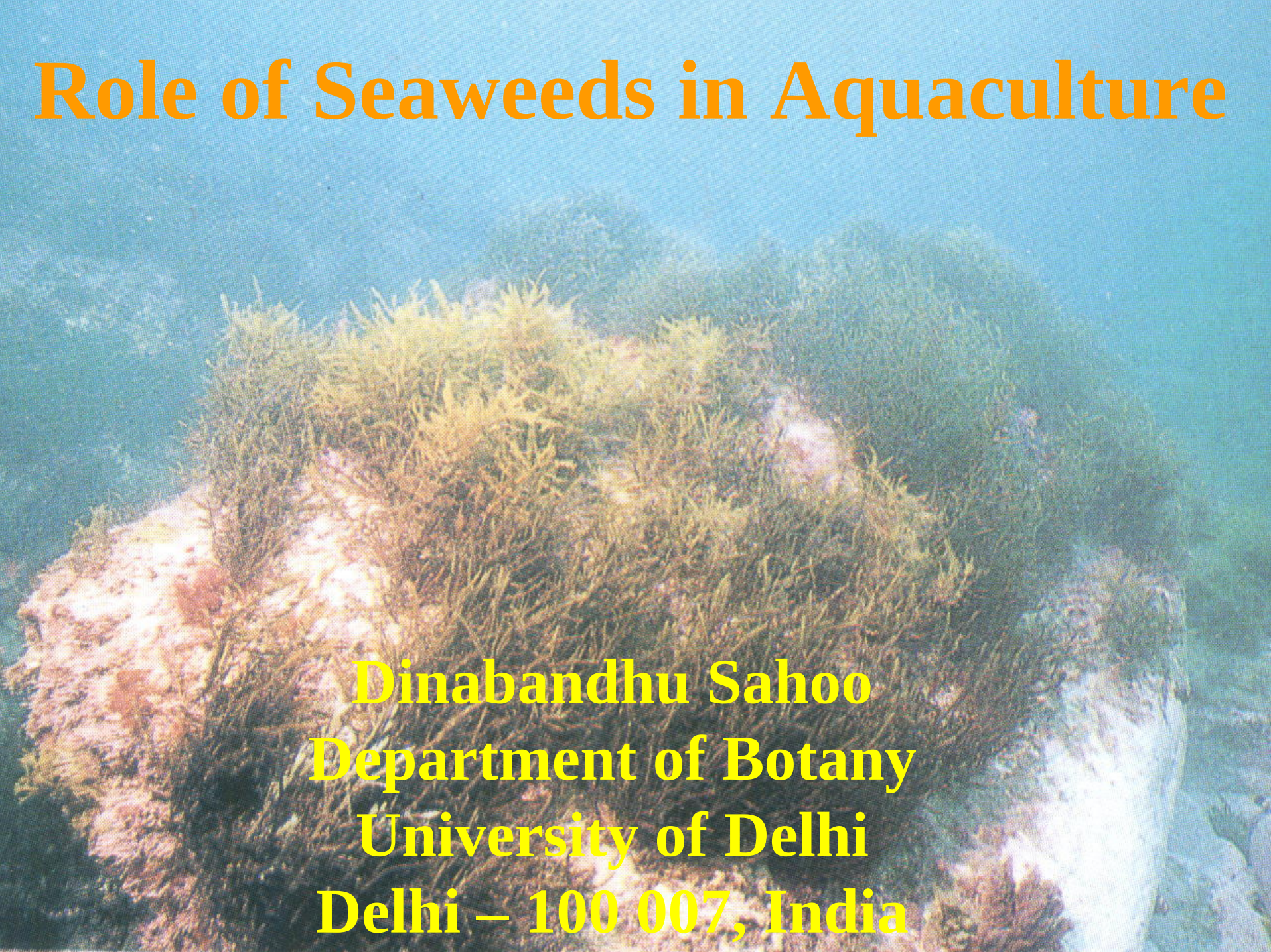
Role of Seaweeds in Aquaculture



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What is Aquaculture

“Aquaculture can be defined as the introduction of certain principles of animal husbandry to gain control over the aquatic organisms and their environment.”

or

“Rearing of aquatic organisms under controlled or semi controlled conditions.”

What is Aquaculture

Under water agriculture concerned with four major taxonomic groups :

- **Fish**
- **Crustacean**
- **Molluscs**
- **Algae**

Why Aquaculture

- Aquaculture plays crucial role in rural development and in the fight against hunger
- Major source of Food especially Protein
- Whether cleans the environment or pollute it ?

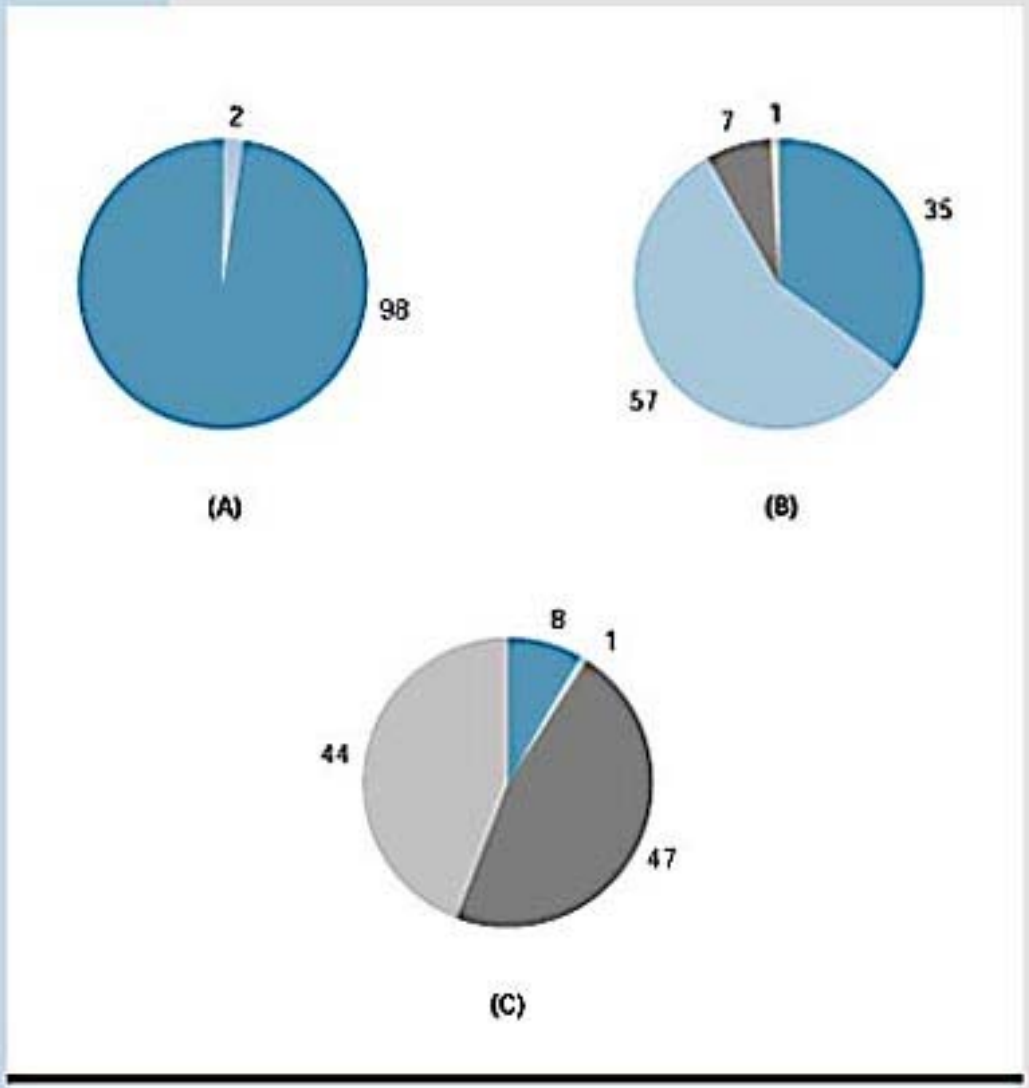
Need for Aquaculture

Uniform supply of good quality and quantity of aquatic products

Sustainable AQUACULTURE

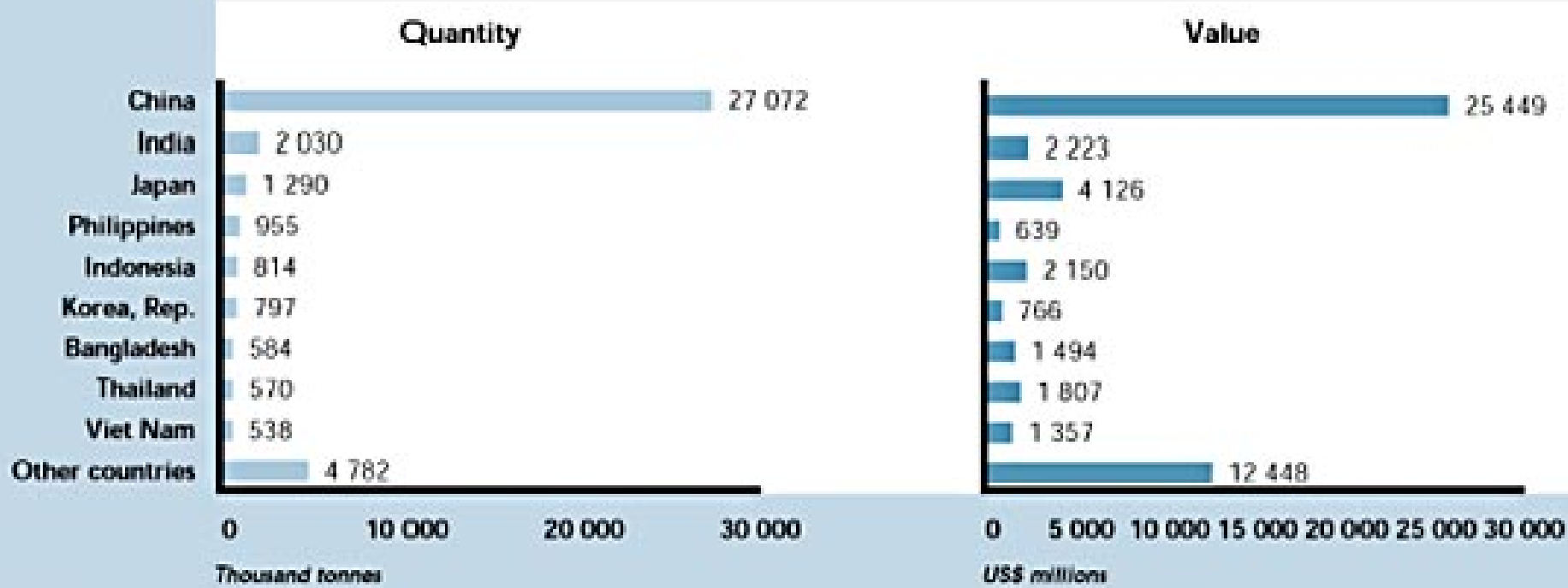
DINABANDHU SAHOO
S.Z. QASIM

Global aquaculture production by species groups in freshwater (A), brackish water (B) and marine (C) environments in 1998



Source: FAO

Aquaculture production: major producer countries in 1998



Note: Data include aquatic plants. Countries listed are those with a production volume of more than 500 000 tonnes

Source: FAO

World Fisheries Production and Utilization

Production	1996	1997	1998	1999	2000	2001
Inland			**Million Tonnes**			
Capture	7.4	7.5	8.0	8.5	8.8	8.8
Aquaculture	15.9	17.5	18.5	20.1	21.4	22.4
Total Inland	23.3	25.0	26.5	28.6	30.2	31.2
Marine						
Capture	86.1	86.4	79.3	84.7	86.0	82.5
Aquaculture	10.8	11.1	12.0	13.3	14.2	15.1
Total Marine	96.9	97.5	91.3	98.0	100.2	97.6
Utilization						
Human Consumption	88.0	90.8	92.7	94.4	96.7	99.4
Non-Food Uses	32.2	31.7	25.1	32.2	33.7	29.4
Population (Billions)	5.7	5.8	5.9	6.0	6.1	6.1
Per Capita food fish Supply (Kg.)	15.3	15.6	15.7	15.8	16.0	16.2

World Marine capture fisheries production (in millions of metric tons) by Ocean

Ocean	1995 Tons	1999 Tons	2000 Tons	Percent
Pacific Ocean	53.3	52.9	53.8	63
Atlantic Ocean	23.5	23.2	23.5	27
Indian Ocean	7.8	8.5	8.6	10
Southern Ocean	0.1	0.1	0.1	--
Total Marine Capture fisheries production	84.7	84.7	86.0	100

Source : FAO

Global Scenario

World wide increased at an average compound rate of 9.2 % per year since 1970.

More than half of global aquaculture production originated from Marine Or Brackish water.

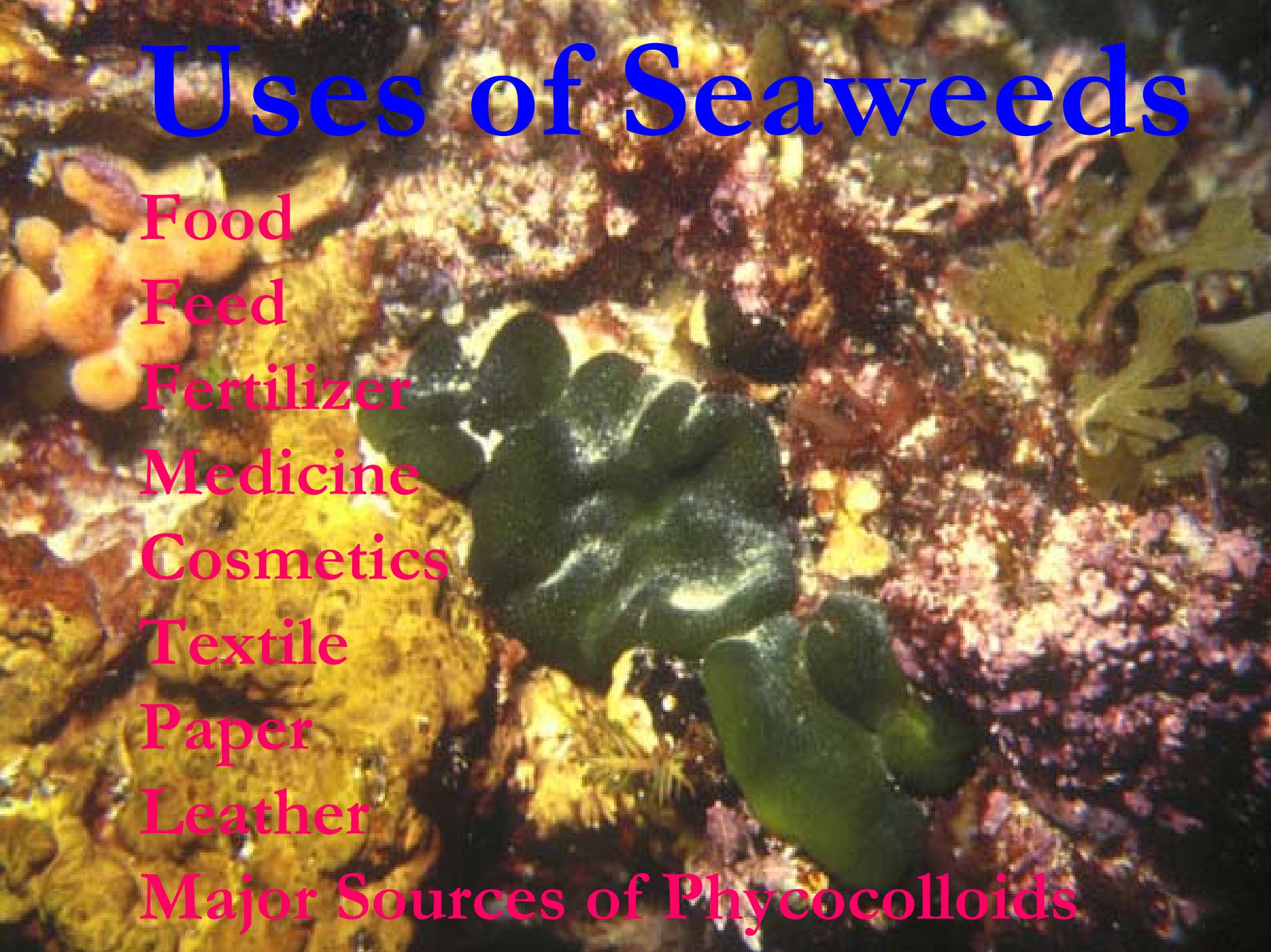
In 2000 total aquaculture production was 45.7 million tones by weight And US $ 56.5 Billion by value.

In 2000 Brackish water aquaculture production was increased by 4.6 % of total global production by weight and 15.7 % of total production by value.

Why Seaweeds

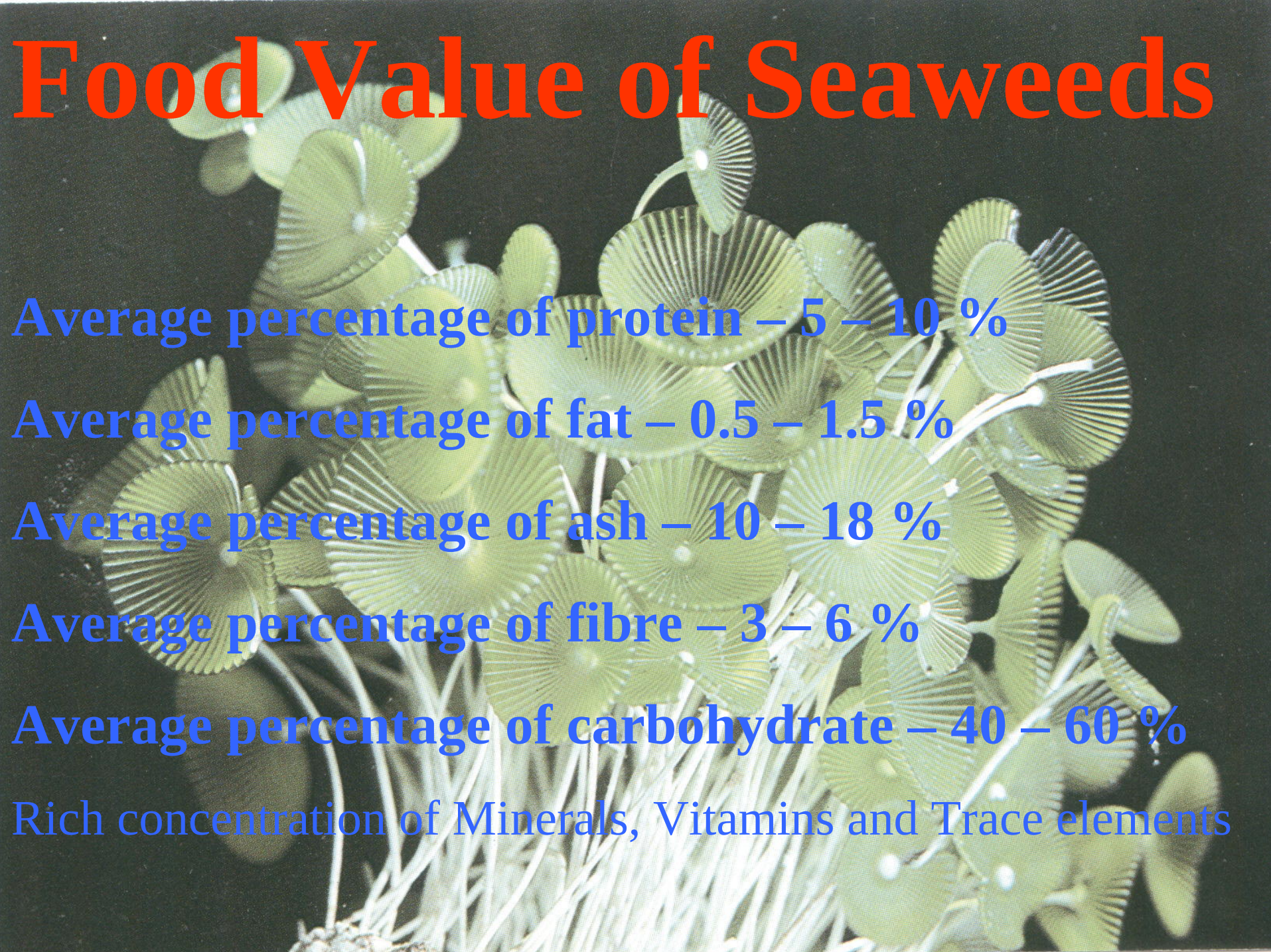
Seaweeds have several uses, gaining momentum as a new experimental system for biological research and is a part of integrated aquaculture systems (Sahoo 2000; Sahoo et al. 2002).

Uses of Seaweeds



Food
Feed
Fertilizer
Medicine
Cosmetics
Textile
Paper
Leather
Major Sources of Phycocolloids

Food Value of Seaweeds



Average percentage of protein – 5 – 10 %

Average percentage of fat – 0.5 – 1.5 %

Average percentage of ash – 10 – 18 %

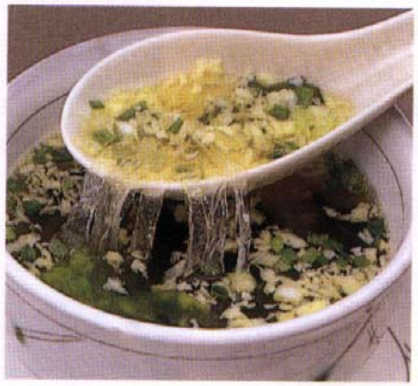
Average percentage of fibre – 3 – 6 %

Average percentage of carbohydrate – 40 – 60 %

Rich concentration of Minerals, Vitamins and Trace elements

ところ天

自然食品




AGAROSE
CAS NO. 9051-12-9
NET WT. 50 KGS
LOT NO. 01111
NO. 1
MADE IN JAPAN


다시다
미역국
다시다
미역국
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미역국


SEAMOSS
SEAMOSS
SEAMOSS

World Seaweed Utilization

- 221 Species of seaweeds are commercially used.
- 145 species as food
  - 79 Red
  - 38 Brown
  - 28 Green
- 101 species for phycocolloids.
  - 33 Agar
  - 27 Carrageenan
  - 41 Alginates

24 species are used for Medicines
25 species are used in Agriculture.
2 species are used for paper manufacturing.

THE TOTAL ANNUAL MARKET OF SEAWEED IS US$ 6.2 BILLION

Seaweed Industry

	1984 Production (Wet Weight)	1994/1995 (Wet Weight)	% (Growth Rate)
Chlorophyceae	8,402 tons	39,986 tons	376%
Phaeophyceae	2,392,958 tons	4,736,519 tons	97%
Rhodophyceae	1,035,760 tons	2,770,249 tons	167%
Total	3,437,120 tons	7,546,754 tons	119% (Over all Increase)

90% of these seaweeds came from just six countries.

China, Japan, Korea, France, United Kingdom and Chile.

52% of seaweeds are produced through Mariculture.

74 % Green

22 % Red

82 % Brown

China, Japan and Korea contribute to 90% Mariculture

World wide Economic value of Seaweeds Cultivated for Food Consumption

Taxa	Value (10^6 US$)	Raw material (mt)	(UA $/mt)	Product (mt)	(US $/mt)
(Kombu) ***Laminaria***	2,866	4,055,027	707	1,014,000	2,826
(Nori) ***Porphyra***	1,464	909,122	1,610	91,000	16,088
(Wakame) ***Undaria***	229	495,390	462	33,000	6,939
Totals	4,559	5,459,539		1,138,000	

Source: FAO (1997)

. Top five Cultivated Seaweed Genera in the World (1995)

Taxa	Value (10^6 US$)	Raw material (mt)	(UA $/mt)
Laminaria	2,866	4,055,027	707
Porphyra	1,464	909,122	1,610
Undaria	229	495,390	462
Eucheuma	42	441,665	95
Gracilaria	31	71,533433	
Total	**4,632**	**5,972,737**	

Source: FAO (1997)

Indian Scenario

Growth of aquaculture has been slow.

Reasons:

Technology Constraint

Socio-Political- Land Grabing, increase in land rates

Environmental Problems

770 species of Seaweeds
Chlorophyceae – 184 sps.
Phaeophyceae – 166
Rhodophyceae - 420

Map of India

Coastline more than 7,000 Km

Aquaculture in India

Fresh Water
Brackish Water
Marine Water

Production :

Total Fish Production 52.28 lakh tones
Brackish Shrimp Production 80,000 tones
Marine Sector Production 28.73 Lakh tones
Total Inland Production 23.55 Lakh tones

Seaweeds Aquaculture : NIL

Aquaculture Practices in India

Intensive Poly Culture

Integrated Rice- Fish

Sewage- Fed Fisheries

Prawn Culture

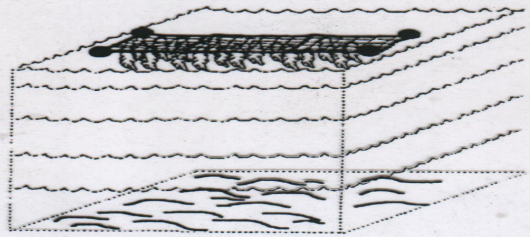
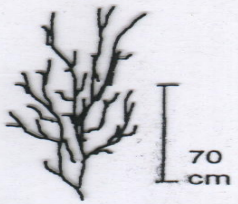
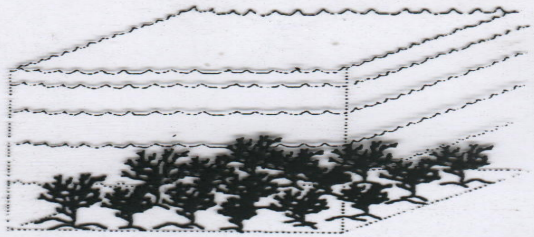
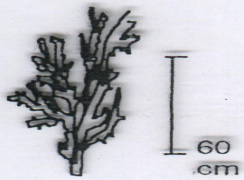
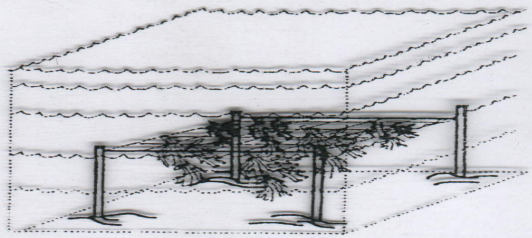
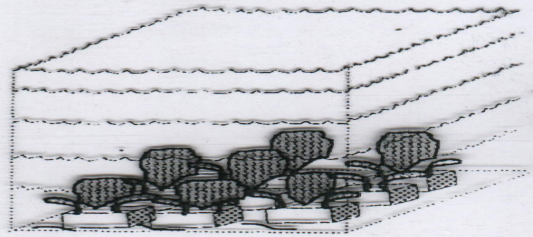
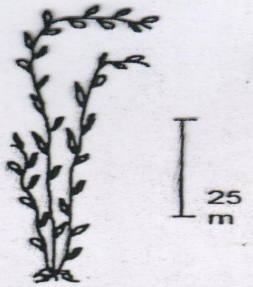
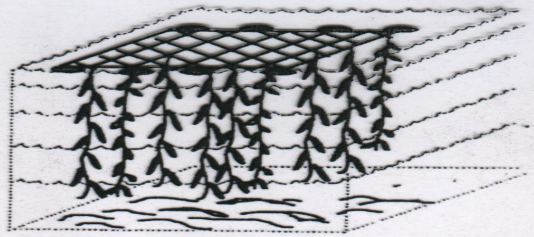
Molluscs Culture

Seaweed Culture

FARMING THE OCEAN

Seaweeds Cultivation and Utilization

Dinabandhu Sahoo

Agronomic group	Representative species	Farming method
Foliose, thin algae	 Porphyra Ulva Enteromorpha	 -Nets in surface levels
Thin, corticated cylinders	 Gracilaria Sarcodiotheca	 -Bottom planting -Gentle but active currents
Thick, corticated cylinders	 Eucheuma Kappaphycus	 -Middle water -Stronger currents
Bladed macroforms	 Sarcothalia Gigartina	 -Middle water or bottom on artificial substratum
Kelps	 Macrocystis Laminaria Undaria	 Rafts in deeper water

Seaweed Selected for Aquaculture

- *Gracilaria* sps
- *Grateloupia* sps
- *Porphyra* sps
- *Ulva* sps
- *Enteromorpha* sps

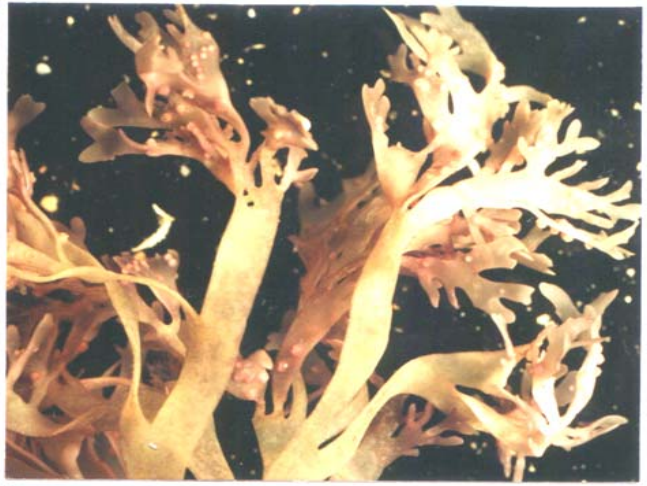
Porphyra Species from Indian Coast

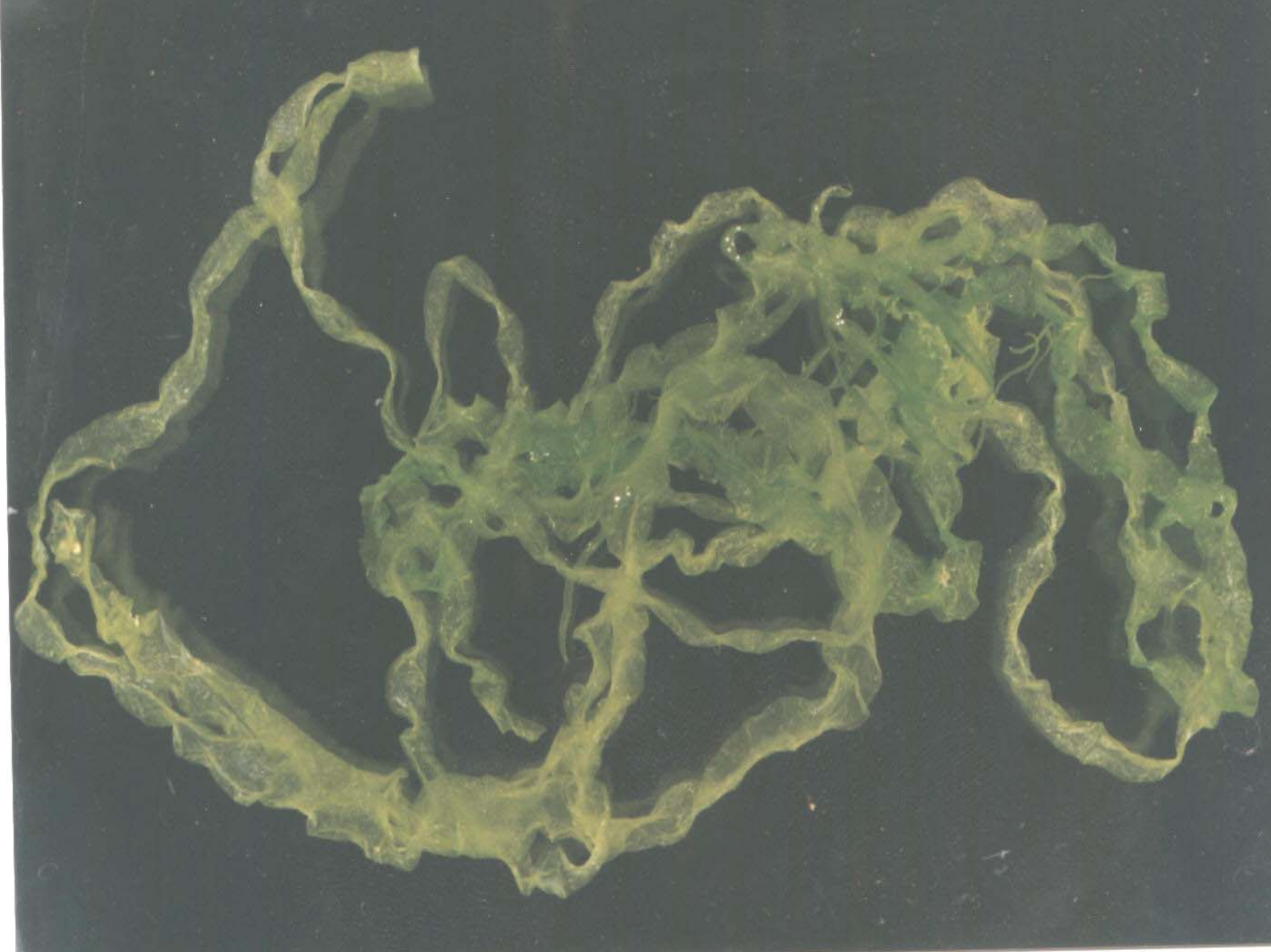
P. kanyakumarensis

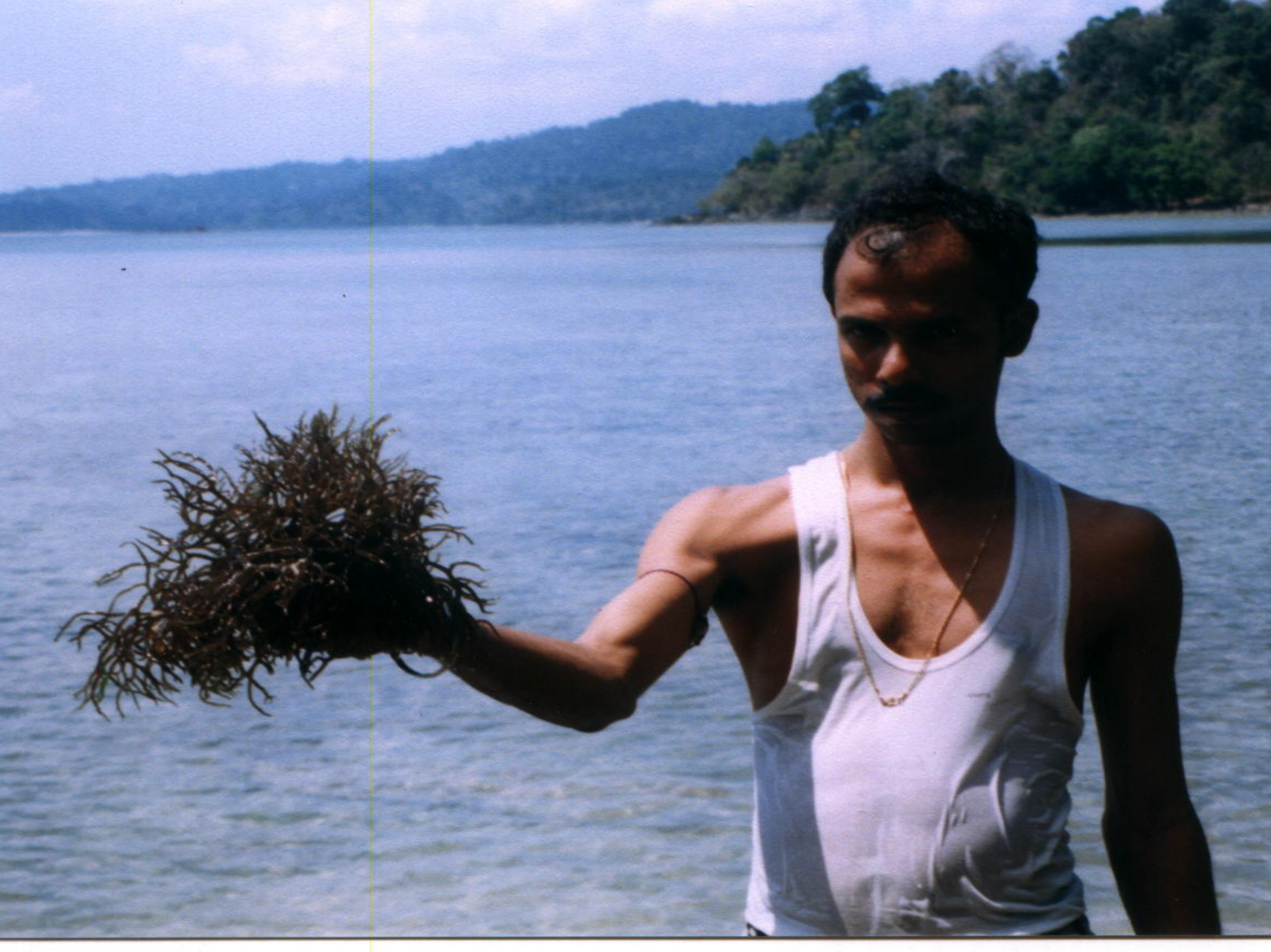
P. vietnamensis

P. vietnamensis

P. suborbiculata







BENEFITS OF SEAWEEDS CULTIVATION

Seaweeds farms acts as nutrient sinks

Seaweeds farms increase the primary productivity

The farms act as habitat for certain fish and shell fish

Seaweeds farming provides a sustainable lively hoods

In many cases women are involved in seaweeds farming

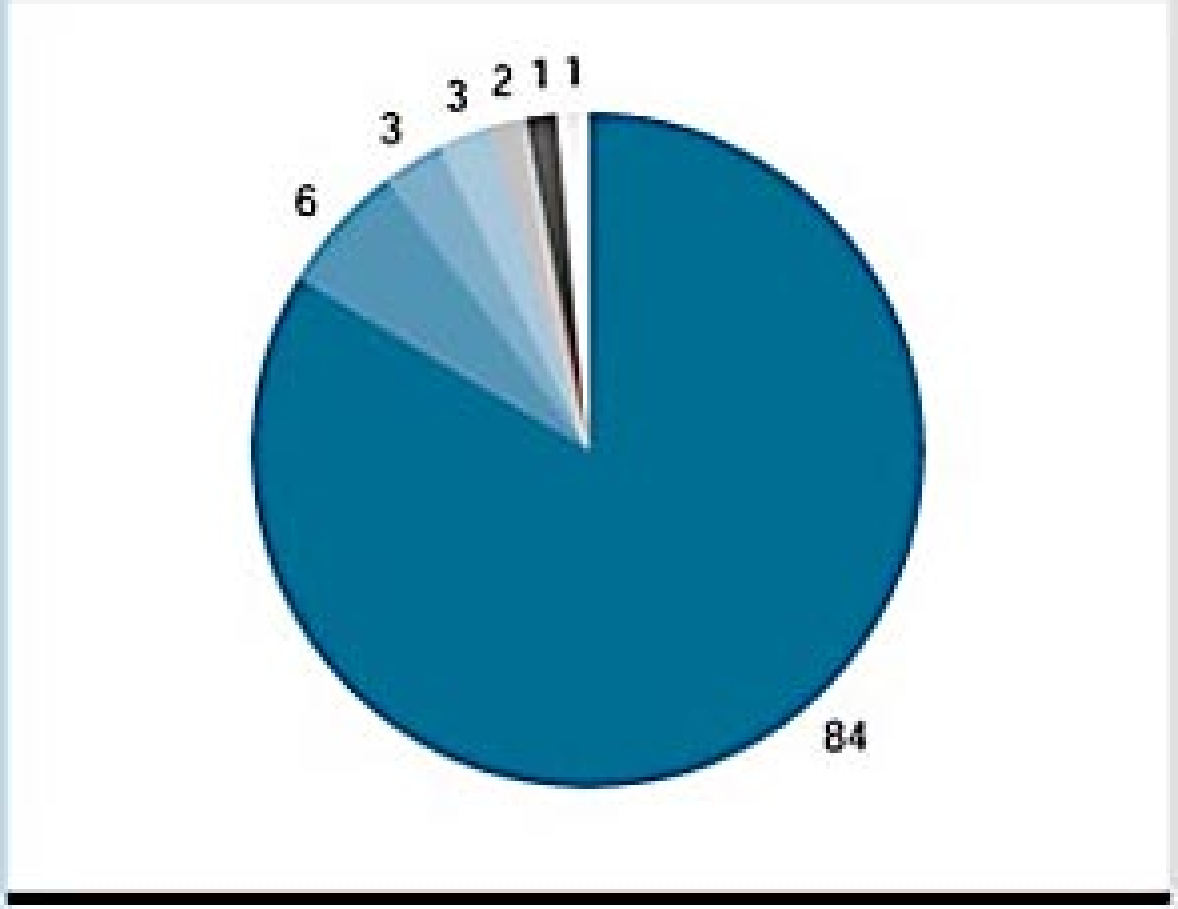
Many old people are engaged in tying and drying of seaweeds

Since it is a sustainable and lucrative business, it prevents migration

Since seaweeds are cash crops it gives instant money to the farmers

In many island nations, these seaweeds have become the crops with highest export earnings

Aquaculture production: contribution of LIFDCs in 1998



Note: Data do not include aquatic plants

Source: FAO

Thank You