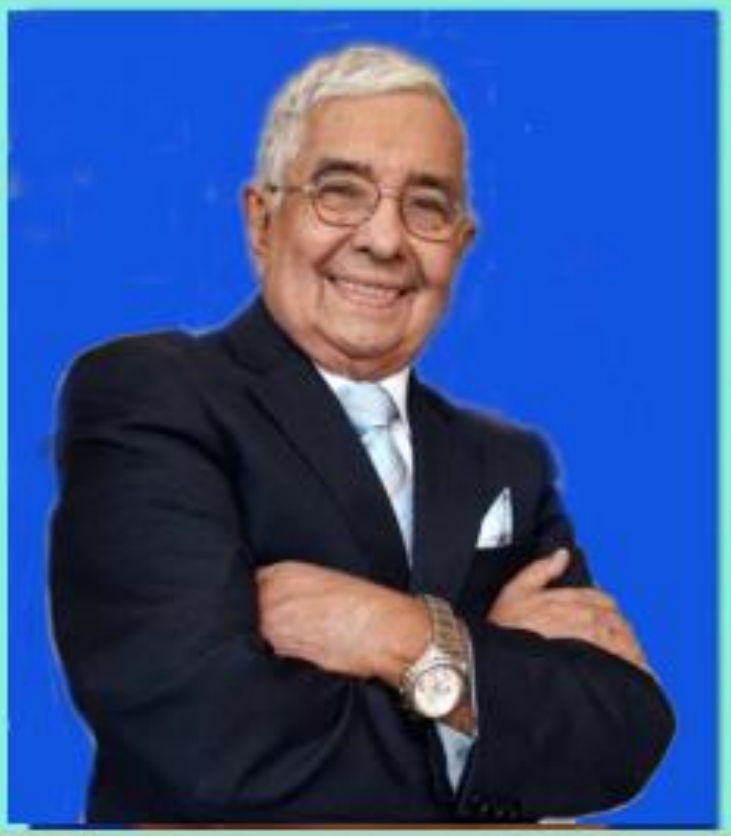


Bioeconomía en Venezuela

IICA

Bioeconomía y desarrollo productivo

Ciclo de Encuentros Virtuales

"Biorremediación de suelos y aguas en Venezuela"

18 de mayo 2022

10:00 AM Venezuela
11:00 AM Brasil
11:00 AM Argentina
9:00 AM México
8:00 AM Costa Rica

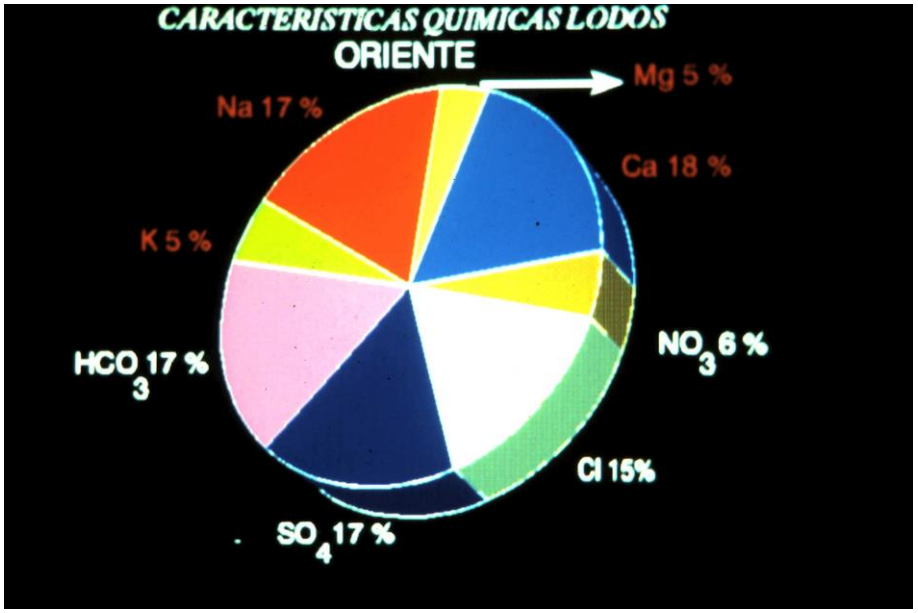
Dr. Oswaldo Luque Mirabal
Environmental Consultant
Vetiver System Application Specialist

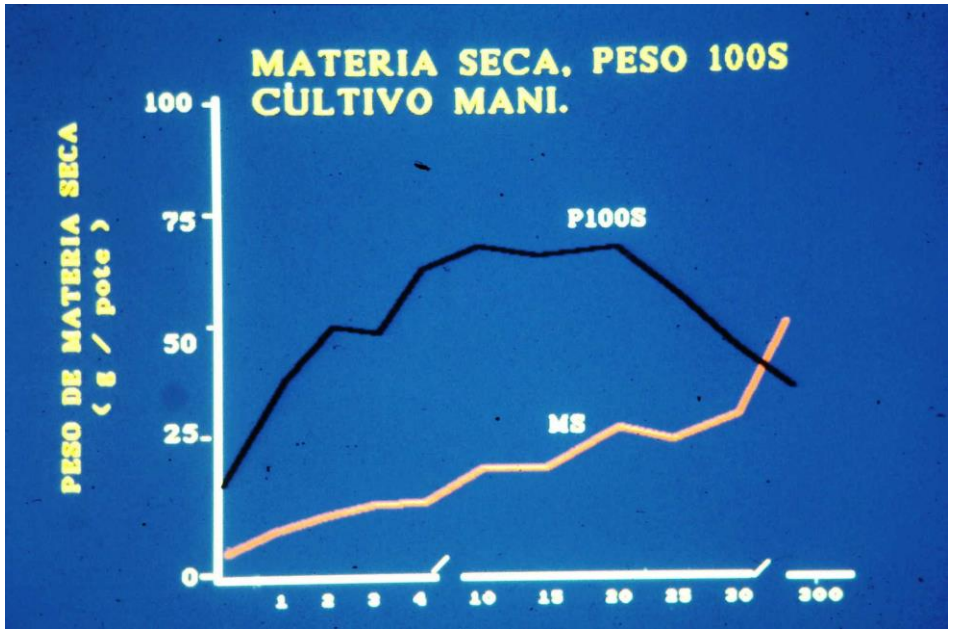
"Biodegradation and recycling of non-hazardous organic waste from industrial origin. Biofilter Vetiver System

CONVENIO FONAIAP FUNDACION POLAR
1.982

Risponsible research Dr. Oswaldo Luque M.

The start-up of the wastewater treatment plants of Empresas Polar generated a large amount of residual sludge that was difficult to dispose of environmentally. For this reason, a research study was agreed between Fundación Polar (today Fundación Empresas Polar), and FONAIAP, (today INIA), an agricultural research institution of the Venezuelan State.





During four years, basic and applied research was carried out to use the sludge as a soil conditioner for Ultisols (very sandy and well-drained soils from the Mesa de Guanipa, Edo. Anzoátegui-Venezuela).

	NO3-S	P-S	Ca-S	% N	% P	% K
P--Suelo	0,63					
Ca-Suelo	0,64	0,92				
pH	0,69	0,92	0,96			
% N		0,67	0,70			
% P		0,79	0,87	0,79		
% K		- 0,53	- 0,63	- 0,71		
% Ca		0,67	0,74			
% Mg		-0,68	- 0,64			
Materia Seca				0,88	0,87	- 0,86
Peso Fruto				0,87	0,81	- 0,86
Numero Frutos				0,85	0,80	- 0,87
P100Semillas						- 0,96

The results from greenhouse, laboratory and farmer's plot tests indicated that pretreated Residual Sludges (RS) could be used in an environmentally safe way, resulting in significant yields increases in the multiple crops tested. Qualifying the RS as non-hazardous organic waste.

The Cervecería Polar de Oriente Company, (using the research results obtained under the direction of Dr. Oswaldo Luque M., in 1987), founded the Center for Recycling of Residual Sludge from the Brewery (CEPAREL), on a plot of 3.5 hectares in the industrial zone of Mesones. 2,500 tons of compost were produced per year. It has worked continuously for 12 years and is recognized as an environmentally safe company, recycling all its waste.

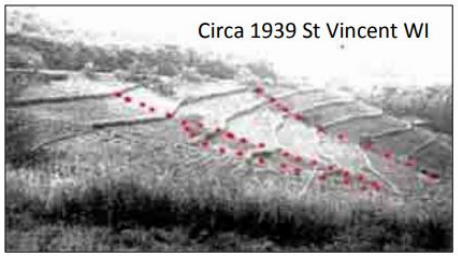
CONTRIBUTIONS OF CEPAREL'S COMPOST in BIOREMEDIATION and ENVIRONMENTAL RECOVERY: Dr. Oswaldo Luque M, created a methodology known as Biofilter and then in 2001, with the results of Dr. Paul Truong, published by "The Vetiver Network International"), incorporated vetiver grass into the process. Today known as BIOFILTER VETIVER SYSTEM (BVS). CEPAREL's compost played an important role in the environmental recovery of the Guri Dam loan site, where some 500 hectares and 600 million cubic meters of extracted material were affected. (Roger Flores, personal communication)


- BIOFILTER IN CEPAREL (inactive)


Guri´s Dam loan site.

HISTORY - VETIVER – 3000 BC to 1960s

Pre 1930s Traditional/commercial uses -- field demarcation (India, Nigeria), forage, aromatic oil for perfume industry, medicinal uses, erosion control, pan-tropical distribution.

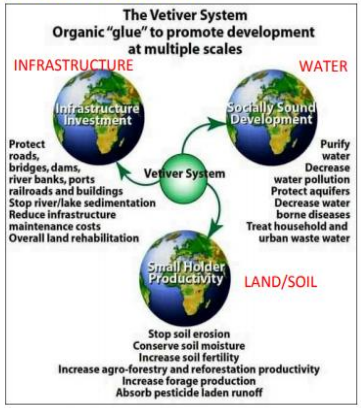


1930 – 1960s **British** colonial service "toolkit". Vetiver hedgerows for soil conservation (West Indies, Uganda, Fiji, Tanzania, Mauritius…)

Post WW II - Shift to engineered conservation structures (*TVA Effect*)
Vegetative & cultural methods "forgotten"
---- Consequences: $$$$ | disposal of water | soil health ignored

"It can take a generation or more to introduce a technical innovation…. can social media shorten that?

The story of the development and global dissemination of Vetiver Grass Technology (VGT) as a tool for climate change adaptation, and community resilience."



TECHNOLOGY DEVELOPED & EXTENDED
BY A GLOBAL COMMUNITY OF USERS & SCIENTISTS WORKING TOGETHER

including three special people
JOHN GREENFIELD (AGRICULTURIST) PAUL TRUONG (SCIENTIST),
KING BHUMIBOL THE GREAT OF THAILAND (SAW THE NEED, SUPPORTED, ACTED & LED!)

PHASE 2 - WORLD BANK - 1987- 1994
Extending to other countries – Mainly Asia

FOCUS – AGRICULTURE SOIL AND WATER CONSERVATION

Driver = Asia Agricultural Technical Division (ASTAG)

- DISSEMINATION through mainly Bank projects and processes: **India** (*Greenfield*), **Malaysia** *(Yoon)*, **Thailand** *(King)*, **China** *(WB Red Soils Project/ China Academy of Science)*, **Australia** *(Truong, Queensland Department of Primary Industries)*, **Ethiopia** *(Smyle)*, **Bangladesh & Tanzania** *(DANIDA)*, **Venezuela** *(Rodriguez/Luque)*, **Central America** *(WB/Smyle)* **Philippines** (*WB/ Gunasekera*).
- Newsletter" & cash awards for R&D;
- Vetiver research continues and expands – India, Australia, Malaysia, Thailand China
- Greenfield's farmer handbook: "*Vetiver Grass A Hedge Against Erosion (1987)*"
- US National Research Council: scientific audit (Drs. Borlaug, Lal, & Popenoe) published "*Vetiver Grass – A Thin Green Line Against Erosion*" (1993).

Dick Grimshaw on the occasion of the 40th anniversary of the World Bank in support of the Vetiver System, presented a conference on the evolution of vetiver applications over time.

The Vetiver System and its role in the Conservation of the environment, and in the Phytoremediation of Soils and Waters.

PHASE 4 - GLOBAL EXPANSION - from 2000 -2020

NEW MAJOR APPLICATION -- PHYTOREMEDIATION

- Phytoremediation applications developed (Australian/Chinese/Thai/Ethiopia research)
- Computer modeling (Truong) for small scale treatment of polluted water
- Pest control applications – Maize stem borer (2012), rice stem borer (2018)
- Social applications like handicrafts, thatching, community eco-restoration

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- TVNI website becomes important, global knowledge hub (2020 - 600,000 visits, 1.8 million pages)
- Certification of competent VGT operators
- Vetiver Tracking app (2019) developed by Thais − now switching to iNaturalist -- bigger and better/easier platform

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- Increasing involvement of private sector on all continents: bioengineering, phytoremediation, disturbed land reclamation, plant production, poverty related programs − China - Indonesia.
- NGO involvement, social groups, land care groups, networks, and more
- TVNI facebook page (2015) encourages other users to create Internet presence (41 FB pages in 2021 w/ ~20,750 members), blogs, Whats app groups, webpages.
- **Ascendency of vetiver orientated social media groups**

PHYLOSOPHY --- **"LET 1000 FLOWERS BLOOM"**

(Cover)

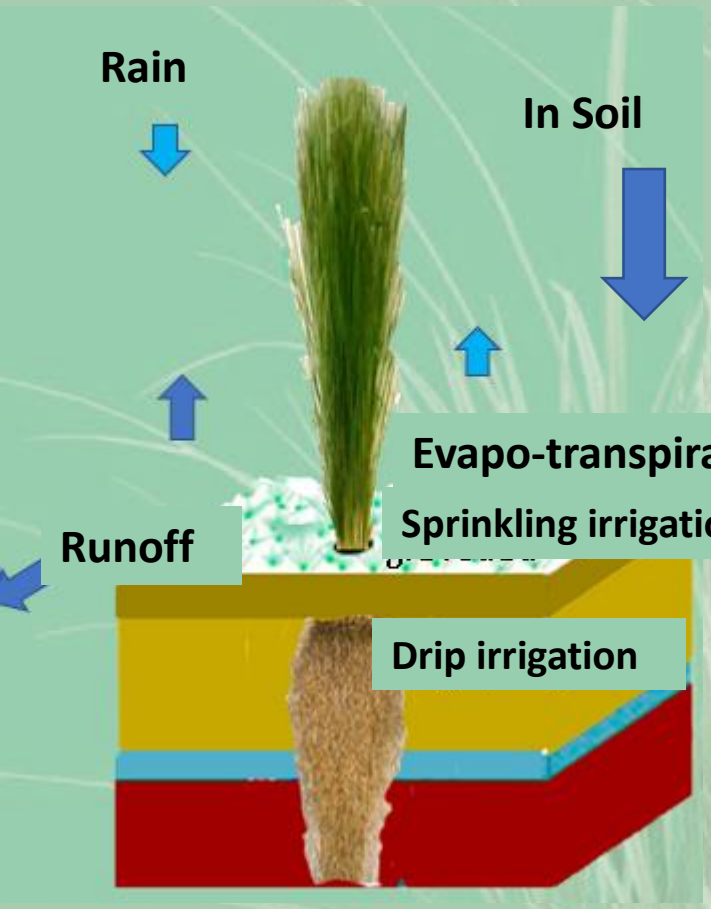
VETIVER ROOTS

THE VETIVER SYSTEM TECHNOLOGY HIDDEN HALF

Dr. Paul Truong
Technical Director
THE VETIVER NETWORK INTERNATIONAL

Dr. Paul Truong et al, for more than 20 years have conducted scientific research to demonstrate the important role of Vetiver, as a plant to phytoremediate soils and waters; on a small, medium and large scale. In two books "The Vetiver System to Improve Water Quality" and another recently published: "Vetiver roots. The Vetiver System for Technology Hidden Half" (both can be read in PDF, on page http://www.vetiver.org; He present cases of work carried out by high-level scientists, published by TVNI and in indexed journals.

Vetiver (Chrysopogon zizaniodes) as a useful plant in the PHYTOREMEDIATION PROCESS



In water

PHYTOREMEDIATION PROCESS

- PHYTOEXTRACTION (TRANSLOCATION)
- PHYTOSTABILIZATION
- RHIZOFILTRATION
- PHYTODEGRADATION
- RHIZODEGRADATION
- PHYTOVOLATILIZATION
- BIODEGRADATION

Applications of the Vetiver System in Venezuela, for Social Development and Phytoremediation of soils and waters.

Dr. Oswaldo Luque M, directed the Vetiver Project of Fundación Empresas Polar (2001-2006), Cerámicas Caribe and others, where in communities of low economic resources, a system of social, economic and ecological development were implemented. To make vetiver handycrafts and phytoremediate small water courses and deliver them clean to the environment

1


2


3


4

VETIVER SYSTEM BIOFILTER

1) Bodegas Pomar, they make wine

For bioremediation and combined phytoremediation of organic waste of non-hazardous from industrial origin, (remains of the grape, and others, (Photo 1).

2) Polar Chivacoa Food

2 a) Products not suitable for the manufacture of flours, v (Photo 2): Operational Area and vetiver rows.

(Photo 3) Vetiver wetland, to treats all runoff liquids, with excellent results

.2 b) For the phytoremediation of wastewater.

The process is complemented with floating vetiver platforms. (Photo 4).

Thanks very much

Dr. Oswaldo Luque M.
Email oluque1@gmail.com
Teléfono +58 424 318 12 20

I dedicate this Conference to Fundación Empresas Polar in commemoration of its 45th anniversaries, and very especially, for the support I received from this Organization that allowed me to generate all this knowledge and experiences in the Environmental Area in Venezuela.

18 de mayo 2022