MACROALGAE CURRENT STATE IN LATIN AMERICA

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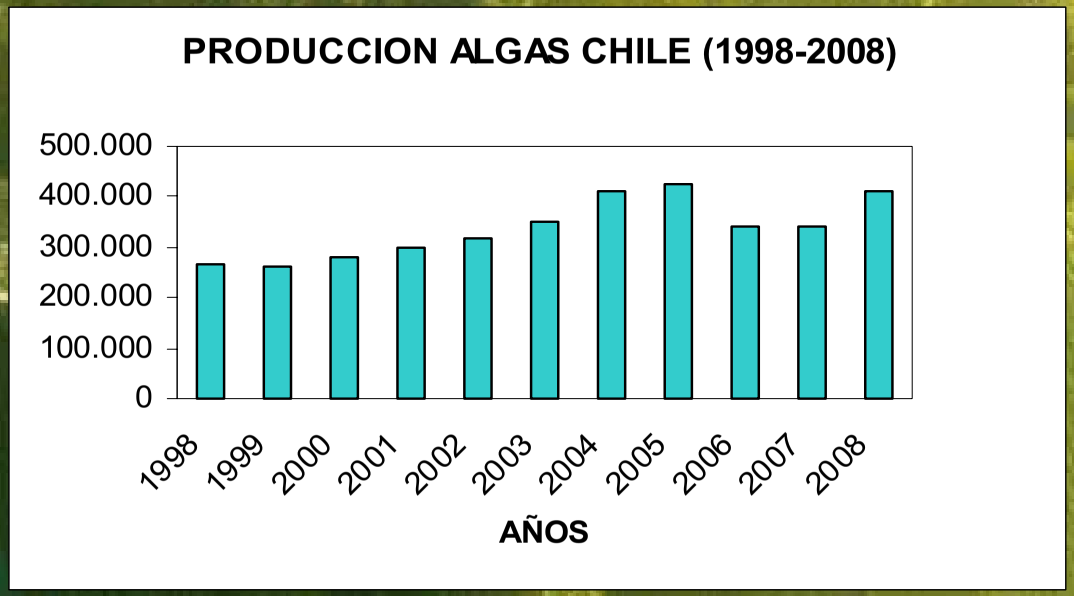
Algae America Latina most widely used are:

Lessonia, Gracilaria, Gigartina, Sarcothalia, Mazzaella, Macrocystis, Chondrus, Porphyra, Callophyllis, Durvillaea

Sarcothalia

PRODUCER OF MACROALGAE IN LATIN AMERICA



PRODUCER OF MACROALGAE IN LATIN AMERICA

Mexico

Commercial seaweed species

Genus	species	type	Total mt	Cultivated
Gelidium	*robustum*	red	1,200	0
Gigartina	*canaliculata*	red	200	0
Gracilaria	*lemaneiformis*	red	205	0
Macrocystis	*pyrifera*	brown	8,800	0
total			**10,405**	**0**

Argentina

Commercial seaweed species & production

Genus	species	type	Total mt	Cultivated
Codium	*spp.*	green	n/a	0
Gigartina	*scottsbergii*	red	22	0
Gracilaria	*verrucosa*	red	2,276	0
Macrocystis	*pyrifera*	brown	20	0
Porphyra	*columbina*	red	3	0
Ulva	*spp.*	green	n/a	0
total			**2,321**	**0**

PRODUCER OF MACROALGAE IN LATIN AMERICA

Brazil

Commercial seaweed species & production

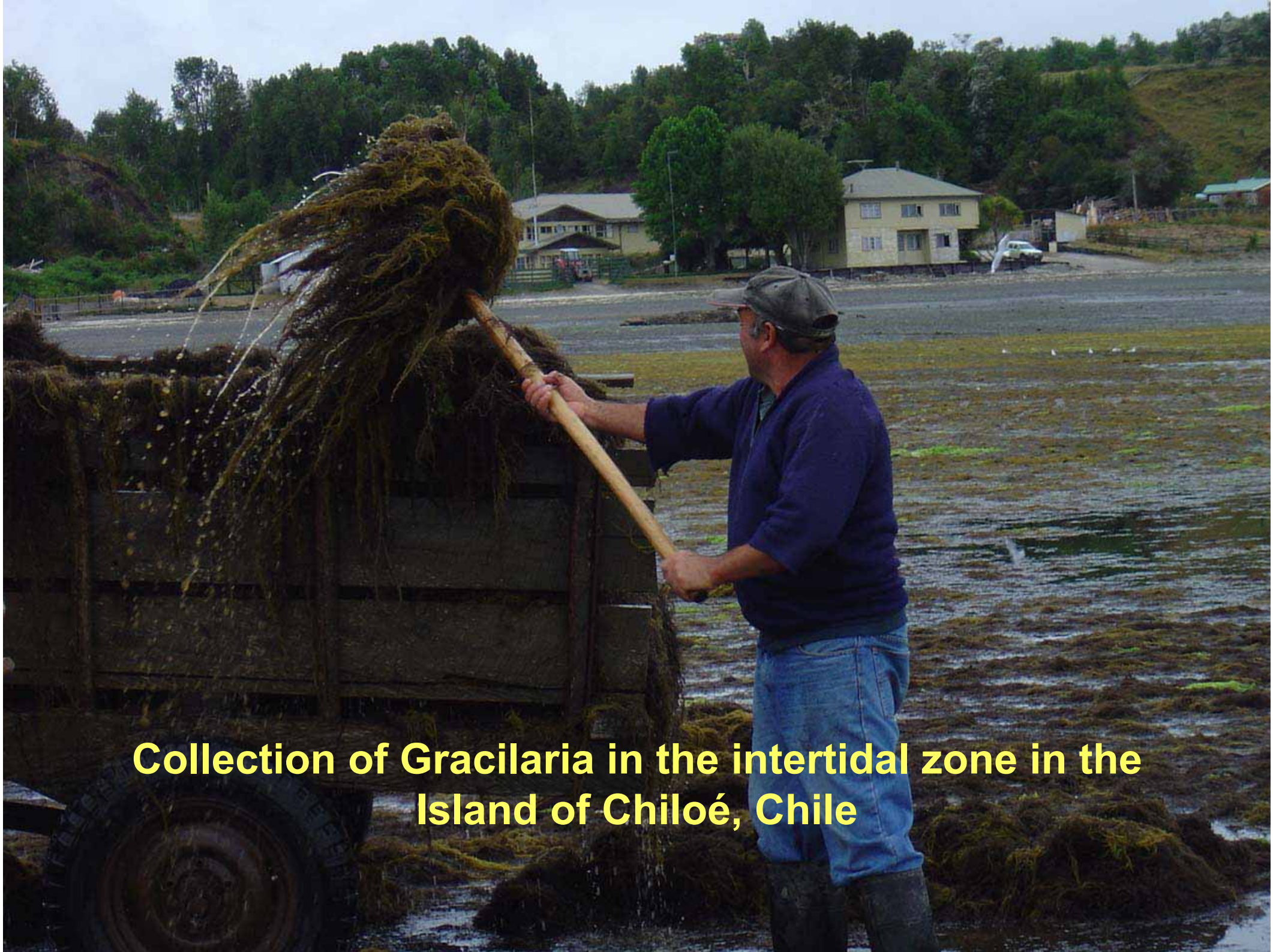
Genus	species	type	Total mt	Cultivated
Gracilaria	*caudata*	red	n/a	n/a
Gracilaria	*cornea*	red	n/a	n/a
Gracilaria	*domingensis*	red	n/a	n/a
Gracilariopsis	*tenuifrons*	red	n/a	n/a
Hypnea	*musciformis*	red	n/a	n/a
Porphyra	*spirilis*	red	n/a	n/a
Sargassum	*spp.*	brown	n/a	n/a
total	**n/a**		**n/a**	**n/a**

Summary:

Chile	**400.000 TM**
Peru	**14.000 TM**
Mexico	**10.405 TM**
Argentina	**2.321 TM**
Brasil	**No Info**

MACROALGAE PRODUCTION
collection and culture

In Latin America most of harvested algae are collected from natural meadows. Some techniques have been developed to culture *Gracilaria* and *Macrocystis*



Collection of Gracilaria in the intertidal zone in the Island of Chiloé, Chile

NATURAL MEADOWS USE FOR FISHERMENS (CHILE)

Developing technique for Gracilaria culture by braiding.

Yield:

2 persons can produce 12.000 meters of Gracilaria rope in eight hours. One ha is formed with 20.000 meters (2 day of production)

For one ha is necessary 6500 kilos of wet seaweed. 70-120 TM/ha/yr

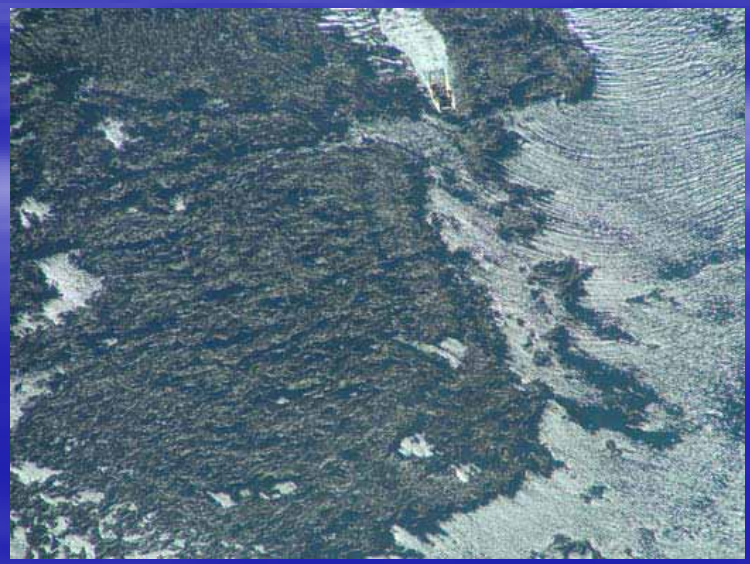





Culture of Gracilaria, intertidal zone

Culture of Macrocystis (laboratory – fixation, sea seeding – growth – final product/harvest)

Transferring technology from Mexico to Chile. Mechanical harvest system (first steps)



Uses of Macroalgae in Latin America

ARGENTINA CHILE, PERU AND MEXICO PRODUCE DIFFERENT PRODUCTS OF ALGAE AS AGAR AGAR, ALGINATE, CARRAGEENAN,











Other uses: BIOSTIMULANTS, ALGAE FOR HUMAN AND ANIMAL CONSUMPTION

Biofuels in Chile (Macroalgae)

GOBIERNO DE CHILE
CONICYT
FONDEF

Project D06I1099
Fourteenth FONDEF Project Competition i & D
2006/2007

DEVELOPMENT OF A TECHNOLOGICAL PACKAGE FOR BIOENERGY PRODUCTION FROM ALGAE

La Araucana
CORPORACION DE EDUCACION

Description Problem

* Chile imports 98% of national consumption of gasoline and diesel.

* Crisis recurring oil prices at international and national impact.

* Search for substitutes to produce biofuels from raw materials of agricultural crops.

* Requires large tracts of fertile land that is not enough to meet domestic consumption needs.

OPPORTUNITIES

* Chile is a country with a high potential in aquaculture, which would allow a diversification of the energy matrix, to hold algae as feedstock.

* The use of micro and macroalgae allows independence of agricultural crops, increasing yields of biofuels area.

* The intensive cultivation of microalgae is a recent technology and global importance, that Chile has produced successful private initiatives associated with biomass production and raw pigments.

* The meadows of macroalgae such as Macrocystis currently represent a resource with a high development potential and does not require big investments, just good management of extraction.

SOLUTIONS AND OBJECTIVES PROPOSED

Develop a technology package for the technological production of biofuels from algae in two stages:

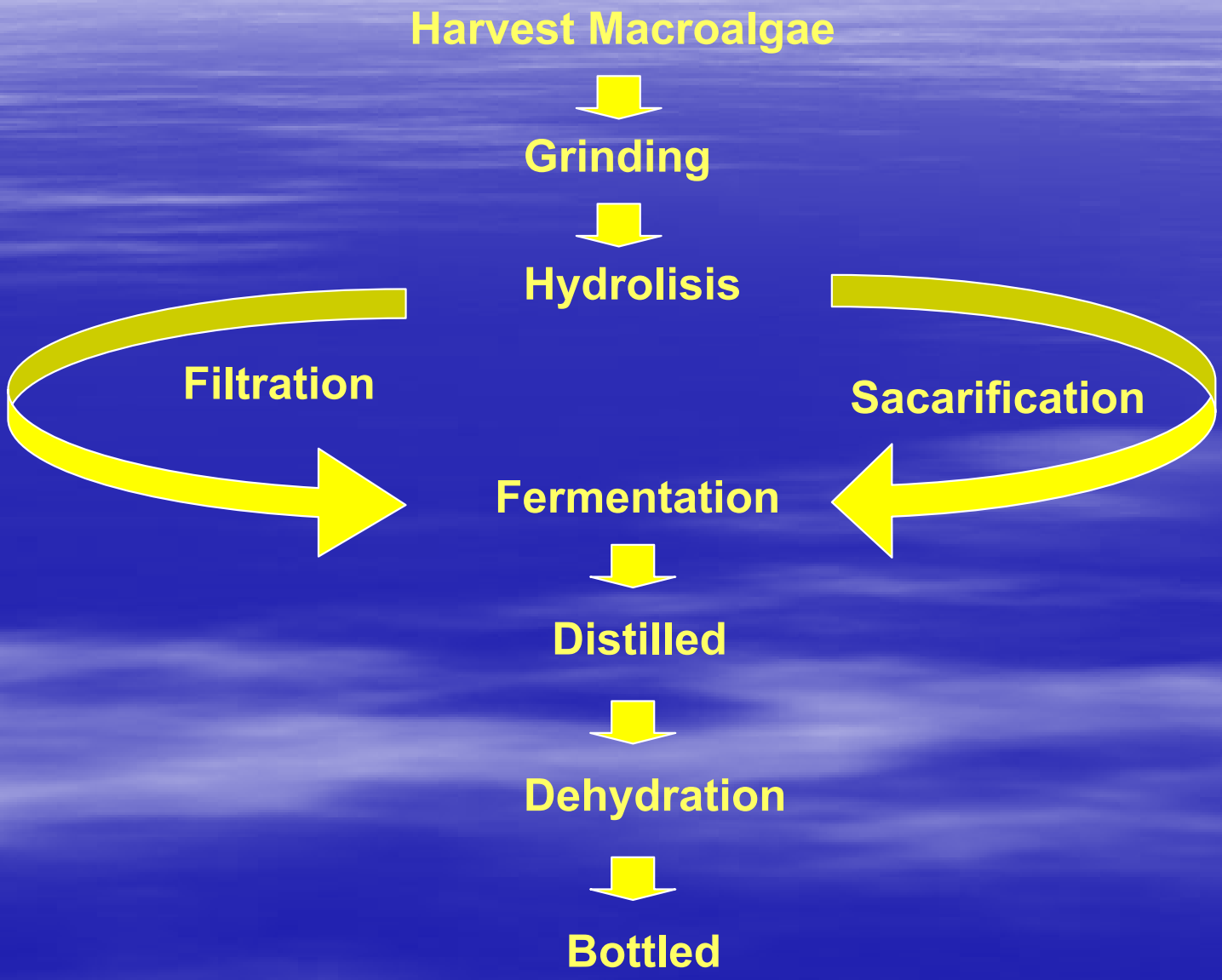
1) The generation of biodiesel from microalgae, through fluid technology of supercritical carbon dioxide, which allow a high recovery rate of high purity vegetable oil.

2) to develop biotechnology for the production of ethanol from fermentation of macroalgae.

Objectives

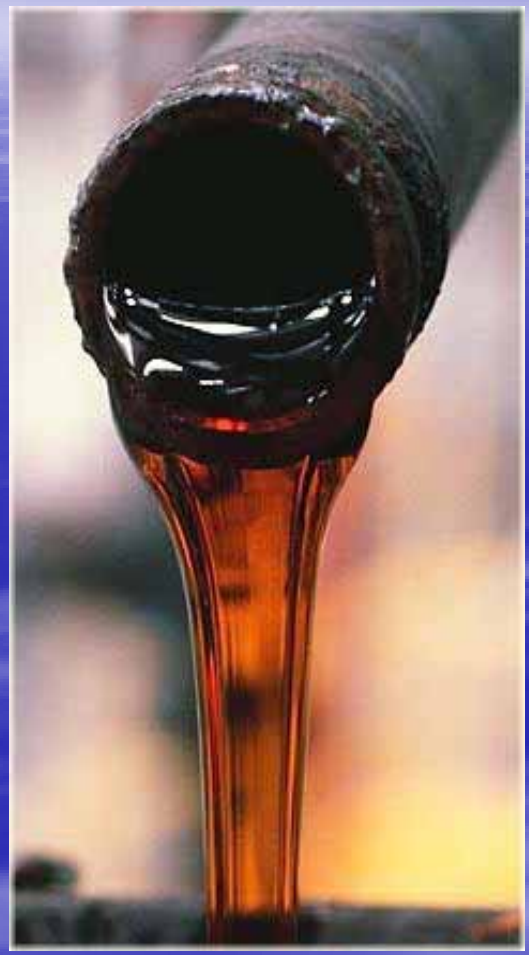
*** Research, develop and design ± ar a process for ethanol obtaining from macroalgae.**

Ethanol process



Yield

Macroalgae wet (Harvest)		1000 kg
Macroalgae dry	10 %	100 kg
Macroalgae % sugar	40 - 55 %	50 Kg
% extraction sugar	20 - 40 %	15 liters ethanol



Biofuels in Mexico (Macroalgae)

Project: Production of Biodiesel from Salicornia

Salicornia is a freshwater seaweed which can tolerate salt water

Global Seawater

500.000 ha

Next: 5 – 8 años

Culture in dessert areas irrigated with seawater

Estimated yield: 1893 liters/ha

Investment: US$ 35.000.000

Future plan: expand operation to different countries (Brasil, Chile,

Macroalgae Potentials

Potential

Coastline (km.)

Chile:	6435 km
Perú:	2414 km
Brasil:	3745 km
México:	9330 km
Argentina:	4989 km

Productivity Chile

Macrocysitis

Natural: 75 – 250 TM/ha/yr (10% dry)

Culture: 120 – 300 TM/ha/yr (10 %dry)

Gracilaria

Culture intertidal:

80 – 200 TM/ha/yr (13 %dry)

Culture sudmareal:

100 – 250 TM/ha/yr (13 %dry)

Productivity Mexico

Macrocysitis

Natural: 100 - 200 TM/ha/yr (10% dry)

Gracilaria

Culture: 200 TM/ha/yr (13 %dry)

Potential

Estimating productivity:

If we use only the 10% for the coastline of potential producer countries (Chile, Peru, Mexico, etc) with a 200 meters wide (coastline)
We can use the following areas:

Chile:	**128,7 km2**
Perú:	**48,3 km2**
Brasil:	**74,9 km2**
México:	**186,6 km2**
Argentina:	**99,8 km2**

The biomass generated in these areas could reach the following volumes:

Chile: 2.574.000 TM/yr (200 Tm/ha/yr - Macrocystis)

Perú: 965.600 TM/yr (200Tm/ha/yr-Mc)

Brasil: 886.067 TM/yr (118,3 Tm/ha/yr – Gracilaria)

Mexico: 2.799.000 TM/yr (150 Tm/ha/yr – Macrocysitis)

Argentina: 718.416 (72 ton/ha/yr – red algae)

Potential

Estimating Volume of Biofuels:

If we take a yield of 1,2% of Biofuels coming from wet Macroalgae and use the hypothetic production mentioned above. The total production of Chile, Peru, Brasil, Mexico and Argentina anually would be:

Real

7.943.083 TM x 1,5%

119.146.200 liters

Hypothetic transforming 55% sugar in algae

7.943.083 TM x 5,5%

436.869.400 liters

Hypothetic transforming Cellulose in sugar – yield: 80% dry wet

7.943.083 TM x 8%

635.446.400 liters

Economical feasibility

- **Wet macroalgae: 1000 kg**

Ethanol	Animal food (abalone)	Alginates
Yield: 15 liters ethanol	Yield: 1000 kg wet algae Ch$ 70/kg	Yield: 2% from wet algae 20 Kg Alginate
Price: US$ 1,1/liter US$ 16,5	Price: US$ 0,12/kg US$ 127,2	Price: US$ 20/Kg US$ 400

Thank you for your attention