

BIOGAS Energy & Its Natural Integration to
FARMING and **WASTE** Eco-Management
(IFWEM)

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Prof. George L. CHAN

CONSULTANT

Ministry of Agro-Industry & Fisheries, MAURITIUS

&

ADVISER

Zero Emission Research & Initiatives International,
(ZERI International), BELGIUM

The **WHOLE** Concept of **DEVELOPMENT** in
the **WHOLE** World, Rich & Poor, is **WRONG!**

The **BASIC** and, probably **ONLY** One of the Few,
EXACT Truths in **SCIENCE** is that **MATTER**
Cannot be **CREATED** nor **DESTROYED.**

YET, this Simple **PRINCIPLE** is just **IGNORED**
Every Day, in **ALL** Human Activities from Simple
FARMING to the Most Complex **INDUSTRY**, by
Almost Everybody in Every Country in the World!

DEVELOPMENT is NOW Based on :

**MATERIALS + MACHINERY &/or LABOUR
+ ENERGY + HUMAN KNOWLEDGE =**

**GOODS / SERVICES + PROFITS + WASTES
+ SQUALOUR + POVERTY =**

EMPLOYMENT + INEQUITY + POLLUTION

So DEVELOPMENT is NOT SUSTAINABLE!

DEVELOPMENT should be Based on :

**MATERIALS + MACHINERY &/or LABOUR
+ ENERGY + HUMAN INGENUITY + WILL =**

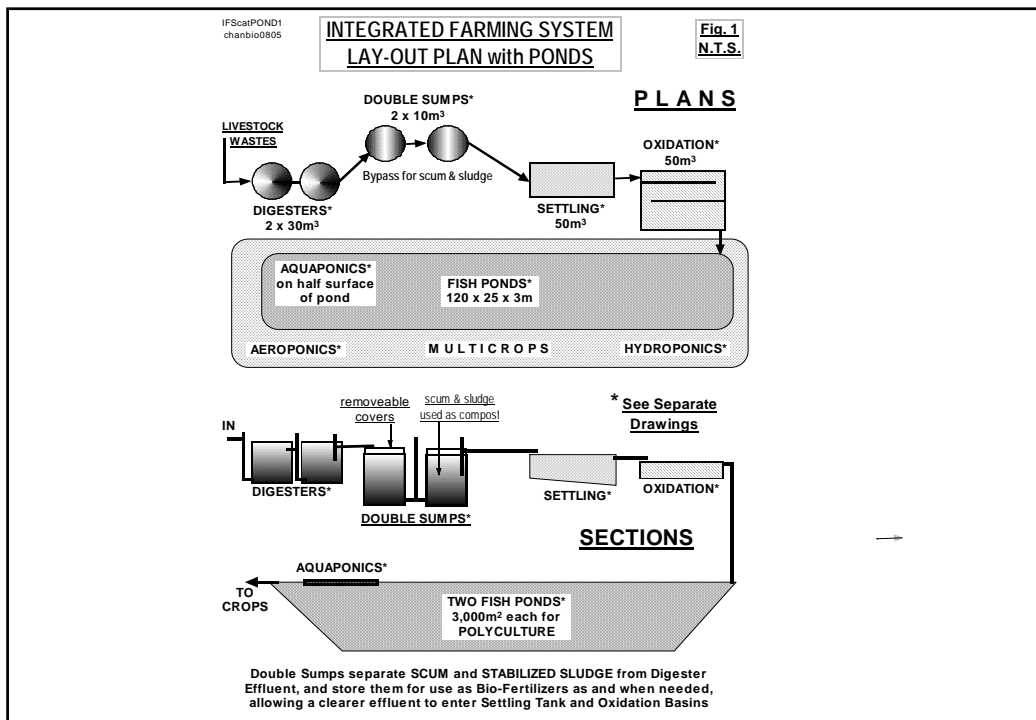
**GOODS / SERVICES + PROFITS + WASTES
+ TOTAL RECYCLING =**

EMPLOYMENT + WEALTH + EQUITY

for DEVELOPMENT to be SUSTAINABLE!

**This is WHAT the IFWEM
(INTEGRATED FARMING/FOOD &
WASTE ECO-MANAGEMENT)
SYSTEMS ARE ALL ABOUT!**

**BIOGAS Energy is ONE of the Most
Important PRODUCTS of Such
Sustainable DEVELOPMENT, Together
with Organic FERTILIZER, FEED, Raw
MATERIALS, & WATER Re-Utilisation.**



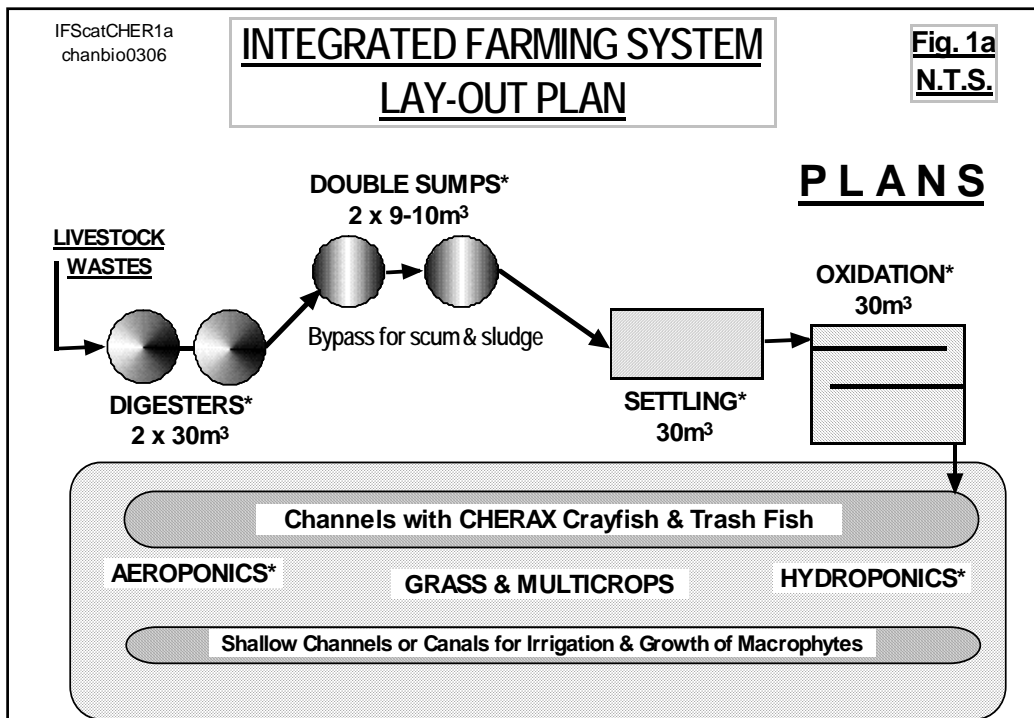
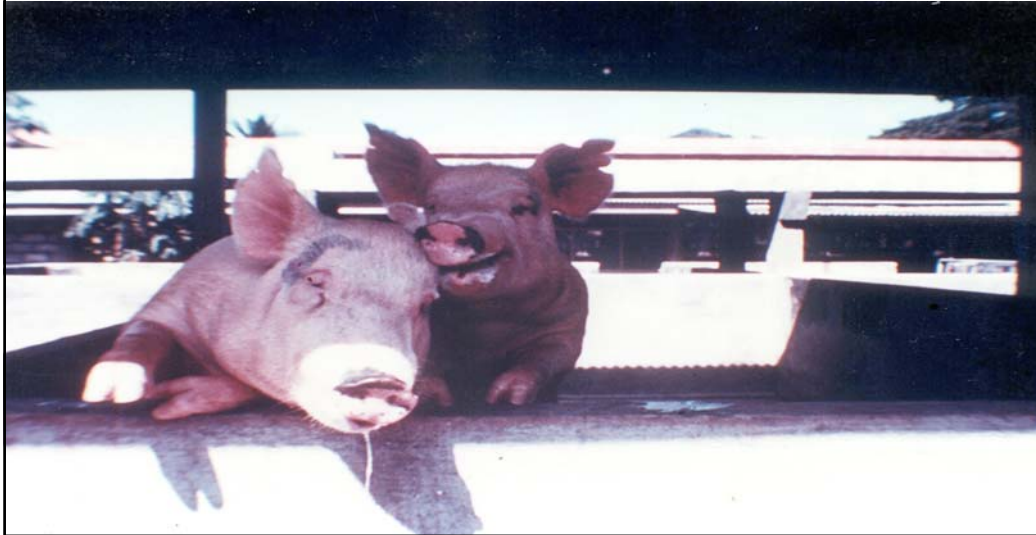
Pigs were confined to their pens and lived with their wastes during the 8 months of their lives before being washed and sent to the abattoir.



In the IFWEMS, the pigs are washed when they get out of their pens every morning, and are kept clean until they return to their washed pens in late afternoon.



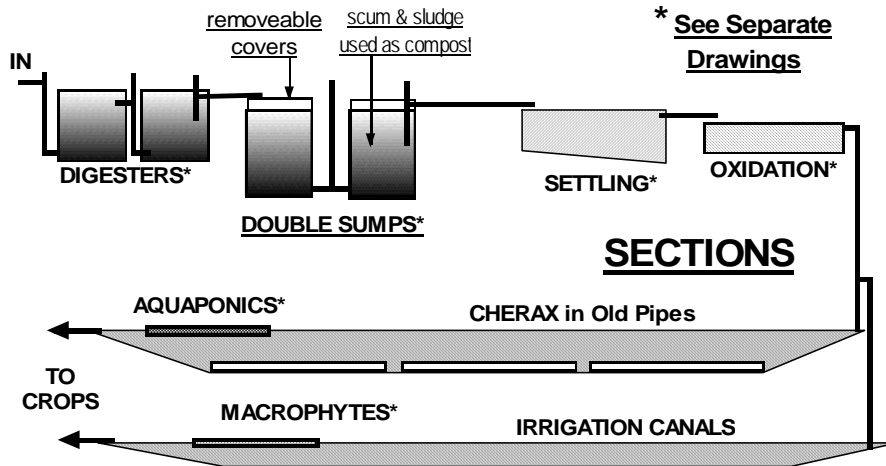
Well-fed, happy and contented pigs in a clean environment are what should result from proper animal husbandry all over the world – in Integrated Farms . . .



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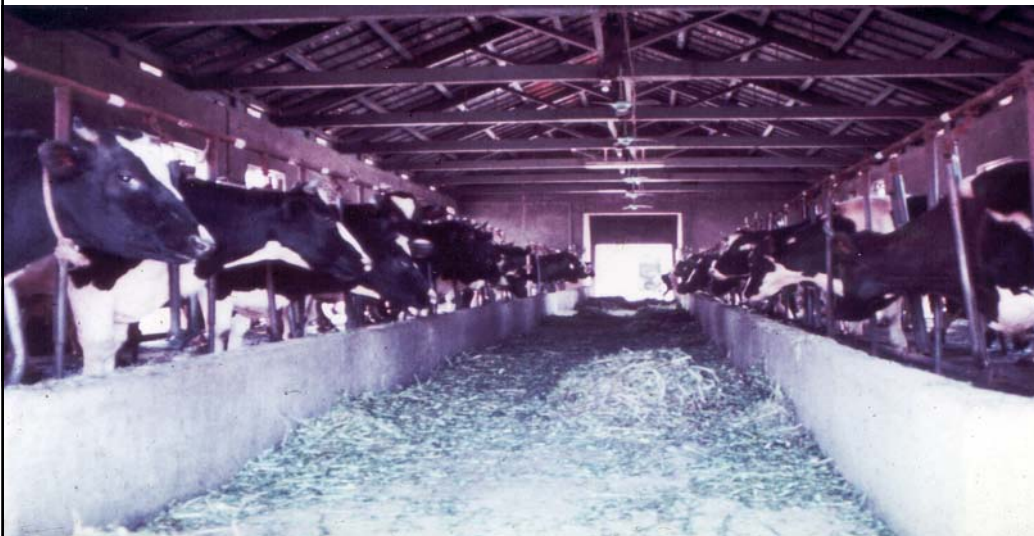
INTEGRATED FARMING SYSTEM LAY-OUT PLAN

Fig. 3b
N.T.S.



Double Sumps separate SCUM and STABILIZED SLUDGE from Digester Effluent, and store them for use as Bio-Fertilizers as and when needed, allowing a clearer effluent to enter Settling Tank and Oxidation Basins

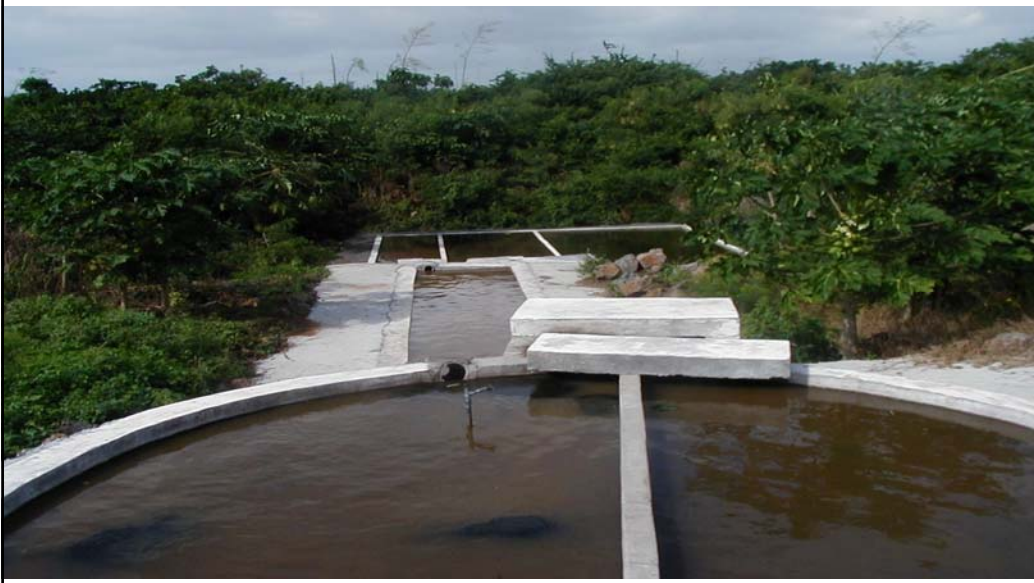
Animals and birds can do much for humanity, besides FOODS, & should be well fed and kept in clean & well-aerated pens, even if they will end up in slaughter houses.



A bull or cow produces 10 times its body weight in wastes every year as raw materials for BIOGAS energy & NUTRIENTS for fish and crops.

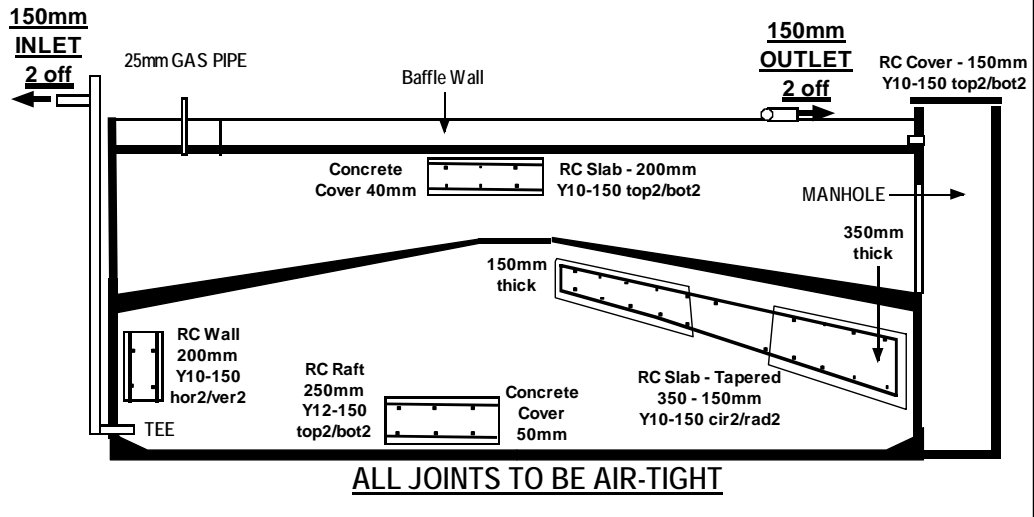


UASB DIGESTER, SETTLING TANK & OXIDATION BASINS PERFORMING WELL at BASSIN REQUIN in MAURITIUS



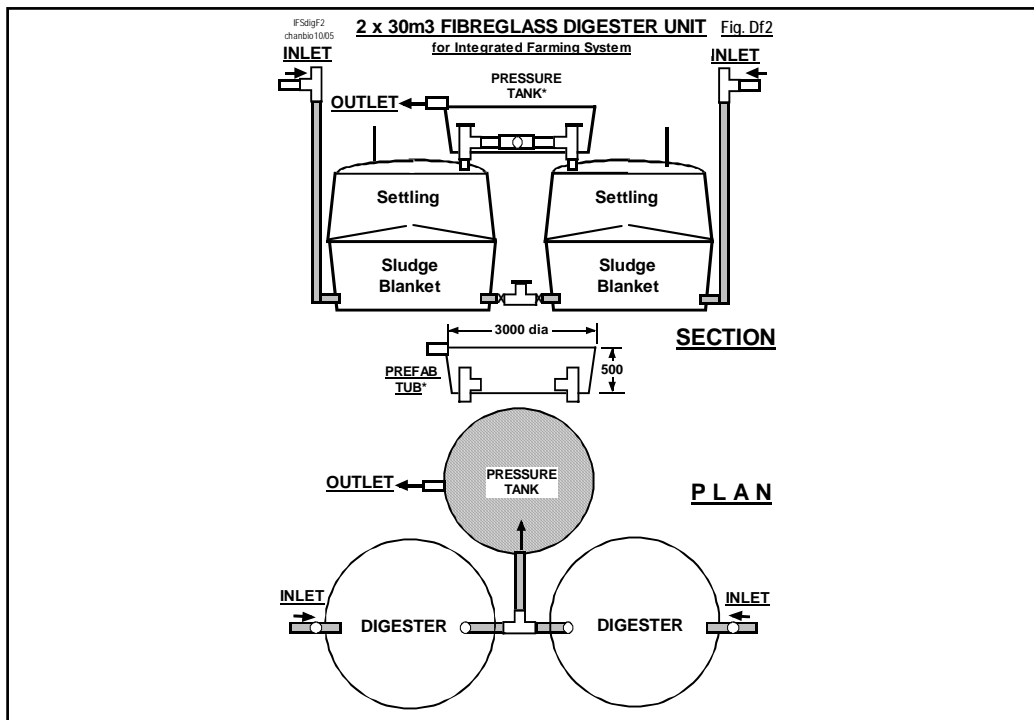
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40m³ R.C. DIGESTER **REINFORCEMENT DETAILS** **(Only main ones shown)**



Pre-Fabricated Fibreglass Digesters





WHAT IS HAPPENING INSIDE THE DIGESTER?

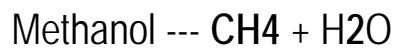
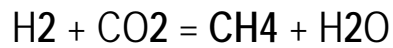
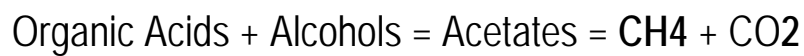
The Stable Inorganic parts, soluble and insoluble, of Livestock WASTES go through the Digester unscathed.

The Unstable Organic parts are transformed by THREE Groups of Natural BACTERIA present (Facultative anaerobes & Anaerobes in 1st & 2nd stages, & Anaerobes in 3rd Stage):-

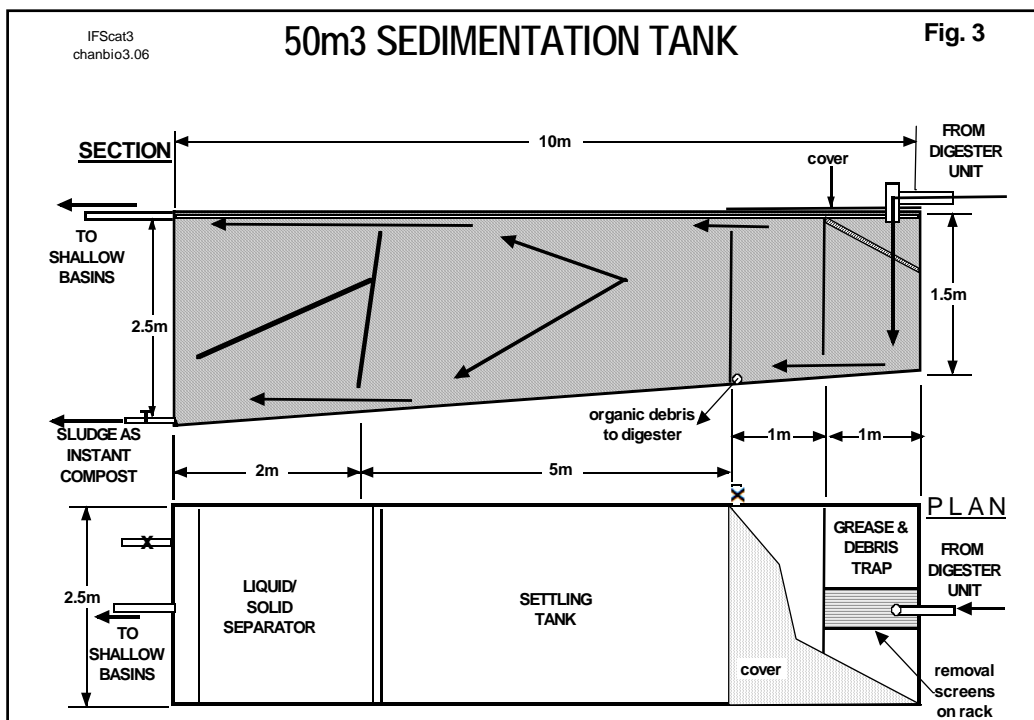
1. LIQUEFACTION – Hydrolysis and Solubilisation of the Complex Insoluble and Unstable Organic compounds, such as Carbohydrates, Lipids and Proteins, into Simpler Sugars, Fatty Acids, Amino Acids, & are Mixed with the already Soluble Organics to undergo the second stage.

2. ACETOGENESIS – Acid, Alcohol, and Acetate (CH₃COOH) Formations that include Formate (HCOOH), Methanol (CH₃OH), Methyl Amine (CH₃NH₂), Propionate (CH₃CH₂COOH), Butyrate [CH₃(CH₂)₂CH₂COOH], Carbon monoxide (CO), Carbon dioxide (CO₂), and Hydrogen (H₂). So the Original WASTES have disappeared, and replaced!

3. METHANOGENESIS – Production of Methane and Carbon dioxide as the final Products :



SO the Original WASTES are REPLACED by Other COMPOUNDS

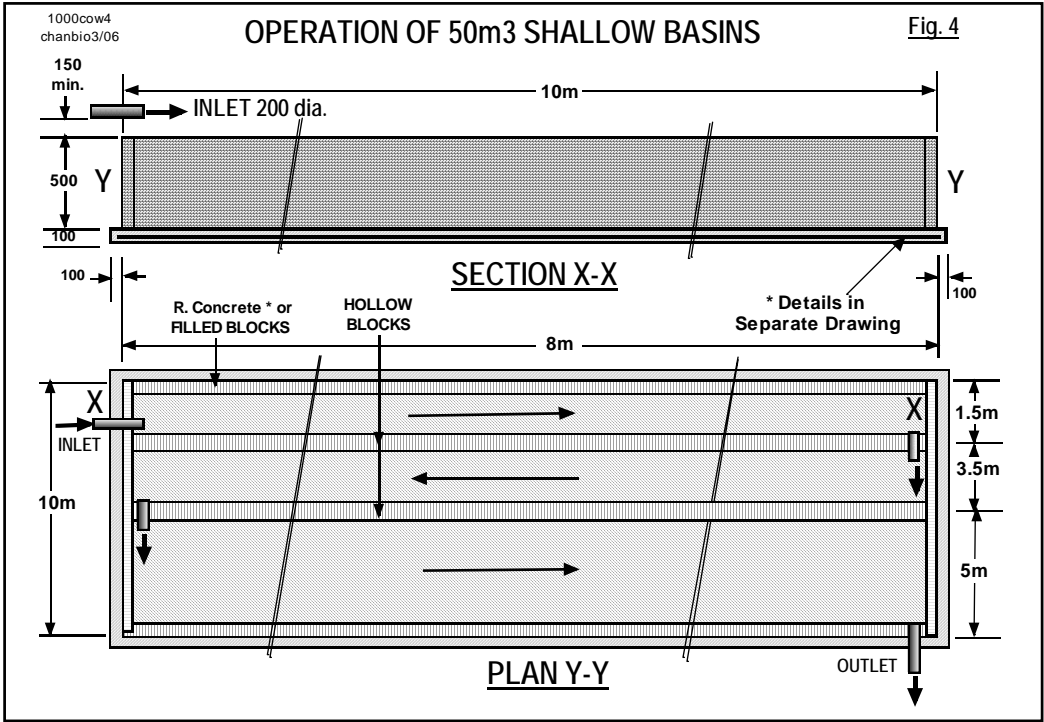


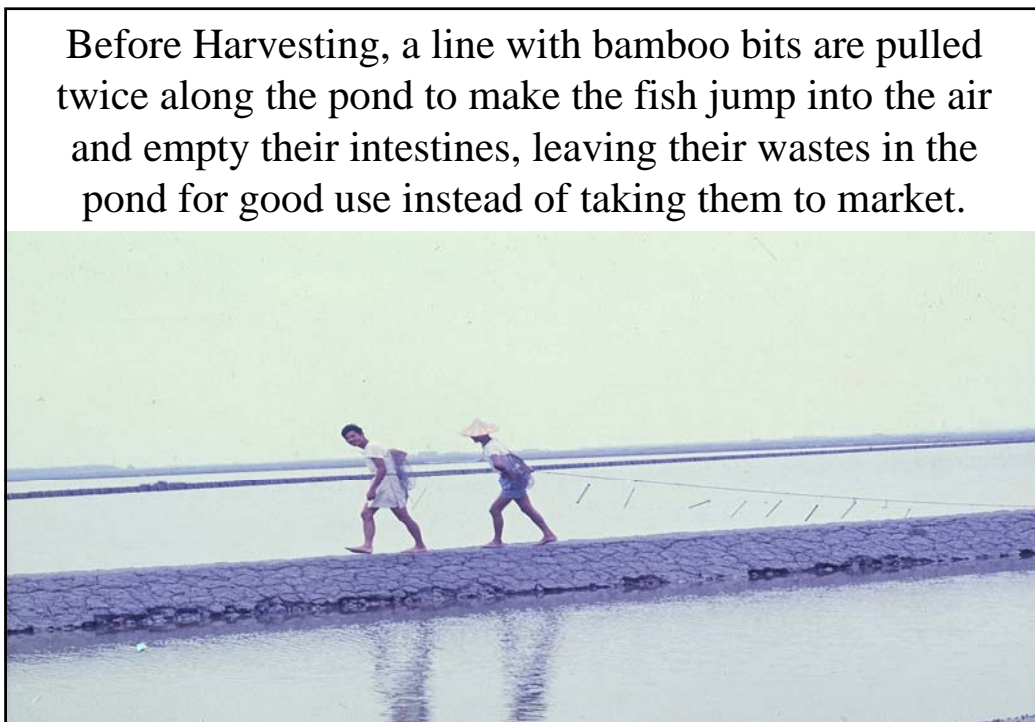
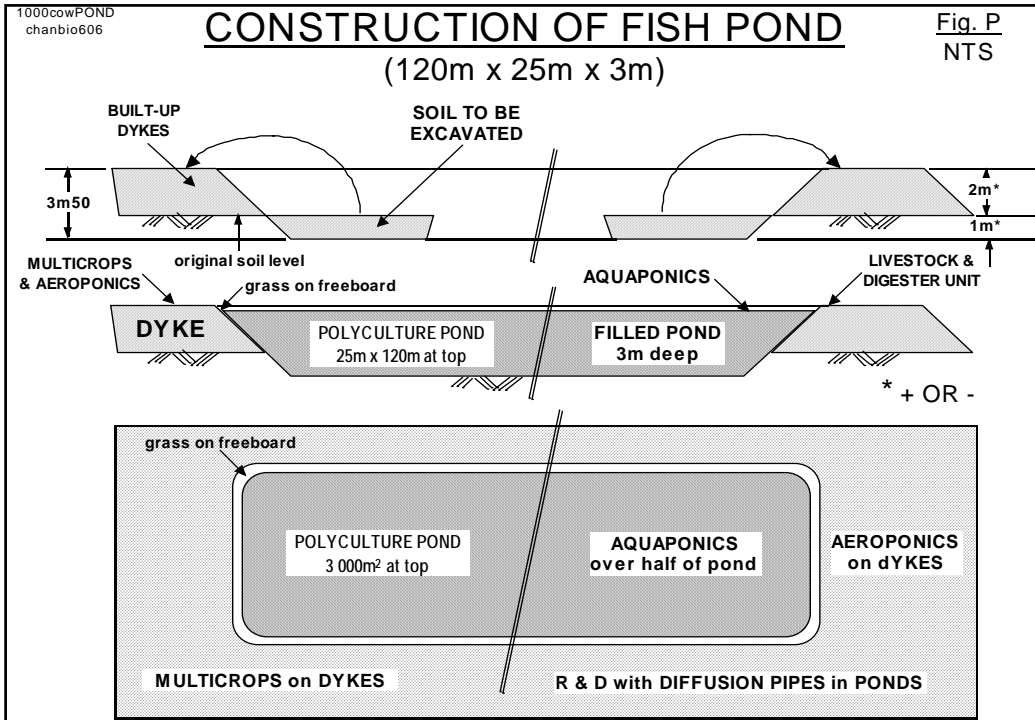
New design of Shallow Basins



Prolific culture of natural chlorella algae occurs with intense solar energy, especially in the tropics, through photosynthesis, fixing carbon dioxide from the air.







Prolific FISH Polyculture without purchased FEEDS



The big breakthrough is Aquaponic Culture of Cereals & Flowers on Polyurethane Floats on Half the Pond Surface



The same aquaponic culture is done with vegetables, flowers, fruits, etc. without any prejudice to the fish.



The dikes have also provided industrial activities, with mulberry bushes on half the area & their leaves to feed silkworms, producing 8 crops of high-value SILK yearly.



The silkworms feed on mulberry leaves, leaving the stems that are, with the silkworm wastes, also treated in the digester for total recycling.



The Cocoons are Left in the Sun to Grow



The Cocoons are then Taken to the Factory for Processing



The nutrient-rich pond water is now pumped, with free biogas, to overhead tanks and then distributed to perforated pipes to irrigate & fertilize various crops.



Napier grass and sugarcane are irrigated and fertilized at their roots **DAILY**, and grow very well without having to leave any space in between, and no excess of nutrients.



The same goes for citrus trees and other cash crops, that remain healthy, and do not attract pests which are encouraged by excess use of fertilizers & pesticides – as claimed by a French professor.



BANANA TREES are Usually Planted in **Modules** of 1-2m in order to **Share** the Available **Nutrients**. Fertilizing **DAILY** with Pond Water makes **CLOSE** Planting Possible.



The overhead irrigation and fertilization work well for leafy vegetables, with 2 kinds of seeds broadcast at the same time, one harvested 1 month & the other 2 months later.



During the cold weather, a Nylon 'greenhouse' raises the temperature by 2°C, enough for additional crops.



Simple and Low-Cost Greenhouse can be built with Bamboo and Polyethylene Sheets.



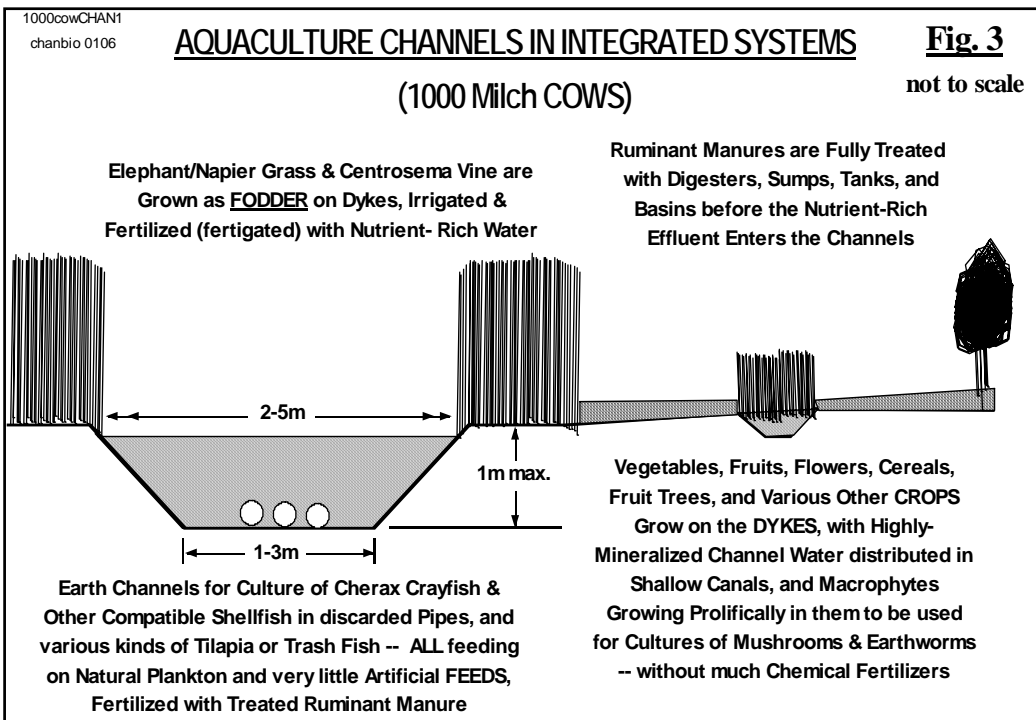
Many Cheap Greenhouses can Generate Big Profits.



Hydroponic cultures of vegetables and fruits are done in pipes at multi-levels (17 in all), with the nutrient-rich pond water circulated continuously with FREE BIOGAS



Hydroponic culture of melons is done in the same way, but the heavy melons are held in baskets attached to the roof frame to prevent them pulling the plants down.



Macrophytes are also grown in shallow channels and used as substrate for mushroom cultures, with the residues used as animal feeds, & then used as substrate for culture of earthworms as feeds.



The bags are incubated for a couple of weeks before fruiting, with the mushrooms piercing the plastic bags



The mushrooms grow well and are harvested as they become ready for the market during a few weeks.



California red earthworms (*Eisenia fetida*) are cultivated on organic household GARBAGE from a family of four, and various fiber wastes, including shredded office paper.

