

“Kandyan Forest Garden” the Sustainable Agroforestry system  
in  
Sri Lanka for Food security and Conservation of Biodiversity

*Ajith Gunawardena*

*Asst. Director – Geo-Informatics  
Central Environmental Authority  
Sri Lanka*

SAFE PROTOTYPE



# Sri Lanka

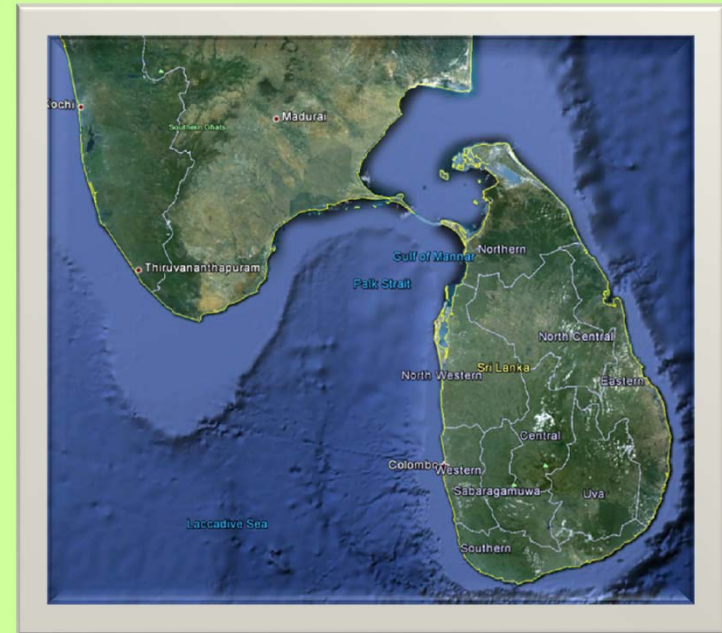
Total area **65,610 km<sup>2</sup>.**

The land area is **64,740 km<sup>2</sup>**

Water is **870 km<sup>2</sup>.**

Coastline **1,340 km**

The highest point **2,524 m**



The GDP (purchasing power parity) of Sri Lanka is \$82.02 billion and GDP(official exchange rate) is \$30.01 billion.

Growth rate of GDP of Sri Lanka is 6.8%. and per capita GDP is \$4,000.

Agricultural sector 11.7%

Industrial sector 29.9%

The services sector 58.4%.

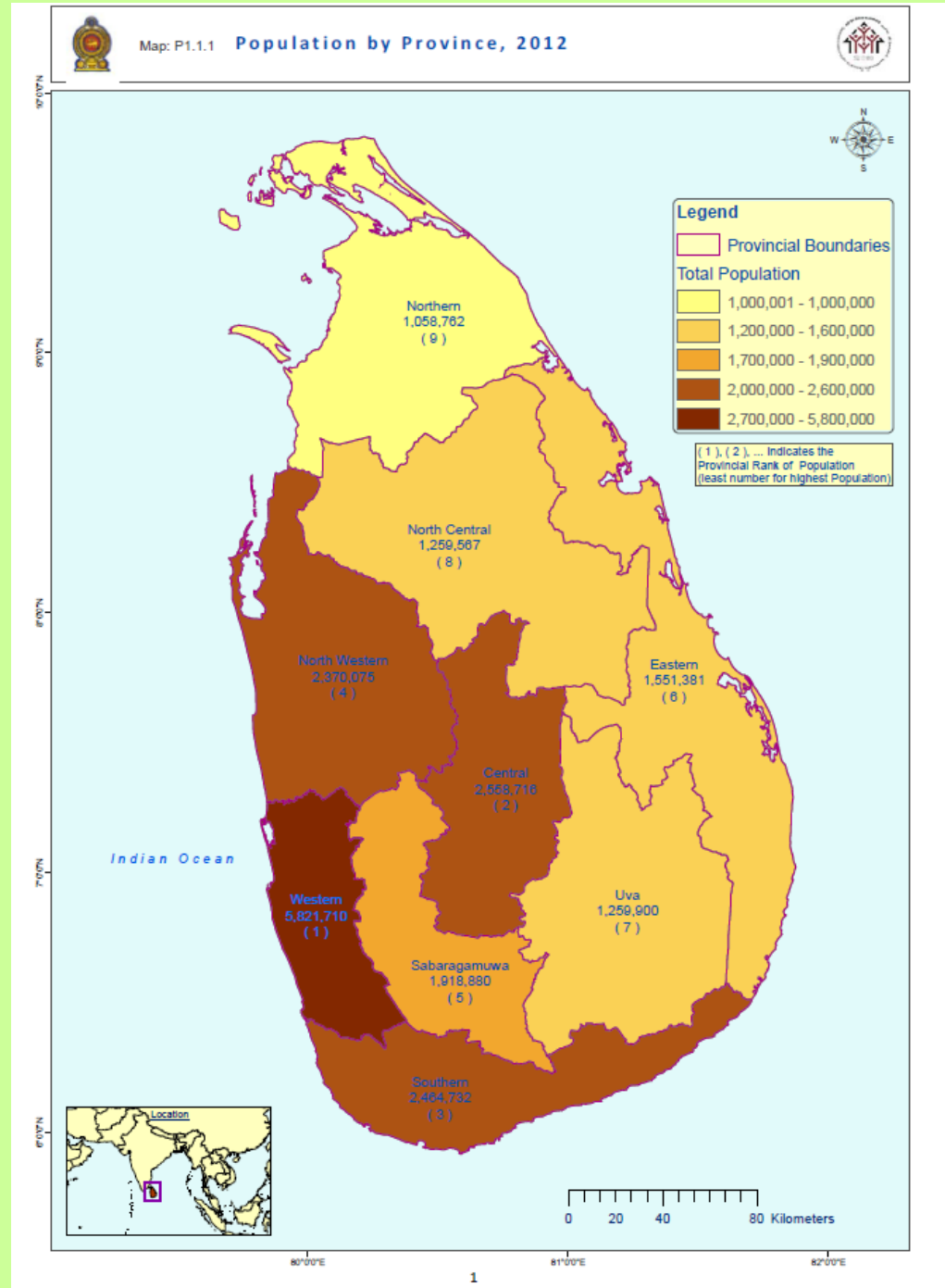


# Total population

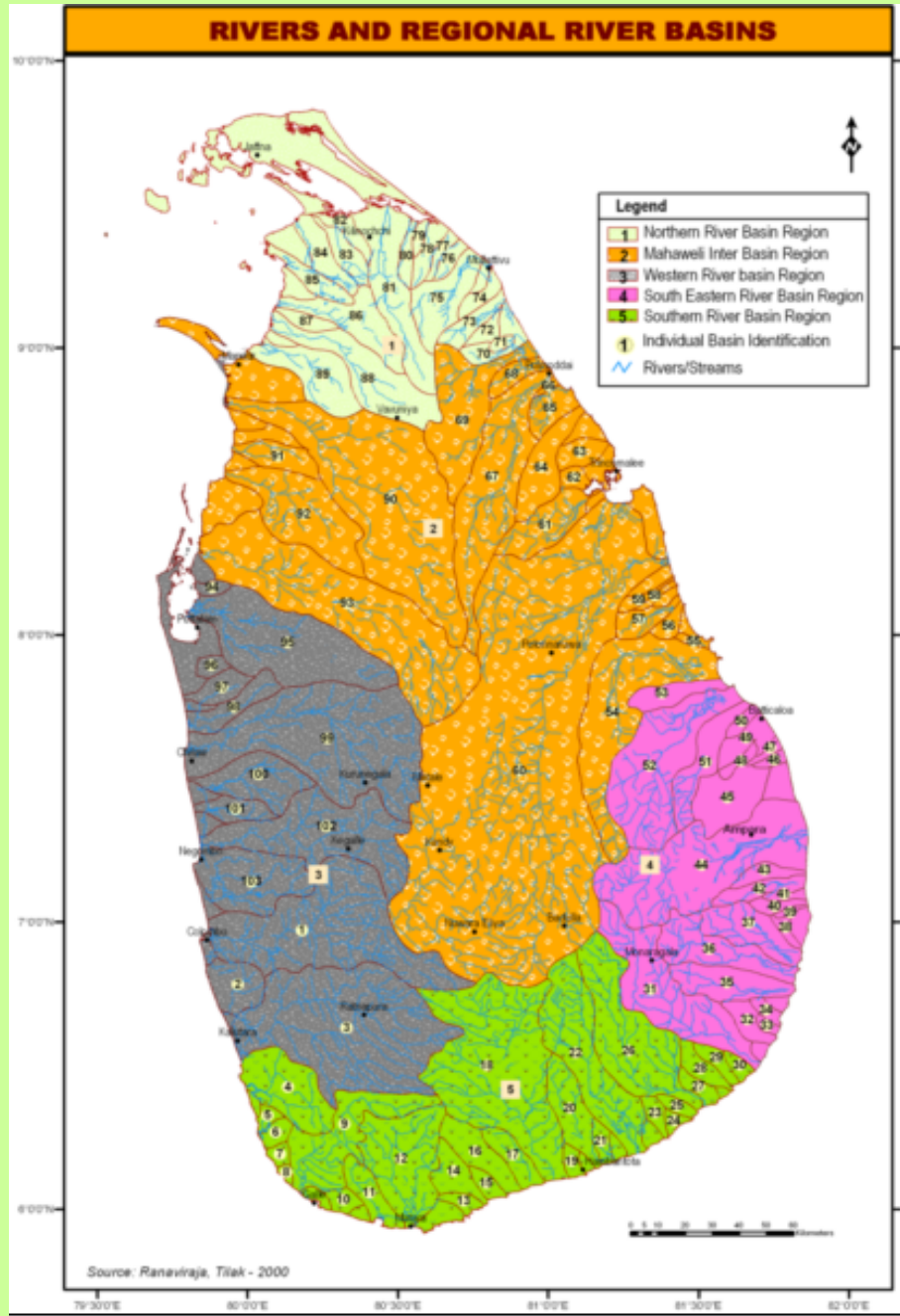
**20,277,597**

Average annual growth rate – **0.7%**

Literacy rate **90.6%**

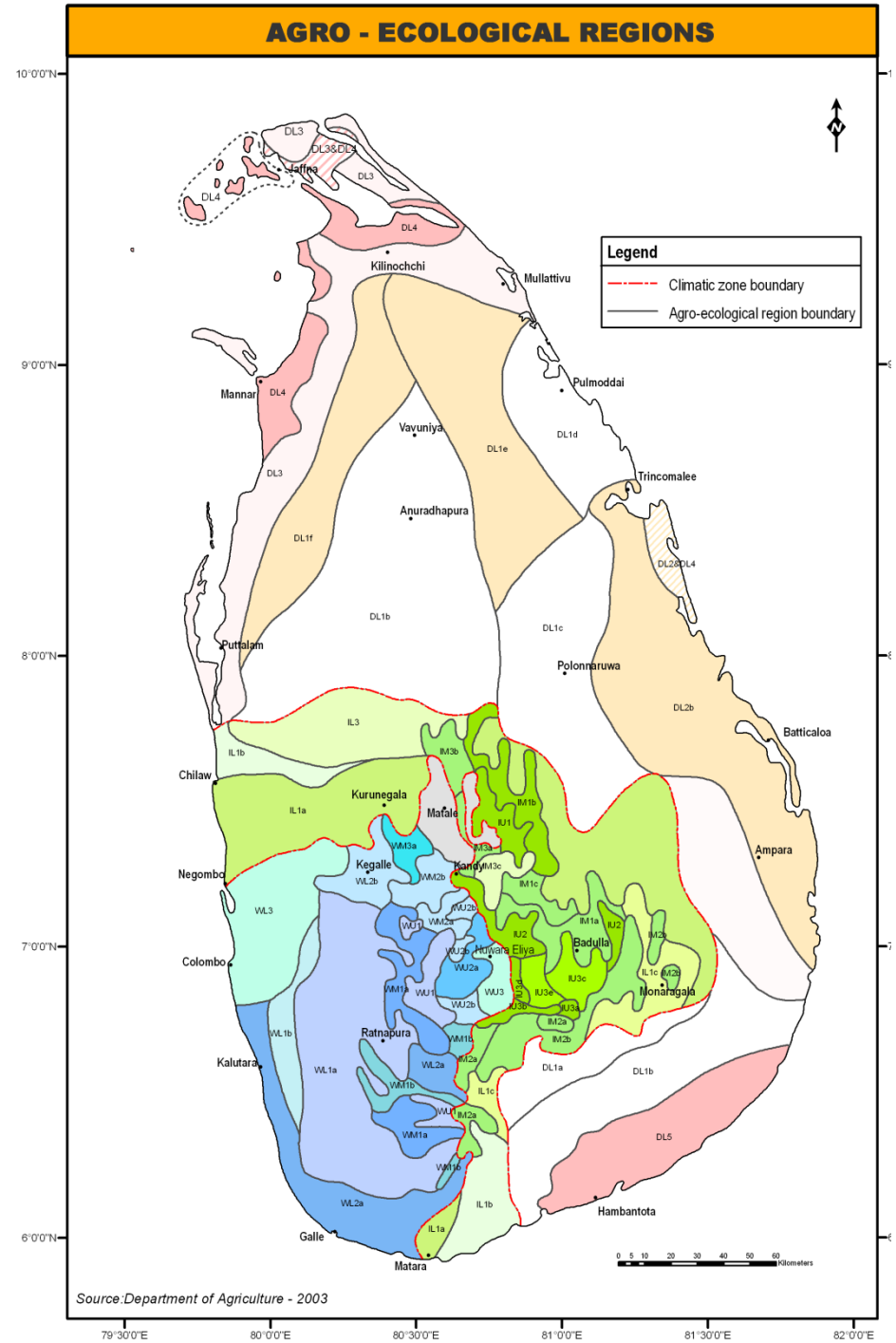


# Rivers and Streams

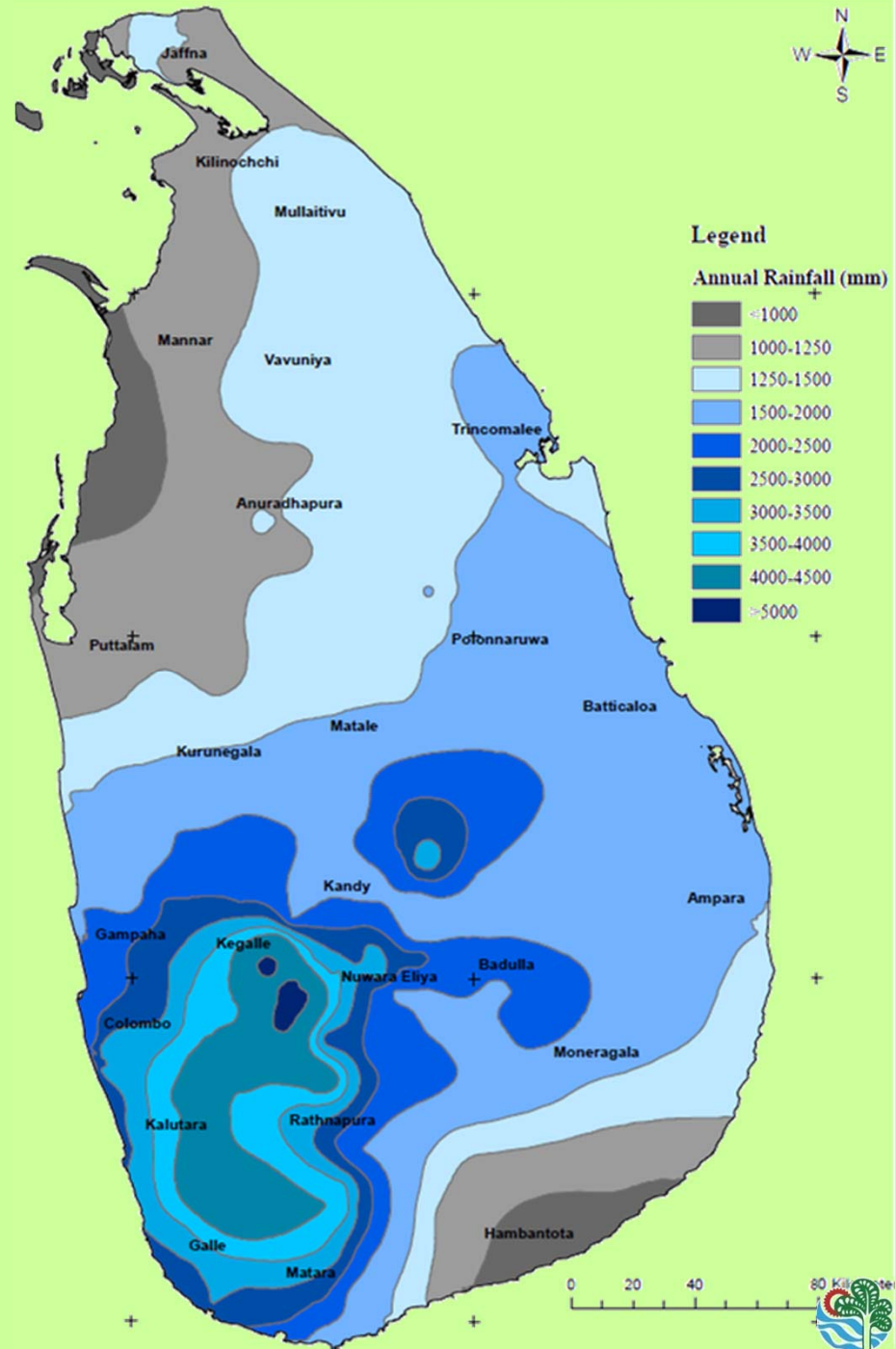




# Agro-ecological Zones of Sri Lanka



# Mean Annual Rainfall distribution of Sri Lanka



# Sri Lanka and Agriculture

## Rice

### Staple food of Sri Lankans

Rice varieties (in 1900) - about 3000

50 years ago there were - about 280

Rice varieties cultivate - about 15

### Land extent (2008)

Sri Lanka - 730,000 ha

Dry & Intermediate - 610,000 ha

Wet Zone - 120,000 ha

### Harvest

Yala Season (2011) - 1,878,617 Mt.

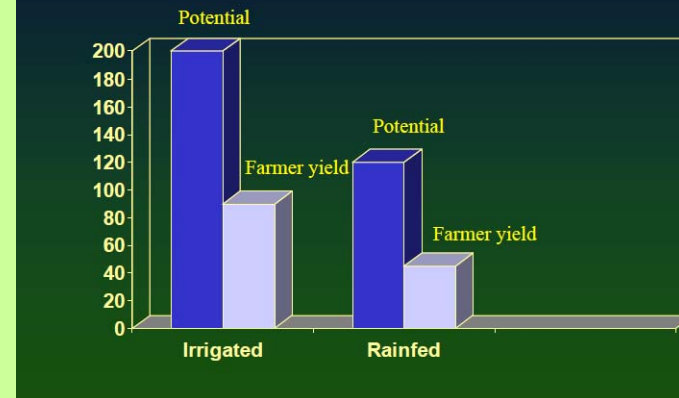
Maha Season (2011) - 1,996,184 Mt.

**Total - 3,874,801 Mt.**

Total paddy area - 977,140 ha (2010)

Average rice yield - 3.74 ton/ha (2010)

### Rice yield under rain and irrigated



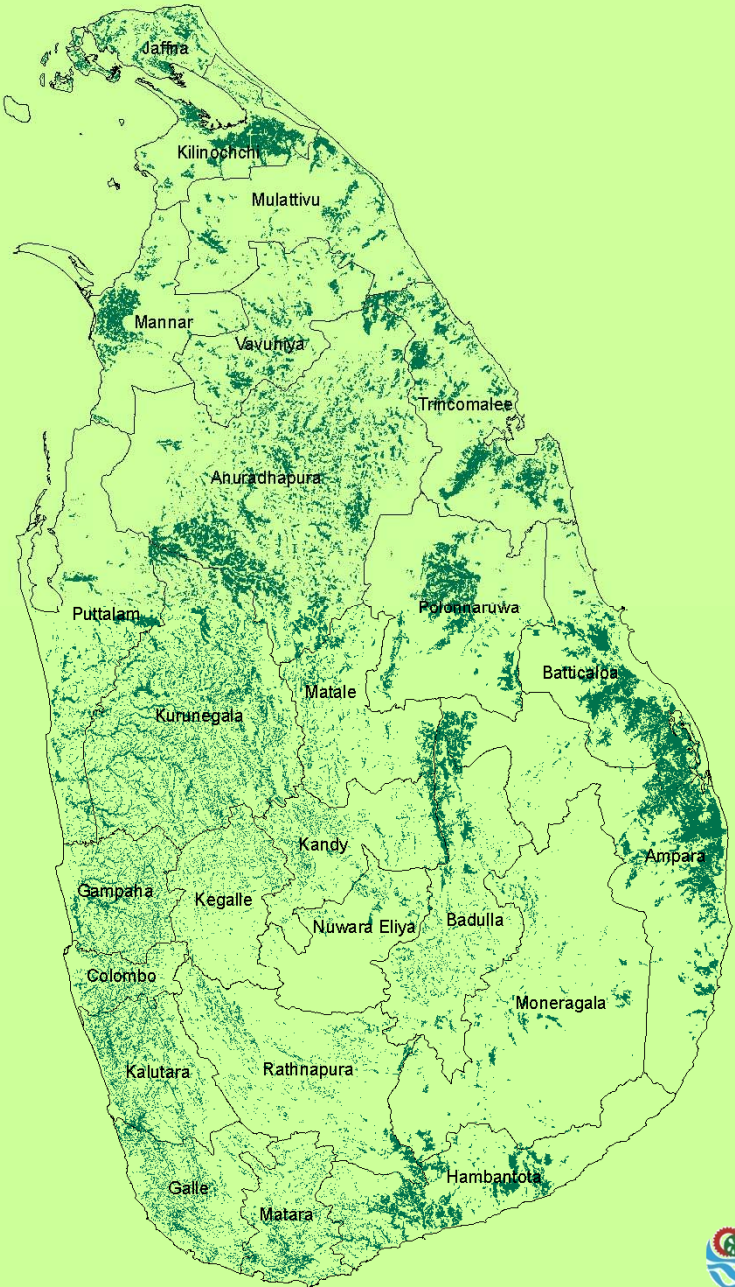
### Four Breeding Stations

Batalagoda	Bg
Bombuwala	Bw
Labuduwa	Ld
Ambalantota	At





# Paddy cultivation areas of Sri Lanka

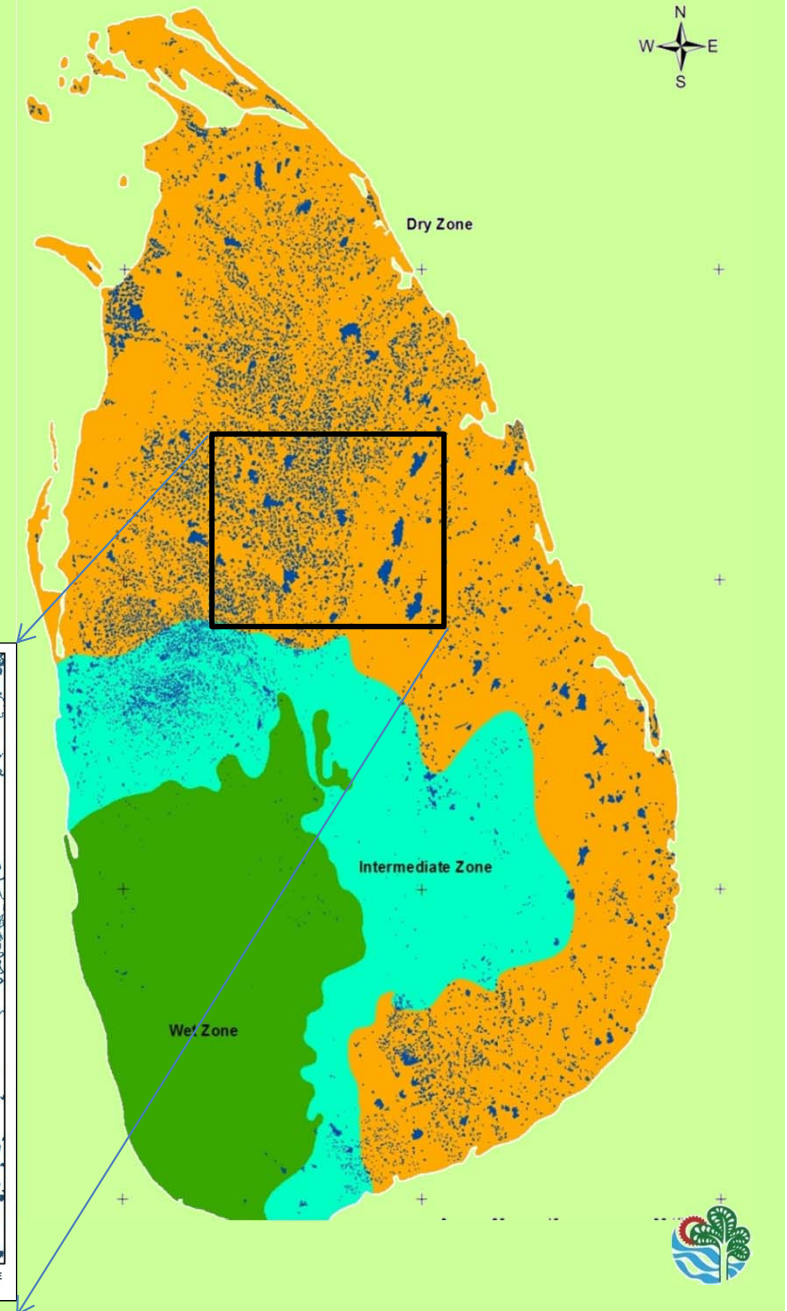
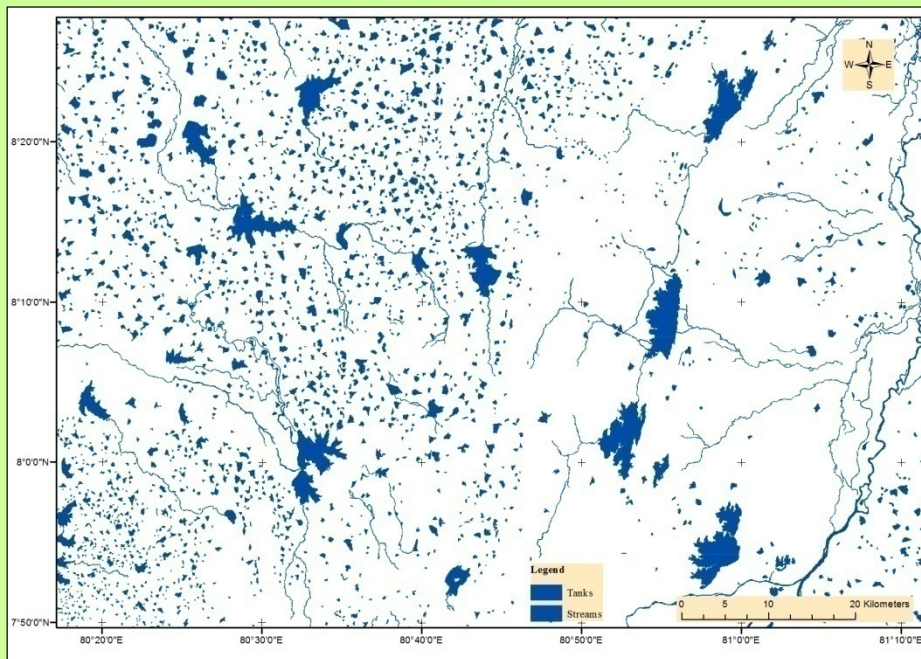




# Ancient Irrigation Systems and Paddy cultivation

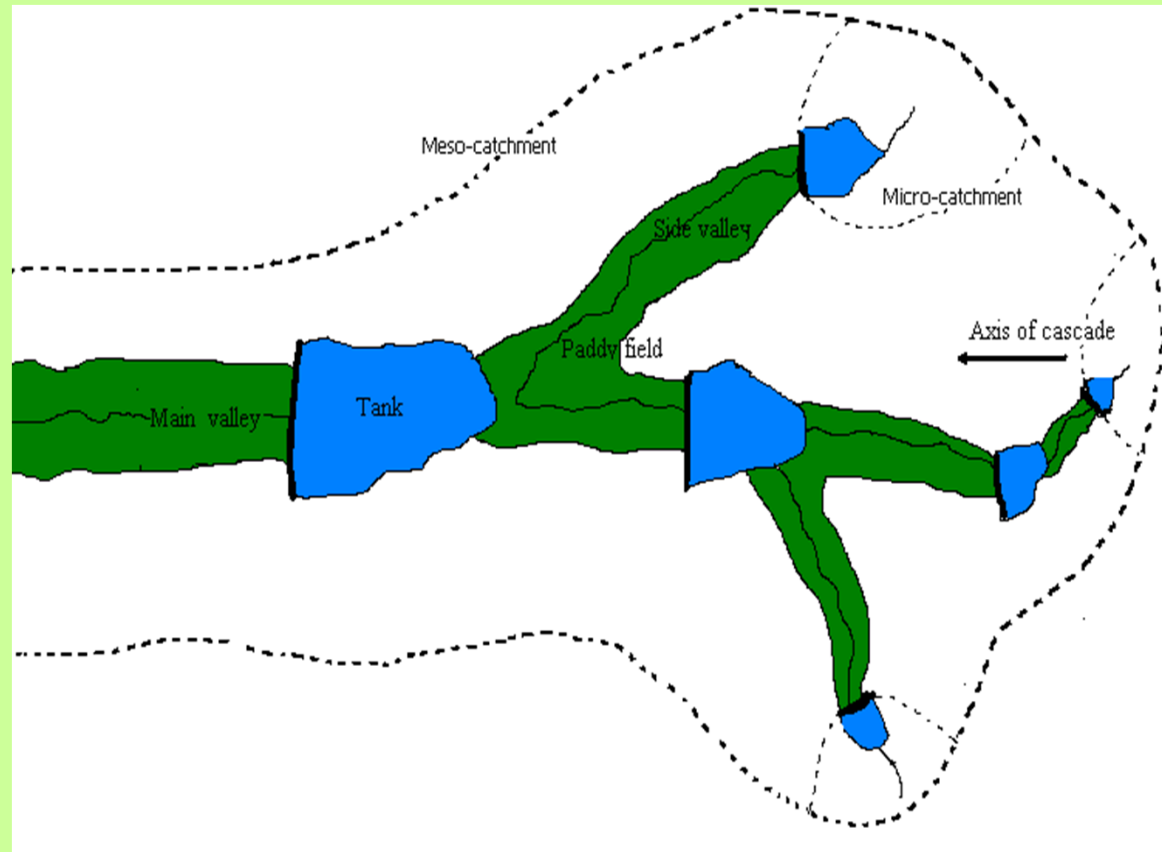
Sri Lanka is a classic example of the "hydraulic civilization" which had developed in 543 BC. Cultivation of rice developed into a grand scale in the rolling plains of North and North Central and the South Eastern.

- |                |                 |
|----------------|-----------------|
| Man made Tanks | - around 10,900 |
| Reservoirs     | - around 52     |
| Canals         | - around 70     |



## Cascade System

A Cascade - chain of tanks connected by water, flows from one to another, located in the downstream.



long canals with exceedingly low gradient, such as 87 km long Jaya Ganga, which carried water from Kalawewa to the city tanks of Anuradhapura with a gradient of less than 10cm per kilometers within its first 27 km, it continued to behave as natural stream



## Other Major Food Crops Cultivated in Sri Lanka

### Vegetables

Tomato	Brinjal	Mushroom	Leafy Vegetables
Bitter gourd	Snakegourd	Luffa	Cucumber
Radish	Carrot	Leeks	Cabbage
Beetroot	Knol-khol	Capsicum	Beans
Pumpkin	Okra	Winged Bean	

### Fruits

Banana	Mango	Papaya	Pineapple
Rambutan	Guava	Avocado	Water Melon
Wood-apple	Durian	Passion fruit	Pomegranate
Grapes	Mangosteen	Dragon Fruit	Jack fruit
Sweet Orange	Lime	Lemonime	Mandarin
Pummelo	Grape fruit	Beli	Amberalla

### Coarse Grains

Maize	Finger Millet	Sorghum	Other Millets
-------	---------------	---------	---------------

### Condiments

Chili	Red Onion	Big Onion	
-------	-----------	-----------	--

### Grain Legumes

Mung bean	Cowpea	Pigeon pea	Chickpea
Black gram	Soybean		

### Root & Tuber Crops

Potato	Cassava	Sweet Potato	Dioascorea
Kiriala	Innala		

### Oilseed Crops

Groundnut	Sesame	Sunflower	Mustard
-----------	--------	-----------	---------





## Home Gardens in Sri Lanka

### Dry Zone Home Gardens

- Average size 0.5 to 1.0 ha
- Species composition is low
- Water scarcity is major problem
- Soil fertility is high
- Potential for more crop varieties
- Very Low sloppy land



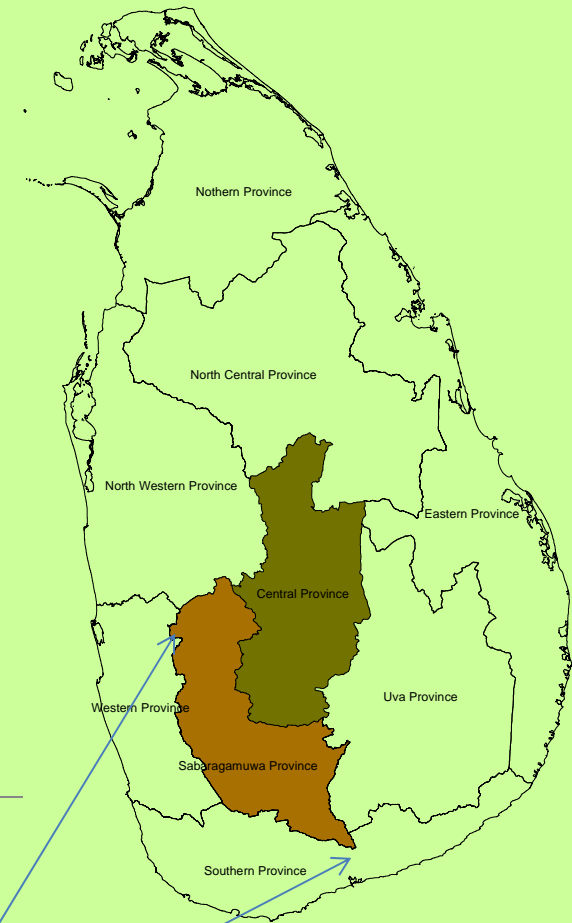
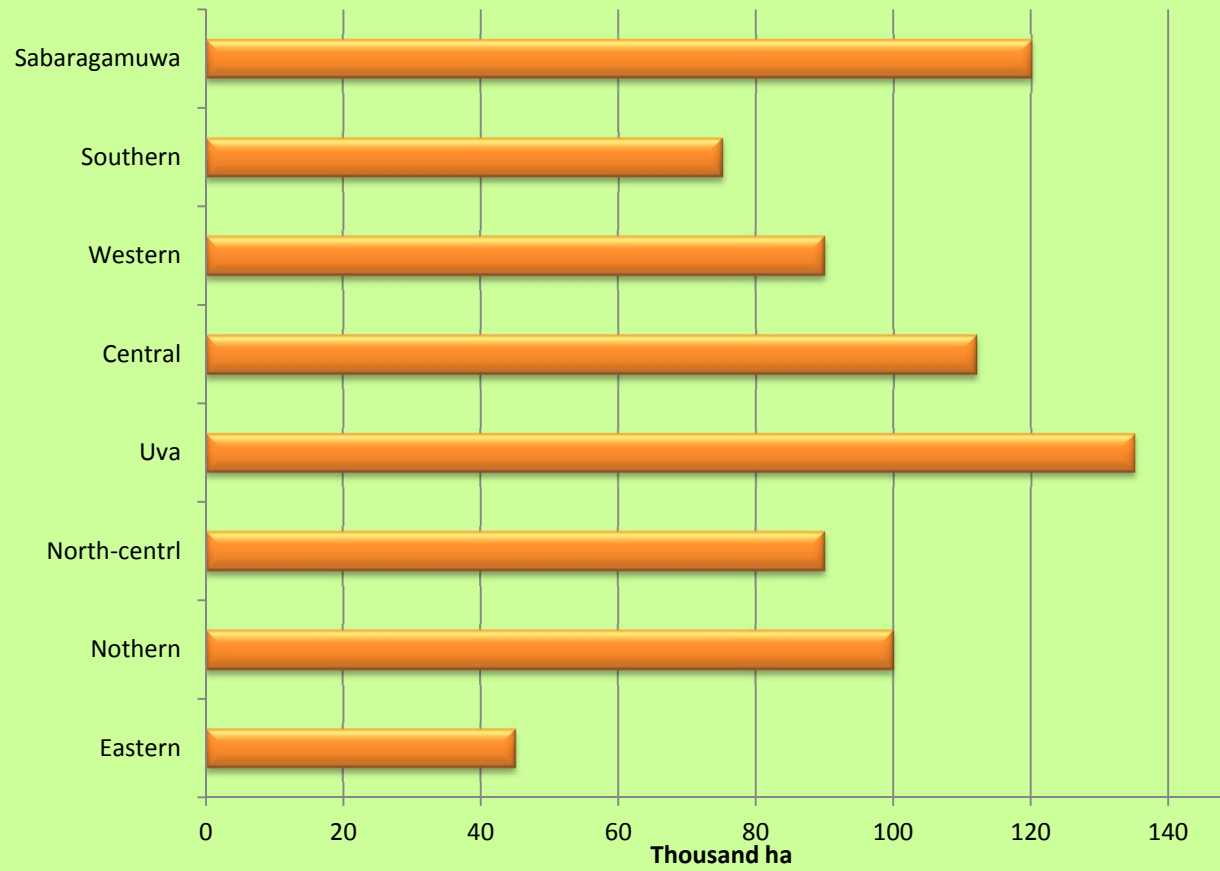
### Wet Zone Home Gardens

- average size 0.25ha
- Species composition is very high
- Soil fertility is very low
- Perennial crops are more common
- Very High sloppy land





# Distribution of Home Gardens in Sri Lanka



Kandyan Forest Garden



## Kandyan Forest Garden

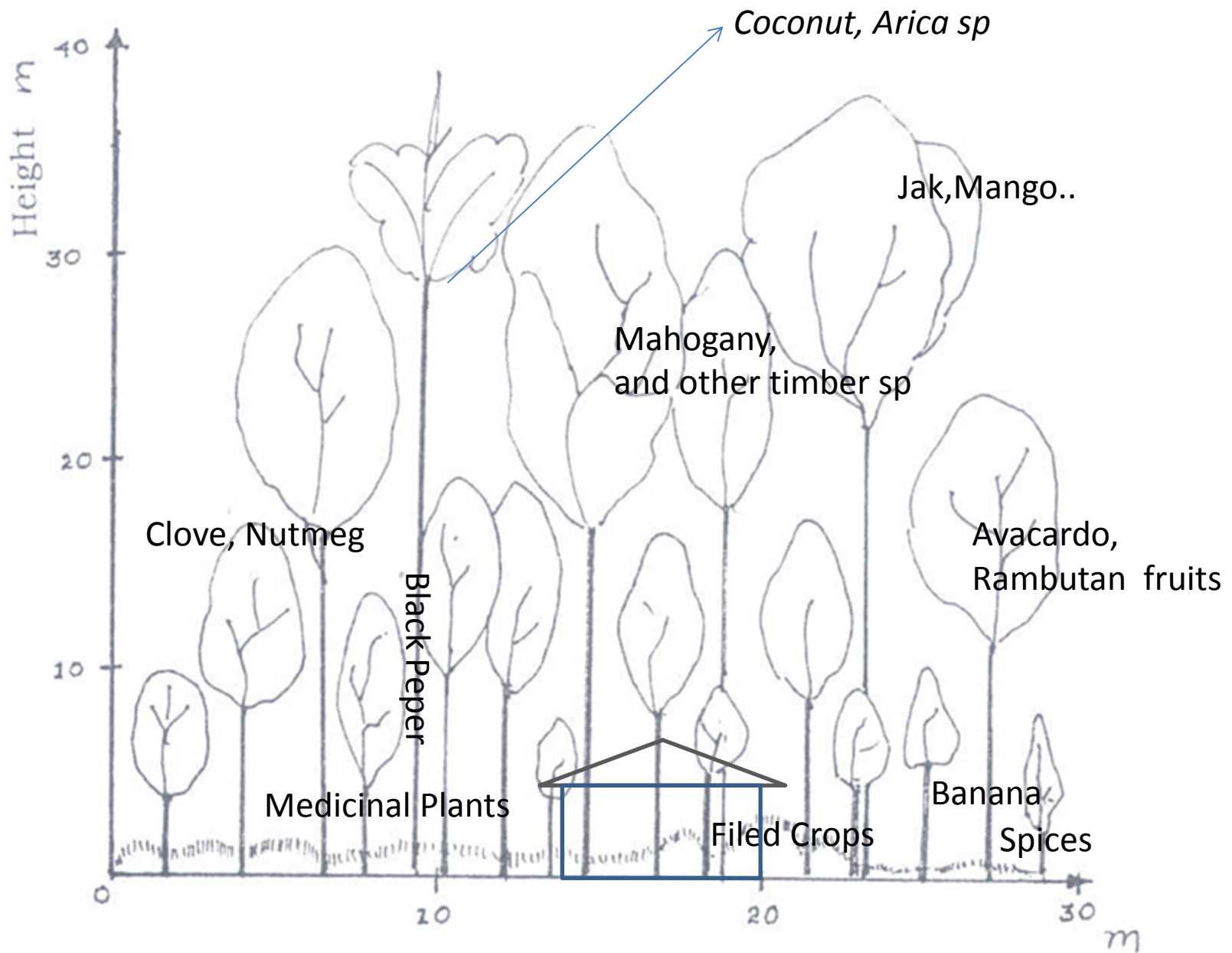
Located in Kandy, Matale, Kegalle and Ratnapura districts of Sri Lanka

Out of total area 20% consists KFG in Kandy district.

- Almost same as Tropical Rain Forest Structure
- Tree height is around 30 m – 35 m
- Many strata – almost 5 canopy layers
- Litter is very thick
- Very low light penetrate to the ground
- Soil erosion is very low - similar to the Tropical rain forest
- Provide many habitats for wild animals
- Animal husbandry – Cattles , Poultry (free range system)



# Kandyan Forest Garden





## Kandyan Forest Garden



- Almost same as Tropical Rain Forest Structure





1/23/2011



Image NASA  
© 2012 Google  
Image © 2012 GeoEye



Close Canopy

## Benefits of Kandyan Forest Garden

### Productive role

Food - fruits, vegetables

Timber – country 70% timber requirement

filled by home gardens

Spices

Shade trees

Ornamental plants

Fodder for Cattle and Goats

Firewood -

90 % - 100% fuel wood







**Food - fruits, vegetables**





## Major Spices grown in Kandyan Forest Garden



Curry Leaves



Turmeric



Clove



Cinnamon Quills



Cinnamon Chips



White Pepper



Black Pepper



Cardamom



Lemon Grass



Nutmeg



Vanilla



Ginger



Mace



### Protective role

- High species diversity flora provide habitat for fauna
- Thick canopy - prevent soil erosion

(most KFGs located in very sopy lands)

- High litter content keep soil texture and structure and chemical properties well
- Conservation of Wild Varities of Crop
  - Insitu genetic conservation of crop wild varities
  - Source for Plant breeding program



## Observations of Kandyan Forest Garden

### Species diversity of KFG

Flora	- Trees	88
	Herbaceous	124
Fauna	- Birds	79
	Butterflies	28
	Amphibians	12
	Reptiles	33
	Mammals	12

### No. of canopy layers

4-5



(Source: Ajith Gunawardena and S.P.N.Nissanka, 2007)

## Biomass estimation of Kandyan Forest Garden

- Amount of Biomass is very high
- Absorption of CO<sub>2</sub> also very high
- Species diversity is very high
- Tree heights varies (more canopy layers)
- Very Slopy land – very difficult to field work
- Use of Remote Sensing

may be alternative



**Thank You**

