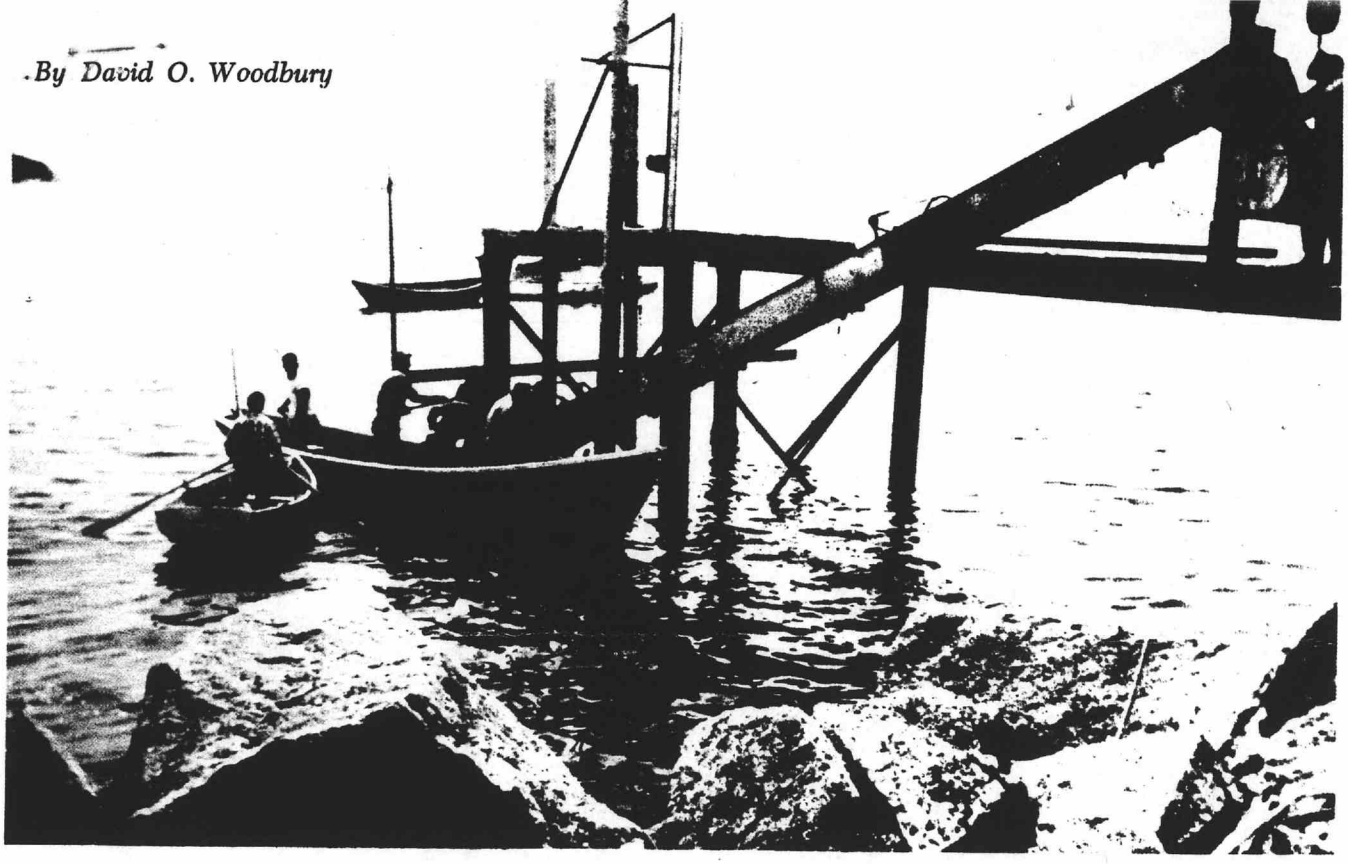
By David O. Woodbury

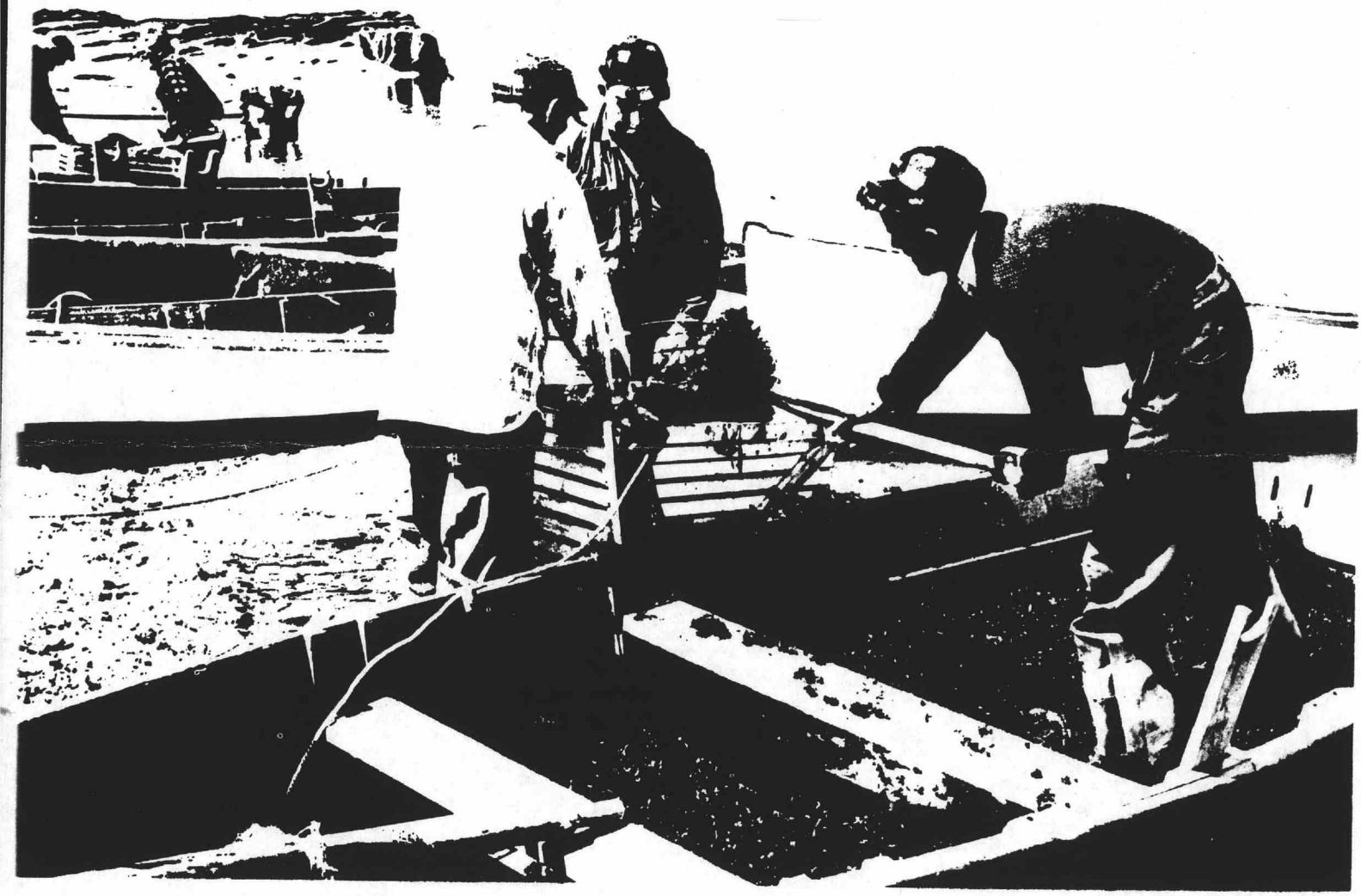


THE FABULOUS CROP OF THE SEA FARMERS

THE day after hurricane Esther hit the New England coast last fall a shabby little truck came bumping down onto a lonely Maine beach at low tide. A man and a boy jumped out with pitchforks, attacked a long roll of sea moss the storm waves had thrown up and heaved it into the truck. As soon as they had a load they hurried off, then quickly returned for more. Some hours later, with their third load hoisted in, they stopped to rest. They could afford to, now, for they had beaten the coming tide and won a rich prize. When they had rested they spread and dried the moss in a nearby field. The ton or so they had gathered would bring them more than $200 in cash.

Along 1100 miles of shoreline from Cape Cod to Newfoundland hundreds of people do the same thing after every storm. Many communities make their livelihood by farming the sea in this way. For, hidden in the delicate purple fronds of this derelict weed, known as Irish moss, is a constituent called carrageenan. This chemical and its companions, algin and agar, derived from rockweed and kelp, have become so valuable in the food and other industries, and show such promise in many more, that harvesters can't meet the demand.

All over the world, but especially in cold water like that of the North Atlantic, Irish moss grows in abundance. Only a small part of the seaweed needed as raw material can be found beached after a storm. Most must be harvested by hand direct from its beds on submerged ledges a few feet below low tide. The moss clings to rock surfaces by stems known as "holdfasts." Harvesters take great care not to wrench these loose; if they pull them off, the plant will not grow back again. If the slender fronds alone are taken the plant thrives, and will luxuriate again in a few months. From May to November many hundreds of fishermen, vacationing students and part-time workers gather Irish moss and other seaweed from small boats, using long-handled rakes.



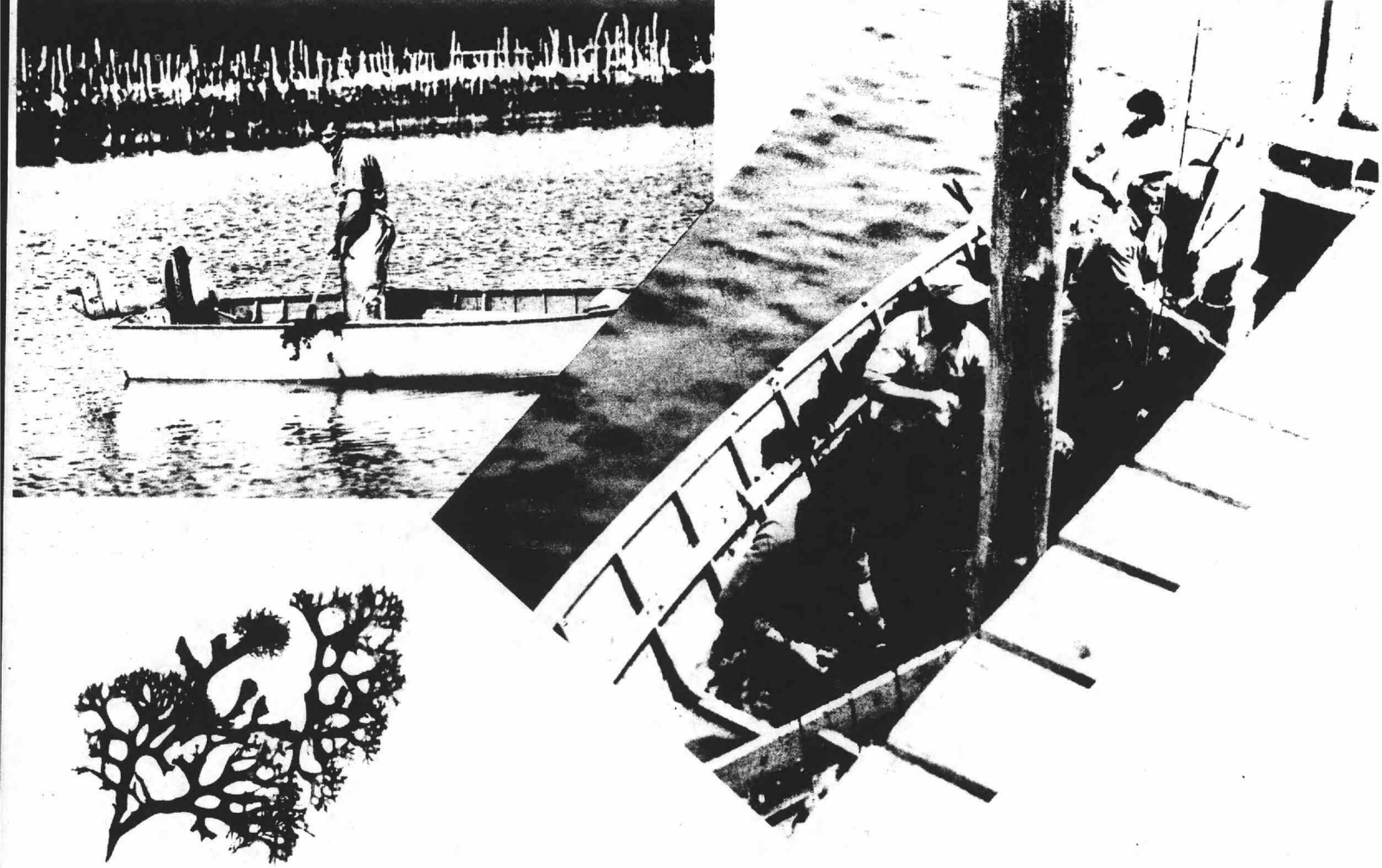
Delivered wet to commercial drying stations along the coast, Irish moss brings up to $1.75 a hundred pounds. If the mossers do their own cleaning and drying they can make as much as $10 a hundred.

Once dried, the moss is trucked to Marine Colloids, Inc., at Rockland, Maine. Every year this factory puts more than ten million pounds of seaweed through its extraction machines to obtain the two chemicals. Both algin and carrageenan are polysaccharides — natural sugars. In food they are tasteless and colorless "stabilizers." You eat them in pie fillings and cheese spreads, jams and jellies, malts and frappes. Carrageenan makes ice cream smooth, keeps mayonnaise and salad dressing from separating and toothpaste from drying out. It also makes ink flow to print newspapers, and helps printed designs on curtain and dress goods to hold form and color.

Chemical derivatives of algin products have recently turned up in water-base paints, and have given better finish to shoes and leather bags. One derivative is an ingredient in penicillin shots, another is in the compound the dentist uses to make impressions of your teeth. And the Rockland firm, Marine Colloids, Inc., says the potentialities have hardly been touched.

SEAWEED harvesting has been known for 5,000 years. Shen Nung, the "father of medicine," prescribed seaweed in 3000 B.C. Confucius praised its curative value. For centuries the Japanese used it for food, as did many other maritime nations. Generations of French peasants in Brittany burned kelp to make potash and iodine. The American Indians fertilized their corn with it. The wife of the German bacteriologist, Robert Koch, discovered agar gel as a nutrient carrier for the microbes her husband was studying. It is the standard culture medium today in all medical laboratories.

Many kinds of seaweed are gathered today, but the "sea farming" of Irish moss has a romance all others lack. The Irish themselves discovered it



600 years ago, first harvesting it in County Carragheen on the south Irish coast. For centuries they used it for medicine and food and fertilizer and eventually found that small quantities of moss, boiled with milk, would produce a "set," or jelly. This is the origin of the dessert the French call blanc mange. Scotch-Irish settlers in the American colonies brought the taste for moss with them and gladly imported it from home at two dollars a pound. Finally, Dr. J. V. C. Smith, an early mayor of Boston, spread the word that he had found Irish moss on Massachusetts beaches. The citizens eagerly exploited the discovery and the colony became the first community to harvest the moss in the New World.

For centuries Irish moss, with its hidden carrageenan, had been used to soothe rough skin, while the milk gel did duty as a complexion cream. Mothers relied on it for sore throats and to combat the murderous croup. But not till 1888 did British chemist E. C. C. Stanford extract and analyze the several constituents and give them names. Because of its Irish ancestry he called the extract from moss Carrageen, to which modern chemists have added the sugar-designating suffix "an." Stanford's discovery went unnoticed for thirty years.

In the deep depression of the 1930s a young French chemist, Victor LeGloahec, arrived in New York with a method he had patented for extracting algin under precise control, to yield an entirely new standard of purity.

Although the financial community in New York was in the doldrums he found an imaginative businessman, Robert S. Holt, who listened. Here was a way to put hundreds of people to work along the Atlantic seaboard who were starving in the fishing industry. The two set off up the coast to find good sources of seaweed. They located rich beds of it in southern Nova Scotia and almost as much in Maine. They determined upon Rockland, Maine, as the central point for their extraction factory.

It was not until 1937 that Holt and LeGloahec got their venture off to a modest start in a converted lime-burning plant in Rockland. But their imposing name, the Algin Corporation of America, helped them believe in the future. What helped more was a team of two young brothers, Nick and Bart Pellicani, sons of an Italian-born stone mason. Nick got

the job of scouting the coast for people willing to do seaweed harvesting. Bart determinedly went to work learning the details of LeGloahec's patent, actually began designing the equipment.

FOR the first ten years the Algin group barely scraped along. The thing that kept them in business at all was the top grade quality of the extracts from the new process. Algin of controllable grade and wide variety of chemical compounding turned out to be ideal in the field of stabilizers for jams and jellies, even printing inks. More important, its excellence immediately earned it a place in the new application of seaweed products in surgical jellies, salves and ointments. Here only the best could be employed.

Just as they were reaching success with this innovation a sudden fire in the plant's alcohol tanks virtually wiped out everything in fifteen minutes. The day after the disaster it seemed as if the venture and the hundreds of kelp gatherers who now depended on it were finished. But the Pellicanis insisted on salvaging what they could. In their shirt sleeves they straightened out the twisted pipes, and with secondhand equipment borrowed and scraped together over the countryside, they struggled into operation again. Then they sat down to wait for word from New York as to the fate of the company. It soon came. The investors had decided to try again.

Immediately their worst problem was competition. Some years before, a Chicago seaweed firm called Krim-Ko had established an Irish moss plant in Scituate, Massachusetts, where mossing had been done for 150 years. Under chemist Earl C. Jertson, this outfit was eagerly exploiting the uses of carrageenan, previously untouched. Jertson's first try with the new chemical was to rescue chocolate-flavored milk. The beverage had never been successful because the cocoa always settled out, leaving unsightly streaks on the glass that were very hard to wash off. Carrageenan remedied that at once — kept the drink smooth and palatable and ended the cleansing problem. Success of the idea was so immediate that Jertson bought the business and set up the Seaplant Corporation, with a factory at New Bedford, using many of the same harvesters as the Rockland firm.

An Algin Company salesman on the West Coast, encountering the formidable challenge of carrageenan, persuaded the Rockland people to get into the game. Seeing an answer to their troubles, LeGloahec and Bart Pellicani quickly adapted their algin-making machinery to carrageenan and plunged in. Soon they began to have an advantage, for the French chemist's alcohol process had a clean lead in the matter of quality.

Presently carrageenan found a host of other jobs. It began to find a place as a stabilizer in ice cream. It lent richness and permanence to whipped cream and maintained the flavor of fruit syrups and pickles. It was useful in biscuit mixes, cakes and soups. Its high quality and uniformity gave it a start in pharmaceuticals. Nowhere was it more magical than in toothpaste, where today it figures in every well known brand but one.

A few years ago the Algin and Seaplant companies merged to form Marine Colloids, Inc., and largely because of carragneenan this has become the dominant producer of seaweed extracts in America and probably in the world. On the Atlantic seaboard it has only one competitor, the Kraft Foods plant at Portland, Maine. In Europe it owns one of the only four plants there are, the factory in Normandy. There is a competitor in England, one in Denmark and a third in Morocco.

Marine Colloids gets its seaweed from every corner of the world and blends the product to obtain dependable uniformity of chemical properties — vital in the food and drug industries. Gatherers on the east African coast, in India, Malaya, Aus-

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Marine Colloids Rockland plant, right, fronts on Rockland Harbor. For every pound of dry sea moss processed here, five pounds of wet moss must be hand-harvested.

tralia, along the borders of the North Sea and the eastern Atlantic, all contribute to the extracting vats in Rockland, Maine. Gathering methods in the rest of the world are still extremely primitive, even in Ireland and France where modern weed farming was born. Either the harvesters rip the weed off the rocks by hand at dead low tide or wait for storms to bring the catch in to the beaches. It is the despair of the American engineers that they can't seem to induce the gatherers in foreign communities to use up-to-date methods.

In the past all mossers had to do their own drying, but the procedure was arduous; wet moss must be spread very thin over an open field or on wooden racks and turned after the sun has dried out one side. The crop can survive only one wetting by rain, without bleaching and rotting.

The Rockland company has recently set up mechanical drying stations along the coast of Maine and Canada, and now the mossers have only to run their loaded boats in to the company dock, fork their moss into trays lowered to them, watch it get weighed and then receive cash for it on the spot.

Chemically the extraction process is simple, though it must be carried on under rigid control. The seaweed plants are cleaned, ground and boiled in great vats of pure water, which dissolves the carrageenan as salt water cannot do. The residue is thrown away, while the chemical is dried out by alcohol extraction. A white powder is all that is left.

MY friend Joe of Maine's Casco Bay is a champion mosser, and typical of the many men who stoutly make a go of it. Joe's life is moss and nothing else from May to October. Besides the boat, a 16-footer, he has a special steel rake he welded up himself by attaching a row of blunt galvanized spikes to a steel bar and fitting it with a 12-foot handle. A mesh basket, fixed to the handle, catches the loosened moss and permits him to bring up about fifty pounds at a time. The sea is never still and he must time his raking strokes so that the waves will help him.

Joe is a thin, wiry man with the weatherbeaten face of a Maine coaster. He has tremendous strength but doesn't weigh much – a very good combination for mossing. Joe gets nearly a ton of moss into each boat load. Under favorable weather and tide conditions, he has made up to $200 in a week. Mossing is one of the few remaining industries where the rewards are strictly proportional to how hard you work.

Like most good sea farmers Joe has a mind like a map and has committed to memory every important moss bed in the entire bay region. There are probably a hundred miles of shoreline in the area, counting inlets and islands; he divides his time between harvesting and looking for new beds; he is quick to abandon a worked-out ledge and move to a new one. For this prospecting he has developed great skill in detecting the purplish shadow that means moss below. Sometimes in bright sunlight he uses a glass-bottomed box. But generally he can tell from the surface what the situation is. "Once you've learned how," he says, "you don't need trick gadgets."

Just the same, Joe's adventurous spirit drives him incessantly toward improvement. He once considered skin diving to gather moss, a crude form of which is generally practiced in Europe. He found it nowhere near as fast as raking. Lately, he has been working on a small machine, something like a hedge clipper, to harvest moss by a power cable from the boat. The company is financing his attempt. Ordinarily, Joe and his colleagues would have misgivings about mechanization, for fear of overproduction. But the company has assured him there is no danger. Their principle concern is to get *enough* moss to satisfy their hungry extracting machines. They point out that the really fertile beds of moss lie in deep water on flat ledges, too far down for human hands to rake. These great beds promise a huge gain in harvesting if a machine can be made that will reach them. But there is little danger that any machine can compete successfully with hand-manipulated tools in shallow water among the clutter of boulders and wave-worn ledges.

FARMING the sea can yield untold new wealth. Some of the seaweeds have very high Vitamin C content. There are proteins and enzymes, and the algae which seem to be slated for diets in space are among the seaweeds, too. Only the skill and imagination of the organic chemist are needed to expand the value of carrageenan and its sister extracts. Animal foodstuffs, electrical insulation, explosives, resins, industrial chemicals, coloring pigments, drugs, blood plasma substitutes, coagulants – all have been, or are soon to be, investigated as products of the inexhaustible farmland of the sea.

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