Development of Aquaponics Combined with Open Culture Adapting to Arid Regions for Sustainable Food Production

Science and Technology Research Partnership for Sustainable Development (SATREPS)

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Our aquaponics system

Use of saline water

Production of fish and crops

High water use efficiency

conventional water use

Salinity Stress !

Saline water

Aquaculture

collection of water and reuse

Hydroponic s

Field culture

Prevention from soil salinization

No use of fossil fuel

Applicable to the area out of electrical transmission

Use of photovoltaics

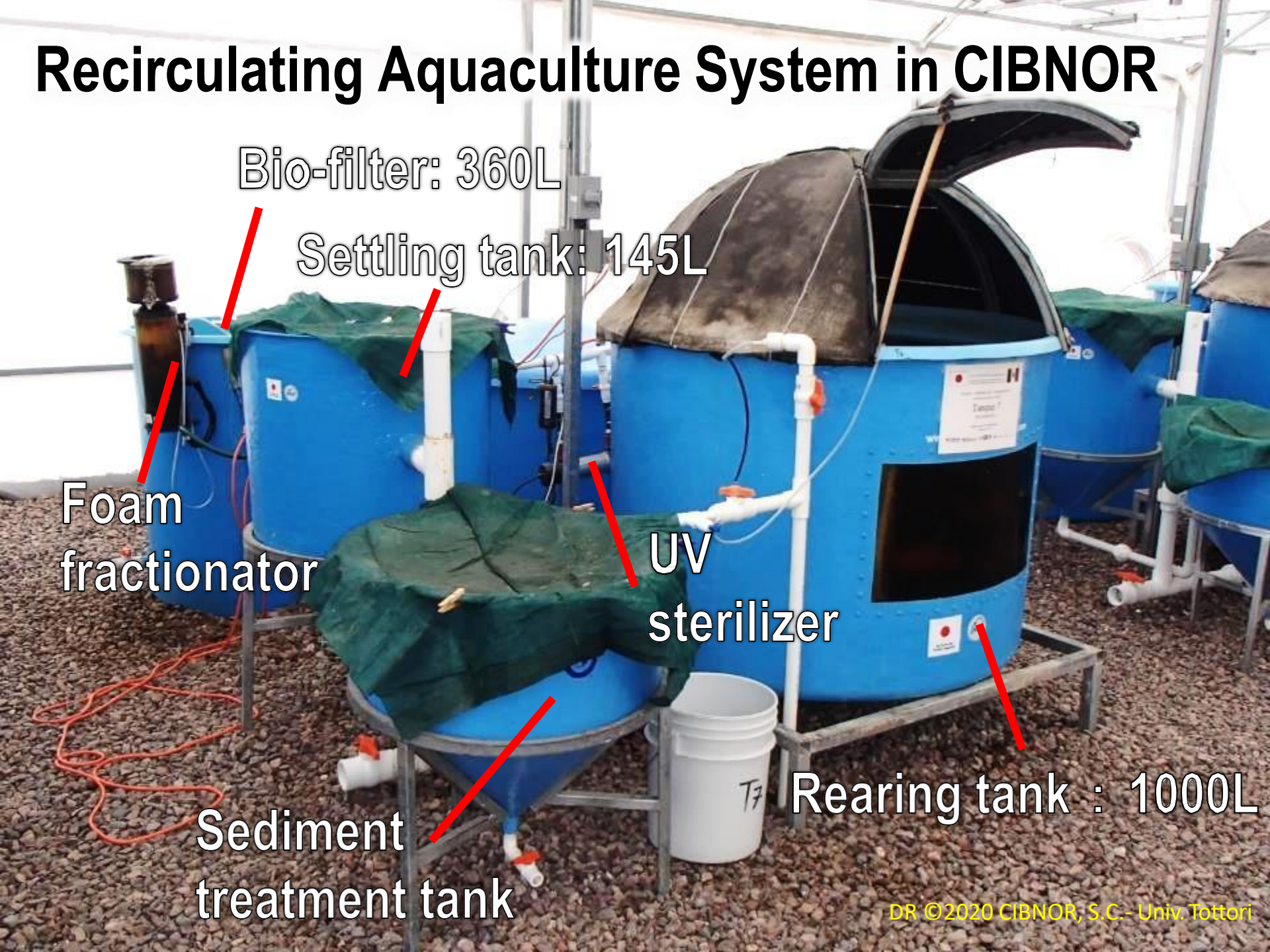
Guarantee of sanitary security

Evaluation of microbiological security

CIBNOR – Model System. Research to standardize optimal conditions and select potential species. Pilot studies for production yields and bioeconomics projections

Farmer´s Verification system. Scaling to higher volume/surface production units. Pilot and commercial production for more realistic production yields and bioeconomics projections. Training of local farmers, students from agriculture and aquaculture careers

Recirculating Aquaculture System in CIBNOR



Outputs: Tilapia Production

Market Shipping & Sales Results of Tilapia

Times	Date of Sales	Sales destination	Number (fish)	Standard (g/fish)	Tolal weight (kg)	Unit price (peso/fish)	Total sales (peso)
1	2018/11/30	Mercado Bravo, Pesacaderia Morales	88	678	59.7	23	1,373
2	2018/12/7	Mercado Bravo, Pesacaderia Morales	145	683	99.5	23	2,277
3	2018/12/14	Mercado Bravo, Pesacaderia Morales	116	685	79.5	23	1,829
4	2019/1/11	Mercado Bravo, Pesacaderia Morales	132	681	90.0	23	2,070
5	2019/2/8	Mercado Bravo, Pesacaderia Morales	144	590	85.0	23	1,995
6	2019/4/11	Mercado Olachea, Pescaderia Sinaloa	59	722	42.6	22	937
7	2019/4/11	Mercado Bravo, Pesacaderia Morales	95	722	68.6	23	1,578
8	2019/4/25	Mercado Bravo, Pesacaderia Morales	175	726	127.0	23	2,921
9	2019/8/1	Evaluacion de fileteado	37	492	18.2	23	419
10	2019/8/21	Products tasting (for meeting in Aug. 23)	31	503	15.6	–	–
11	2019/9/1	Mercaado Bravo, escaderia Morares	84	523	44.0	23	1,012
	Total		1,106		729.7		16410.2

The "evolution" of the tilapia market in Mexico distinguishes three segments

- **Fresh whole tilapia**: Represents the traditional consumption form, it is usually prepared fried and whole. It is the most demanded form in the Center, East and South of the Republic.
- **Fresh fillet tilapia**: It is intended for consumption in fillet or ground for ceviche. It is the most demanded form in the Midwest and Northwest of the Republic.
- **Whole and fillet frozen tilapia**: Normally of imported origin, the products are vacuum packed, individually frozen. From the commercialization stage it is difficult to know the quality of the product production process (CEC-ITAM, 2006).

Outputs: Swiss chard production

Market Shipping & Sales Results of Swiss chard

Times	Date of Sales	Sales destination	Number of sales (bandle)	Standard (g/bandle)	Tolal weight (kg)	Unit price (peso/bandle)	Total sales (peso)
1	2018/12/28	Mercado Aramburo	100	180	18.0	4	400
2	2019/1/10	Mercado Aramburo	100	190	19.0	4	400
3	2019/1/24	CIBNOR (NO SALES)	273	182.4	49.8	0	0
4	2019/2/1	CIBNOR (NO SALES)	193	207.5	40.0	0	0
5	2019/2/8	CIBNOR (NO SALES)	193	217	41.2	0	0
6	2019/2/15	Central de Abasto	360	122.56	44.1	4	1,440
7	2019/2/22	Central de Abasto	232	245.17	56.9		
8	2019/3/7	Central de Abastos	800	354	283.2		
9	2019/6/6	Mercado Aramburo	61	295.4	18.0	4	400
10	2019/6/27	Mercado Aramburo	53			4	213
	Total		2,365		570.2		2,853

Recommendation of crops with high market value for aquaponics system

Hydroponic section:

- aromatic herbs
- leaf lettuce,
- swiss chard with tolerance to moderate salinities.

Open culture in soil:

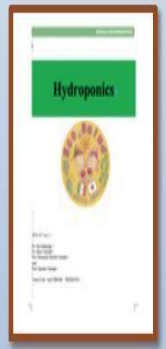
- saladette, cherry and ball tomatoes
- spicy chiles (serrano, jalapeño, habanero, guerito)
- cucumbers,
- aromatic herbs
- beet
- coriander

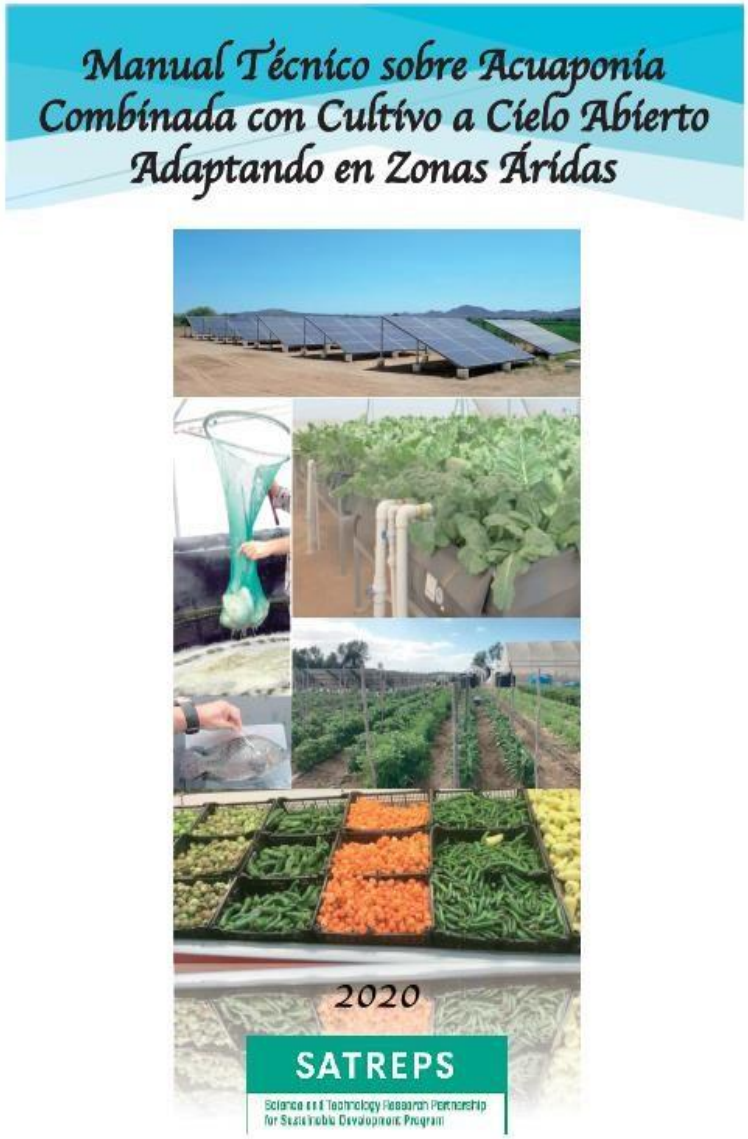
Outputs: Exhibition and training

	DATE	ORGANIZER	NUMBER (PERSON)	WHO	PURPOSE	REMARK
1	2018.11.15	Private	2	Farmers (San Jose de Los Cabos)	To know aquaponics	High intension to introduce
2	2018.11.25	B.C.S. Gov.	17	Graduate school students of CICIMAR & UABCS	To know aquaponics	
3	2018.12.04	Local junior high school	about 20	Junior high school students & teachers	To know aquaponics	As education of Mr. Cristobar (model farmer)
4	2018.12.09	B.C.S. Gov.	43	Farmers	To know aquaponics	
5	2019.1.13	B.C.S. Gov.	11	Farmers	To know aquaponics	They asked detailed technical question.
6	2019.2.20	Private	2	Farmers (San Jose de Los Cabos)	Meeting for launching aquaponics	Repeater
7	2019.2.27	UABCS	about 20	Studens in Dep. of Renewable Energy	To study food production system by PV.	They requested individusal training course.
8	2019.3.5	Tottori University	12	Student of fac. Of Agriculture	To experience work in aquaponics combined with open culture.	
9	2019.3.14	Dr. Larrinaga	8	Fermers	To know aquaponics	Dr. Larrinaga himself explained.
10	2019.4.29	Los Planes Agricultural Junior High School	4	Teachers	To teach aquaponics to students.	They may add aquaculture to teach.
11	2019.5.28	Shrimp fermers	2	Technician	To study aquaponics, mainly tilapia rearing technology.	Shrimp fermers in Los Planes.
12	2019.6.7	CIBNOR	4	Japanese private company	To know aquaponics	
13	2019.7.6	Dr. Larrinaga	6	La Paz citizen	To study Acuaponics.	
14	2019.8.23	CIBNOR	5	President, Tottori University		Dr.Yamada explained.
15	2019.9.19	UABCS	14	Students of UABCS and Tottori University		Dr. Kaburagi explained.
16	2019.9.27	CIBNOR	5	Vicepresident, Tottori University		Dr.Yamada explained.

Outputs

Technical Manuals

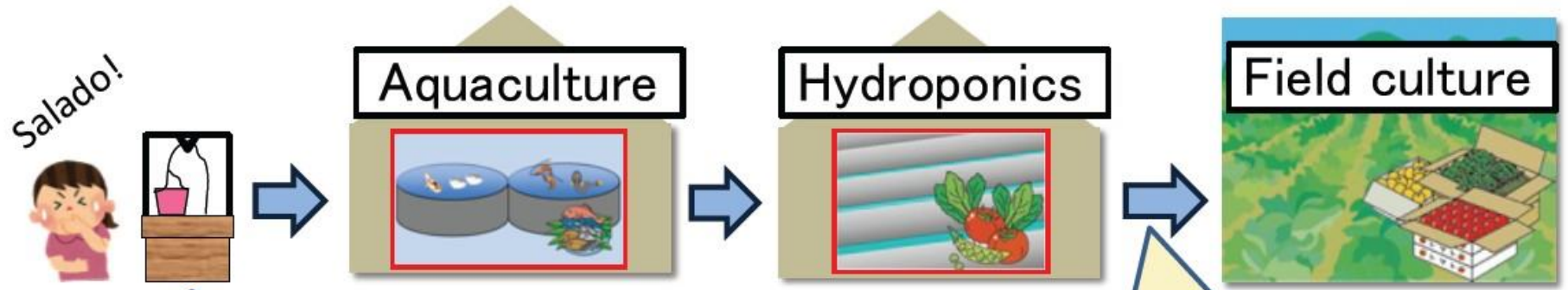
	G1	G2	G3	G4	G5	G6
Spanish						
English						
Japanese						



Outputs

CO_2 – emission Zero

Outputs Desalinization as Na^+ (mM)



CIBNOR

22.2
Feb.1 st, 2019

23 % ↓

16.9
March 24th, 2019

72.3
Jun.16 th, 2019

4 % ↓ *

69.0
Jul. 6th, 2019

21.9
Nov.29 th, 2019

42 % ↓

12.5
Feb.. 3rd, 2020

Los Planes

29.0
Feb.7 th, 2019

55 % ↓

13.0
Feb.21 th, 2019

10.8
Jul.5 th, 2019

50 % ↓

5.3
Jul. 23 th, 2019

*; Purslane

Near future outreach: appropriation of knowledge by local producers for already-existing aquaponics modules in BCS state

Existing aquaponic infrastructure, supported by SADER, CONAZA and GOB-BCS, as well as private sector interested in this technology

8 aquaponic production modules.

- ❑ Reforma agraria N°1,
- ❑ El Centenario.
- ❑ **San Juan de Los Planes**.
- ❑ **Las Castellanas**.
- ❑ El Pescadero.
- ❑ Caduaño.
- ❑ Miraflores.
- ❑ Santiago,

Expected middle to long – term outreaches of such production system

- Rural poverty reduction.
- Environmentally responsible aquaponics-agriculture system with low water and energy consumption as well as low C and N emission.
- Establishment of local food production chains with high nutritional quality
- Warranty of freshness and safety food production

Thank you