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COMMERCIAL EXPLOITATION OF SEAWEEDS IN INDIA

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The commercial exploitation of seaweeds in India has started in 1966. At present the seaweeds are exploited in Gujarat coast and many localities in Tamil Nadu. The following are the seaweed centres along the southeast coast of Tamil Nadu:

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|--------------------|----------------------|
| 1. Rameswaram | 7. Kalimankundu |
| 2. Pamban | 8. Kilakarai |
| 3. Vedalai | 9. Ervadi |
| 4. Seeniappa Darga | 10. Valinokkam |
| 5. Pudumadam | 11. Mundal |
| 6. Periapattanam | 12. Kanyakumari area |

The seaweeds harvested from these areas are *Gelidiella acerosa*, *Gracilaria edulis*, *G. crassa* and species of *Sargassum* and *Turbinaria*. The places and season of harvest of each species and the drying techniques for them are given below.

Gelidiella Acerosa

G. acerosa is being harvested from 1966 onwards. It can be collected throughout the year since it is a perennial plant attached to rocks and coral stones. It is collected at six centres namely Rameswaram, Pamban, Vedalai, Seeniappa Darga, Kilakarai and Ervadi. The collection is mainly done around the islands in Gulf of Mannar, using country boats. Shore collection is done at Kilakarai and Ervadi throughout the year, whenever the tide conditions are favourable. Shore collection is done mainly by women and children. The seaweed is sold fresh to the dealers on the seashore itself, and they dry it on the beach

before transporting to godown. The ratio between fresh wt and dry wt of *G. acerosa* is 3:1. But, invariably, *G. acerosa* is found mixed up with *Ulva reticulata*. Also, other coral associated plants are plucked out, too, along with *G. acerosa*. Hence the dried material may only be 50% pure, which has again 25% moisture. The rate for this material is Rs. 5000 per ton. As the availability of *acerosa* is inadequate, *Gracilaria edulis* is generally added with it for agar extraction. The dried plants are to be cleared of all epiphytes and materials got collected along with the plants, and this is done by engaging labourers. Then the plants are washed thoroughly, dried and bleached.

Gracilaria edulis

Gracilaria edulis is being collected since 1966 from five centres, namely Rameswaram, Pamban, Vedalai, Seeniappa Darga and Kilakarai. The collection of *G. edulis* is possible throughout the year around the islands in Gulf of Mannar. Generally, many other algae get mixed up with the harvested *G. edulis* plants, viz. *Gracilaria foliifera*, *Hypnea valentiae*, *Sarconema furcellatum*, *Acanthophora spicifera*, *Laurencia papillosa* etc., growing in the same area. The shore collection is very meagre in the case of *G. edulis* and the major part of the collection is made around the islands using country craft. Fresh *G. edulis* plants are sold at the rate of 50 paise per kg. The ratio of fresh and dry weight is 7:1. The cost of 1 tonne of dried *G. edulis* is Rs. 11600/- when it is 60%

pure with a moisture content of 22%. Fresh plants are dried on the beach for one day before stocking in sheds. Unwanted plants are removed before weighing and loading.

Gracilaria crassa

Gracilaria crassa is being collected since 1983 from three centres: Pamban, Vedalai and Kilakarai. As *G. crassa* grows attached to pebbles and stones in shallow areas, collection is by handpicking. The plant is prostrate and entangling, and so lots of sediments settle over the plants. And added to this, the standing crop is very little. Therefore, only negligible quantity is harvested, and that too when there is no collection of *G. edulis*. The cost of *G. crassa* is Rs. 1000/-per t (dry wt).

Sargassum

Species of *Sargassum* are the major constituent of the seaweeds that have been harvested for commercial use since 1966. Of these, *S. wightii* is the most important. The rest are *S. myriocystum*, *S. ilicifolium*, *S. plagio-phyllum* and *S. tenerrimum*. The major portion harvested is from the Gulf of Mannar islands. Shore collection is done only at Pudumadam and Kanyakumari areas (Kooduthalai to Leepuram). Generally *Sargassum* is brought in boatloads. They are not weighed in fresh condition. Instead, the weight is decided by eye estimation, which is agreeable to both seaweed collectors and seaweed dealers. The rate is fixed at Rs. 70/-per t (wet weight) of seaweed. Algin industries like M/s Cellulose Products of India Ltd, Ahmedabad, requires formalin-treated material, because, procured during the peak harvesting season, i. e., August/September-December/January, it has to be stocked for as long as a year. Other algin industries procure beach-dried *Sargassum*. In formalin treatment, the fresh plants are soaked in 2% formalin for a 2-hour period and then dried in sun. The formalin is supplied by the algin industries free of cost. Formalin treatment is generally done in large wooden or cement tanks constructed

on the beach, often changing the formalin after a few soakings. The ratio between fresh weight and dry weight is 5:1. However, during recent years, the treatment is being done by spraying formalin. A layer of fresh weed is spread and formalin is sprayed over it and then another layer of weed is spread above and sprayed, this process continuing according to the bulk to be treated. After 2 hours of treatment the plants are spread in sun and dried. This method is more economical than the soaking method.

Dried *Sargassum* is baled after weighing, since the dried weed is voluminous and yet one gunnybag full weighs only 30 kg or so. The cost of ordinary dried *Sargassum* is Rs. 650 per t and that of formalin-treated *Sargassum* is Rs. 700 per t with 80% purity and 20% moisture content. *Sargassum* form about 70% of the total seaweed harvested.

Turbinaria

Turbinaria conoides, *T. decurrens* and *T. ornata* are the three species growing in Mandapam area. Since 1975, *Turbinaria* is being collected from six centres, namely Rameswaram, Pamban, Vedalai, Seeniappa Darga, Periapattanam and Kilakarai. The collected material is eye-estimated and is sold at the rate of Rs. 40 per ton. The weed is dried on the beach. The ratio between fresh weight and dry weight is 7:11. The cost is Rs. 650 per t of dry seaweed with 75% purity and 25% moisture content.

The season for the collection of *Turbinaria* varies from one area to another. At Kilakarai January to March is the peak season, whereas at Periapattanam it is between August and December and at Seeniappa Darga, Vedalai Pamban and Rameswaram April-July is the season.

Transport and Other Expenditures

Generally the transportation is by road for most of the nearby industries producing agar and algin. But, for the industries situated at distant places such as Ahmedabad and Bombay the seaweed is transported up to

Madurai by road and from there by rail. In addition to the cost of transport, the seaweed industry has to incur expenditure towards the cost of formalin, transport of formalin carbuoys to the main supplier, cost of gunny bags, etc. Including all these expenses, the cost of 1 ton (dry weight) of formalin-treated *Sargassum* on arrival at Ahamedabad from Kanyakumari may cost approximately Rs. 1,600.

The seaweed dealer has to incur the following expenditure:

1. Erection of stocking sheds.
2. Transport of formalin carbuoys to the collection spot.
3. Return of carbuoys from collection spot.
4. Labour cost for soaking/spraying the seaweed in formalin, drying and storing.
5. Transport up to the storage shed.
6. Transport of gunny bags to the collection spot.
7. Packing charges.
8. Loading charges.
9. Salary to employees.
10. Commission to subdealers.

Employment Opportunities

The fishermen of the coast from Rameswaram to Mundal and of Kanyakumari area get employment in seaweed collection in addition to their normal fishery activities. During the peak *Sargassum* and *Turbinaria* collecting season, many fishermen leave fishing activity and go for seaweed collection. Later, whenever the conditions are unfavourable for fishing, they go for collection of seaweeds such as *Gelidiella acerosa* and *Gracilaria edulis*. Each fisherman gets an income of Rs. 30 to 50 per day during the peak season. For the formalin treatment, drying, packing, etc, many persons are engaged as daily wage labourers. The wage per day varies from Rs. 10 to 12 for men and Rs. 5 to 8 for women. Approximately 2000 persons get employment during the peak

Sargassum collecting season August-January. Even though the employment opportunity is seasonal, an assured income of Rs. 30 to 50 per day attracts them towards seaweed collection. Some data collected by Umamaheswara Rao (1970 and 1973) on the quantities of seaweeds harvested from Pamban, Periapattanam and Kilakarai are shown below. The fresh weight was estimated based on 80% moisture.

Data on harvested seaweed (tonnes)

	Locality			Total dry weight	Total fresh weight
	Pamban	Peria- patnam	Kila- karai		
1966	15.19	—	—	15.19	75.95
1967	18.35	65.55	58.07	141.97	709.85
1968	16.59	8.00	304.65	329.24	1646.20

The data on harvested seaweeds collected by Central Marine Fisheries Research Institute for a period of eight years from 1978 to 1985 from different centres are given in Table 12. The figures were arrived at by enquiry from the fishermen and from records maintained by the dealers, sub dealers and industrial personnel.

Agar Industries

The list of the agar-and algin-producing industries in India is given below.

1. Ice and Agar Industry, Pamban, Ramnad District, Tamil Nadu.
2. Crystals, Kilakarai, Ramnad District, Tamil Nadu.
3. Sayee Industries, Manaloor, Pasumpon Muthuramalingam Dist., Tamil Nadu.
4. Cellulose Products of India Ltd., Kappaloor, Madurai Dist., Tamil Nadu.
5. Indian Polysaccharides, Tiruparankundran, Madurai Dist., Tamil Nadu
6. Indian Phycocolloids, Tennagar, Madurai Dist., Tamil Nadu.
7. Maya Marine Enterprises, Tiruvedagam Post, Sholavandan, Madurai Dist., Tamil Nadu.

Table 12
(Total Seaweed Landings dry weight in tonnes)

Landing Centre	<i>Sargassum</i> spp								<i>Turbinaria</i> spp							
	1978	1979	1980	1981	1982	1983	1984	1985	1978	1979	1980	1981	1982	1983	1984	1985
Rameswaram	—	—	50	—	—	—	—	—	22	40	150	30	126	50	10	15
Pamban	635	700	300	85	150	185	100	70	—	—	—	—	—	—	—	—
Vedalai & Seeniappa Darga	675	600	608	400	1025	605	160	582	250	300	180	20	63	25	—	—
Pudumadam	40	5	5	10	10	20	20	5	550	345	95	62	305	100	45	80
Periapattanam	850	1170	708	550	655	350	30	315	—	—	—	—	—	—	—	—
Kalimankundu	5	—	—	25	—	—	—	—	44	50	—	—	10	—	—	—
Kilakari	841	1060	857	700	546	250	150	630	—	—	—	—	—	—	—	—
Ervadi	350	275	190	350	105	300	10	226	—	—	—	—	50	—	20	20
Valinokkam	160	100	120	120	75	—	—	123	—	—	—	—	—	—	—	—
Mundal	60	230	115	145	140	35	—	50	—	—	—	—	—	—	—	—
Kanyakumari area	20	116	137	137	470	325	310	95	—	—	—	—	—	—	—	—
Total	3636	4256	3090	2522	3176	2070	780	2096	1021	1281	438	222	704	375	235	385

Landing Centre	<i>Gelidiella acerosa</i>								<i>Gracilaria edulis</i>								<i>Gracilaria crassa</i>		
	1978	1979	1980	1981	1982	1983	1984	1985	1978	1979	1980	1981	1982	1983	1984	1985	1983	1984	1985
Rameswaram	7	10	70	16	25	50	15	20	—	4	40	—	—	1	—	—	—	4	—
Pamban	112	100	40	40	5	30	60	27	175	200	60	24	40	4	15	30	—	2	—
Vedalai & Seeniappa Darga	15	86	—	—	—	—	—	—	187	120	112	68	180	285	300	225	85	80	21
Pudumadam	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Periapattanam	2	—	5	—	7	3	—	5	—	—	—	—	—	—	—	—	—	—	—
Kalimankundu	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Kilakarai	142	345	77	50	50	145	70	110	33	18	1	25	5	1	5	14	—	10	24
Ervadi	10	—	55	25	15	65	65	27	—	—	—	—	—	—	—	—	—	—	—
Valinokkam	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Mundal	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Kanyakumari area	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Total	288	541	247	131	102	293	210	189	395	342	213	117	225	291	320	269	85	96	45

8. Sri Industries, Silaiman, Madurai Dist., Tamil Nadu.
9. Marine Byproducts, Kappaloor, Madura Dist., Tamil Nadu.
10. Nellai Agar-Agar Industries, Vannarpet Tirunelveli Dist. Tamil Nadu.
11. Bharath Agar Industries, Industrial Estate, Kovilpatti, Tirunelveli, Dist. Tamil Nadu
12. Indo-Nippon Seafoods, Thuvakudi Industrial Estate, Tiruchirapallai, Tamil Nadu.
13. Gurukripa Chemicals, Ahamedabad, Gujarat State.
14. Gel Products (P) Ltd., Prantij; Gujarat State.
15. Gel Enterprises, Vallabh Vidyanagar, Gujarat State.
16. Oceanic Products (P) Ltd., Latti Bazaar, Kakthapith, Ahamedabad, Gujarat State.
17. Sea Products of India Ltd., Chembur Industrial Estate, Bombay, Maharashtra State.
18. Cochin agar and Chemicals, Chulickal, Cochin-5, Kerala State.
19. South Sea Chemicals, Judimetla, Hyderabad, Andhra Pradesh.
20. Algae Chemicals, Muralinagar, Visakhapatnam, Andhra Pradesh.
21. Inagar Chemicals Ltd., Mahatab Road, Cuttack-3, Orissa.
6. Omege Industries, Kappaloor, Madurai Dist., Tamil Nadu.
7. Lakshminarayana Chemicals, Madurai, Tamil Nadu.
8. Seachem Industries, Amaravathipurur, Karaikudi, Tamil Nadu.
9. Snap Natural & Alginate Products, Ltd., Plot No. 1, Sipcot Industrial complex, Ranipet. North Arcot, Tamil Nadu.
10. Sri Balaji Chemicals, T. J. Road, Coimbatore, Tamil Nadu.
11. Excel Industries, Madras, Tamil Nadu.
12. Pondicherry Alginate & Allied Products Kirumanbakkam, Pondicherry.
13. Pat Brothers, Ahamedabad, Gujarat.
14. Cellulose Products of India (P) Ltd., Ahamedabad, Gujarat State.
15. Algitex and Allied Chemicals, Ahamedabad, Gujarat.
16. Ramkarsh Industries, Kapasic Bazaar, Ahamedabad, Gujarat.
17. Ashahi Chemical Industries (P) Ltd., Firobos R. A. Mehta Road, Shaibuf, Ahamedabad, Gujarat.
18. Algae Chem Industries, Odhar, Odhar Road, Ahemadabad, Gujarat.
19. S. Kumar & Sons, 7th Floor, Kamaide Flats, Ellus Bridge, Ahamedabad, Gujarat.
20. Western Chemicals, Ahamedabad, Gujarat.

Algin Industries

1. Altex, Pamban, Ramnad Dist., Tamil Nadu.
2. Meenakshi Chemicals, Kappaloor, Madurai Dist., Tamil Nadu.
3. Madurai Marine Chemicals, Kappaloor, Madurai Dist., Tamil Nadu.
4. Kothari Phytochemicals, Nagari, Madurai Dist., Tamil Nadu.
5. Marine Byproducts, Kappaloor, Madurai Dist., Tamil Nadu.
21. Excel Industries, Hadapson Industrial Estate, Poona, Maharashtra.
22. Harivardhana Chemicals, Ernakulam, Kerala State.
23. Belur Chemicals, Mysore, Karnataka, state.
24. Brahmaweer Chemicals, Brahmawara, South Kanara, Karnataka State.
25. Indian Ocean Alginates. Pattancheru Industries Estate, Hyderabad, Andhra Pradesh.

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