

Fertilizer Usage for Coconut and Intercrops in Sri Lanka

**Presentation on Importance of site- specific fertilizer use on
coconut- intercropping systems (For small holders) IPI + CCB project
Sri Lanka Foundation Institute on 05 December 2005**

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Contents :

- ➡ Importance of coconut production in Sri Lanka
- ➡ Constraints in coconut production
- ➡ Fertilizer usage for coconut & intercrops
- ➡ Assistance program
- ➡ Summary

Present Status of Coconut

- Current production – 2400 -2600 mil nuts/year
- Coconut extent – 950,000 acres
- Decrease in coconut lands – 50,000 acres
(During 10 years)
- New areas of coconut –
Anuradhapura , Monaragala, Ampara, Polonnaruwa
- Price for coconut/ nuts
 - Season - Rs.12-14/-
 - off season - Rs. 15-17/-
- Export earning of coconut – 2004
 - In Rs. - 16,000 mln (+3.5%)
 - In US\$ - 110 mln (-1.96%)
- Export –
 - Coconut oil
 - D.C. - 40,000 m.t./annually
 - Fresh nut - 50 mln. (4% ↑)
 - Activated carbon - Rs. 30 mln. (2% ↑)



Situation of Coconut and other crop production

Global demand for cereals

1.0 billion tons \longrightarrow 2.7 billion tons
(2020)

2% Production increase

Improved varieties

Fertility management

FAO (2002) Estimated :

Urbanization

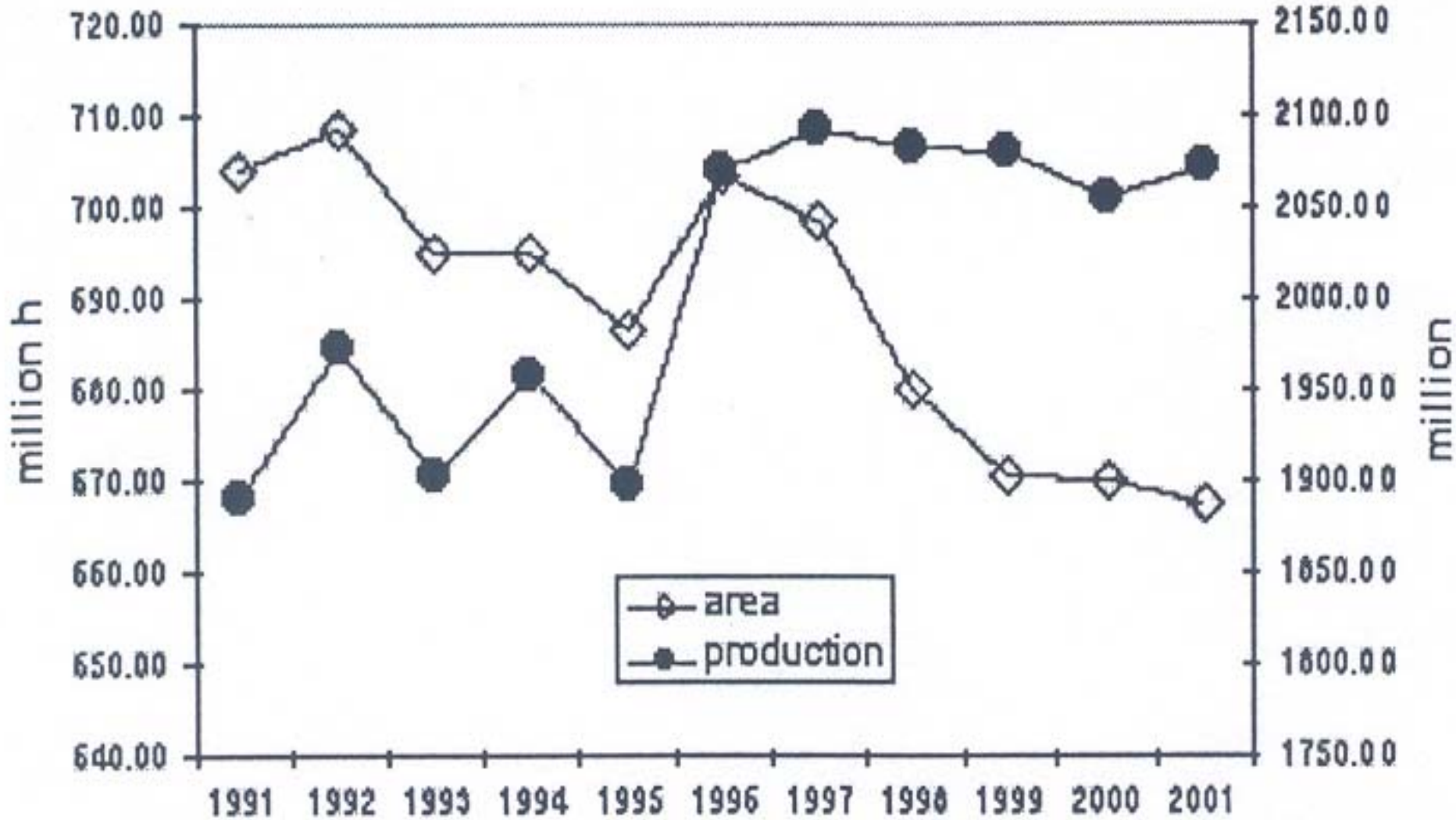
Within next 20-30 years – 60% of
population will live in towns

At present - 48 %

Plat nutrient from rural areas \longrightarrow Towns \longrightarrow Rivers & sea with
agric products.



Global cereal cultivated area and production (FAO 2002)



Vegetable oil production

Last 10 years –

Area increase – 28%

Production increase only by – 18%

Soya bean ✓

Oil palm ? (3500 kg of oil/ha)

Coconut X (800 kg of oil/ha)

Free trade

Coconut oil to India



At present coconut is a social & political crop

Coconut an economical crop?

Farm gate price of coconut?

Cost and returns a typical monocrop cultivation (Rs/ha)

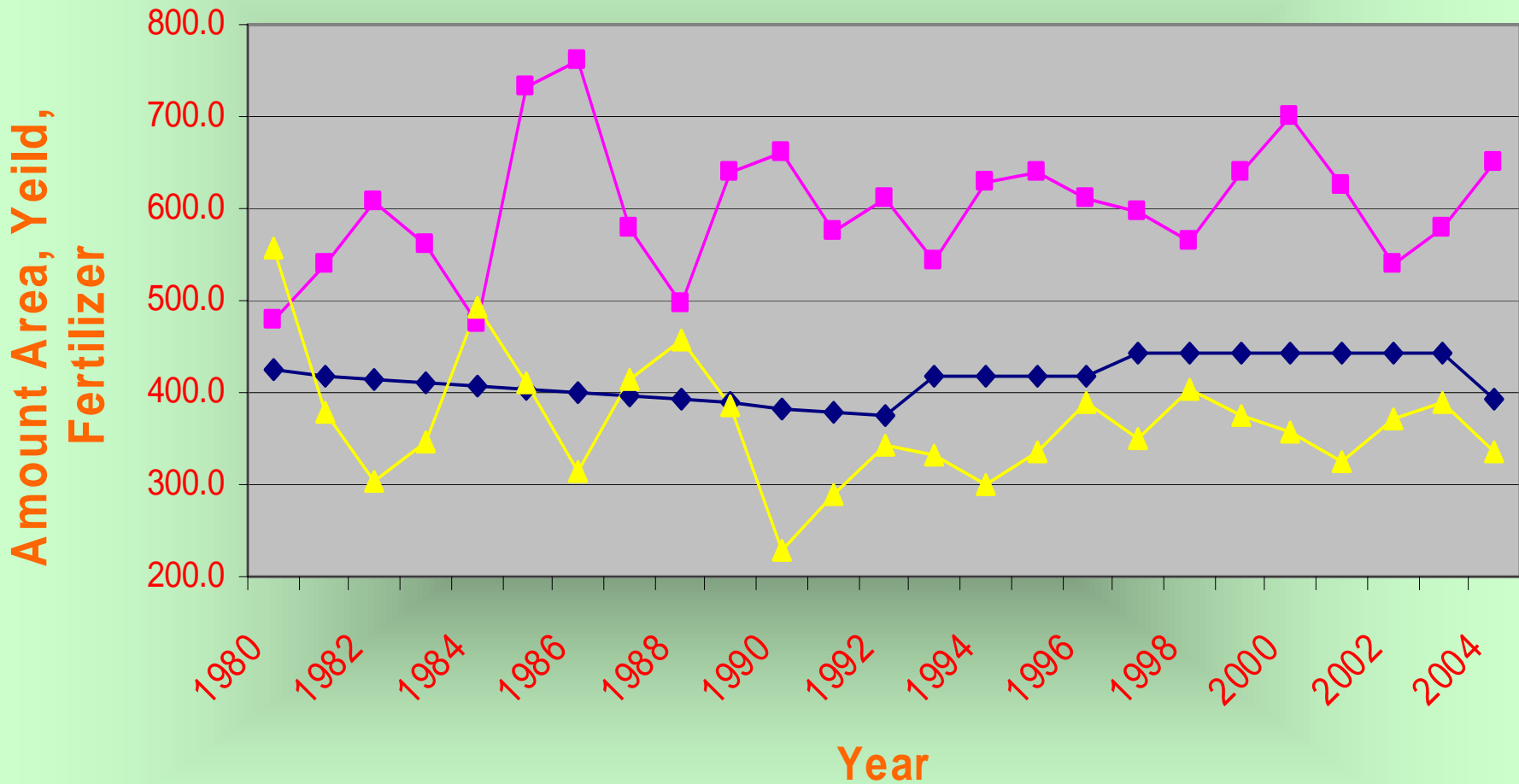
Cost components	Yr 1	Yr 2-6	Yr 7-11	Yr 12-16	Yr 17 & onwards
Gross income (Rs/ac)					
1. Coconut yield (nuts/ac)	0	0	15,600	38,520	10,800
2. Price of a nut (Rs/nut)	-	-	10	10	10
3. Gross income (Rs/ac)	-	-	156,000	385,200	108,000
Cost (Rs/ac)					
1. Land clearing					
– Land clearing	1,920				
– Preparing pegs	240				
– Line marking	194				
– Opening up of planting holes in gravel soil (3'x3'x3')	10,241	185			
Planting of seedlings					
•Mixing top soil with cow dung+YPM+dolomite & adding into the pits (25pits/md)	1,315				
•Placing husks in planting holes+closing up of pits (pits/md)	3,072				
•Dipping in termite control pesticide	132	10			
•Re-planting of vacancies (32 seedlings/da)	67	77			
•Mulching	3,890	14,030	8,294	6,912	1,382
•Fertilizer application	492	6,421	7,012	5,844	1,169
•Watering	2,013	83			
•Weed control	1,972	9475	20,483	20,484	4,097
•Soil moisture conservation	0	29,272	29,273	29,273	
•Pest and disease control	0	100,17	15,600	13,920	1,440
•Picking & collection of nuts	0	0	8,630	10,730	2,431
•Transportation	3,780	2,784	4,354	7,217	1,831
2. Material cost					
– Seedlings (14)	6,574	540			
– Fertilizer (15)	10,692	28,342	40,310	42,696	8539
– Agrochemicals (16)	2,352	28,396	9,240	7,392	
– Coconut husks (17)	9,676	161			
– Cost for fencing (18)	32,794	0			
– Maintenance of fence etc	4,80	2,400	2,400	2,400	480
Total cost	91,893	132,149	145,594	146,868	21,367

Year Period	Percentage cost of fertilizer
1	12
2-6	21
7-11	28
12-16	29
17 and onward	40 (an year)



- ❖ Cost of fertilizer is generally high compared to other maintenance cost in adult coconut plantations

Coconut Trends



◆ Area (x1000 Ha) ■ Yeild (Nuts/per Ha x 10) ▲ Fertilizer Applied (MT x 100)

- Area under coconut is declining slowly
 - 5000 acres per year
 - Sudden drop in 2003-2004
 - Shifting to new areas (eg: Ambilipitiya)
- Fertilizer usage
 - Highly varied
 - Gradual decline could be seen
- Productivity (nuts/ha)
Varied but stagnant
- Over last twenty years :
National average increase
only by 10 nuts/year
2400-2600
- Variety ? Or Management?
Or both



Fertilizer consumption by crop sectors (m.t.)

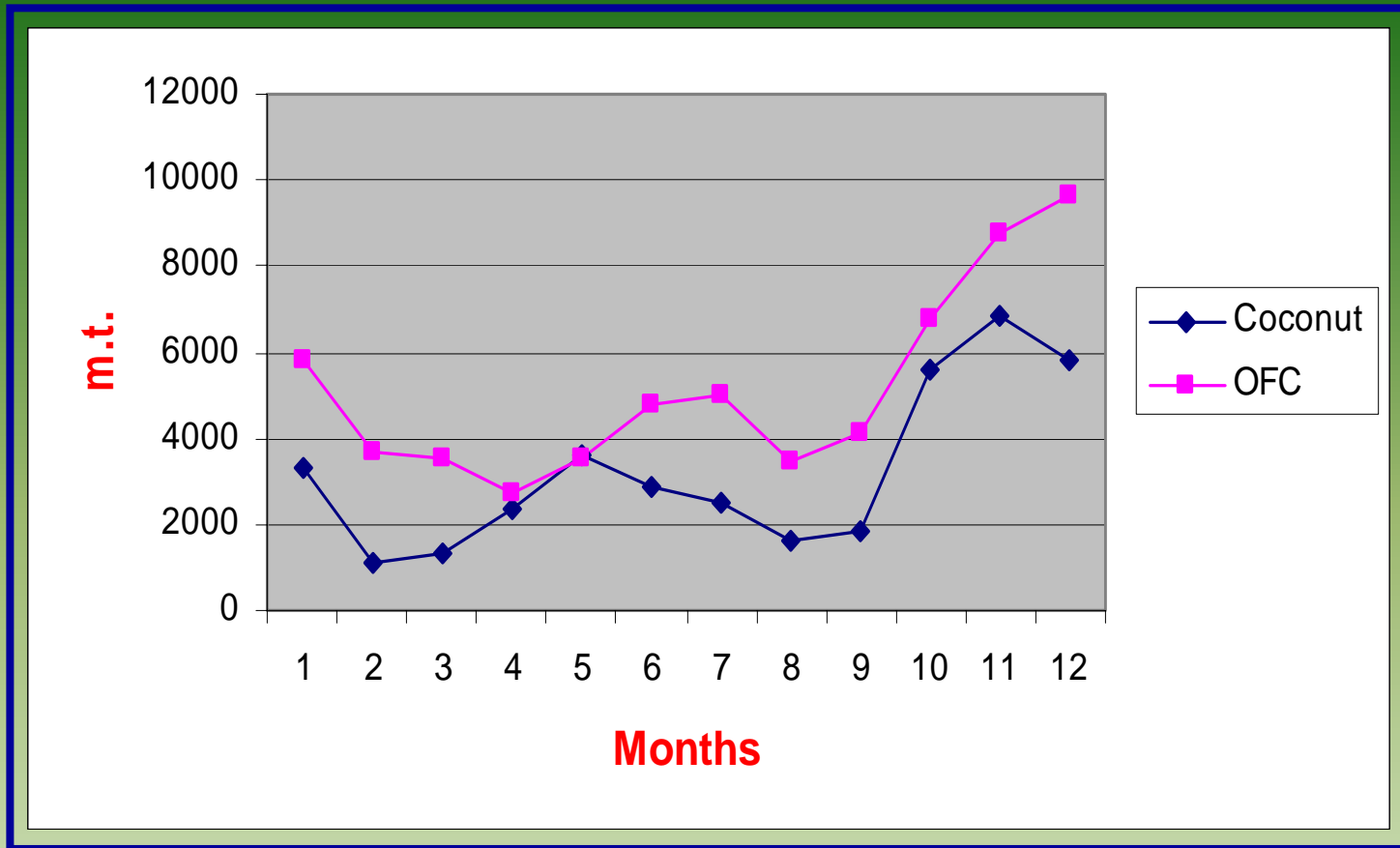
crop	1998	2000	2002	2004
Tea	182,329	200,254	185,059	
Rubber	15,684	13,801	6,924	9,200
Coconut	37,667	33,942	34,452	33,648

Tea – Consumed the highest

Coconut – maintained at the range
of 33,000 -38,000 m.t./year

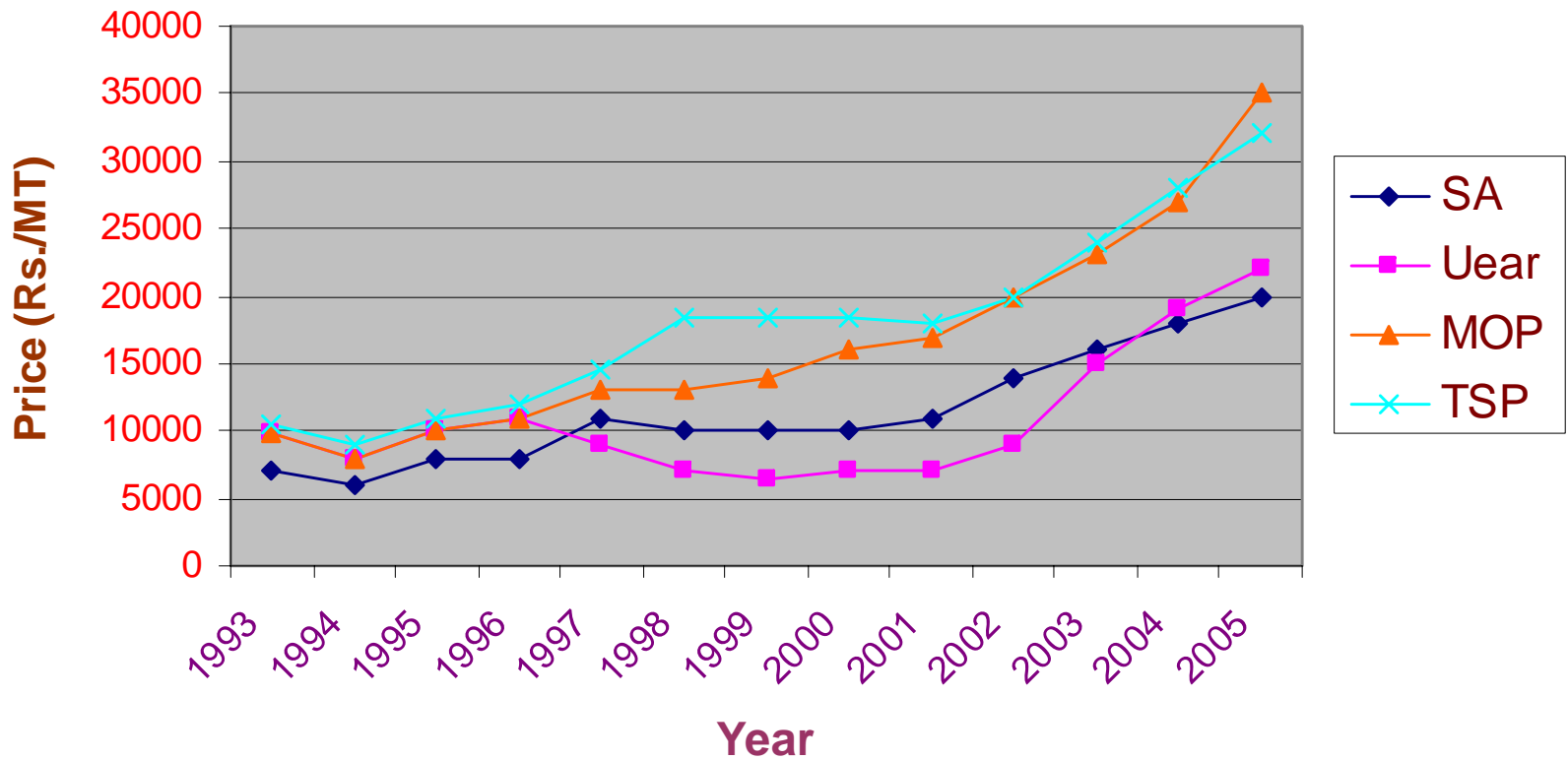


Monthly use of fertilizer for coconut and other field crops in 2003 (m.t)



Generally, fertilizer usage for coconut is high
During :- October – January
May - June

Average Retail Price of Major fertilizers



1. Upto 1996 price per m.t. of Urea, TSP and MOP was not much differentiated
2. Price of TSP was steadily increased from 1997 upto now.
3. The same could be seen from MOP. From year 2001, increase price of MOP is not affordable per the coconut grower
4. Low price of urea is due to the government subsidy.

The current retail price of coconut fertilizer mixtures (ex. Colombo –Rs./m.t)

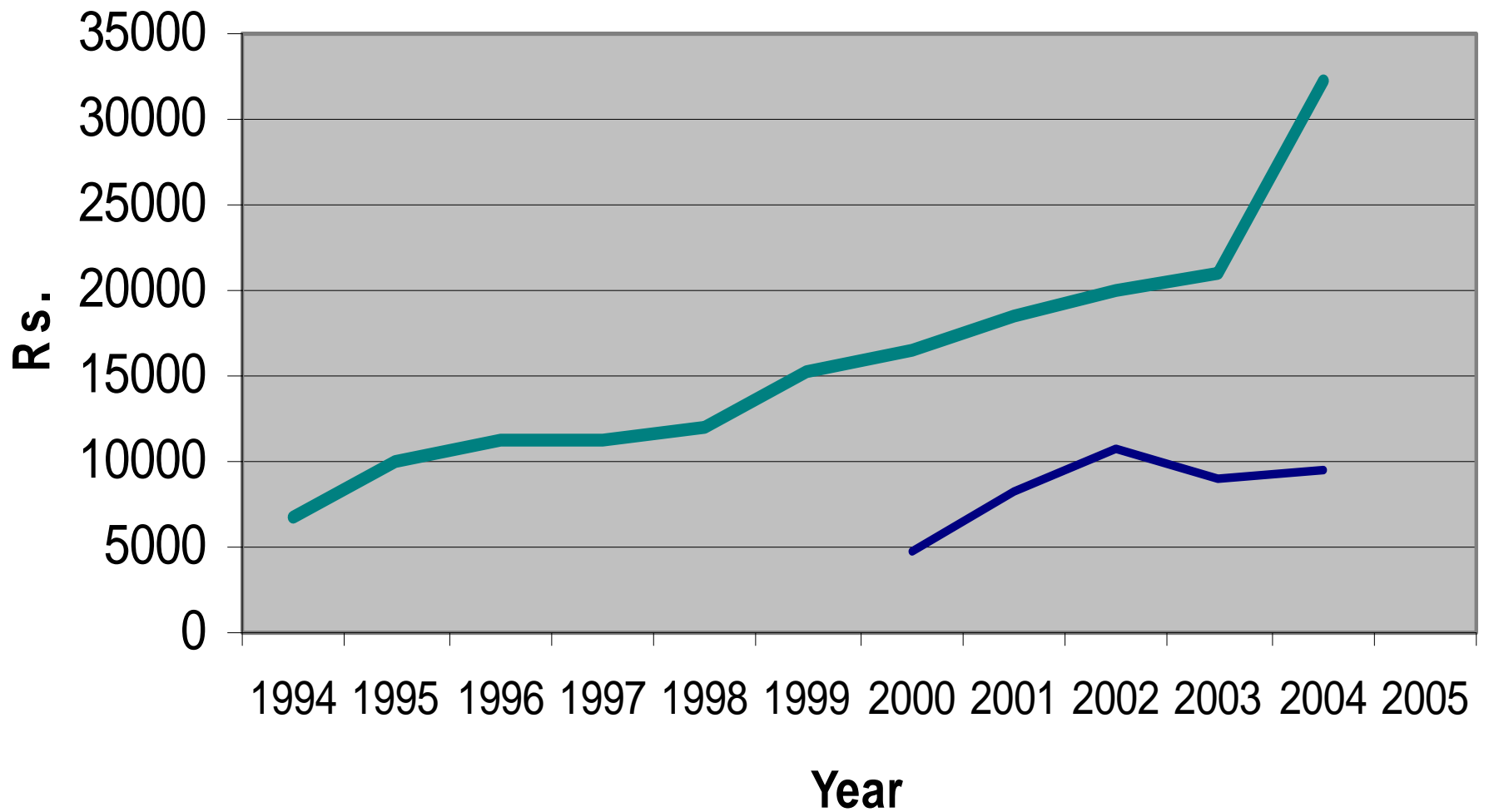
Coconut	2002	2003	2004	2005
APM	16,400	20,140	20,400	24,120
YPM	14,400	17,300	17,240	19,600



47% ↑ (2002-2005)

Devaluation of Rs.?

International price?



— W.M.P. of Fresh Coconut (Rs/1000 nuts)
— Price of MOP (Rs./m.t.)

Consequences of changing cropping Pattern for the nutrient management

- Foods from rural areas Urban areas (Coconut)
- In world wide –
N+P₂O₅+K₂O → 83 million tones/ years

Drained to rivers or sea

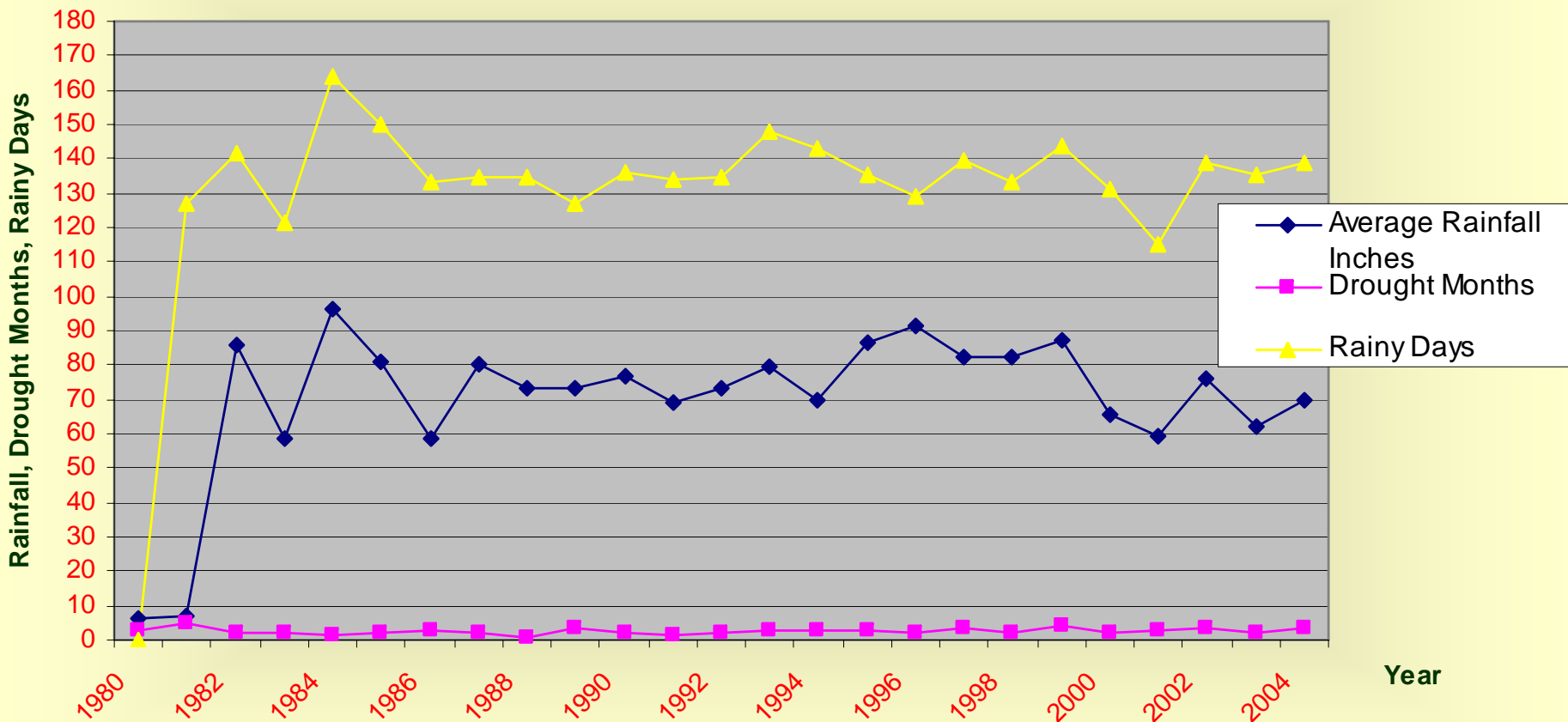
So,

Urban waste → Back to Agricultural fields



Rainfall or fertilizer Application ?

Rainfall in Coconut Triangle



Coconut production

Rainfall > Fertilizer application

Fertility management should be emphasized

Coconut + Pineapple Intercropping System

- ❖ **Area** - WL3
Gampaha, Kurunegala,
Galle, Matara,
Kegalle
- ❖ **Varieties** - Murishi, Kew
- ❖ **Nutrient removal** - high
 $N > Mg > K > P$
- ❖ **Period** - 10 month- (5 years)
- ❖ **Profit** - Rs. 60,000/ac/yr



Fertilizer mixture :

➤ Urea	-	24 Kg
➤ ERP/IRP	-	25 Kg
➤ MOP	-	51 Kg

Annual Fertilizer Requirement (kg/ ac)

➤ Urea	-	70.0
➤ IRP	-	75.0
➤ MOP	-	150.0

Note – Application of Dolomite (affect coconut yield)

Recycling of Crop residues

Excess application of urea by growers

Coconut + Rambutan Intercropping System

- ❖ Area
 - Gampaha, Kagalle, Galle, Polgahawela. (WL 2 Zone)
- ❖ Varieties
 - Malwane Special
- ❖ Advantages
 - Bud - grafted plants
 - Leaf Litter accumulation
 - Nutrient removal is moderate



❖ Yield - 3 years
- 2000 fruits/tree/yr

❖ Profit - Rs. 6000/tree/yr
- Rs. 150,000/ac/yr

❖ Fertilizer application – g/tree/yr

Urea	-	700
ERP	-	1360
MOP	-	6535

Coconut + Banana system

- ✓ Area
 - Depend on varieties
- ✓ Varieties
 - Ambul
 - Local market
 - Ash plantation
 - Local market
 - Kolikuttu
 - Dry zone
 - Ambun
 - WL2 zone





- ✓ Constraints
 - Excess production of some varieties
 - Low market price ?

- ✓ Recent Development -
 - Kavendish
 - Dole (Asia) Ltd
 - Crop expenditure

- ✓ Current Fertilizer recommendation: g/plant/yr

Urea	-	400
ERP	-	120
MOP	-	900
Kieserite	-	300

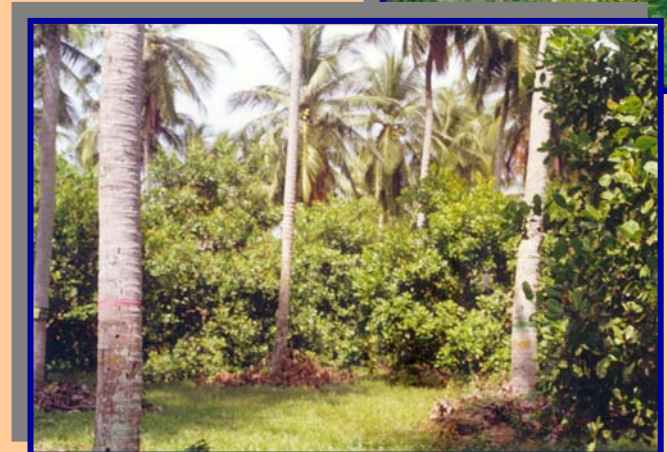
Example for coconut + intercrop site – specific fertilizer recommendation

- Banana – Dole planting in Kuliyaipitiya
- Fertilizer –
 - Planting hole - 5 kg compost
 - every 4 weeks - Urea - 138g
 - (depend on RF) - MOP - 138 g
- Yield – 20 kg/ bunch
24 kg/ bunch (expected)

Area expanded - 1250 acres in the southern province

Coconut & Cashew Intercropping System

- ✓ Bud- grafted cashew
- ✓ Benefits of cashew :
 - Add Organic matter
 - Cover the bare ground
 - Nutrients removal is low
- ✓ Yield - 7 Kg/tree/yr



✓ Income

- Rs. 400/tree/yr

- Rs. 10,000/ac/yr

✓ Area

- Puttalam, Gampaha,
Kurunegala, Hambantota.

✓ Fertilizer application -

Coconut + Tea Intercropping

+ Area – WL2 Zone

Galle, Matara, Kegalle, Kalutara, Rathnapura

+ Tea yield – 800 kg of fresh leaves/month/ac

+ Profit – Rs.80,000/ month/ac
(10 folt over coconut)

+ Nutrient management

Tea – Acidic soil (high level of N)

Coconut – pH – 6.0 – 7.0)

Need attention for Mg and K

+ Recommendation for coconut

APM – 3kg/ palm/ year

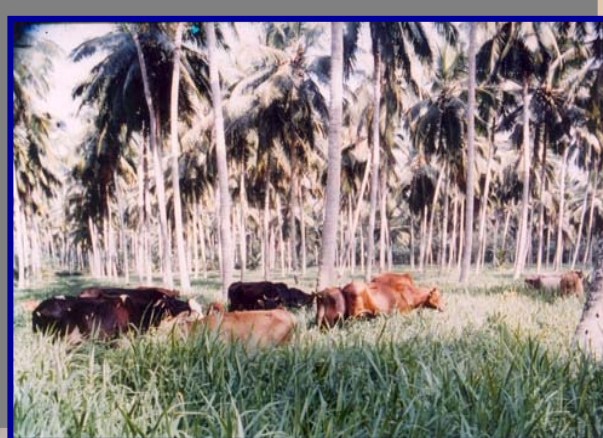
Dolomite – 2 kg/ palm/ year

Kieserite – 0.5 kg/ palm/ year



Coconut + Pasture Integration

- ◆ Importance of national milk production
 - ◆ For cattle management
 - ◆ Price – Rs.25/per litre of milk
 - ◆ Systems –
 - Cut & feed systems
 - Open grazing
 - Semi- Intensive systems
- ✓ Nutrients recycling



- **Cattle Breed**
 - European – Friesian, Ayrshire
 - Indian - Sahiwal
 - Local
- **Recommended breeds**
 - Jersey x Local
 - Jersey x AMZ
- **Recommended grasses/ Fodder**
 - Brachiaria milliformis (CORI grass)
 - Brachiaria ruziziensis (Ruzi grass)
 - CO₃ Fodder

Pasture Productivity



	Dry matter kg/ha/year
Bracaria milliformis	7,500 -10,000
Bracaria ruziziensis	13,500
CO ₃ Fodder	57,600



- High removal of nutrients?
- Correct estimation



Fertilizer for pasture - (kg/ha)

Fertilizer	recommendation	Kg/ha/yr
	at the establishment	Top dressing
Urea	-	1300
IRP	125	-
MOP	200	-
Dolomite/Lime	-	-

Note :-

Nutrient removal & recycling

Adaptability of the system

Pasture management

Cattle dung – for coconut (sustainable)

Urea & others – for pasture (efficient)

Integration of legumes (Gliricidia)

DFR technique



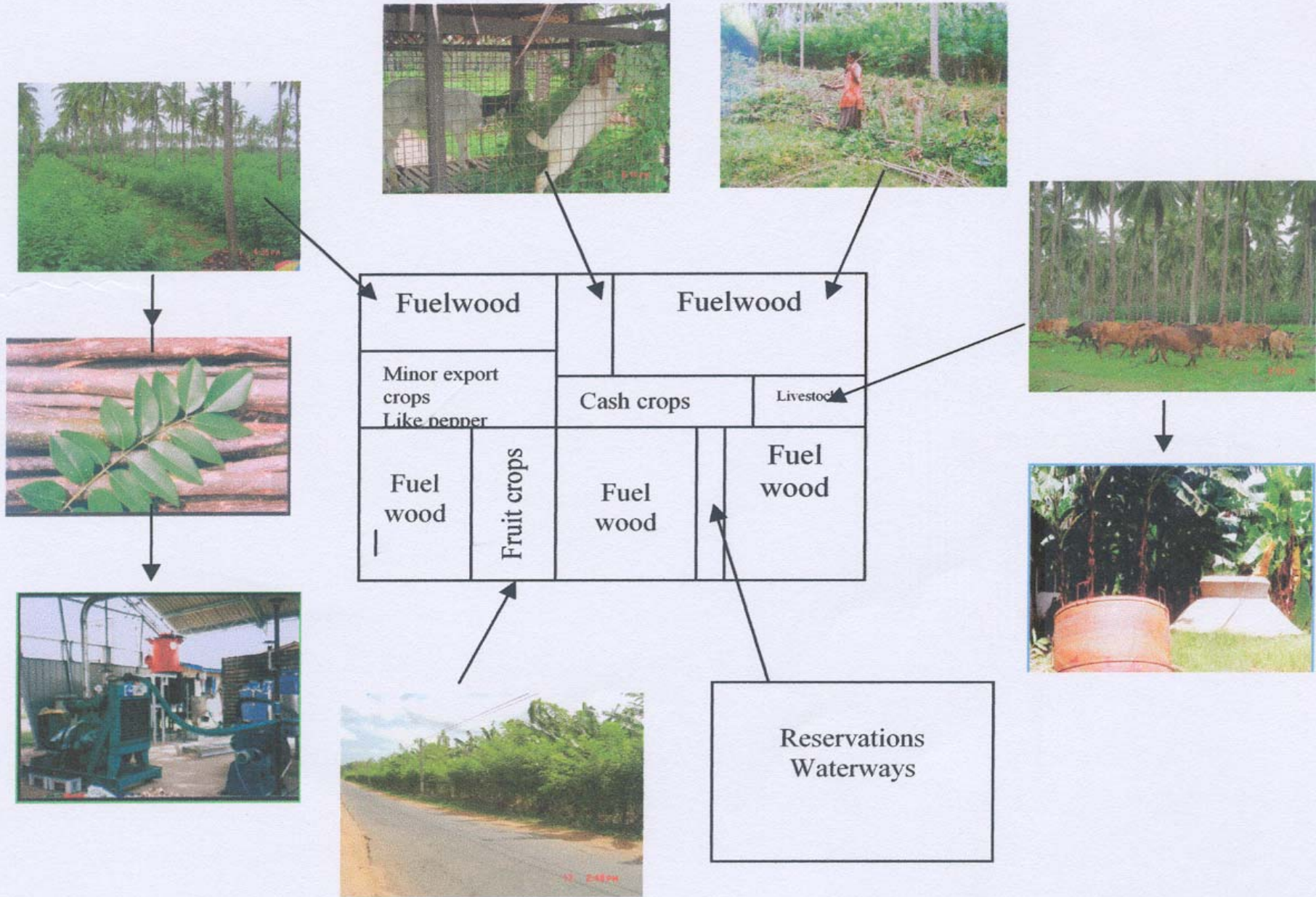
Fuel Wood Farming

- High demand for energy crops over food crops
- Gliricidia – 4th plantation crop

Will be expanded to 200,000
acres in year 2008

- Green energy + Green manure
- Wood – Rs. 2/50 - 3/- per kg
65 kg of fresh leaves = 1.0 kg of urea
- Wood yield – 20.0 m.h./ ha
- Dedicated energy plantation
8,000 trees/ac





Integrated Farming Model

Leaf Nutrient levels of coconut - 14th leaf

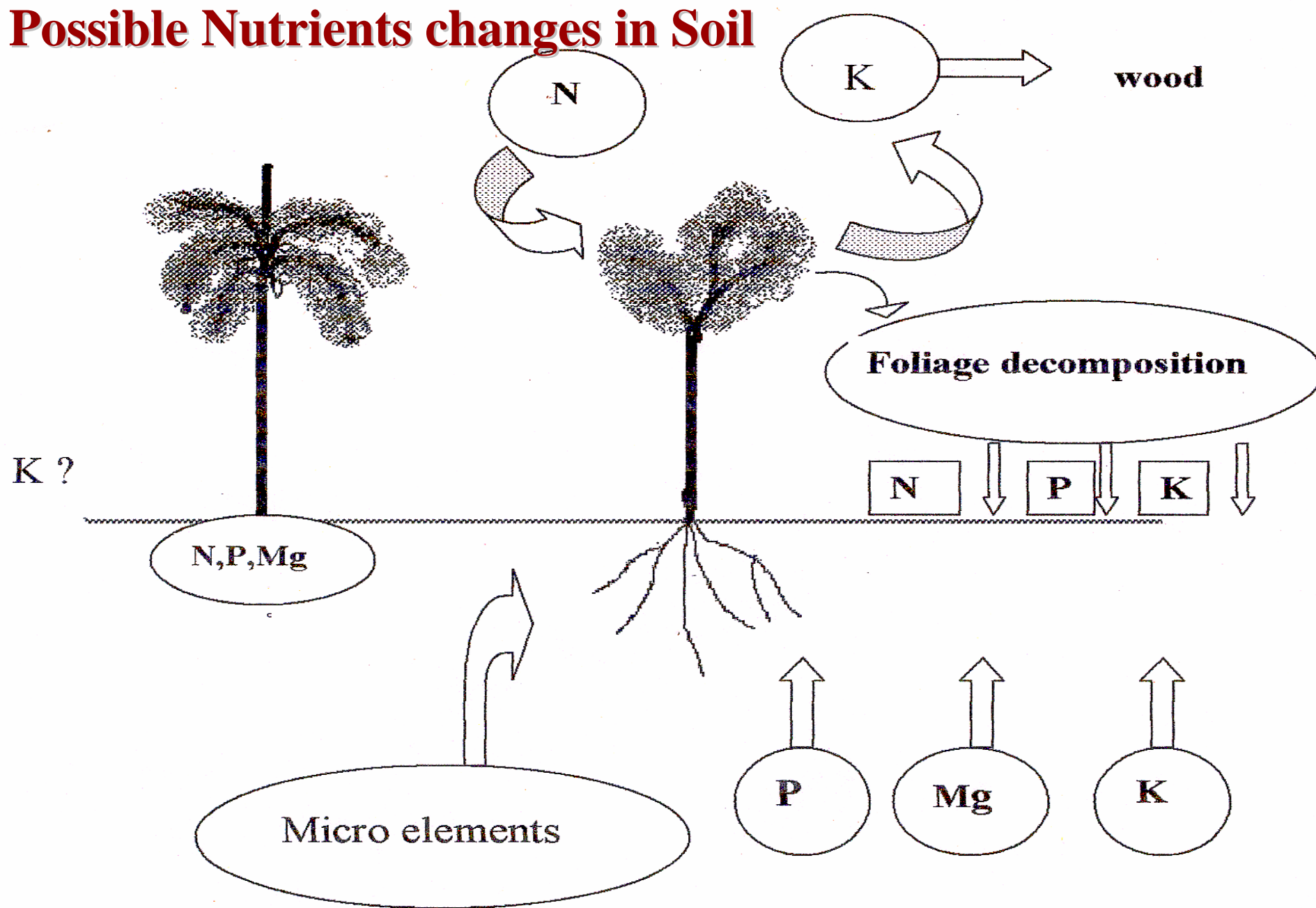
	N%	P%	K%	Mg%	Ca%
Coconut alone	1.68	0.11	0.91	0.35	0.39
Coconut+ Gliricidia	2.18	0.12	0.84	0.33	0.54
Sufficiency range/level	1.9 – 2.1	0.11- 0.13	1.2-1.5	0.25- 0.35	0.35- 0.50



Note:- Nitrogen of coconut has been elevated over sufficiency range

- P, Mg were not affected
- K nutrient has been lowered

Possible Nutrients changes in Soil

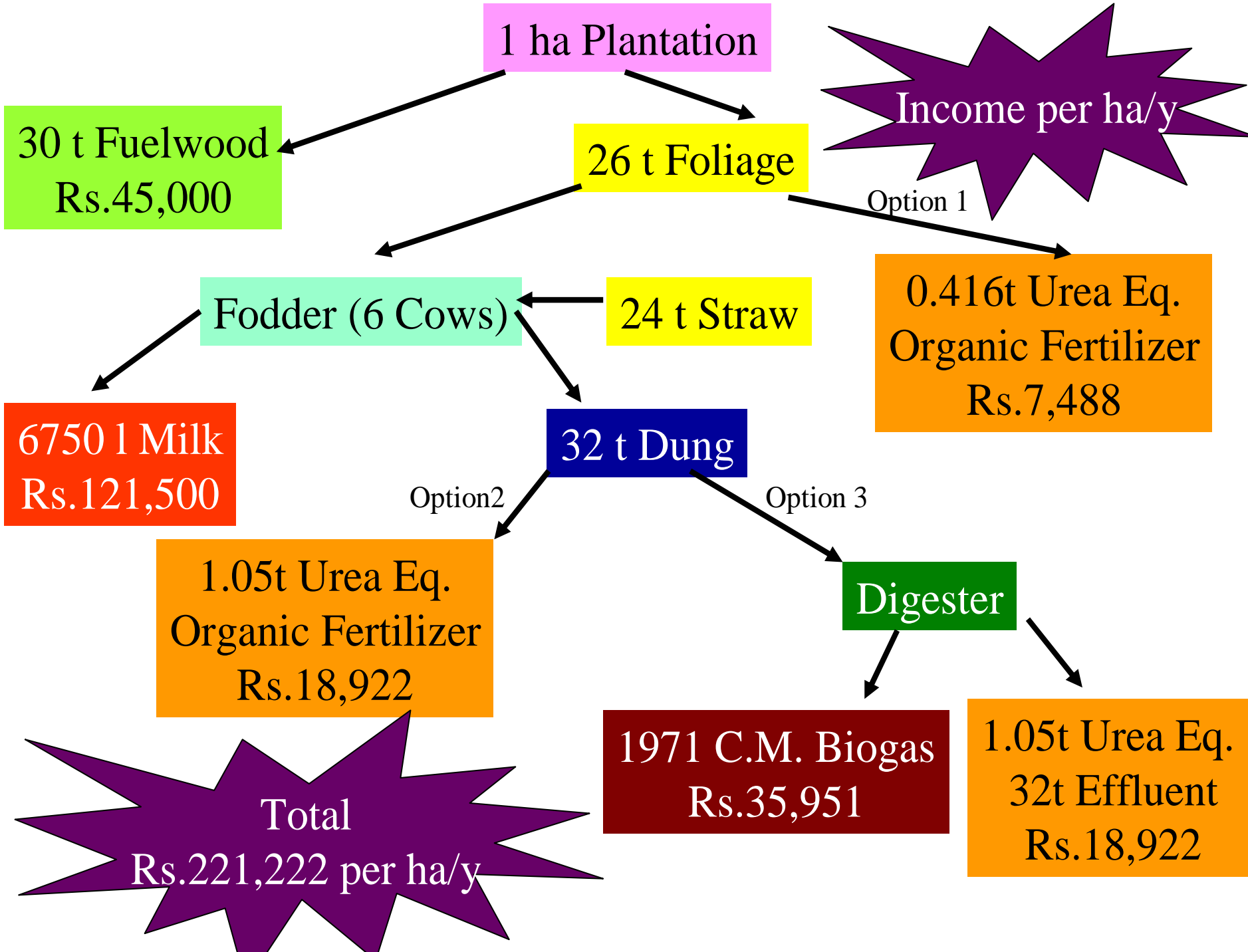


Gliricidia as a Substitute for Urea

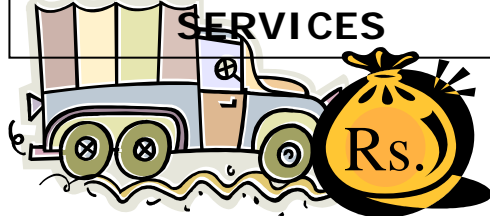
Use of Gliricidia as a Fertilizer for Coconut:

	APM (kg)	Gliricidia (50 kg/palm/yr) (kg)
Urea	0.8	-
ERP	0.6	0.35
MOP	1.6	1.0
Dolomite	1.0	0.5





TRANSPORT & RELATED SERVICES



EMPLOYMENT

HELP WANTED

Biomass Economy



Fuelwood

Electricity

Heat



MACHINERY INDUSTRY

ASH

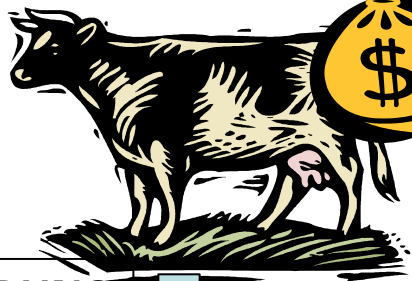


MARKETS

ENERGY PLANTATION

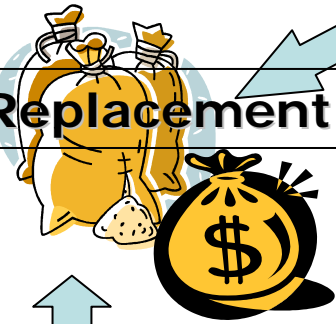
FODDER

LIVESTOCK



Milk

Urea Replacement



DUNG

ORGANIC FERTILIZER



ORGANIC FERTILIZER

Government Assistance

	2000	2001	2002	2003	2004
Fertilizer promotion scheme (Rs. million.)	-	-	32.0	103.0	-
Use of fertilizer (m.t.)	35,615	32,487	37,048	38,958	33,648
National coconut production (nuts/mln.)	3096	2769	2392	2562	2557



1. Annual national production is ranged from 2500- 2800 mln. nuts
2. Fertilizer consumption in coconut varied 32,000 -39,000 m.t.
3. Fertilizer promotion scheme (Rs.5000/- per m.t.) Largely benefited to grower but not met the national interest.
4. Direction need a change

Small holder?

Soil Fertility

- ❖ Fertilizer application X
- ❖ Soil fertility management
 - Soil organic matter 2% (Humas)
 - CEC
 - pH
 - Reduce soil erosion
 - Soil biology (eg. earth worms)

So

- ❖ Use of organic fertilizer
- ❖ Cover cropping - *Gliricidia*
- ❖ Cattle grazing (reduce over grazing)
- ❖ Intercropping (eg: Cocoa)
- ❖ Contour drains
- ❖ Reclying of husk, fronds ect.



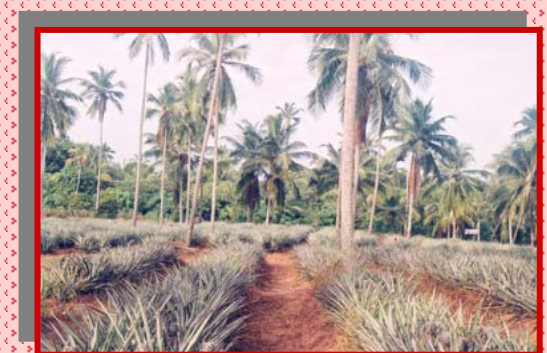
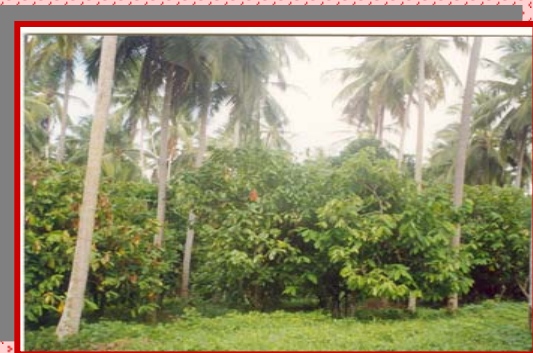
Present Assistance

- Planting of 20,000 acres in year 2002
 - Seedlings - 1.4 mln
 - Basal fertilizer – YPM + Dolomite
 - Provide to the estate
 - Proposed assistance in 2006
 - Subsidy for MOP – 20,000 m.t.
Rs. 5000 per m.t.
- } **Free of charge**
- So, 20,000 m.t
 - CESS fund – (oil CESS)
 - Hope that coconut grower can get the benefit of urea subsidy in addition to MOP



Crop Classification : (based on fertilizer input/removal)

Low	Moderate	High
<p>Cocoa</p> <p>Coffee, Clove,</p> <p>Cashew</p> <p>Gliricidia</p>	<p>Coconut (Low production)</p> <p>Pepper</p> <p>Passion Fruits</p> <p>Cinnamon , Citrus spp</p> <p>Rambutan, Areca</p>	<p>Coconut (high production)</p> <p>Tea</p> <p>Pineapple, Banana, Betel</p> <p>Cashew, Ginger, Pasture,</p> <p>Tuber crops, Vegetables</p>
<p>Income generation ↓</p> <p>Sustainability ↑</p> <p>Organic fertilizer x</p>	<p>Income generation ↓↑</p> <p>Inorganic + organic</p>	<p>Income generation ↓↑</p> <p>Productivity ↑</p> <p>Sustainability ↓</p> <p>Soil depletion ↑</p> <p>Organic + Inorganic</p>



Summary

- ❖ Coconut : General fertilizer recommendation
DFR
- ❖ Coconut plus intercrops – (mixed situation)
 - At present – Fertilizer recommendation for individual crop should be followed
 - In commercial/ large scale – Fertilizer should be based on -
 - ✓ **Soil test**
 - ✓ **Crop removal**
 - ✓ **Climate**
 - ✓ **Recycling**
 - ✓ **management techniques (eg – Drip irrigation)**
- ❖ Integrated coconut farming – Integrated nutrient management
 - Based on cost/profit
 - Sustainability

One step forward