SURVIVAL BY SEA WATER MOVEMENT TO SAVE THE EARTH AND ENVIRONMENTAL REFUGEES

Launched by

THE RYAN FOUNDATION
(International)

The greatest threat of the

21st Century is not war but WATER

Dr. Felix A. Ryan, D.Sc.
Consultant, Drought and Water management

We need technology to solve the problems created by technology — Javier Perez de Cuellar, UN Secretary General at the Environmental Conference, Moscow, Jan 1990.

☆☆☆☆☆

Avoid Government pipelines and help the poor help themselves

☆☆☆☆☆

Let there not be peasants without land and land without peasants.

SURVIVAL BY SEA WATER

World-wide Movement

launched by
The RYAN FOUNDATION
(International)
INDIA

on

Earth Day 1990

to

Save the Earth

Motivated and Monitored

by

Dr.Felix A.Ryan.
UN (Adviser)Global 500 Laureate
Environmental Appropriate Technologist.

Document and call for action
addressed to National and
International Governments,
NGOs & Church agencies and
Peoples of the world.

If Governments do not let in sea
water expeditiously to save humanity
from peril, the scramble for ground
water will increase, water tables will
fall further and drought, disease,
destruction and death will increase by
the turn of the century.

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SURVIVAL BY SEA WATER

Survival by sea water is a revolutionary concept of Dr.Felix Ryan, who was awarded the United Nations Global 500 Honour in 1989 for his outstanding environmental achievements in some Third Countries. Dr.Ryan who warns that the greatest threat of the 21st Century is not war but water believes that the only sensible way to save the world from a water catostrophe and expedite another development is to take sea water into interior lands by man-made canals and connect them to dry and dirty rivers as well. He explains simple methods of desalinating sea water by solar evaporation for human consumption, tapping waves for generating electricity and for lifting sea water by wind and wave power. He also points out with proven field tests that hundreds of plants and trees grow well in saline soil and sea water and indicates endless employment possibilities that inland sea-water can provide not only to relieve poverty and hunger but also to restore sick ecology and environment back to good health; arrest pollution, help formation of Ozone gas by promoting mangroves and saline soil-trees, promote inland water transport and by all these approaches also keep down the rising sea level and save several countries such as Bangladesh and Maldives being submerged in the sea by the turn of the century or so, as feared by Global Scientists.

Dr. Ryan cites several National and International reports, especially those of the World Bank and UNICEF, to convince that the closed system of water supply (by hand pump, windmills attached to bore pumps etc.) has miserably failed to take water to the poor but only increased corruption in Third World and wasted trillions of dollars. He holds that only the self-help open system can take water to rural people without imported machines and machine-made inputs, metals and plastics made by multinationals.

" The pledge of safe water and sanitation remains unfulfilled. Thousands of water pumps remain unrepaired due to lack of funds, expertise, capability or spare parts." (page 3,procedings of the Asia and Pacific Regional Consultation of the Asian Development Bank on Water Supply and sanitation-Beyond the Decade. June 1990) The several reports that DR.RYAN cites firmly supports his "Survival by Sea Water" movement launched on 22nd of June to mark Earth Day 1990.

This booklet which is a call for action addressed to the United Nations, National and International Governments, NGOs, rural communities and individuals is an appeal to exploit the sea on a war footing to save our planet and divert the money being spent on war and chemicals, on water and useful resources like canals. Dr. Ryan points out that the call and cry of the day is people's participation in programmes to benefit the people and the involvemet of women and children in such programmes. In the water front this can be brought about not by installing one hand pump for

ten thousand people, one windmill for hundred thousand people or one large dam for one million people but by providing just one canal; a water way through every village for a perenial supply of sea or saline water where fresh water is scarce.

The Drinking Water Decade ushered by the United Nations has miserably failed to justify the financial, technical and manpower input to produce negligible results here and there. By and large the water situation in the world today is worse than what it was before the water decade was launched. Let the United Nations declare a sea water decade now and they will see extraordinary success and people's participation everywhere and the methods of harnessig sea water for our survival is explained in this Blue print and call for action.

Dr. Ryan released in 1988 his booklet "Pumps without Water", as a prelude to launchig the movement to exploit sea water and a companion to the movement entitled "Water Management in Homes and Villages". For these publications, contact: 1) Ryan Foundation (International), 8 West Mada Street, Srinagar Colony, Madras 600 015, India, 2) The other India Book Store, Above Mapusa Clinic, Goa, India or 4) any leading Book shop in your country.

* * * * * *

Our progress towards health for all by the year 2000 can be made possible only if rural people take over the responsibility of water supply and sanitation as in the past.

In 1972 Paddock and Paddock wrote their book, "We don't know How - An Independent audit of what they call success in Foreign Assistance, and these authors Concluded that aid agencies tend to reinvent the wheel, build myths about the achievements of their own performance, and had amazingly short institutional memories. In other words, they were not learning form experience". This is very true in particular in the water front.

The Ryan Foundation
thanks Miss. Rosalind Alphonse
for typing this script
and Miss. Catherine Joseph
for editing this booklet.

First Publication : July 1990
Second Publication (Revised) October 1990

GRAVITY OF THE PROBLEM

As a prelude to this call for action four journal reports of internationally known water experts or agencies are reproduced in the initial pages to highlight the water problem threatening our planet - with courtesy to the authors and the journals.

1

Water Scarcity A Major Threat, Says Study

R. Chakrapani
Washington, December 14th, 1989

A creepig water scarcity threatens the world engulfing ten countries of North Africa, tens of thousands of villages throughout India and 50 cities in China according to a World Watch Study released here. Water shortage will also create problems for Mexico, West Asia, Soviet Union and the United States.

Egypt will be the worst-hit and its water supply problems could worsen from as early as 2000 AD when the bounties of river Nile will dwindle.

The report prepared by a team headed by Vice-President, Ms. Sandra Postel, attributes the impending water scarcity to a "confluence of forces such as poor water management, water logging and salinisation of soil, precarious fall in water tables and worsening environmental damage caused by greenhouse effects.

> Appropriate Technology is "Community-can-do-it" technology that is suitable to provide basic needs and opportunities for people of all strata of society of the present and future generations.

An obvious implication of the water shortage will be its adverse impact on food supplies."As world population grew by more than 3 billions over the course of this century the spread of irrigation became vital to meeting food needs", Ms. Postel told newsmen." But now crop shortages may follow on the heels of water scarcities rapidly emerging in many regions."

Focussing the nations like India and China the report identifies two major problems-spread of salinity and fall in water tables.

In India salinity is reducing yields on some 20 million hectares while an additional 7 millions have been abandoned as salty wasteland. India faces the worst salinity problem in the world's irrigated land damaged by salinisation. China has about 7 million hectares of saline and alkaline agricultural land.

Regarding drop in water tables the report says that situation is serious in India and China.

Heavy pumping in portions of Tamil Nadu had led to decline in water tables by 25 to 30 metres in a decade. In Gujarat overpumping by irrigators in the coastal districts has caused salt water to invade the aquifer, contaminating drinking supplies.

In China, groundwater levels are falling up to a metre a year in northern parts.

Another region threatened by water shortages is North Africa with Egypt called upon to bear the heaviest brunt.

Egypt's 55 million people are almost solely dependent on Nile. Its burgeoning population, drinking water and food needs are rising rapidly. Water demands will most likely exceed the available supplies within a decade. Egypt's water problems will escalate sharply when Ethiopia which controls the head waters of 80 per cent of the Nile's flow, implements its plan to divert more water to meet its national requirements. There is no "quick fix" to solve water problems says the report."Transforming crop production into a water-thrifty but still highly productive enterprise is a monumental task.

HINDU-daily paper of India,15-12

2

Worsening water crisis in West Asia

ALREADY plagued by economic woes and sectarian conflict West Asia is facing an imminent new danger that could plunge the region into famine and war. Water resources historically in short supply are on the verge of being overwhelmed by runaway population growth, placing a huge strain on fragile political and ecological systems.

This issue could decide the fate of the region, says Mr Usama al-Baz, senior advisor to Egypt's President Mr. Hosni Mubarak. "If the water problem is not solved you will have famine and this will destabilise big countries, and instability will move to neighbouring countries".

Experts attribute the gathering crisis primarily to the pressures of population growth, which have stretched available resources to the breaking point in the region's three main river basins — the Nile, the Jordan and the Tigris-Euphrates. Unless population growth rates, now averaging three per cent in West Asia are curbed, excess population will wipe out all projected gains in water development and conservation within 30 years. If conservation efforts falter, the crisis could come much sooner.

Worsening water shortages are also a function of climatic changes that have intensified drought cycles and of inefficient water management, In Saudi Arabia, for example, irrigation for growing wheat, Which the country could import far more inexpensively, could deplete underground acquifers — the source of 90 per cent of the kingdom's water within 20 years.

Experts warn that in the foreseeable future there will be no panacea in dealing with the impending water shortage. Desalinating sea water for mass irrigation will remain prohibitively expensive until the technology is advanced and energy costs are lowered by breakthroughs in solar energy or nuclear fusion. Impressive recent advances in biotechnology which have produced more water efficient crops are not keeping pace with growing food demands.

The growing likelihood that water disputes could fuel regional tensions stems from three factors.

— Fifteen nations now compete for the dwindling resources of the Euphrates, Jordan and Nile each controlled by a non Arab state (Turkey, Israel and Ethiopia).

— Because of existing political tensions none of the three basins is governed by a comprehensive water-sharing agreement.

— International law which is contradictory, has not provided a clear basis for such agreements.

Throughout the region water is replacing oil as the most prized and contested commodity.

Since the days of the pharaohs, life along the Nile has conformed to the inexorable cycles that ensured an eventual flood after every drought. But for reasons that remain unclear, the amount of water in the Nile has decreased over the past century, according to a study by Princeton University expert Mr. John Waterbury.

Elsewhere in West Asia, Turkey's plans to tap the Euphrates for its massive south eastern Anatolia development project have sounded alarm bells in Syria and Iraq, which both rely on the river for agriculture and power generation. Competition over the Euphrates could exacerbate existing tensions by raids on Turkish territory by Kurdish guerillas operating from Syria and Iraq.

The biggest problem lies in the smallest river basin, the Jordan, where competition for water resources between Israel,Jordan and Syria has already led to bloodshed and now threatens to put peace between Israelis and Palestinians living in the occupied West Bank and Gaza Strip beyond reach.

Experts say the incipient water crisis could serve as a catalyst for political cooperation, spurring the fractious nations of the region to find ways to develop and share common water resources. But if water is the best way to peace, it could also prove the shortest route to conflict in a region already beset by old feuds and now armed to the hilt with sophisticated weapons.

In Jordan, where talk of a water shortage is in the present tense, demand is already outpacing supply. Under an unratified river-sharing plan brokered by the Eisenhower Administration in 1953, Jordan was to get a 275 million-cubic-metre annual share of the Jordan river, enough to irrigate thousands of acres in the fertile Jordan Valley. But Israel and Syria, the Jordan River's two other main users, are taking more than their share, leaving Jordan with less than half that amount. With its nonrenewable aquifers being overtapped at a rate of 15 per cent a year the Hashemite Kingdom is on the verge of a critical shortfall.

To avoid a projected 50 per cent water deficit by the year 2005, Jordan is counting heavily on a joint project with Syria for construction of the Unity Dam at Maqarin on the Yarmuk, the only untapped tributary of the Jordan. But the project has been delayed for years because of Israel's objection that the dam will cut into its fair share of the yarmuk.

Meanwhile, Syria is planning to use a series of seven small dams to divert Yarmuk water upstream because of the extra demands Turkey is placing on the Euphrates.

With its 55 million people entirely dependent on the capricious offerings of the Nile, Egypt is more vulnerable to water shortages than any country in the region.

During the Eighties, Egypt was placed on notice by the worst drought in a century. River traffic was stranded, water and power rationed,and the country's strategic water supply, trapped behind the giant Aswan High dam, reduced to 20 per cent of capacity.

The country was saved by good rains upstream in the Ethiopian highlands last year. But with a million new mouths to feed every nine months, and with drought cycles growing longer and more frequent the respite is only temporary with virtually no rainfall. Egypt relies on the Nile for agriculture industry and domestic use - **Chritian Science Monitor.**

3

Crisis on Tap: A World Running Short of Water

Sandra Postel

Parakrama Bahu, the Great, 12th Century king of Sri Lanka, set the ultimate standard for water engineers: "Let not even a small quantity of water obtained by rain go to the sea without benefitting man."

But now the limits to Parakrama's vision are swiftly coming to light. Exhausted rivers, falling water tables and shrinking lakes testify to worldwide human abuse of water resources. Regional shortages are cropping up around the globe, and the threat will certainly spread if demand continues to escalate at current rates. Emerging scarcities will force hard choices and a shift in priorities.

The outcome of such choices will produce no winners until we begin to bring human wants and population size into line with the natural limits of water resources. Meanwhile, the question for many parts of the world is not if a crunch will come but when.

The next war in our region will be over the waters of the Nile, not politics. says Boutros Ghali, Egypt's minister of state for foreign affairs. Israel's Meir Ben Meir, a former head of the agriculture ministry agrees: "If the people of the region are not clever enough to discuss a mutual solution to the problem of water,war is unavoidable."

Nowhere are conflicts over water potentially more incendiary than in the arid Middle East, where three river basins form the backbone of water development efforts: the Jordan,the Tigris-Euphrates and the Nile. Usage has nearly reached the limit in two of the three, and contentious political relations have thwarted efforts to reach water-sharing agreements. Yet the region has some of the highest population growth rates in the world and a climate that makes food production heavily dependent on irrigation. While Israeli farmers are among the most water-efficient in the world, in little more than a decade, the country's available supplies could fall 30 per cent short of demand.

Under the most optimistic assumptions - including nearly a ten per cent increase in water supplies from completion of a joint project with Sudan - Egypt appears headed for crisis. In a land where rain is scarce, 55 million people depend almost entirely on the waters of the Nile, none of which originate within the nation's boundaries. Its population leaps by one million every eight months, and with virtually no additional sources to tap, Egypt has no choice but to squeeze more out of its existing supplies by upgrading and better managing its irrigation systems.

China Daily reported last May that Beijing's two main reservoirs were diminishing rapidly. Water tables beneath the capital drop one to two metres per year, and a third of its wells have gone dry. India's 835 million people face severe shortages stemming as much from gross mismanagement of its land and water resources as from nature's fickleness. By the late 1970s, the government had invested more than US$12 billion in 1,554 large dams, but deforestation has now undercut much of that effort. Denuding of watersheds causes more water to run off in floods and less to percolate into the ground.

Common to these tales of shortage is the near-universal failure to value water properly in view of its scarcity. In the western United States, an imperfect but promising remedy is catching on: water markets. This practice involves the long-term transfer

of water or water rights for an agreed-upon price. It can operate where systems of water law and allocation establish clear property rights, and has been used in various countries for hundreds of years.

By helping establish a scarcity price, markets push water toward higher valued use. Farmers in Israel, the Texan High Plains and the Soviet Ukraine have shown that water use can be reduced 20 to 30 per cent in a matter of years by adopting modern technologies and management practices. Upgrading sprinklers, recycling used irrigation water, installing water-thrifty drip systems and irrigating only when crops really need it are just a few of the ways farmers can save. Moreover, since agriculture consumes such a disproportionately large share of water in most water-short areas, freeing even a small part can cover enormous growth in urban drinking water demands.

Yet economic incentives and efficiency alone cannot avert shortages. Any hope for balancing Egypt's needs with supplies,for example, rests as much on the nation's ability to slow birthrates as it does on modernizing irrigation system. And in degraded areas such as the Himalayas, reforestation effort may be needed to restore critical watersheds. Averting outright water wars in the Middle East will require that Israel,Jordan, Syria and other neighbouring nations begin co-operating to find mutually acceptable solutions to their shared predicament.

Societies can muddle through with another dam here and a well there but only for so long. Ignoring water's natural limits will only make the consequences of overstepping them hit home sooner and harder.

Sandra Postel is Vice President for Research at the Worldwatch Institute in Washington, D.C. This is an excerpt of an article published in Worldwatch *magazine*

4

Over-exploitation of ground water

Sir, - In recent times large scale pumping of ground water is resorted to in many of our cities and towns due to shortage of surface water supply. Many authorities including social organisations and even men in public life are voicing their concern

about the risks of indefinitely continuing this exercise, particularly about the depletion or complete drying up of the underground resources due to insufficiency of recharge. But, there is yet another possible danger from over exploitation of ground water, that is the land subsidence which does not appear to have received much publicity in our country.

There are reports to show that in a number of cities in different parts of the world land subsidence has taken place due to large scale extraction of groundwater. Among them may be mentioned, Bangkok in Thailand, venice, Milan and Pisa in Italy and Nagoya in Japan. In Bangkok, for example, a recent study indicates that excessive exploitation of ground water in the past 30 years has caused frightening land subsidence resulting in flooding and waterlogging problems and damage to buildings and other infrastructure. Wherever it was possible to cut down the pumping of groundwater the subsidence has stopped and in some cases even rebound of surface has been noticed. Wherever it was not possible to completely ban ground water pumping due to shortage of surface water supply, artificial recharge is contemplated as a supplemental remedial measure.

No subsidence studies appear to have been done in our cities so far, except in coal mining areas. However, it appears there are some visible impacts of subsidence in Calcutta, such as tilting or settlement and cracking of some building, creation of water-logging problems in some areas etc. Unless systematic subsidence studies are conducted, nothing definite could be concluded and remedial measures taken. It is not known if such studies are done or contemplated in Calcutta. Similarly, in our big cities, like Bombay,Madras, Bangalore, Hyderabad etc and in other cities and towns where there is large scale pumping of ground water, such studies are called for to avoid possible future hazards. Necessary knowhow for carrying out subsidence studies is available in our country with the Central Mining Research Station. Dhanbad (Bihar), the Banaras Hindu University, Department of mining, and perhaps a few other Universities and institutions concerned with land subsidence in coal mines.

It is needless to emphasise the advantages of taking timely precautions in these matters, in the larger interest of protecting the community from further environmental disasters. It is hoped that the metropolitan authorities and other concerned would take note of the problem and initiate necessary timely action as the situation demands. H. S. Bhat, Formerly chief Engineer, Karnataka Government.

Reproduced from the HINDU dated 26th July 1990.

5

A Third of the World's arable land is threatened by desertification - REFUGEE (United Nations) March 1990

ABSTRACT

Water is getting more and more scarce in our planet and by the turn of the century civil wars will be fought for drinking water leaving the world face a grim picture. The best solution is to exploit the sea,this should be done with Government sanction,help and small investment by rural communities. National and International Governments and multinationals will have to provide the infrastructure for villages far away from the sea by providing sea water canals, deepening catchment areas and taking the sea water from one village to another which is much easier and less expensive than laying railway lines and roads as these canals do not need foundation and brick and mortar work.

In certain types of soils sea water stored in lakes lose salinity or salinity is reduced in course of time. Several plants and trees grow in sea water and saline soil and there are plants, weeds and trees with many uses that grow completely submerged in sea water as identified by the USAID, Ryan Foundation International and other agencies and thousands of industries can be started based on them. Fish, crabs, turtles etc. may also be promoted and exploited for providing food and jobs for millions in every country and several by-products can be developed for income generation.

Ryan Foundation has devised a low cost table-model still to desalinate sea water which rural families can afford. Humanity can be saved from peril only by exploiting sea water. Ways and means are explained in this blue print.

6

Introduction

There are many ways of developing, conserving and managing drinking water in rural areas but the fact remains that ground water and rain water is getting scarce, level of under ground water is falling badly and deep bore wells are sucking saline water. As a result polluted water borne diseases are increasing. National and International Governments have been trying out methods of combining oxygen and hydrogen

to produce water and converting sea water by the reverse osmosis process. These methods are very expensive, cannot be taken to rural areas and cannot benefit the poor.

When bulk of our planet is made of water it is not proper or fair to ask the poor who don't have money to buy half a morsel of rice to pay for drinking water. Ever since Adam, water has not been a priced commodity and it should never be priced. If some Governments or Corporations sell water for drinking and cooking, besides charging for supply services it is unfair taxation and a criminal violation of human right.

We shall examine how sea water can be exploited and taken to interior inlands and rural settlements with small decentralised investment. We shall in particular, examine how National and International Governments and multinationals can Co-operate, encourage and provide the infrastructure with small investments where necessary, for rural communities to help themselves with abundant water. Obviously, this is by channalising sea water to rural and drought prone areas and teaching people very simple ways of desalinating sea water.

We shall also explain the best methods of lifting saline sea water to over-head tanks from which water can be supplied to homes and settlements at no cost by local self Governments or village administrative committees in the light of the fact that metallic and plastic handpumps and windmills fail within a few months after they are commissioned as investigated and published by the Ryan Foundation citing authentic reports including UN reports.

7

Wind Pumps Fail

Bore pumps connected to windmills are short lived not because the wind does not turn the blades but because the pumps don't work. Either there is blockage or breakage in the pump or the worn out washer is not replaced and remote villagers have neither the money nor the knowledge to maintain windmills or bore pumps. Therefore, millions of windmills all over the world stand like skeletons of dead giants.

The Energy Development Corporation of the Government of Tamil Nadu gives free to farmers windmills each costing about Rs.22,000/- and scores of them can be seen along the sea shore on the way to Mahabalipuram from Madras. An indepth

investigation by this author revealed that almost all of them were defunct or most unproductive. The sails go round without pumping water and yet their owners are made to pay maintenance charges every year.

The Special issue of the UNDP Centre on Small Energy Resources (No.12 of August 1988) reports the performance of windmill pumps as under,based on the information provided by D. Lovejoy, Inter-regional Adviser, United Nation Department of Technical Co-operation for Development, USA.

1. "Egypt - some 2000 windpumpers were installed in the 1960s along the mediterranean coast, west of Alexandria, mostly imported but with some local manufacture. They have been largely displaced by rural electrification."

2. "Kenya - some hundreds of imported windpumpers were formerly in use."

3. "Mauritania - Many Windpumps were installed in the past but most are no longer functioning."

4. "Morocco - some 5000 equipments were installed from 1930 to 1960, mostly imported but with some local manufacturing. Most have fallen into disuse, being replaced by gasoline and diesel pumps."

5. "Nigeria - some windpumpers were formerly installed in the north but most have fallen into disuse."

6. "Senegal - Many machines were installed in the past but they have largely fallen into disuse."

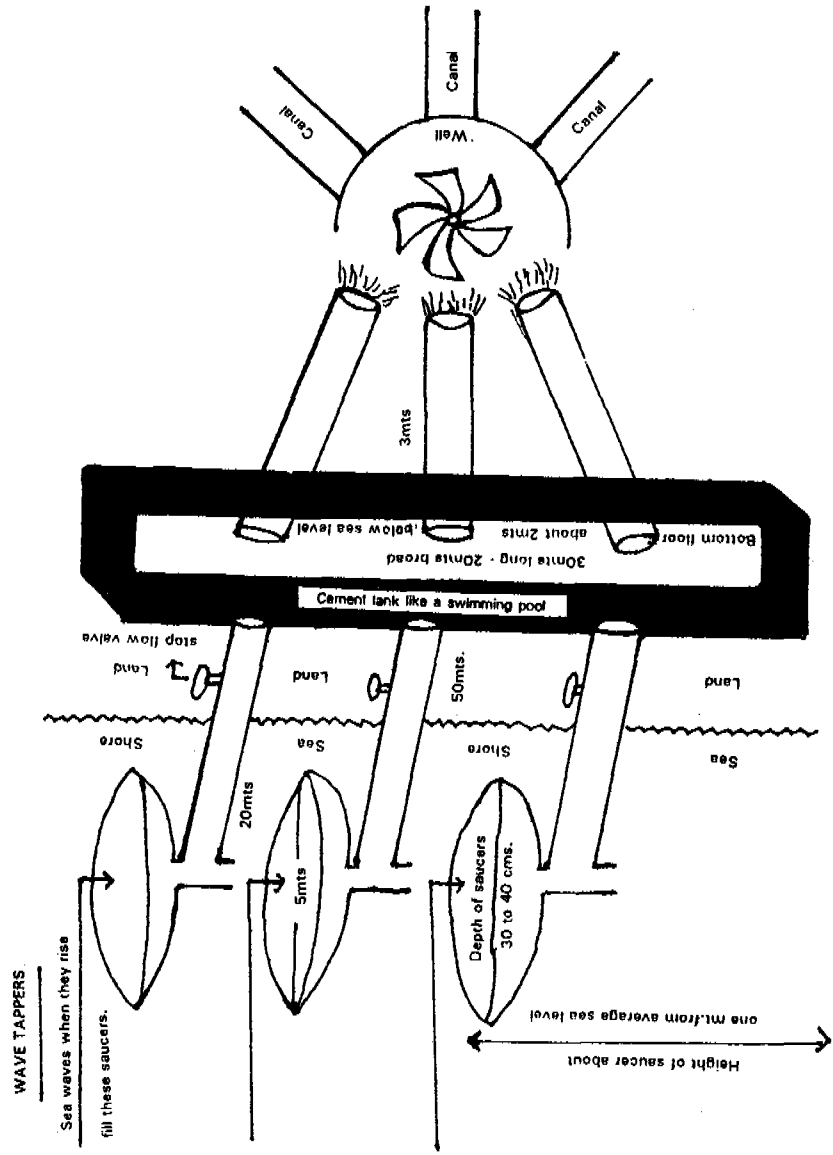
7. "Somalia - with very favourable wind conditions, some 2000 imported machines were installed before 1940. They have virtually all ceased to function through lack of maintenance."

8. "Sudan - more than 100 windpipers were installed in former times; although most have fallen into disuse."

9. "Tunisia - some 1200 equipment were formerly installed. Most have fallen into disuse."

The report also reveals that it costs about US $ 5740 to instal one windpump in a country like Cape Verde out of which US $ 2240 is on imported parts(prices relate to 80's).

Dia. 1


Canal
Canal
Canal
Well
3mts
Bottom floor
about 2mts
below sea level
30mts long - 20mts broad
Cement tank like a swimming pool
stop flow valve
Land
Land
50mts.
Land
Shore
Sea
Shore
Sea
20mts
5mts
Depth of saucers
30 to 40 cms.
Height of saucer about
one mt.from average sea level
WAVE TAPPERS
Sea waves when they rise
fill these saucers.

9

Channalising Sea Water

During acute drought the British who ruled India made villagers dig a canal called the Buckingham canal connecting the Andhra coast to the Madras coast which is 420 Kms long, the canal was made navigable by steam and country boats and the banks of the canal was humming with activities at that time. From this canal water used to be taken to drought ridden villages by small outlets dug by village communitie for their own benefit and survival. They fished and farmed on saline soil and also processed their by-products. All this has been abandoned now in south India but there is a move to restore this canal and bring it back to life. Similar man-made canals may be dug in many countries with filter and sluice (lock) arrangements on either side of the canals, and inbetween as well, to wet dry and drought ridden soils.

In many cities and towns and villages inland waterways, rivulets and streamlets are dry and dirty and the bottom line of most of them are below sea level or more or less in level with the sea. They may be deepened in suitable places and connected to the sea with underground pipes or open cut canals with flow control system. From these canals feeder outlets may be provided to nearby villages and the sea water stored in dry ponds and catchment areas and lakes. Storage tanks of one village may be connected to tanks in adjoining villages by cutting narrow open canals which will be maintained by rural communities. As copious water will always be flowing in and out, maintenance will be easy and the water will not get polluted even if livestock are washed in the canals. In fact, it is healthy to wash livestock in sea water.

10

Lifting To Overhead Tanks

Lifting sub-soil water by hand pumps and wind mills and lifting ground water to overhead tanks by mechanical or electric devices have not been successful in rural areas of very poor countries (Felix A. Ryan 1988-Sanchar kendra, India) The failure is due to corrosion, lack of maintenance. want of spares and in particular, to drought and falling of water tables. Handpumps work well only when they are new and go out of use, get abandoned or stolen, within a year as investigated and reported in "pumps without water".

Most of the wind-mills to pump sub-soil water have also proved a failure as reported by water experts from so many countries in international conferences as cited earlier. Moreover, sea water will corrode metal and therefore metal pumps and windmills should not be used.

What really works trouble free and can be easily maintained by rural communities is lifting water from open wells, canals and catchment areas by fibre ropes and canvas or flexible plastic buckets and this system is cheap as well and can be constructed and maintained by village communities without having to depend on external aid. Constructional details are explained in dia 2,3,4. From overhead tanks water can be taken to door steps of huts by rigid earthern-ware pipes or flexible garden hose or bamboo pipes.

They can also be taken by narrow streamlets inside the village and every family can take its own connection. Any amount of evaporation and seepage will not empty the sea.

11

Wave Tappers

Wave tappers are a row of two, three or four large concrete saucers of 5 mts. dia mounted one metre above sea level on concrete pillars some 50 metres away from the sea shore. The saucers are connected by pipes to a shallow tank,bottom of which is about 20 cms. above sea level. As the waves rise in the sea they fill the saucers and flow into the tank. There may be a 3 or 4 metre deep well in proximity; the tank inside which a mini generator may be set. one pipe from each saucer may be laid to drop the sea water on the generator to produce electricity. The water accumulating in the tank may be led through open canals into villages. This method is explained clearly in dia 1(page16)

Ryan Foundation has invented another system which lifts sea water into overhead tanks to a height of about ten metres by sea wind-power and from the tank water is chanelled and taken to villages. See "Pumps without water" by the author. Publisher: Satprakashan.

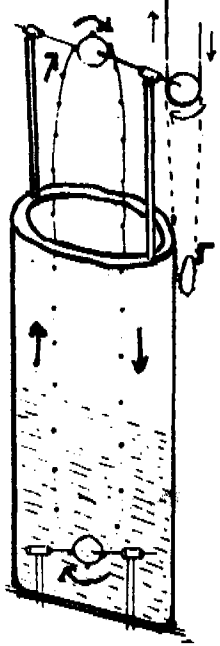
12

Saudi Method

Sea water is being converted into fresh water on a large scale by solar power north of Jeddah, Saudi Arabia, by American technology. The desalination process uses heat from the sun to produce steam. Powerful lenses are used to intensify sunlight by 40 times, and the steam is used to work machines to freeze,sea water. When sea water freezes,the salt in the water collects on the outside of the ice crystals, and the salt can be separated by washing the ice crystals in fresh water. Then the crystals are melted into fresh water. Further, research is bound to simplify this process and make it even more economical than now. Since this process has proved successful many countries are soon bound to turn to the sea for fresh water. Perhaps the hot and dry countries will be driven to resort to this system in the near future. Wind mills on the sea shore can be used to lift the water into the boilers and freezers. By installing a chain of units large extent of lands can be brought under fresh water irrigation and perhaps organic fertilizers can be mixed in the water flowing to the fields.

13

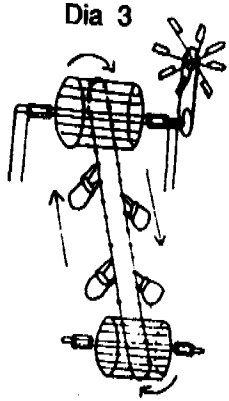
Dia 2



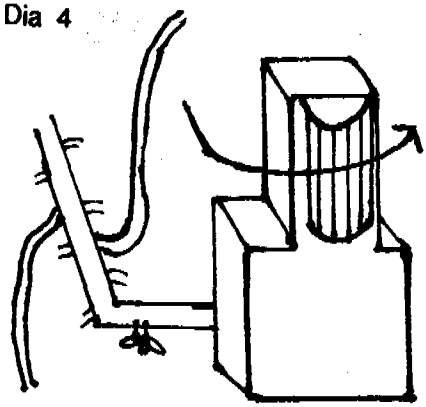
Ryan Foundation Water Lift

This is a simple and easy to maintain village mechanism to lift water from open wells, tanks and ponds on to overhead tanks. A windlass is fixed at the bottom of the well and another 3 mts above the wall of the well on pillars as shown in dia,2. Position and fixing arrangement of windlass is shown in Dia

Dia 3



Dia 4



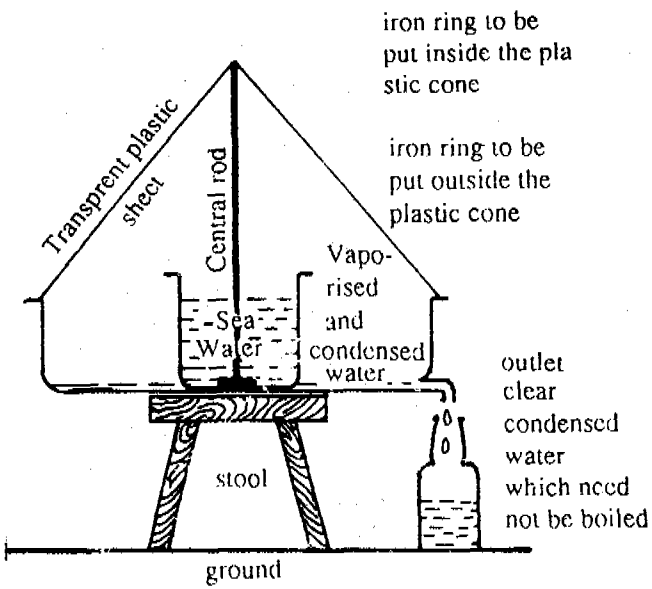
3. The axles of both are 3 cm. in dia and pass through bush bearings. The top axle attached to a pulley is connected to a wind mill as shown in Dia 3.

A long fibre rope with several knots made in it with gaps of 30 cms between knots is passed round the windlass as shown in diagrams 2 and 3. Ten leak proof canvas or car tube bag buckets each having two handles (flaps) is tied to the knots at equal distance. The tail of the 'T' shaped water tank (dia 4) projects over the well and under the top windlass. When the top axle turns by wind water fills the tank. A Verticle pipe brings water to ground and a 'L' joint leads it into a horizontal pipe laid flat on the ground. From the nipples of this pipe flexible hose pipes take water to convenient locations. By folding the delivery end of the hose pipe the flow of water is stopped.

A small pulley attached to the shaft of the top pulley is connected with a thin knotted rope to a pulley on the wall of the well with a turning handle to be used when the mill does not move by wind.

14

Ryan Foundation Still (table model)



INSTRUCTION FOR CONSTRUCTION

1. Take a large flat basin or tray-like vessel 60 cm in diametre. It may be made of mud, metal or plastic but nothing like having it in aluminium which is rust proof. If made of mud or plastic, use small mirror or plain glass sheets at the bottom of the basin and some pieces to line the side wall. Fix a small outlet pipe or tube at the bottom of the basin as shown.

2. Place a slightly smaller basin (about 55 cm

dia) inside the big. If not made of metal, this may also be lined with suitable pieces of glass or mirrors.

3. Place a wooden, non-corrosive or painted metal stand fixed to a base-plate in the middle of the smaller basin as shown; length/height of stand may be 60 cm and one cm. thick. 4) Take a thin circular transparent polythene sheet 2 mts. in diametre and put it on top of the stand which will have a nob or ring on top and allow the sheet to fall like a cone into the bigger basin touching the side wall uniformly. 5. Place one ring inside the cone and tuck the sheet (bottom of the cone) under the ring to close all gaps and air getting into the cone. 6. Before setting the still thus, fill the middle container with sea or saline water. Place the still on a stool or elevated place in the open sun and connect a rubber or plastic tube to lead the condensed water into a bottle as shown. To prevent air entering in place the other ring (59 cms in dia) outside the cone to sit on top of the ring inside the cone. The two rings should be of the same size. If some mirrors, glass sheets or shining metal sheets are available set them on a higher level and reflect the rays of the sun into the small basin.

7. Water from the small basin will evaporate, hit the plastic cone, get condensed and drip into the big basin and flow into the receiver (you may also stick silver paper or aluminium foil on a cardboard to reflect the sun)

8. One still is enough to give pure water for a small family and the water need not be boiled. Two buckets of sea water will give nearly one bucket of pure water. If sea water is used salt will stand as residue inside the small basin which can be collected and used in the kitchen.

9. Diametre of the big basin may be 60 cms and that of the small may be 55cms. . Height of the big may be 15 cms and that of the small may be 20 cms. Diametre of the outlet pipe may be 3 cms. This may be metal pipe welded to the basin or a plastic tube drawn through a hole made in the basin. (Invention by Dr. Felix Ryan). ALLEVIATE POVERTY WITHOUT DISTURBING ENVIRONMENT.

15

Recommendations

1. Further extraction of ground water should be discouraged.

2. Use of metallic handpumps and wind mills connected to metallic bore wells should not be promoted.

3. The open system of providing water and lifting water should be encouraged all over the world, especially in the developing countries.

4. Sea water must be exploited as for as possible and desalinated using solar energy.

5. Brackish water, where available, should also be desalinated in solar stills. Villagers may use the RYFO Pit still (Page 52).

6. National Governments should take sea water to nearby coastal villages with sluice and lock and filter arrangements and regulate the flow of sea into the land.

7. People should help themselves to dig narrow open canals and lead the water from one village to another.

8. Safety outlets may be provided by the people in every storage tank for surplus water to over flow into dry wastelands.

9. NGOs should help to build village community overhead tanks and wind mills with canvas bucket lifters.

10. National and International Governments should build saucer lifters and instal mini generators.

11. They should encourage multinationals to promote and maintain these systems as a service to society.

12. Ryan Foundation solar still must be popularised and every home should have one still and they may be made of bamboo, transparent plastic sheets and basin or trays made of clay or wood as far as possible. The pit model explained on Page 52 is excellent for villages.

13. More and more plants, trees and weeds that grow in sea water and saline soil must be identified and promoted to generate livelihood activities for the rural poor.

14. Fish and fish based industries such as fish meal, fish gum, fish oil,* dried fish, chicken and cattle feed, fertilizers etc. must be promoted.(when plenty of non-edible fish is used as fertilizers soil salinity is reduced and fertility increased.

15. Inland waterways transport arrangement for quick and cheap transport of fish and other rural produce and products must be promoted.

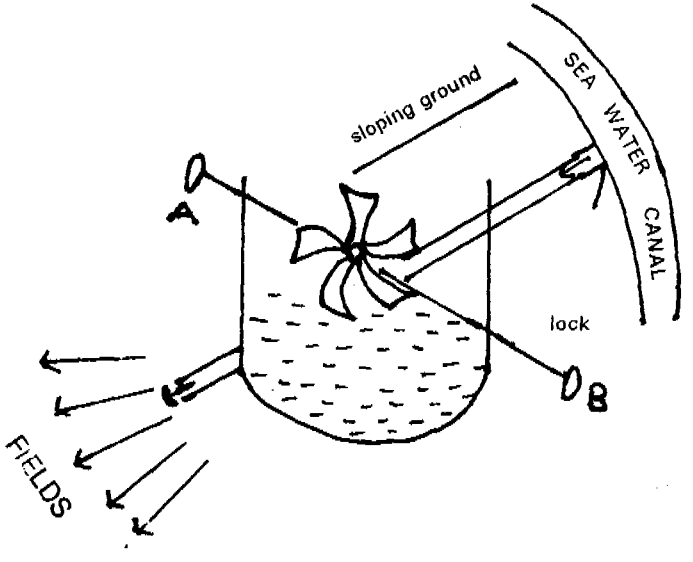
16. Governments must spend on water and not on warfare.

17. Governments should promote, rather than provide water and sanitation facilities.

16

Sea Water Energy for Grinding

Village to village sea-water canals and channels may be dug atleast one metre below mean sea level and about 5 metres broad. Bunds on either side must have a slope of 45 degrees or more to prevent slope sliding. (The main sea-water ways may be 3 metres deep and 10 metres broad to be navigable by country boats and steam launches.)



In villages where land or catchment areas lie more than 2 metres below sea level the canal and channels may be dug in high ground and through cement, earthernware or bamboo pipes water may be taken down the slope

into a pit of about 3 mts. in diametre. The length of the pipes should be atleast 10 mts so that the water flowing inside gains force.

In about half metre below mean sea level mini turbines may be erected inside the pit as shown and an outlet pipe provided below the level of the turbine for water to flow out of the pit, spread and drain into open fields and get evaporated.

Where the pipe connects the canal there may be a concrete gate with iron or concrete slab-control lock arrangement to let or stop the flow of water.

On either end of the axle of the turbine attached pullies may be connected to grinding wheels or flour mills with fibre rope belts with knots as done in Napal.

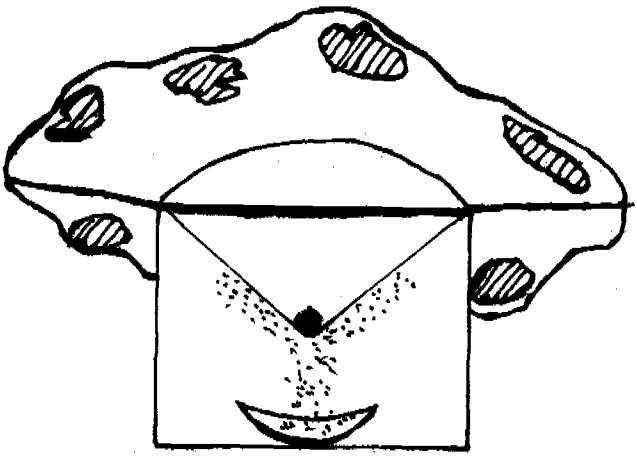
The flow gate must be opened, closed and regulated by a named person in the village for a remuneration and he should keep the grinding wheels/mills working for 2 hrs. in the evening.

With small cycle dynamos some light may also be provided in the area.

This system is possible and easy to construct where the land or catchment area is below mean sea level. If the land is not low enough, the catchment area may be deepened or the length of the flow pipe increased or water dropped through a pipe from an overhead tank holding sea water.. Such mini generators, water wheels and grinding mills powered by water from streams and rivulets are efficient and successful and can be seen in several villages in Nepal. There is no reason why they cannot be promoted using water dropping from streams and rivulets of sea water from man-made canals and tanks including over-head tanks..

The DTCD News Quarterly of the UN, reports in the 2nd Issue of 1991, " The water table in parts of South Morocco has dropped nearly 100 metres in the last 20 to 30 years. As a result of lowered water tables due to over-exploitation, pumping costs have soared, springs, streams and wells have dried up, waste lands have disappeared."

Drinking Water from Nowhere



Wherever human beings live some water can be produced from the earth but the quantity obtained will depend on the soil, the climate and the atmospheric air. Water can be produced even in the middle of deserts by the method explained here.

In a Third World village a pit of one cubic metre is enough to produce a cup of water but in a desert a pit of the same size will give only about an ounce of water because there is less water in the atmospheric air.

All that is required is a bowl or basin to be placed in the middle of the pit and a thin transparent plastic sheet as big as a bed sheet. The sheet is spread to cover the pit and then stones (weights) are put all around the pit on the sheet to hold the sheet. Before the sheet is stretched the middle portion of it should be made to sag into the middle of the pit. This is easily done by placing a stone in the middle of the sheet as shown. Sand or dug-out earth may be heaped all around the pit on the plastic sheet to close gaps and prevent outside air entering the pit.

During night the hot air inside the pit hits the plastic sheet shaped like a funnel and the cool atmospheric air of the night above the plastic sheet, and the moisture in the air inside the pit condenses and drips into the basin. In deserts day temperature is high and night temperature low and this helps condensation.

If the soil is wet more condensed water can be obtained. On the banks or bunds of sea-water canals and channels the poor can have enough and more water for family consumption and this water obtained by condensation need not be boiled. Thus, there will be saving on fuel-wood or cooking fuel. Let therefore, sea water-ways, canals and channels be led into drought ridden areas to give water for people to survive. For taste they may mix a little of salt, herbal essence, basil or cummin seeds in the water.

If sea water is made available in a village, several families will cultivate kitchen gardens and they can be taught to process and preserve fruits and vegetables. Live stock and by-products based on vegetation can be promoted to generate employment for the people. Fish and fish products can also be developed and sea water plants and saline soil trees may be introduced. Refer to the book "Plants and trees that generate employment" by the same author.

* * * * * *

The idea of self reliance is the central feature of Appropriate Technology.

* * * * * *

Conservation means utilization of natural resources in the most efficient way to benefit the greatest number of people for the longest period of time.

* * * * * *

The main engine of development is, and has always been, self-help and hard work and not aid. No amount of Government statues or legal measures can substitute for the people themselves taking up the responsibility, especially when it comes to finding basic needs of life such as water, fuel, and shelter for survival.

* * * * * *

18

Water Extractor for Desert Air (WEFDA)

By Roman Gammad S. Barba

(Barba Research Laboratories, Cataggman Nuevo, Tuguegarao, Cagayan, Philippines.

Filipino, born February 23, 1941. Inventor-researcher, owner of Barba Research Laboratories Educated in Philippines, B.Sc. (Physics) from FEATI University, Manila in 1964.).

The Water Extractor for Desert Air (WEFDA) is a machine designed to provide potable water for human use, agriculture and industry. It can range in size from that of an ordinary refrigerator to massive superstructures covering several acres of desert land.

In essence, it is a modern version of the ancient "air wells" (used since Biblical times), structures made of stones or rocks, erected in the desert to extract water from the air during night time, or, occasionally, during favorable day time periods.

The main aim of the WEFDA is to make the deserts of the world autonomous, habitable and productive regions.

There are two types of WEFDA machines; the domestic and the agri-industrial complex type. The domestic version is about the size of a refrigerator, and is intended primarily for the production of drinking water. Its output is about 200 liters per 24 hours, and it is powered by solar energy or desert winds, or electricity if necessary. It has an intake port backed by a suction fan, in front of which is a filtering system to remove airborne dirt, dust and organisms. Air brought in is then passed by the condensing unit of the machine, basically a modified refrigerator evaporator,which reduces the air temperature to the dewpoint. This condensed water trickles into a receiving tank, from which it can be dispensed by a faucet for drinking. In this type of domestic WEFDA, a by - product is cooled, dehumidified desert air, which can be used to aircondition a small room, thus allowing the unit to double as an air-conditioner. In this way, the domestic WEFDA is really being used to modify a small portion of the desert (the house itself), into a tiny, comfortable and habitable location. In the agri-industrial complex type of WEFDA machine, the procedure is the same, except that the machine itself covers a large area of desert land. In this complex, the roof of the WEFDA is actually the condensing unit,serving multiple purpose; as the roof of the structure, as the condensing area for cooled desert air,and as a collector for the condensed water moisture.

The key element in the agri-industrial complex WEFDA is the condensing system; this is actually the modified evaporator of a refrigerating system, which is integrated into the roofing system of the WEFDA superstructure. Under transparent glass or plastic panels, vegetation is allowed to grow, and carry on the process of photosynthesis. The refrigerants of the WEFDA are recycled within the system under the panels, reducing the air temperatures to dewpoints, and collecting the moisture trickling down the transparent panels. The refrigerating system is composed of a compressor and its drive mechanism, the condenser, the receiver, the piping, and other components for the reclaiming and control of the refrigerant.

In operation, there are two by-products from every WEFDA machine; waste heat from the desert air, and cooled, humidified, filtered air from which the desired moisture has been extracted. These by-products can be used for cooking or processing food for the WEFDA inhabitants, and for air-conditioning the living quarters, shops or offices within the WEFDA structure.

The principle of extracting water from desert air is ancient and well known; the practice of doing it on an efficient scale has not been adequately explored. For using modern materials, the science of refrigeration, the vast amounts of solar energy available in typical desert environments, and the concept of selfcontained "processing units" the WEFDA approach offers a way of combating desertification that deserves further investigation.

The current aim of this project is to construct a working model with a capacity of producing approximately 1,000 liters of water per 24 hours period, in order to evaluate the present designs for the operating system, and to gather data for larger, agri-industrial scale, WEFDA's.

In principle, the eventual efficient extraction of water from desert air could lead to very large complexes, housing people, agricultural units, and commercial areas. Once begun, such units could be significant factors in the fight against desertification, and the raising of living standards in desert areas.

NOTE:
If sea water canals are led into the desert there will be more water in the atmospheric air in deserts and more water can be collected by these machines or by the simple pit method explained in page 25.

19

Surprises from Salt Water

Development Forum 5 (United Nations)
January - February 1990

TODAY, THIRSTY PLANTS are not only drinking, but thriving on seawater at an experimental farm near the Israeli town of Askelon on the Mediterranean Sea.

The seawater-irrigated plants, which have been proven nutritious as well as edible for sheep and camels, are the first of many which Dr. Dov Pasternak, the head of the project, hopes to grow on water from the sea.

"I am trying to make people see that salt is beautiful", says Dr. Pasternak, head of the Boyko Institute for Agriculture and Applied Biology of the Ben Gurion University. Dr. Pasternak oversees studies of 150 species of plants irrigated by seawater. So far, he and his team of five scientist have screened 20 species for salt tolerance.

We are concentrating on the raising of plants for fodder, he explains, carrying out nutritional studies of animals to see if these plants are suitable for them. One salt bush from Buja, California, for example successfully grown in salt marshes, has been found to be palatable to both sheep and camels.

The team is also giving its attention to grains, oil and medicinal plants. Ornamental plants are already growing on saline water in gardens near the Ultra-salty Dead Sea and the port City of Eilat on the Red Sea.

Dr. Pasternak says that the Universities of Arizona and Delaware in the US are carrying out similar experiments; the University of Delaware is concentrating on grain and fodder, while scientists at Arizona are interested in oil plants.

The research into seawater for irrigation is directly related to the successful efforts of Dr. Samuel Mendlinger, also from the Boyko Institute, to produce a special strain of sweet, high quality autumn melon grown on brackish water using drip and sprinkler irrigation.

"Stress induces sweetness",explains Dr. Pasternak, obviously referring to fruits and vegetables, but, he adds, like people, each plant possesses a personality and has individual needs. Some young plants are sensitive and must be irrigated with freshwater at an early stage; others get sensitive to salt as they mature.

Other fruits and vegetables being successfully irrigated by saline water from underground acquifers, commonly found in many desert areas, are asparagus, broccoli, sorghum, olives, pears and pomegranates.

Dr. Pasternak believes that the growing of field crops from salty water is the key to the future of desert agriculture and he points out that cotton has so taken to salt water that its yield has been increased by 20 per cent.

A major effort is also being invested in the development of salt tolerant medicinal plants, like the evening primrose, and the buffalo gourd for starch production. The cashew, jujube, papaya, jack fruit tree and some cactus species are among lesser known fruits which are the concern of a long-term project being carried out at the Boyko Institute aimed at the selection and development of a wide range of subtropical high quality fruits.

Agricultural Information Development Bulletin

* * * * * *

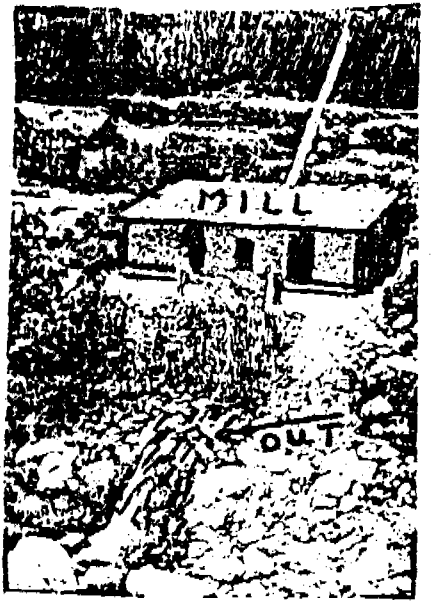
TOMATOES GROWN ON SALTY SOIL. Washington may 28. Scientists are finding new crop grown on salty soil and irrigated with salt water that may be useful

in Third Countries with long ocean shorelines and scarce fresh water. The US National Research Council has just published the results of a four year study of hundreds of plants that can tolerate salt. The report was prepared by a panel set up by the Council's board on science and technology.

Seeds from a wild tomato found on the sea shore of Ecuador's Galapagos islands produced small and bitter tomatoes. But when crossed with commercial tomato, fruits were obtained in 70 percent sea water. (Reported in The Hindu 29.5.90)

20

Micro Hydro-Power



A typical water mill in the hills of Nepal.
Photo: FAXT HYDRONET-3/89

People of Nepal have made a mark in the world for deriving motive power for turning various machines to meet domestic needs. Most of the Micro hydro power units of Nepal are owned and managed by individual villagers in their neighbourhood. People use water powered mill to hull rice, press oil seeds, grind flour and even to operate a band saw in some places. The journal Hydronet from Germany dated March 1989 from which the photo reproduced here is taken with courtesy, reported that atleast 600 such hydro powered water wheels were in existence in Nepal in 1989 and indicated that they were becoming more and more popular.

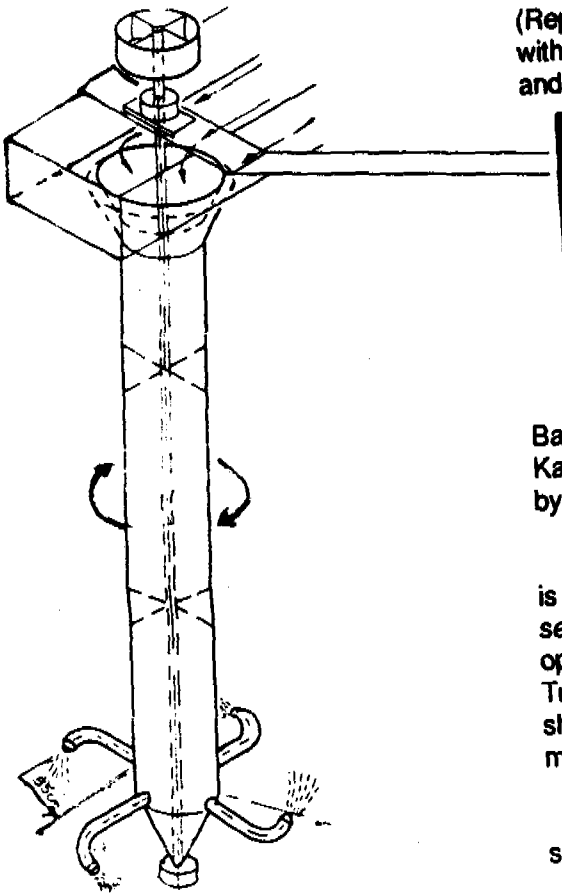
Water to turn the turbine is diverted from a streamlet or rivulet by piling a row of rocks or poles to make a barrier. The diverted water is led to a pipe to flow on the turbine. A simple hut or shed is built around the turbine to call it a mill. The water filling the pit below the turbine inside the hut is led to lower level through a gutter as shown in the picture and out into the open to join other rivulets or to form new streamlets, take it's course and flow away.

Cost of a micro hydro power unit depends on the length of the lead-pipe, the size of the turbine, the number and size of machines attached and the installation of additional attachments such as generators, bandsaws or grinding wheels.

Water wheels/ generators can be erected on slopes of mole hills,slopes of lake or pond bunds or catchment areas. A distance of three metres between the water level and the bottom level of the receiving slope or pit is adequate to make the system work efficiently. If depth is not adequate the length of the lead may be increased so that the water flowing through it gains force. Alternatively, water may be lifted into over-head tanks and allowed to fall on turbines. On the spot investigation by Dr . Felix Ryan. (Photo by FAKT)

21

Baker's Turbine



(Reproduced from Mini Technology vol.11 with courtesy to the authors A.Bachmann and B.R.Saubolle.)

This Barker's turbine was made by Balaju Yantra Shala. P.O. Box 20 Kathmanadu,Nepal. Test runs were made by mid 1982.

In coastal towns and cities if seawater is carried through PVC Pipe and into sewerage junctions (inspection/cleaning openings with a manhole cover) Barker's Turbine like this or sewerage generators shown in RYAN foundation handout 213 may be installed.

By this arrangement not only the sewerage lines (gutters) will produce

electricity in mini generators to light some street lights but also flush out the gutters, keep them clean and less infected with cockroaches, mosquitoes and evil bacteria because of salty water. Fibreglass should be used to avoid corrosion.

22

Making Water at Sea is easier than you think. RO Filtration - Expedient and Efficient

By Thomos C. Duncan.

On planet Earth, where two thirds of its surface is salty seawater, obtaining potable water in sufficient quantities to maintain life is a daily challenge in many parts of the world. It is especially difficult on ocean-going vessels, whether they go for pleasure or for work.

Over time, man has developed various methods to recover fresh water from seawater. Of these, only reverse osmosis filtration is the most efficient and least expensive for "manufacturing" drinking water while at sea.

Although it seems complicated, reverse osmosis (RO) is really a very simple process. Water flows selectively out of a concentrated salt solution, diffuses through a polymeric, semipermeable membrane, and then flows into a solution with a low salt content. Other impurities are removed in the process, with the end result being "good" water for drinking, bathing, laundry, cooking etc.

The RO Process relies on pressure imbalances on both sides of the membrane to keep the flow going; osmotic pressure is approximately proportional to the concentration of salt. For natural seawater, the osmotic pressure is about 26 atmospheres (atm), meaning that, in the absence of other forces, water will tend to flow from pure water into seawater across the membrane, until a static head of 25 atm builds up on the seawaterside - the point of equilibrium. Thus, water is passing into the seawater solution by osmosis because the pressure differential across the membrane is less than the osmotic pressure of the seawater. But, when the pressure difference is greater than the osmotic pressure on the seawater side of the membrane, then reverse osmosis takes place, and water will flow from the seawater solution into the pure water side. The higher the salinity of the seawater, the more pressure is required to recover potable water from it.

In all types of marine RO water purification systems motor-driven pumps are used to create pressure on the seawater side of the membrane. Unlike other methods of desalinating seawater, such as flash evaporation or distillation, one never ends up with the salt in a solid form to dispose of. There is none of the wasted heat that is generated by both distillation and evaporation methods, and fuel requirements for motors and pumps to drive the system while producing comparable quantities of potable water are considerably less. The recovery rate from sea water using RO is a seven to ten percent yield of fresh water from every membrane module used.

Reverse osmosis water makers are common anywhere potable water is scarce, and a good supply of seawater is at hand. RO water making systems are found on commercial vessels, including ocean going tugs, fishing boats, cruise ships, freight barges, tankers and government boats, as well as on pleasure yachts and charter fishing vessels anchored in ports spanning the globe.

Oil rig platforms and land based structures such as resort hotels, multiple unit condominiums, and single family homes on remote islands rely on RO equipment. In addition to marine applications, there is a growing demand for RO systems that process freshwater from brackish water.

Capacity Depends on Usage

Today, frame mounted, stand alone, and modular systems for the boating industry are available. Some systems start at a production capacity of 200 gallons [757 liters] a day and go up to 1,000 gallons [3,785 liters] per day. Commercial duty water makers can range from 200 gallons [757 liters] all the way up to 1,800 gallons [6,813 liters] per day.

As a general rule of thumb, a 500 gallon [1,892 liter] per day water maker would be sufficient for a boat of between 40 and 6 feet [12.2 and 18.3 meters]; on a boat of 60 to 110 feet [18.3 to 33.5 meters], a 1,000 gallon [3,785 liter] per day unit would be appropriate, but two 500 gallon [1,892 liter] per day units could be used. If the vessel is over 140 feet [42.67 meters], a dual system is highly recommended.

It is backup insurance. Our company builds custom designed RO systems for processing seawater that are capable of 150,000 gallon [567,750 liters] per day output.

One of the more innovative systems developed in recent years is the combination water maker/ice maker. These units are popular on at-sea fish processors, and with resort and cruise ship operators. They can amortize the cost of the equipment easily. RO equipment costs, up front, easily defray the long term costs of bringing ice on board or barging out fresh water. It is right there in the ocean around them. A 1300 gallon [4920 liter] per day water maker/ice maker will produce roughly a ton of crystal clear ice, plus 500 gallons [1,892 liters] of water for drinking.

Thomos C. Duncan is the founder and president of Offshore Marine Laboratories Incorporated. The company manufactures reverse osmosis water purification systems in Laguna Hills, California.

What is reported here with permission is the first part of his article which appeared in the journal SHOWCASE USA, 2nd, Quarter 1990. The 2nd part which related to what to look for in RO system is not reproduced here.

RO machines of different sizes made by different companies are available now and there are small machines which urban/ rural communities and individuals families can afford to own.

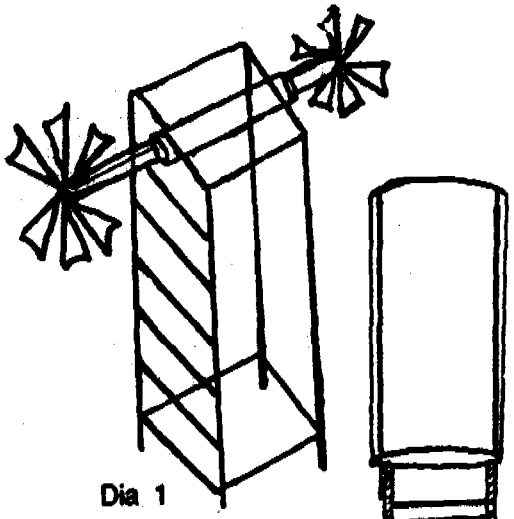
23

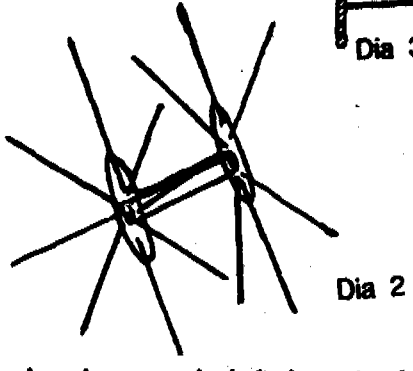
Ryan Foundation Wind Mills

The traditional windmills attached to bore pumps have failed all over the world. See RYFO Handout 337. Reasons for failure have been explained in the Ryan Foundation booklets "Pumps without Water" and "Agrifilm for better Storage and Use of water." Nevertheless, wind power has to be harnessed for energy and Ryan Foundation recommends the trouble-free open-ground system where the maintenance can be done by villagers without training or expenditure.

A rural wind-mill must be built of poles and canvas with minimum of metal parts only for the axle and the ribs to fix the sails.

Parts may be of galvanised iron [water pipes] of 5cm diametre and the metal axle rod of 4 and 3/4 Cm dia. Two large metal spools with welded arms on either ends of the axle are also necessary. Dia, 2 shows construction of metal parts [spool with arms] on one side of the axle rod. Two similar units are required like what is shown in dia 2. Alternatively, axle may be mounted on two brick pillars.





Discs on either side of each spool should be as big as a long-playing gramaphone record made of 12 gauge metal sheet. One Cm. diametre arms (ribs) may be welded to them in parallel position as shown.

HDPP Woven cloth of the type used for packing cement, fertilizers or food grains may be stitched like pillow cases and put like a case between two parallel arms as shown in dia. 3. and tied or stitched to stay in position.

Water lifting arrangements from open wells, tanks or sea water canals are explained in RYFO Handout 312 (No 13). The x axle need not revolve to take the direction of the wind but the pole structure should be so built that one end of the axle points to the south and the other to the north.

We cannot direct the winds but we can adjust our sails.

* * * * * *

Land sea and air belong to the global family of which billions are dead millions are living and countless are yet to be born.

24

1. More plant Potentialities

1. Marine algae has great potentials as livestock feed, fertilizer and raw materials for several industries. They are a rich source of numerous minerals and life saving medicines. The liquid seawater fertilizer recently researched and developed is becoming popular in several countries as reported in The Hindu dated 5th June 1990. Some fresh algae,including Spiriluna, Chlorella and Scenedesmus, rich in edible protein, are widely sold as health food in Western countries and Japan.

2. Jojobe for Coastlines

The Central Salt and Marine Chemical Research Institute of Bhavangar has been experimenting on the cultivation of Jojobe - an oil bearing plant in coastal sand dunes under semi-arid conditions in the West coast of Gujarat and in sub-humid regions of Ganjam district of Orissa. Experiments have established that Jojobe could be grown successfully in coastal sand dunes and the oil obtained from the plant could be used as a lubricant and for other purposes.

3. Red Sea-weed

In 1990 The Philippines ranked fourth among the World's producers of Red Sea-weed, exporting about US $ 48 million worth of dried sea-weed and CARAGRENAN - a sea-weed derivative used as a binding agent in food products. If dry and drought ridden ground is moistened with sea water more of this weed can be grown, not only in the Philippines but in several parts of the world.

4. Ablat of Benin

In Benin people cultivate a bean called Ablat which requires very little water to grow. They first put some compost around the foot of the plant and it produces bean all round the year. If the atmosphere is water borne the plant grows quicker and healthier. With sea water vapours in the atmosphere Ablat can be grown in dry and drought lands.

5. Rock Plants and Cactii

It is common knowledge that rockplants and cactii need not be watered but they absorb whatever water they find in the atmospheric air. Some of them convert air into water and store the water in their system. If the atmospheric air is humid due to sea water in the vicinage different types of Rockplants and cactii can be cultivated on a commercial scale and all of them have different uses and some of them yield edible fruits, flowers and roots.

6. Salt Bush (Atriplex)

A halophyte grows excellently well in ariel zones and saline soil and improves habitat of wild life and birds and serves as fodder for livestock and reclaiming sandy soil. Grows wild in the salt stepps of Eastern Asia, low lying salt plains of Australia, the Red Sea basin and the South American pampas. It is an easy to propogate annual and perennial herb.

Sweeter Melons from Salty Fields

Saline Agriculture: Salt- Tolerant Plants For Developing Countries. National Academy Press, Washington, D.C., 1990, US$ 15.

Salinity of soil and water is a major constraint to farming and forestry. Yet saline soils have been farmed and forested for millenia with halopytes (salt-loving plants) and salt-tolerant crops, fodder plants, shrubs and trees.

Increasing population pressure in developing countries and salinization of vast areas caused by improper irrigation practices have fueled the search for higher productivity of saline agriculture.

The National Research Council of the US National Academy of Sciences recently published the report of a four-year study by some 100 experts in over 30 countries on salt tolerant plants and trees suitable for developing countries. The 140-page booklet is considered by the publisher "the broadest publication produced on the subject" intended to serve "as a resource for scientists in developing nations where growing conditions may be less than optimal".

Saline Agriculture

SALT-TOLERANT PLANTS FOR
DEVELOPING COUNTRIES

About 100 plant and tree species are reviewed by the report; for more details the reader is referred to a comprehensive bibliography and list of researchers.

Some of the species described appear rather extoic, for instance, Disticlis, Salicornia and Sporbolus, whereas there are also some surprisingly familiar crops listed, like wheat, barely, rice, cotton and asparagus that can be bred or selected for salt tolerance.

The panel chaired by J.R. Goodin (Texas Tech. University, Lubbock) that prepared the report resisted the temptation to produce an expensive handbook on this timely subject. Instead, it compiled a relatively inexpensive (US$15) introduction to the subject, thus providing both an overview of the international state-of-the-art in saline agriculture and a stimulus to the scientist and planner.

The report does not propose saline agriculture as a panacea for all food, forestry and fuel problems besetting the Third World. Although it states that "the combination of sand, salt, water, sun and salt-tolerant plants presents a valuable opportunity for many countries", it warns that "salt-tolerant plants should not be cultivated as a substitute for good agricultural practice, nor should they be used as a palliative for improper irrigation. They should be introduced only when and where conventional crops cannot be grown".

The booklet lists, for instance, a number of valuable crop, fuel and fodder plants that can be irrigated with seawater. While this seems to promise a miracle to desert countries with large coastal plains, panel member James O'Leary warned: "Using seawater to irrigate brings with it its own set of problems. You continuously have to flush out the soil so that salt does not build up. Then, as a result of the flushing, you have to replace important nutrients. It can get complicated and labour-intensive".

There are extensive arid lands in the Third World which are barren because of brackish groundwater. These areas could be reclaimed and planted with suitable trees, shrubs, crops or fodder plants. Some of these plants. "require fresh water for germination and early growth but can tolerate higher salt levels during later vegetative and reproductive stages", says the report. Transplanting, however, is a labour-intensive, and hence, costly exercise, limiting the usefulness of these species.

Many of the plants discussed by the report still need to be domesticated. "Undomesticated salt-tolerant plants usually have poor agronomic qualities, such as wide variations in germination and maturation". according to the report. Much research is still required to domesticate wild species or to insert salt tolerance in traditional crops and improve their productivity, for instance, through application of new biotechnology methods.

Salt-tolerant species are not exclusively cultivated for production purposes. Fixing sand dunes, growing shadow trees or windbreakers, lowering the salt content of the soil or the water table could be the primary objective. Some plants remove salt from the soil at the root level by concentrating it in the leaves, while others help to drain the soil where a high or brackish groundwater table is the problem, thereby helping to rehabilitate marginal land.

Moderate levels of salt, the report explains, are not always a disadvantage. Many halophytes grow better with than without salt. Salt stress can make some crops tastier.

Near East farmers, for instance, have often found that the sweetest melons are growing on salty fields.

Courtesy - Heinrich von Loesch

26

Cleaning the Cooum

(Excerpts from a recording of discussions between senior World Bank Officials and Indian Environmentalist and Water Expert, Dr. Felix Ryan, held on 15.3.91)

WB: You have said in your paper presented to the World Bank that the inland rivers of the city of Madras must be flushed by sea water. How is this feasible?

FR: The feasibility has long been established. As a boy, I have gone several times to parts of Andhra Pradesh in steam boats by the 420 Km long Buckingham Canal which was then clean and navigable, flushed by sea water. All along the canal there used to be fishing and people kept cows, goats, pigs, fowls, ducks and cultivated patches of land, vegetables, fruits, and lived happily. The city and the environment was clean and healthy and the land looked fertile.

WB: Why then does not your Government restore navigation by that Canal now?

FR: You are throwing my question back to me. I can only say, there is no political will for development or for keeping our rivers and environment clean, healthy and useful. Third World Governments are interested only in projects which involve large investment that would help them fill their pockets through foreign contracts and local favours. When millions and billions of dollars are made available by the World Bank, IMF, EEC, CWS or IDAs and advanced countries, which bankrupt Government will think of small projects and low-cost appropriate technology? Excessive foreign aid is the root cause of maldevelopment, over-development, incomplete development, inflation, downward growth rate and mounting corruption in most of the developing countries,including India. Third World Countries are spoilt children of the UN system.

WB: Do you mean to say aid should not be given for improving water position in rivers and lakes?

FR: From time immemorial rural communities of poor countries maintained their lakes and ponds and removed the silt in them during summer but now Third Countries are asking the World Bank money to deepen ponds and tanks, to dig wells, and lay roads and the bulk of the money they get from various sources go into their private pockets and enter the Swiss Banks or go underground or overseas. How many instances do you want from the countries where I have been working for the UN?

I had written to the World Bank three years back regarding one particular water related project proposal for Rs.200 Crores from a country when it was on the anvil. Had that project been sanctioned bulk of the money would have filled private pockets.

It is amazing that the Common Wealth Secretariat gave Rs.3 Crores (US $ 30 millions) to a British firm in England, only to give a report to the Government of Tamil Nadu on ways of cleaning the Cooum and other city water ways involving an expenditure of Rs.125 Cores (US$1250 millions) Nothing came out of that report but the CWS proudly claims the report as an "aid" to India and not to a British firm or to England.

WB - Do you think that report is not good?

FR - Any report which cannot be implemented is not good, be it for want of funds, facilities, infrastructure or clean administration. The time, money and energy spent on such reports are a total waste and we have thousands of such reports gathering dust in India and many Third Countries. Writing proposals and reports merely to obtain aid or to give aid has become a fine art which National and International Governments are now specializing in and they employ paid experts and computers to do the job for them. If aid does not produce results it is as harmful as AIDS.

WB - What is the Appropriate Technology that you have been advocating for cleaning the city rivers?

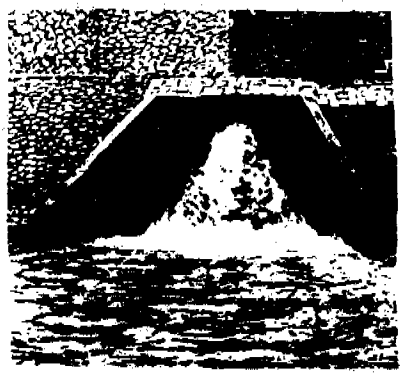
FR - There are two main canals cutting across the city of Madras - the Cooum and the Buckingham. Two others are small streamlets. While thousands of city sewerage outlets are let into the Cooum, the largest within the city, the Buckingham is comparatively clean but for some filthy inlets here and there.

In several parts of the city the Canals are at a distance of just 2 to 5 Km from the sea. In very many places they are 4 to 6m deep and can be made deeper

if necessary. The average height of the landmass of the city above mean sea level is about a meter and a half all along the coastline but as one goes cross country there are high grounds and low grounds, ever dry rivers and rivulets, ever dry lakes, ponds and catchment areas, which, if at all, hold water for a few days during monsoons.

27

Simple Sea Water Inlet



This is model of a typical seawater inlet system leading into canals and inland water ways to flush the filth stagnating in the waterways, make the water ways navigable and keep the city clean and cool.

The pipe shown in the picture may be one or half meter in diameter depending on the receiving in and flowing out capacity of the canal. The pipe should be made of reinforced cement, fibre glass or high density solid PVC (polythene) pipes but not out of metal as metal will rust in sea water.

Instead of round precast pipes square pipes sides of which are built out of brick and mortar will also serve the purpose. Such square gutters can be built even by village masons. The inflow control system should be built with care and calculation.

Governments of Third countries can construct this type of inlets with their own funds without asking the World Bank or the EEC for money. When constructed, several sea water based activities can be promoted and the water from the canal led into villages in small man-made open canals and the country will move towards progress and prosperity.

Simple family scale method of desalinating sea water for drinking, for plants and trees that can be cultivated by sea water and for several sea based industries that can be promoted have been explained by the Ryan Foundation (included in this booklet)

Stainless steel filter boxes to prevent sea sand flowing into the waterways and lock and sluice arrangement to regulate or stop the flow of water are also explained. The stainless steel or fibreglass filter box about one cubic meter in size may cost about Rs.2000/- or US $ 200/- and transporting these boxes from where

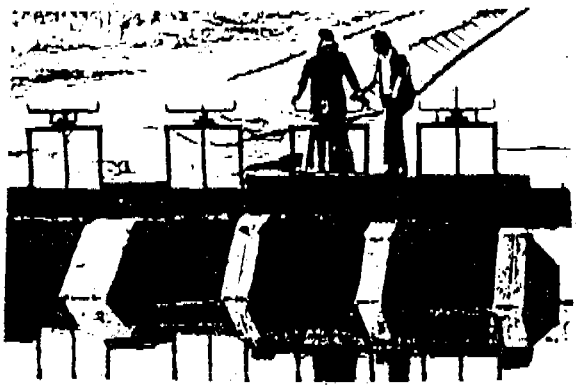
they are fabricated to far away third countries will cost money. As an alternative to filter box the mouth of the pipe into which sea water enters may be closed with a sheet of rubber (car tube opened out) or leather, and tied. The middle portion of the rubber or leather should be hammered with a screw driver and perforated with hundreds of slits. Sea water will enter these tiny perforations but bulk of the sand carried by the water will not enter. However, by this method the water that comes out at the other end of the pipe will not be forcible and so mini generators cannot be worked to produce reasonable amount of electricity.

Humanity can survive in the 21st century only by harnessing sea water.

28

Illustrations

A



B

A

The usual lock and sluice arrangement to let sea water into the land. It is inexpensive, safe and can be operated by one man. The number of locks depends on the breadth of the canal (outlet) and the amount of water to be drawn from the sea. Picture shows irrigation system in the MESCENE area in Syria. International water agencies should instal this system in water scarce countries to improve environment, food production and employment

B

The Buckingham Canal runs almost parallel to the world renowned Marina Beach beside the seat of the Government. It is just a kilometre from the sea near the Presidency college and the Government Hospital for women and children. After the British rulers left the canal has become a breeding ground for mosquitoes and contageous

diseases in the city. Picture shows the canal lined by huts and filth near chepauk. Note the TV Tower at the rear end.

C

C

A typical rural fish pond recommended by the Ryan Foundation to be built near sea water canals or channels from where water can be led in and out of the pond through bamboo pipes. In the place of boundry walls thorny fence may be put to protect children and stray cattle falling into the pond. It is easy to culture and cultivate fish in such small ponds by the village community and harvesting the catch is also easy. Such projects (ponds) can give food and livelihood for rural women and children.

(discussions with World Bank officials continued)

If a pipe 60 cm in diameter is laid 2 to 3 meters under ground connecting the sea, say, at Besant Nagar, with the Buckingham Canal, somewhere near the Cancer Hospital at Adyar which is a distance of about 3 kms as the crow flies, sea water will flow into the Canal,find its level,and flow out as the monsoon rain water does, or it may be led from the canal into low lying waste lands or into the Palar, a dry river some 50 kms from the city and into dry lakes and catchment areas to cultivate plants and trees that grow in sea water.

Of course,lock and sluice arrangement must be built to regulate the inflow of seawater. Where water drops into the Canal mini generators can be set to produce electricity. Narrow man-made canals or channels can be dug from the main canal and the water taken to interior villages for desalinating, washing cattle, bathing, swimming and for cultivating plants and trees, promoting fish and employment activities using all these developed organic resources. (The Ryan Foundation has invented and widely published a cheap table model still to convert sea water into drinking water by solar evaporation. Any road-side welder or tin smith can fabricate it and one family size unit will cost about Rs.120/- or US $ 8 only in India).The foundation has also developed

and published a clay model still to build which only a transparent plastic sheet 5mt x lmt which will cost about Rs 10/- is required. Diagram can be seen in Page 49. However, the RYFO Pit still explained in Page 52 is the best and most appropriate for the rural poor.

WB: Can your methods be seen in operation any where?

FR: In Nepal villagers dam rivulets flowing on hill slops, lead the water through pipes or bamboos on the slopping ground and generate electricity. When I was working there in 1990, there were over 600 such mini generators in that country and their technology, efficacy and economy was highlighted that year in a German journal, Hydronet, for other Countries to emulate. China has thousands of them, tapping sea water, sea waves and flowing rivulets. Several countries in Europe also have them now in increasing numbers.

Regarding Ryan Foundation table still to convert sea water into drinking water it is now being made and supplied to people who ask for them and are getting popular. Further, cost reduction is being investigated. Brick and mortar structures are to be tried out to avoid metal sheets not available in poor villages. They can also be made out of two large automobile tyres cut in the middle to make circular or" ring basins ". But a cheap and sensible approach will be to demonstrate to the village poor how common clay or prepared clay can be molded into two basins on the ground near the hut lined with polythene film or agrifilm to desalinate sea water. Every rural home could mould its own "basin" which will cost almost nothing. Only 4 to 6m of the thin transparent polythene sheet is to be purchased or procured. If this almost no-cost, no-technology clay design stills are promoted, scarcity of drinking water and drought can be conquered quickly and globally. But to achieve this sea water must be made available to rural people within walkable distance. Ryan Foundation public Charity is hoping that some agency will come forward to promote this idea in developing water scarce countries. To avoid seepage in the clay basins they may be painted with Ryan Foundation glaze paint. (See RYFO booklet on Do-it-yourself Rural Toilets). Better than the clay still is the Pit still for rural homes but a clay still is recommended where a pit cannot be dug, for instance, on house tops.

[(At present the world depends on three nations for 75 percent of all cereal exports. All these-the United States, France and Canada - are expected to experience marked reduction in food production as temperatures rise, rainfall diminish and the soil dries out." (UNEP Media Release for publication 5th June 1991).]

Illustrations

Given the sluice to control the flow village people will organise themselves to dig channels to take sea water into their village. Photo taken from RURAL DEVELOPMENT N0.11 produced by FAO for the UN ACC Task Force on Rural Development, December 1989.

* * * * * *

Even today the Buckingham Canal which holds sea water is navigated in certain parts. Picture shows a fishing boat between the two tourist spots Covalam and Mahapalipuram some 30 km from the city of Madras (photo 1991). Note heaps of crude salt made out of the sea water at the rear end in the picture.

* * * * * *

The idea of digging sea water canals parallel to rivers with about 5 km gap between the rivers and the canals and promoting estuaries and mangroves inbetween them should be implemented wherever possible. When the rivers go completely dry the sea water may be turned into the rivers to keep the rivers flowing and the ground wet for the mangroves and marshy land plants and trees to grow. Plants and trees that grow well in salt water and saline soil have been identified and published widely.

(Discussions Continued)

To get back to the sea water pipes, if several rows of them are laid connecting our inland waterways to the sea, electricity can be generated and supply should be entrusted to private enterprises as power generation in the hands of Governments suffer losses and inefficiency almost always and in all Third Countries.

WB: If your Appropriate Technology is followed will not the sea sand mixed with the water, fill and close the canals?

FR: No, not if stainless steel box filters are used at the inlet point (in the sea) I have seen such filter boxes being used in Japan and they do not get clogged with sand particles because the waves keep slashing on them. However, one may clean the boxes once a month for maintenance. Alternatively the lead pipe may be taken deeper into the sea where there is little or no sand.

WB: Even when filters are used small sand particles will enter the pipes and fill the canals, will they not?

FR: Yes, they will; but accumulation of such small sand particles will really be a blessing in disguise in a city like Madras and in Countries like Bangladesh, Maldives and several African and South American Countries which have thousands of pits and pot holes and extensive low-lying areas. In the city of Madras and Bombay during monsoons our motor cars run like motor boats and many get stuck in water pools while 2 wheelers are lifted by cow drawn carts to cross knee deep or even hip deep water on the highways and by-lanes. If sea particle sand is available in nearby canals we can give employment to thousands of people, to slum dwellers and squatter settlers in particular, by asking them to shift the sand deposits to have the road and land level raised and for sea - defence build -up.

Why should Governments spend billions of Rupees and thousand of tonnes of cement and steel to make tetraploids (4 legad concrete barriers) to defend the sea as they have done in Bombay or place huge cement reinforced water pipes as they are now doing in Madras. (The water pipes were really made for the Veeranam drinking water project which failed. They are now being used to prevent land erosion in the city coastlines.)

When sand is to be shifted within city limits expensive automobiles and motor trucks that pollute the atmosphere need not be used, but instead hand-drawn and animal drawn carts may be commissioned to employ the poor. Thus, lost animal power will also be restored to save on fossil resources and to reduce human labour and suffering.

Man-made mountains and mole-hills may be built out of sea sand particles, and cactii, soil consolidating plants like khas - khas, saline soil shrubs, drought tolerant and desert variety of plants and trees grown on them. Valleys may be formed between such mountains for storing rain water, rearing fish, and promoting water based industries

and water sheds. The USAID, FAO, several UN publications and NGOs have already identified and highlighted many saline soil and desert plants and trees with which millions of jobs can be created for the rural poor and the neglected non-formal sector.

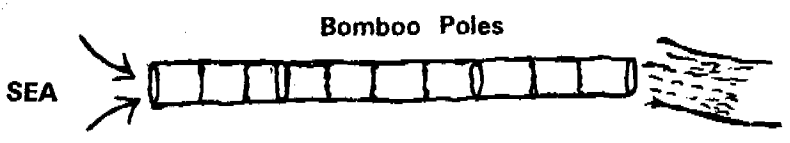
Israel has been researching intensively on plants and trees that can be cultivated using sea and saline water and announcing successful results. The Ryan Foundation has been introducing these plants and trees in coastal villages of Third Countries. We have planted 2000 trees on the coastal village of Kovalam.

In conclusion, as an Appropriate Technologist let me appeal to the World Bank and the entire UN system to give Developing Countries small aid and low technologies to solve problems created by high technologies. To give drain pipes to clean rivers and not dredgers. Dredgers will only help multinationals and not multitudes of single nationals. While drain pipes can narrow the gap between the rich and the poor dredgers can only widen the gap between the North and the South. Dredgers will also consume fossil resources, pollute the atmosphere and will not create jobs for the people. Small is beautiful, especially in poor countries.

Merely taking water to villages is not enough; Women should be madd owners of land. See "Women as Land Owners", article by Dr. Felix Ryan published by the Joint United Nations Information Committee in th JUNICO/NGO series on Women & Development, 1986.

30

Tapping Sea Water by Bamboo Pipes



There are several ways of drawing water from the sea into land to fill dry ponds and lakes. The appropriate technology shown in Ryan Foundation booklet "Pumps Without Water" are quite inexpensive and feasible. Yet, all rural communities may not be able to instal them with their own initiative and financial resources.

In RYFO Handout No.579 a method is shown to draw sea water in bamboo pipes through a brick and mortar chamber. The purpose of the chamber are -1) land mark, 2) level fixing, 3) double"flow block" 4). a steady out-flow and 5) a sense of community ownership and participation in getting water into their village.

However, sea water can also be drawn straightaway without building a brick chamber as shown here. In fact, this method is cheaper, quicker easier and absolutely safe but can serve only one or two villages because of limited flow.

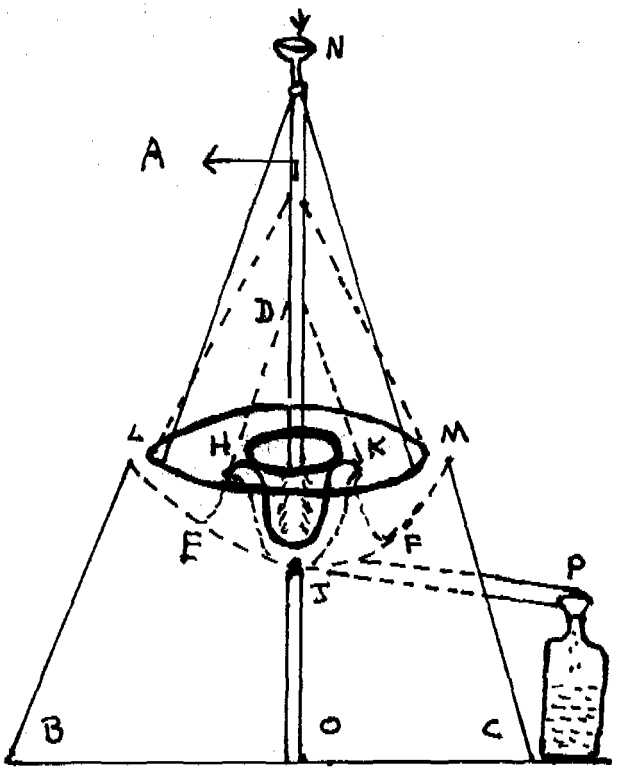
All that is required are bamboo poles preferably of uniform size in thickness and the number of poles required depends on the extent of sand to be covered on the shore by length. The bamboos may be cleared and cleaned inside, for free flow of water (RYFO handout 323) and laid as shown. Joining of the bamboo pipes may be done as a carpenter joins two pieces of wood and glued (joinery). If necessary joints may be wrapped with plastic or rubber sheets (cut car tube) or thick cloth or jute cloth and tied well to reduce leakage as much as possible.

Where the sea water enters the bamboo a strong cloth should be tied to act as filter. The bamboo must be about 15cm below mean sea level and it may have to go about a metre laid on the shore. It may be buried in a slightly slanting position as shown and at the 'out flow' end the community may dig a channel to lead the water to the nearest dry lake or pond or catchment area and from there take the water by channels to other places.

To stop the flow one has merely to go into the sea knee-deep and insert a bottle into the inlet end. Alternatively,a bottle or stopper may be inserted at the 'out flow' end. Thus, all the materials required are some bamboos, discarded car tubes or plastic sheets, old cloth,fibre ropes,country-made glue and some empty bottles.

It is better to lay four or five pipes all leading to the same channel to get a good flow into the village. Instead of bamboo, cement or earthern ware pipes used in sewerages may be used if available. Metal pipes will corrode in sea water and should not be used. PVC drain pipes may also be used if easily available or if some multinational or Rotary Club donates them to a costal village.

R Y F O Clay Still



HIGH GROUND

This is not as complicated as it looks in the diagram. Even an aborigine can see a model functioning and build one for herself or himself without any help. Every poor hut all over the world can build one in the frontage or backyard to convert sea or saline water into drinking water.

Materials Required:

1) About 100 Kgs of clay. (If clay is not available mix earth with other materials and make clay as explained in RYFO Handout 110. Alternatively, prepare mortar mixture as explained in handout 270.

2) One and a half metre long bamboo of 6 to 10 cm diametre. It must be like a pipe without blocks in the middle.

3) Another bamboo pipe almost of the same length but 3 to 6 cm in diametre (smaller diametre)

4) A large empty glass bottle, preferably colorless.

5) 4 to 5 metre of thin colorless transparent polythene (plastic) sheet.(Used cement,fertilizer or milk powder bags may be opened out and heat welded into sheets and used for lining the clay basins .The bags used must be laminated bags and usually they are) .Instead of lininig the clay basins with such plastic sheets they may be painted with RYFO glaze paint to prevent seepage.

HOW TO CONSTRUCT

1) Build a clay or mortar-mix cone. (ABC in diagram)

2) Before it dries cut half the cone with a big knife at LM and discard portion ALM.

3) Make (scoop) cavity (bowl) like LEJFM as deep as point J and make the diametre of the bowl as long as possible without weakening the side wall of the bowl.

4) Before the bowl dries drive the big bamboo pipe 'ON' in the middle upto point ' O ' as shown. The bamboo should have one centimetre perforations above ' J ' to a length of 10 Cms and completely blocked at J. Before the bowl dries drive the bamboo JP also in position.

5) Line the inside of the bowl with the plastic sheet cut to size. Tree gum, fish gum, tamarind seed or cluster been gum may be used for pasting. (for fish gum see RYFO Handout 50l) Build small cone EDF in the middle of the big bowl, cut it into half and make bowl HJK as shown. The height of this narrow bowl should be about the same as the big ball and the gap between the circular side walls of the two basins should be only 10 to 15cms.

6) Cut transparent plastic sheet into a round piece of one and a half diametre. For joining bits if necessary heat seal. If it is hard to find thin plastic sheets in villages, opaque or transparent, to line the basins as already explained paint the basins with village made "RYFO paint for glaze effect" for details regarding glaz paint see page 3 in the Ryan foundation booklet on "Do-It-Yourself Rural Toilets. Add some charcoal powdered to fine mesh to the paint to make it pitch black. Black container quickens evaporation.

7) Fold and stitch or heat seal the boarder end of the transparent plastic sheet like the ends of a handkerchief but the folding should be 5 to 6 cms broad to be loaded (inserted) with weights and closed. The weights may be pebbles or stones.

8) Place the central point of the circular transparent sheet at point 'N' and tuck the hanging circumference around LM into the bigger bowl.

9) When in position, the sheet going into the big bowl should not touch the small bowl. This is very important.

10) To prevent air getting in pack clay between the big bowl and the sheet all around or pack with cotton or rags.

11) Make a small hole in the plastic sheet at point 'N' and insert a small funnel as shown and always keep the hole in this funnel closed with a piece of cloth or cotton.

12) Pour sea or saline water into the funnel and fill the small bowl HJK and close the funnel.

13) Hot sun falling on the conical plastic sheet during the day will evaporate the water which will rise, hit the plastic sheet, get condensed and roll down the sheet along NL & NM, drop into the big bowl and find it's way out through the bamboo pipe FP and fill the bottle.

14) A small rubber tube, long balloon, cycle tube bit or a tube made out of canvas or umbrella cloth may be used to connect the pipe to the bottle at point 'P'.

15) When the bottle gets filled another bottle may be replaced.

16) As the water in the small bowl evaporates more water may be poured into it.

17) If saline or unclean water is poured, after it evaporates a dirty residue will be seen in the small bowl. Remove the plastic sheet clean the bowl and set it again every fortnight.

18) If sea water is used salt deposit will be found which can be recovered and used for cooking. If the salt is dirty dissolve it in clean water, filter and evaporate again to get clean salt (see handout 64 of Ryan foundation which explains).

19) The base BC may be one meter and the still should be built in an elevated place or on a platform.

20) It is very important to enclose the still with thorny fence to prevent children and stray cattle pulling it down as it happened in Somalia when a model unit was constructed at Jalalaqsi by this author.

21) The water collected in the bottle need not be boiled and for taste a bit of salt or sugar may be added to it.

22) If a little flavour is desired cummin seeds, basil leaves,curry leaf or any aromatic leaf or root including lemon grass or Khus-Khus may be added.

23) Though each family can make it's own still, in every village one or two women, youth and unemployed in particular may be asked to specialize in constructing these clay stills and they may be paid Rs. 10/-for constructing a still if materials are provided and Rs. 50/- if materials are not provided.

24) If big mirrors or large shiny metal sheets are available they may be set high on a table or wall to reflect the rays of the sun on the water in the middle basin to expedite evaporation.

25) NGOS may organise the supply of plastic sheets and bamboo pipes for the village community and dealers may be named in each village.

26) NGOS may construct one model cum demonstration unit in every water scarce village for the village community to copy.

NOTE:- This clay model which was invented by Dr. Felix Ryan is now being popularised by the Ryan Foundation International registered public Charity which Dr. Ryan founded.

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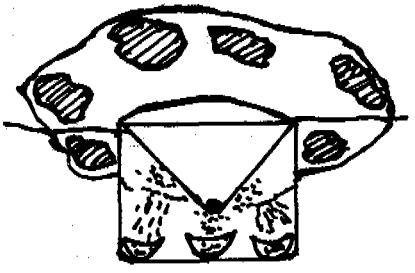
RYFO Pit Still



RYFO pit still is perhaps the best, the cheapest, the easiest, the safest and sane method of converting sea and saline water into drinking water. God willing this should solve the problem of drinking water anywhere in the world where the sun shines and sea and saline water is available. It is expensive to transport potable water from one point to another. So the poor must be taught to make water potable at their door step.

This idea is similar to what I have written under the heading "Drinking Water from Nowhere" in page 25 where water from the desert air is evoporated and condensed inside a pit covered with a thin transparent plastic sheet as illustrated in the diagram.

The pit still idea is to place several vessels of sea water inside the pit along with a clean empty vessel in the middle (right under the cone). The water in the surrounding vessels inside the pit will evoporate when the sun is hot, condense and trickle down the cone and fill the vessel in the middle and this will be clean pure water and need not be boiled. If a family has 3 or 4 pits each of one metre diametre and half metre deep there will be enough water for the family to drink and cook.

Rays of the sun may be focussed on the water inside the pit from all sides by arranging mirrors, metal sheets or aluminium foils stuck on cardboards to augment the heat. It is simple science that trapped heat insides the pit will be more than the heat outside. (green house effect) Vessels containing sea water may be made of any material but those made of metal and painted black will augment heat. Tin sheets (cans opened out and straightened) may be used to line the bottom and side wall of the pit also to augment heat. The solar box (solar cooker) works on the same principle.

Every morning before the sun comes up the pit still may be set and the next morning the condensed water taken out with the vessel and the still set again. The vessel may be removed easily by lifting the plastic sheet on one side without disturbing the setting.

To achieve this all that the poor remote villager requires is 2 metres of plastic sheet and sea water close by and some thrown away tin cans. I appeal to NGOs working in warm countries to promote pit stills and provide water to the people. - **Felix Ryan.**

33

Borepumps a tool for corruption

(Excerpts from front page article (report) which appeared in the popular daily of India,The Hindu,dated March 11,1991)

"The state Government has taken in sinking of over 5000 deep bore wells in chronically shortage zones, particularly in the central and Western parts of the state.

" Over the years the Tamil Nadu Water Supply and Drainage Board (TWAD) alone has sunk nearly 1.15 lakh borewells in the state in addition to several thousands put up by different agencies, such as Department of Social Forestry, Slum Clearance Board, municipalities and panchayats.

" Maintenance of assets (borewells) already created now vests with the local bodies left much to be desired, leading to repeated expenditure in the same localities.

" A recent study in Coimbatore district reveals that owing to over exploitation of ground water the water table is going down by 25.3 mm every year.

" Although the financial allocation provides for deepening of the existing open wells, experience in recent years has indicated an all roud clamour for sinking of borewells and so much of political pressure used to be brought on the officials that often the basic rules and norms were given the go-by."

For detailed and revealing information on borepumps read the booklet 'Pumps Without Water' by Dr. Felix Ryan which is now in circulatic.1 in most English speaking countries and in the hands of agencies which give aid for handpumps, and borewells without getting facts (and the truth) from the field.

34

Water Racket

In some Third World countries, India in particular, drinking water drawn from underground is being commercialized and blackmarketed by middllemen and politicians to the detriment of the poor and lower middle-classes and the environment.(see "Creating water markets: solution or threat for farmers?" by John Colmey in the November-December issue of Development Forum).

We cannot say drawing ground water unscrupulously is illegal as there is no legislation in these countries preventing people from boring the ground and drawing water. But the point is both the ground water and the poor are being overexploited. In several areas like Cuddalore and Saurashtra in India, for instance, available potable water has been sucked out and machines on bore wells are now pouring out saline and sea water.

Local authorities take a commission from the water supply contractors for every tanker load of water drawn from these aquifers or government land leased out to them. Exploiters are making capital out of this scarce drinking water situation. It is time that the United Nations,World Bank or UNNICEF brings out a draft legislation on the use of ground water and insists that the member countries introduce and enforce the legislation to qualify for any United Nations aid for water-related development.

Letter to the editor by Dr.Felix Ryan.

Reproduced from the Development Forum - March-April 1991. (Journal of the UN Secretariat published by the United Nations Department of Public Information for the Joint United Nations Information Committee.)

35

Country to Country Water Sale has started

(UNI reports from Singapore - 1st July 1991)

SINGAPORE:- "Indonesia is to sell water to Singapore under a long term water agreement that will last well into the 21st Century. Under a landmark umbrella accord signed in Jakarta on Friday, Singapore will be able to draw upto 1000 million gallons of water a day from the Riau Province."

Water rich countries may or may not build up their economic power like the oil rich countries and their success depends on the longevity of their potable water supply.

Water scarce countries must exploit the sea and not their neighbouring countries. "Dam the neighbour" is not a good national policy for international co-existence and water for all by the year 2000. One must live at all cost but not at other's cost.

"Live and let live"is adage of the 20th century; "live and help live"ought to be the adage of the 21st century.

* * * * * *

Note: At present, world-wide water withdrawal for irrigation accounts for about 66 percent of water use, 24 percent goes to industry and the other 8 percent to domestic, livestock, recreational and other uses. By the year 2000, many countries will have half as much water per capita as they had in 1975 and many will experience much greater demands on water for agriculture, industry and domestic use (from UNEP World Environmental Day 1991 Media Pack. Pag 26)

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By the same author

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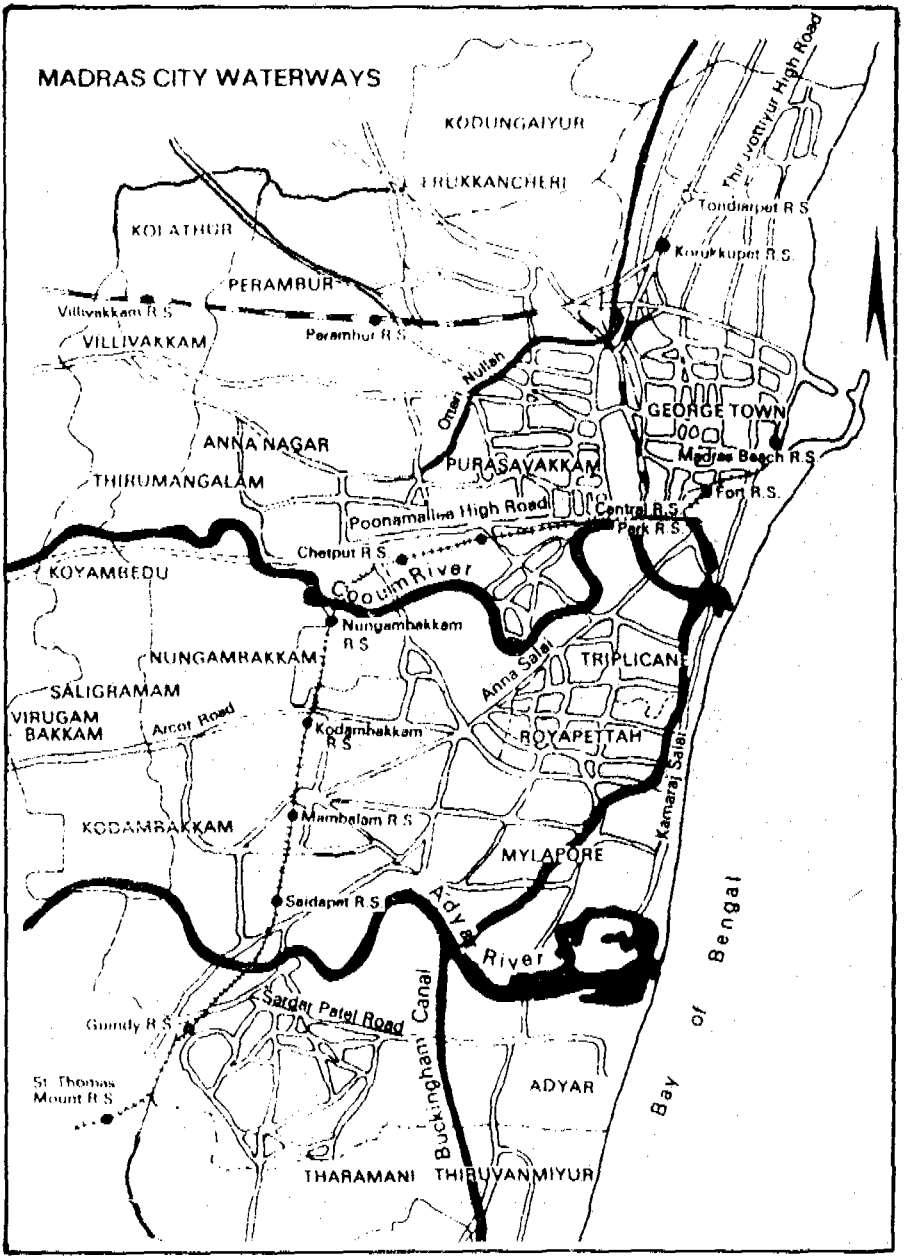
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