

Habit of using deep mined clay for healing their small wounds and cuts and Herbal medicine was known for poisonous bites. Abundantly grown screw pines and a sedge Screw pine, Typha in the region offered enough raw material  
Mat weaving – a livelihood option for the women



# Wild biodiversity

- **The wild biodiversity** of the region is rich!
- The 11 km long stretch of mangrove vegetation
- ***Pathiramanal*** is a large repository of migratory fishes and birds and several species of mangroves, birds and fish species.
- A bird count in 2009 listed out **27942 birds belonging to 56 wetland and wetland associated bird species.**
- The *Kayal* is home to the third largest population of more than 20,000 waterfowls that visit India



## Endangered Birds

- Endangered species of waterfowl that have been identified from the region are:
- **spot billed pelican,**
- **oriental darter,**
- **water cock**
- **black billed tern.**





# Fish Diversity

- The region is an ideal habitat for variety of finfish, shellfish, and several varieties of prawns, black clams, white clams and shrimps. Many fish species are reported to be depended upon the wetland for food, spawning and nursery.



the esteemed golden catfish of Kuttanad

## Plant Diversity

- The aquatic species include:
- 24 spp of green algae,
- 10 blue green algae,
- one species of yellow brown algae,
- 13 desmids and 19 diatoms
- 202 angiosperm species, which include 14 mangroves and 30 mangrove associates.
- 8 species of pteridophyta



## Goods and Services

### *Kuttanadan Rice*

- The rice cultivation area of Kuttanad shares about 25 % of the State's total rice production area and contributes nearly 37 % of the rice production of the state. Owing to its primacy in rice area and production, Kuttanad had been long time referred as "**The Rice Bowl**" of Kerala.



# ***Kuttanadan Fish wealth***

- The Kuttanadan Agricultural Landscape, including the Punja Rice System that surrounded with estuaries, flood plains, Kayals, ponds and canal networks known for its diverse fish wealth.
- Vembanad Fish Count 2009 identified 65 species of fin fish and 14 species of shell fish from the region (ATREE 2009).
- The fresh water environment closer to rice fields and the canals provide abundance of Pearl spots, perchlets, fresh water giant prawns or *attukonju* and freshwater catfishes



# Endangered Fish Diversity

Some of the endangered fish species of the region are the endemic carp of Central Travancore, *Labeo dussumieri* (Toolli/Pullan), the esteemed golden catfish of Kuttanad,

- *Horobagrus brachysoma* (Manjakoory), the riverine coldwater fish,
- *Gonoproktopterus curmuca* (Kooral),
- *Wallago attu* (Attuvaala), the glass perch,
- *Parambassis dayi* (Nandan),
- *Macropodus cupanus*, and
- *Nandus nandus* (Andikalli) The highly Endangered endemic species in the fresh water reaches include
- *Channa micropeltes* (Manal waaha), *C. leucopunctatus* (Puliwaaha) *Pristolepis malabaricus* (Pannakarimeen), *Ompok bimaculatus* and *Clarias dussumie* (Mushi).

# Rice-fish Rotation farming

- Rice –fish rotation is now popular in the region as double cropping of rice turned to be less lucrative and more damaging to environment. The second crop (March to October) is now taken for rearing of fish (various carps)



# Kuttanadan Clam :

## Four species of Clams:

- *Villoritta cyprinoids*,
- *Meretrix casta*,
- *Paphia malabarica* and
- *Sunetta scripta*) are reported from the region, in which Black clam (*Villoritta cyprinoids*)
- Its production was estimated about 31430 ton in 2000.



## Kuttanadan Duck Farming

The ideal condition  
of the system allows  
Duck farming in a  
promising way.  
Famous local breeds  
Kuttanadan duck  
are: **Chara and  
Chempalli**





## Kuttanadan Coconut Gardens



- In garden lands Coconut agroforestry is also followed where coconut is grown with fruit trees like mango, jack and roots and tubers like yams and taros. The palm is also used for tapping toddy, which is another attraction of the region. Apart it contributes to profound scenic beauty

# Environmental services

Control of Salinity intrusion;  
Transportation,  
Recreation apart from crucial regulating service the system plays is the **control of the hydrology of the entire region.**



# Threats and Challenges

## *Kuttanad – A ‘Water Desert’*

Fresh water supply is hugely defective:

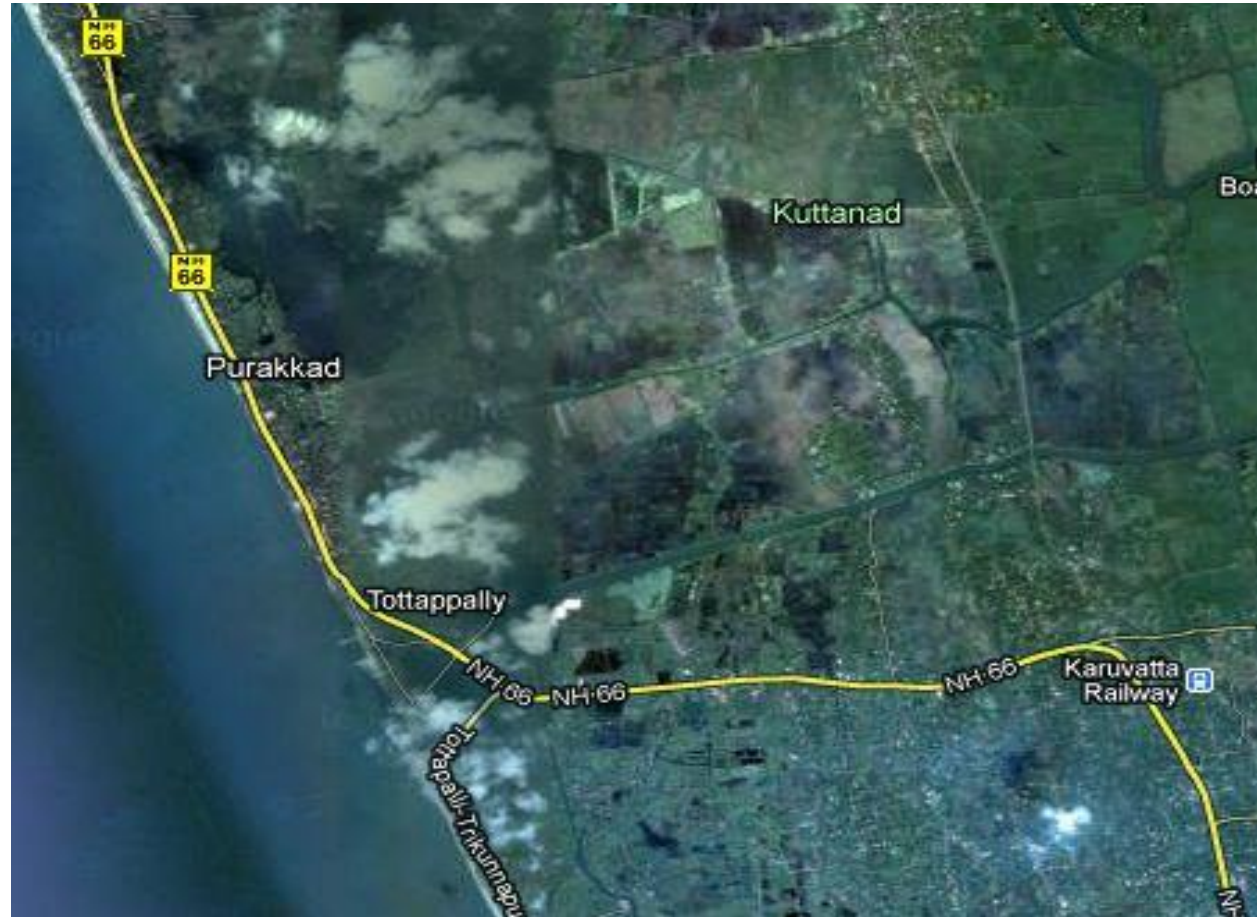
- Pollution,
- Urban encroachment,
- Land reclamation for agriculture and tourism,
- Fragmentation by transportation routes, untreated human sewage from dense settlements, and
- Intensive agricultural run-offs including fertilizers and pesticides.

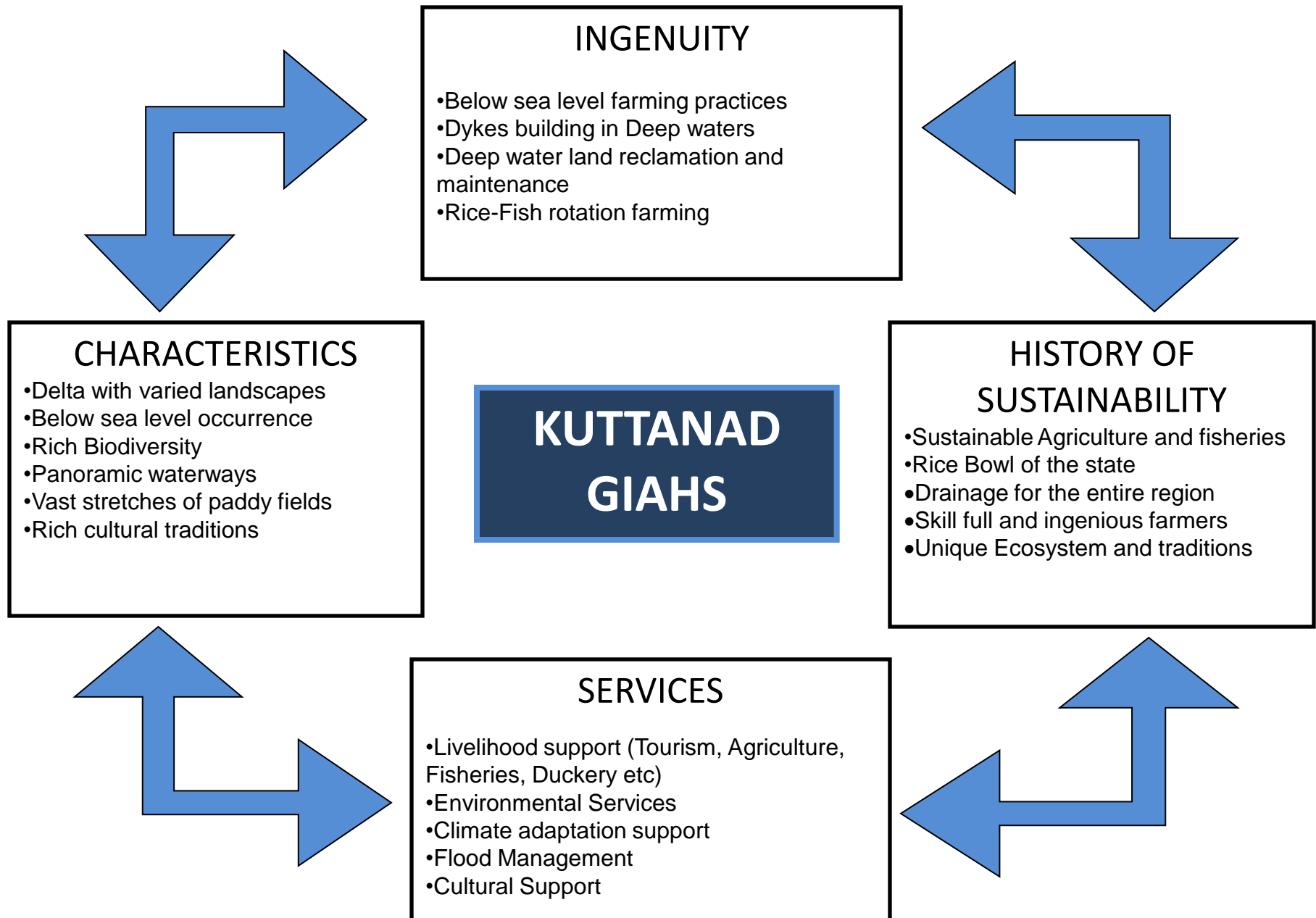
Almost all areas in Kuttanad are reeling under severe shortage of potable water. The people of this water logged area virtually starve for quality potable water.

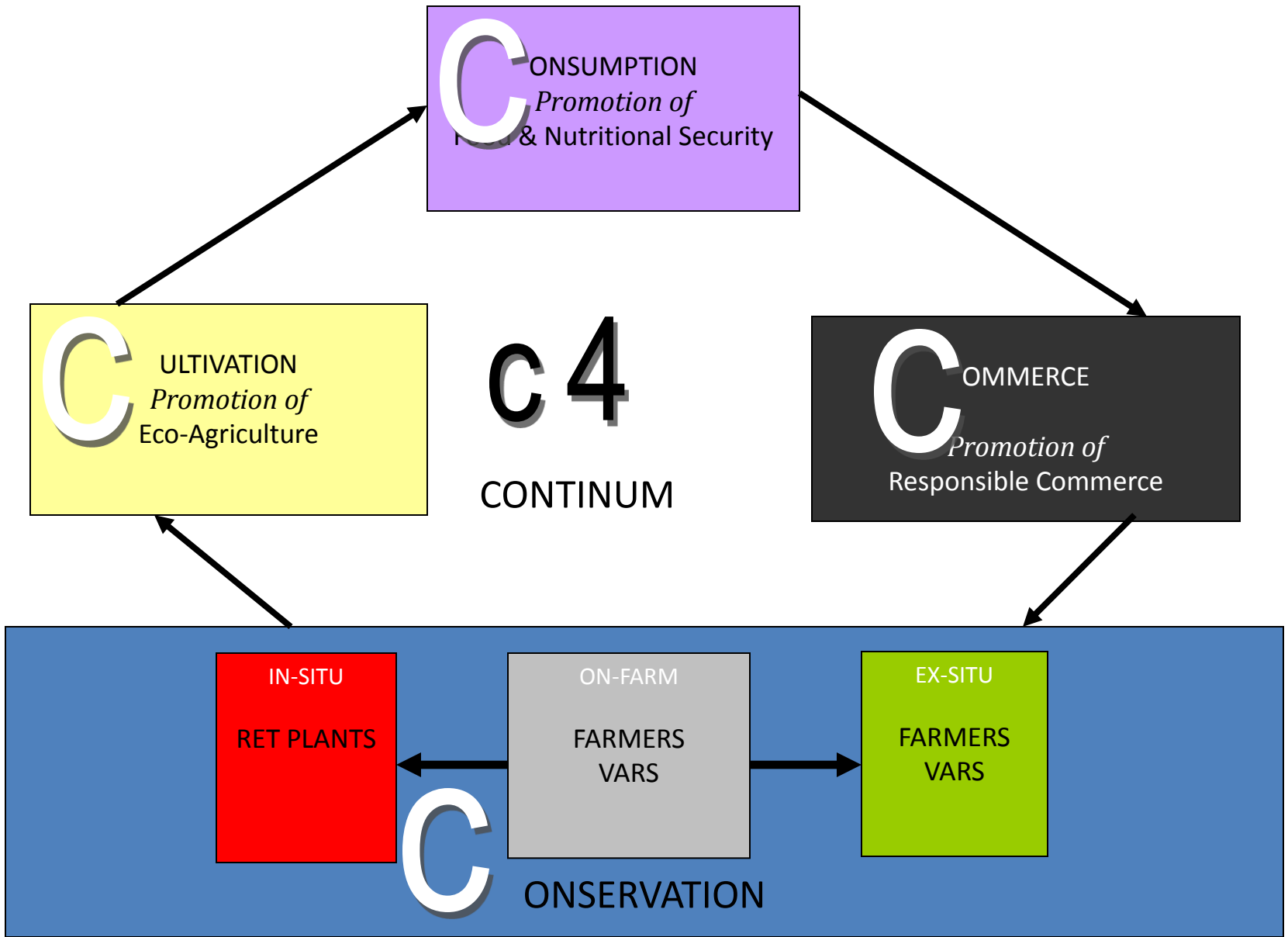


# Global Importance

- The Kuttanad Wetland Agriculture System is unique, as it is the only system in India **that favours rice cultivation below sea level in the land created by draining delta swamps in brackish waters.** And may be the largest below sea level paddy cultivation areas in the world!
- Promotion of a project Kuttanad Agricultural Heritage Villages will help in achieving some **relevant Aichi Targets**

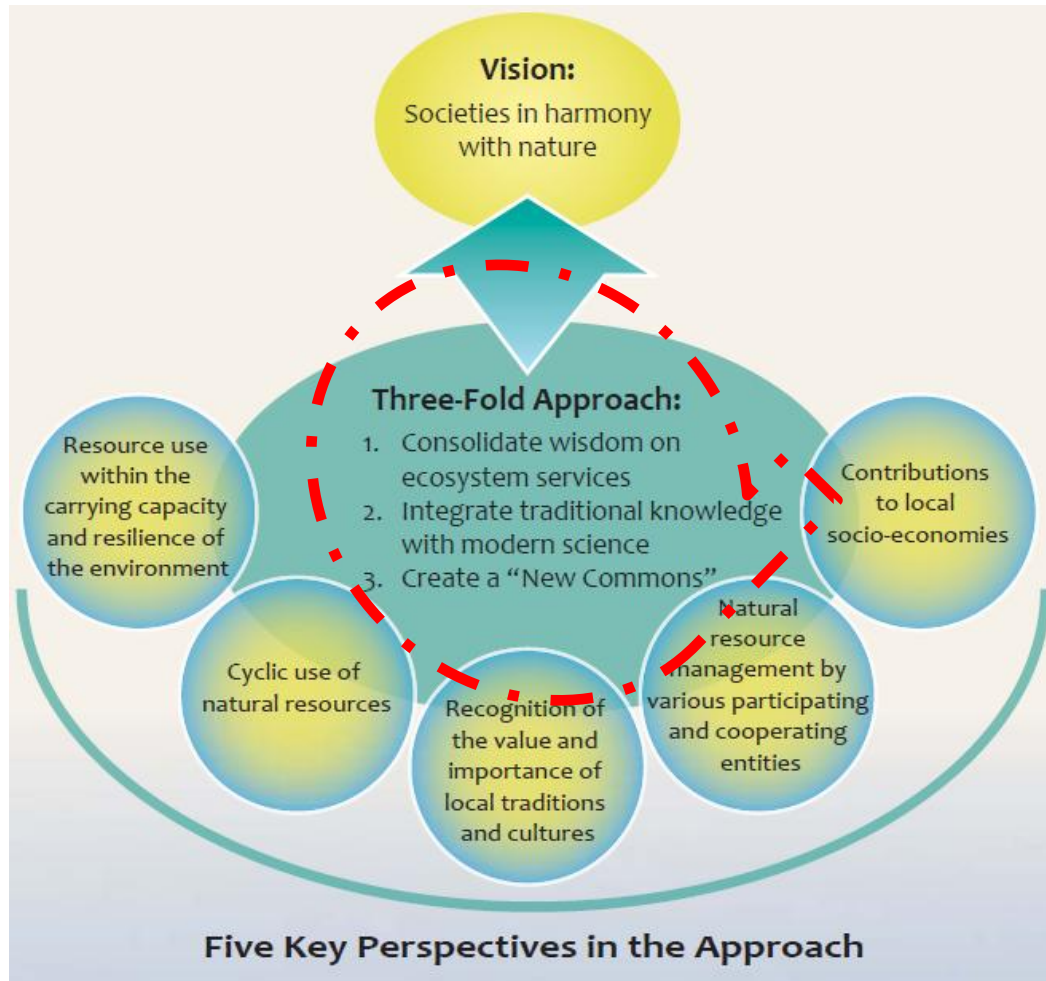






BIODIVERSITY MANAGEMENT: MSSRF FRAMEWORK

# Satoyama Initiative: A Way Forward



Achieving the **Vision** (long term goal) by carrying out activities in accordance with the **Three-fold Approach**, which in concrete terms, entails the **Five Perspectives**.

# THANK YOU

N. Anil Kumar

M S Swaminathan Research Foundation

[anil@mssrf.res.in](mailto:anil@mssrf.res.in)

Presentation at UNU-IAS Yokohama, Japan  
18-12-2012