POEMS WITHOUT WATER

F. RYAN

SATPRAKASHAN

PUMPS WITHOUT WATER

Misconceived Water Policy

FELIX RYAN

"There is only a finite amount of fresh water circulating throughout the planet. More than 97 percent of the earth's surface water belongs to the oceans, leaving only a small percentage for drinking water and irrigation."

– UNDP 1986 Annual Report.

The poor will remain poor if they depend on the technology of the rich.

SATPRAKASHAN SANCHAR KENDRA,
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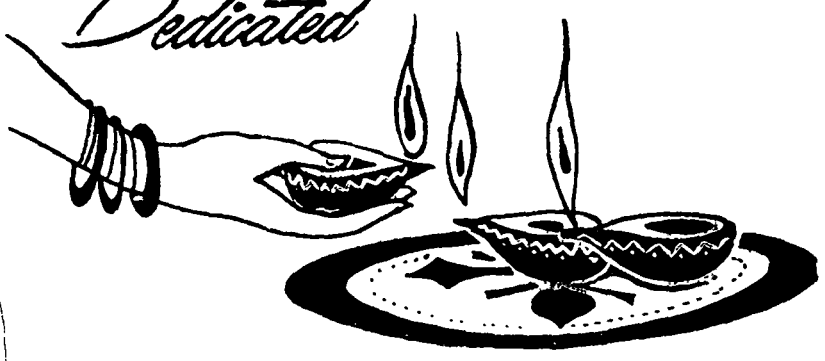
to

Dr. P.C. Alexander

Governor, Tamilnadu

who shaped my career and
the development of
so many countries.

Dedicated



Foreword

PREDICTION

About 97 percent of the total water available in our planet is in the salty sea and out of the remaining 3 percent of fresh water that is available for human consumption 2 9 percent is in the form of polar icecaps and only 0.1 percent fresh water is really available to sustain life in our planet.

Water scientists estimate that in the United States of America about 21 billion gallons of ground water in excess of what gets back into the soil is removed every day, or only half of what is pumped out every day is replenished and in Europe only one third of what is removed every day is replenished. It looks as though before the end of this century humanity will be sucking the earth dry and drinking water will become a rationed and taxed commodity under political, national and international control and wars will be fought between countries, not for land, gold or power but for drinking water. The day is not far off under our present day ruthless system of consuming and wasting water while the population is on the increase demanding more water which is more than a basic human need.

It is the prediction of this author that water is bound to become more scarce and costly in the 21st century - costlier even than oil and many nations that errect rigs and drills for oil will soon be drilling for water off shore. The time will soon come when scientists will realise that humanity has necessarily to depend on sea water for its survival; that simple evaporation and condensation of sea water by solar rays is the only true solution to the water problem of our planet and it is not advanced but appropriate technology that can save humanity from peril.

28th May 88 Felix Ryan.

PART — ONE

Pumps Without Water

Walking with a team of UN experts in Bunumbu, Sierra Leone, where we were promoting a "growth centre", we noticed several, India Mark II pumps. When this pump was developed in the Mechanical Engineering Research and Development Organisation (MERADO) of the Government of India in collaboration with the WHO and UNICEF I was on the Advisory Board of this Organisation. So when my team spoke in appreciation of this pump I told them that it was an excellent improvement on the traditional pump and very good for city slums and villages near urban centres but not for remote Bunumbu. No handpump works after four or five months in backward areas and I warned them that if those pumps were more than six months old they would not work. Sure enough, it was so. The group tried the pump and confirmed my prediction. No technical device, however, "appropriate" can go on functioning without proper care and attention. I have been testing Mark II pumps in

several Villages in many developing countries only to find them in-operative. Just behind my residence and within a mile from MERADO, stands a Mark II pump which is inoperative for over two years, because the children spoilt it.

Much is written about the efficiency and "appropriateness" of Mark II but the reports that enter the press relate to pumps less than six months old, to those in and around urban cities which get some care, or in better developed villages where spare parts and mechanics are available. Usually, when a washer or a bolt gives way there is no replacement in most places and where there is replacement there is no mechanic or tools, or the mechanic demands much money and therefore the Community does not engage him but goes back to the traditional source of contaminated water. Several encouraging reports relate to pumps in India, where the pump itself and the spares are made, and can be obtained if one really tries. But what about pumps in Africa or the Indian Ocean and Pacific Islands where even washers, nuts and bolts are not made? Poor countries have import restrictions and what they get under aid programmes is not carefully safeguarded, stored and administered. Raw materials and machine spares disappearing from office-premises, factories and store houses is a common

occurrence in the African and other developing countries and good administration and proper controls are what these countries are yet to learn and practice.

The main reason for the pumps breakdown, more than want of spares and mechanics and supervisory control, is that they become a play thing for children. One can see commonly urchins pumping and splashing water while smaller children filling them with sand, stones or sticks. Their parents want them to play and believe that it is the responsibility of those who installed them to maintain them.

Reports Maggie Black in UNICEF News, Issue 114, "85 percent of the pumps went out of action almost as soon as the drilling engineer left the neighbourhood and they (people) went back to using the open wells in the vague expectation that the engineers would come back and mend their pump some day." She continues, "It is essential to maintain the pump in working order, otherwise there is no chance that the habits and attitudes of several families can be definitively changed." But changes in habits and attitudes in these countries is not something which can be brought about in our life time.

In the meantime the emphasis should not be on tube wells, borewells and India Mark II pumps but on the provision of open wells, lakes, ponds, rain-water catchment areas and deepening the existing ones. More dams will have to be built and ground water resources must be recharged by making broad boreholes scientifically.

Open wells dug inside dry rivers, ponds, and catchment areas, need not be very deep and most of them retain atleast some water during the dry season.

Interconnection of existing rivers and lakes and catchment areas must be done to collect more water during the rains to maintain sub-soil water level during summer. Flowing of rain water into the sea through rivers must be arrested as far as possible. It should be drained into catchment areas, ponds and dry rivers. This was the basic idea of Vilasa Rao Salunke of Maharashtra, India, who succeeded in controlling much of the flow into the sea through rivers, and diverting and draining the water in the land. To promote his effort he introduced his "Pani-Panchayat idea (water by people's management) which is so successful that it is now drawing wide attention.

Even if one has to dig 100 meters to hit the water table as in Coimbatore or Cuddapah in

south India it is better to spend on open wells which will stay trouble free and serve the community.

The 'Tara' deepset pump which was promising four years back in Bangladesh is now unsatisfactory as the water table has fallen very low and many pumps have gone out of use. Maintenance is a big problem in this poor country.

Many types of Wind Mills are also not suited and one can see thousands of them standing inoperative like skeletons of dead giants. However, Windmills to pump water from open wells with canvas or metal buckets seem satisfactory. There is not much to go wrong in this system and small troubles can be easily noticed and rectified. How effective the take over of photo valtaic cells when the wind drops on these bucket lifters is to be researched and improved. (The writer likes to draw the attention of the reader to his invention known as, "Ryan's water gate" which lifts water at Zero operational cost from open wells to over-head tanks in canvas buckets not by the force of wind or solar energy but by a wicket gate beside the well used by people and school children. For every turn of the gate a bucket of water drops into the overhead tank and from there led into huts by PVC tubes. This invention was commended and

broadcast by the BBC, London, in 1982 under their, "Hullo Tomorrow" programme).

Another way of taking water to people which is not usually done is by digging canals to allow sea water to enter the land under lock and sluice control. People can be asked to contribute free labour for an hour daily and dig half Km. every day and they will be happy to do so to take water to their colonies and homes.

When the British ruled India, during days of extreme drought they employed thousands of villagers to dig a canal and connected Andhra with Madras coast and this 420 Km. Buckingham canal, was made navigable for country boats and steam-launches and all along its course lands were cultivated. Sea water loses some of its salinity as it flows some miles into the land. But even when the water is saline trees like the casurina acasia, palmirah, the dry zone wonder tree called, prosopis Juliflora, sea weeds, etc. can be grown to provide occupation, fuel wood, fibre and edible oil-bearing nuts for people.

Water that is taken inland can be solar evaporated and condensed as it is now being done in some African Countries on a Commercial scale. In Somalia, where I worked for the ILO and the refugees, experiment in Kudha to convert sea

water into fresh water in solar stills was initially successful and produced 400 litres of water per day over its estimated capacity but the project was mismanaged even during its construction and therefore failed. However, the experience gained in Kudha is adequate to make similar projects succeed in other places. In Gujarat, India, a similar project has been producing excellent results for the past several years and separating saline water from salt, serving double purpose. Salt water lakes and ponds may also be built for fish and weed cultivation.

The solar water still developed by the Murugappa Chettiar Research Centre (MCRC) in Madras, is a very cheap device which has been field tested and can be used by individual families to convert sea water into drinking water on a family scale. The poorest family can afford and maintain it.

Depending more on sea water and less on sub-soil water is necessary because of the gradual depletion of the ground water in many countries making shallow handpumps inoperable. Bangladesh, one of the poorest countries of the world, is now facing this grave disaster.

Yet another good approach to take water to people is to dam water flowing away from the

hills to waste and destruction, regulate and lead it into man-made canals to dry or desert areas. In this regard, the world has to take note of the multi-million massive project called the Indira Gandhi Canal project in Rajasthan that is underway for the past 30 years financed by the State Government, Central Government and foreign agencies. The project is taking water of the Ravi — Beas from the foot-hills of the mighty Himalayas to the Thar desert and it is a Herculean task. Just to report one aspect, on an average daily in May, 1983, nearly 44,000 labourers, 3,000 donkeys and 5,000 camels were employed at the canal site, fed, clothed and sheltered by the project administration.

There is no gainsaying that what has been achieved on the canal front is no mean achievement despite the failures, pitfalls, delays and soaring costs beyond estimation frequently pointed out by critics. Thousands of women and children who used to tread 15 to 20 Kms. for a pitcher of water are now getting potable water where they live.

The water from the Hills has already made its impact on the desert districts of Bi Kaner, Barner, Jodhpur, Ganganagar and Jaisalmer. Several villages have sprung up where there was

no habitation for centuries. A large number of agro-based industries are also seen in the benefitting areas which now produce plenty of fruits and oil seeds and Forestation is going on. When the project is completed 20 years from now it will give plenty of water for million people for a million years.

Reports Co-operation South No. 2, 1987, "Like the Mark II, the Maldev pumphead relied on fitted metal bearings which suffered rapid deterioration and were difficult to properly replace at the village level. (This confirms what has been said in the forgoing pages).

"Working with local manufacturers and Du Pont Company, a technical team in Nairobi produced a modified Maldev design featuring injection moulded plastic bearings. Working through other design problems with the Malawi pump, the Kenyan team began field testing the AFRIDEV pumphead proving that the plastic bearing concept could be cheaper to maintain and easier to repair at village level."

The report continues, "According to World Bank Regional Project Officer, David Grey, the AFRIDEV system represents a major conceptual breakthrough because, it is designed to exploit the benefits of modern materials and technologies,

especially, plastics. It is suitable for local manufacture in developing countries. It's easily maintained using minimal skill and few tools. It features a universal small diameter, long stroke cylinder for all well depths, simplifying spare parts requirements and minimising stress forces."

"The total cost of the complete pump assembly is less than US $ 400, and most of the below ground components for the system are made of standard PVC plastic which is readily available in Kenya and other East African countries. The cost of locally produced replacement bearings is only US $ 4 for a complete set."

It is to be questioned that when hard metal parts cannot stand the ware and tear of the pumps in the villages how plastic can stand it. Most Third World countries do not manufacture plastic granules and where they are made the quality is very poor and the cost high. Even in India, with all her advanced technology the quality of plastics is very poor. Indian plastic consumer goods, industrial and automobile parts are very flimsy and short lived. The costliest and best quality plastic water taps made in India, for instance, do not last for more than 3 or 4 months if used daily.

The report cited states that standard PVC plastic is readily available in Kenya and other

East African countries. True, it is available in Kenya but not in other African countries. (other than South Africa). A good majority of African and other Third World countries cannot afford to import these plastic components. In Somalia a PVC garden hose pipe was not available to water the vegetable garden promoted for the refugees in 1984 and we had to stitch canvas like a pipe (tube) to serve our purpose.

The report states that the total cost of the complete pump assembly is less than US $ 400, that is, more than the annual income of most of the families in many Third World countries. It is common knowledge that more than half the world lives below the poverty line.

The report further states, that the cost of locally produced replacement bearings is only US $ 4 for a complete set. This is more than 2 days wages of a labourer in the Indian and many Third World cities.

However the reality is that plastics is not at all a suitable substitute for metal components in hand pumps. If plastic components are introduced it will only encourage exports of plastic components from the advanced countries to their

advantage and detrimental to the development of the Third World. Replacement of parts will be more frequent than metal parts. It will result tn making the poor countries further indebted to the donor countries.

Reports David Spark in the UN paper, Development Forum— Jan-Feb 88: "Pumps run for thousands of hours, "they are run with sand and kiesulguhr (earthly deposit) added to the water. This is because, although gravel is packed round a borehole's lining to keep out sand; it still usually gets in and attacks the working parts." David concludes:"Unfortunately, the difficulties are still not over. Plastic-made rising mains, through which water is brought to the surface, have been failing. They are stretched and compressed as the pump operates, and they are subject to shock if the pump handle thuds down."

As already argued the very concept of providing hand pumps to the Third World is basically impractical. There has to be a radical change to the approach to providing drinking water to the world of thirsting people. The poor will remain poor or become poorer if they are given the technology of the rich with materials made in the west.

PART — TWO

Pumps or Open Wells ?

There is no multilateral "quick fix" and lasting solution to the water agony of the drought ridden developing Countries. When my paper "pumps without water" was sent to National and International Agencies concerned with water development there was a storm of controversy in many quarters. Perhaps the controversy arose because I brought out only financial and maintenance reasons for the failure of hand-pumps and not the political, communal and religious conflicts.

After several years of personal investigation in many Third world Countries I had said in my earlier paper that in most of those Countries, a metal item cannot be easily obtained in rural parts — not even a table pin or a washer and Third World Countries do not have a "machine or maintenance culture" to take proper care of, and benefit from, hand-pumps and bore wells. Economic Times dated 21.08.85 reports: "According to the Managing Director of the National Bank for Agriculture and Rural Development,

90 percent of the existing electric and diesel pump sets installed for irrigation purposes are defective and running at 50 percent efficiency and below, and it is adding to the cost of cultivation and lowering profitability." Therefore, the water problem should be solved less by hand-pumps and more by open wells, deepening rivers and catchment areas, arresting rain water running to waste into the sea and most important of all, by digging canals with lock and sluice arrangement, where costal inland is not more than about 20 feet above sea level (usually it is less than ten feet). Sea water can be desalinised both by expensive high technology and by poor man's inexpensive AT methods which is common now.

One does not deny the fact that the overall utilisable ground water resources is reasonably adequate for human consumption in several drought ridden Countries even though the water table is falling lower and lower year after year. In India alone the utilisable resource has been assessed at 42 million hectare metres as compared with 67 million hectare metres of surface water. Experts such as Mr. D.K. Dutt, Chairman of the Central Ground Water Board claim that some underground reservoirs can regularly yield about 150,000 litres an hour for several years. Mr. Paul

H. Jones, an international expert on the subject says that oil drilling and seismic studies have more or less confirmed that the upper gangetic plain has huge deposits of sand and gravel to depths of over 1500 metres suggesting the existence of layers of prolific fresh water tables.

The point raised in my earlier paper is basically the cost and maintenance factor and the unscientific extraction of groundwater which reduces the water table, making it necessary for drillers to go deeper and deeper at greater and greater cost. A noteworthy example is what happened in Saurashtra in India when indiscriminate and excessive drawals by hand pumps, electric motors and oil engines have led to saline intrusions into sweet water aquifiers, affecting fertility of soil and farm activities in spite of the fact that the Water Policy document of India makes it clear and emphatic that groundwater exploration should be "so regulated as not to exceed the recharging possibility."

The eminent jurist of India Mr. V.R. Krishna Iyer, retired Supreme Court Judge, who stood for presidential election of 1987 writes in the first issue of Loyola Journal of Social Sciences: "Taking our own example, water technology experts have estimated that large parts of India

will go without water by the year 2025 AD if the present alarming rate of consumption by domestic and industrial users continues."

Many Governments do little or nothing to solve the drinking water problem which is so basic a necessity for human survival but expect the UNICEF, the WHO, the World Bank and other International or Regional agencies to solve their water problem. For instance, what is happening in the City of Madras, India? The successive Governments, after the Britishers left, have not even cared to remove the silt which has been accumulating and reducing the water catchment area in the Red Hills lake, the Sembarambakkam lake, and the Poondy lake — the three lakes which supply drinking water to the citizens of Madras.

These three lakes prepared by the foreign rulers to provide water for 14 lakhs people of the City at that time are left like that to provide water for 50 lakhs of people now in the City, not to speak of the silt that have accumulated in them over the years and reduced their holding capacity.

India is a Country of droughts and floods and ever since Independence the Centre and the States have been promising the people about inter-connecting the rivers but never do so because of challenging politics. People are fed up.

Recently there was an article in one of the leading UN journals which claimed that the most practical and suitable way to solving the water problem in the drought ridden Countries is to give the people bore wells. There seems to be a decisive policy and idealism in favour of hand pumps. One agrees that where this idealism can produce results it certainly should be made to do so. But the fear is that idealism is stretched too far without taking into consideration the life-style and social structure and political, communal and ethnic conflicts in the developing Countries.

The UN paper referred to states, "The Hand Pump Project has determined that strong community initiative is essential for the successful long-term maintenance of rural water supply systems, including handpumps. Villagers must be intimately involved right from the planning stage."

"The institutional capacity of the Community must be evaluated. This includes the organizational experience of the Community."

"The more people served by each pump, the longer will be the queues, the greater the chances for breakdown, and the greater the risk, that people will return to alternative traditional sources."

The report continues: "Regional or Countrywide standardization is essential with handpumps because of the complexities involved in obtaining adequate skill levels and spare parts supply to rural areas."

"The villagers must be willing and able to contribute financially atleast to meet the maintenance and operation of the water supply scheme and preferably even to its construction to avoid a distortion between alternatives."

How idealistic! The experts do not take into account the total failure of the Community Development movement and other people's programmes in India and several other Countries and consider the social backwardness, corruption, political factions, caste community, language and religious tensions (Sri Lanka for example) and most important of all the political sabotage of the opposition parties which have taken destruction of public property and community services, as their main weapon of opposition.

As the former Central Minister for Agriculture and Irrigation, Mr. Bhanu Pratap Singh wrote in The Hindu of 16th October 1987, "The new masters have learnt from their predecessors (the British rulers) the lesson of 'divide and rule.' They have become past masters in creating

dissensions in Villages and have in fact succeeded in splitting the rural society, both vertically and horizontally, into big, small and marginal farmers and landless farm workers, and again into scheduled, backward and forward castes."

Those who advocate large-scale hand pumps should come down to live for some days with the illiterate and suppressed and oppressed poor of the Third Countries of Africa and South America who have not seen civilization, and include a visit to the community, caste and political enmity ridden India which is considered to be more advanced than most Third Countries in several ways, and they should also consider the set up of society in Bangladesh, the pacific Islands and the tribalism of Papua New Guinia.

As a Community Development specialist and grass-root worker with experience in several Countries working with tribals and refugees, this writer can say with much conviction that the Third World Society, as it is composed today, will not follow (or be allowed to follow) any of the disciplines spelt out by International water experts as cited above.

Those who have lived in very poor Countries know very well that in the Villages, in the

Cities, and the road-side, the water tap is the starting point of most of the quarrels between families between groups in the Villages and between neighbouring Villages and between tribes. The water pump is the Community "clash centre". Even today in many Third world Countries like India, which has conquered space, produced several Nobel laureates, scholars and scientists to man American industries there are different wells and different taps for different communities and a so-called backward community women dare not draw water from so-called forward community wells or pumps. In every village there is strong groupism and half-a-dozen political parties working one against the other daggers drawn.

This year (1987) the Chief Minister of my State, Tamilnadu, publicly advised members of his (AIADMK) party to always carry daggers with them to defend themselves when attacked by the members of the opposition party in the rural parts and this practice is now in vogue throughout the State, eventhough the press criticised the advise. One may call this terrorism or democracy but it is there, encouraged by the ruling Government and practised by the party people.

Similarity in socio-political conditions are found in most of the African Countries, South America, Certain Caribbean Islands, in the Indian Ocean and Pacific Islands. Experience tells us that an A one project cannot work in a C three State or Society and this is what our planners and policy makers fail to take into account. Always they talk about the human factor and people's participation without giving any consideration to Country's or Community's life-style and multiple factions. Community mentality in poverty stricken Countries is not the same as what it is in rural parts of developed Countries or in poor Countries with pro-western life-style as in some Countries of South America, for instance. North is not South and the West is not East and it is difficult for these cultures to meet and this is something for international experts to think about.

Reports Hindu, a leading daily of India, in October 1987 "Nearly 5000 Harijans were rendered homeless when their huts were gutted by "Vanniars".....Harijans had no enmity with any other section of the people around. Some external force (Opposite party members) had exploited the agitation in rendering the Harijans homeless". (the Vanniar Community was agitating for proper recognition and to get some privileges from the Government).

And in the previous month (September) in the City of Madras one anti-religious group gutted 100 huts of people belonging to another religion and rendered 500 people homeless. In Ranchi, north India, one religious party puts poison in the wells of those who follow other religions and several people are done to death every day. These instances are from India but political and religious opponents are playing hell in many Third Countries where the press is suppressed by the ruling party or the one party government and the common man's cry is not heard.

India which was known for its ancient local self-governments (Panchayat Raj) has now totally lost the sense of doing things collectively, openly or commonly for fear of opposition or communal trouble. When village Panchayats (local self-governments) which were suspended by the then ruling party in Tamilnadu State some 20 years back was restored in 1986, the opposition party captured power in the Village Governments and they are now sabotaging whatever the ruling party does, including the water supply systems. Tension is mounting day by day.

And yet the task of organising Village Panchayats was included as a Directive Principle of the Indian Constitution in the following words :

> "The State shall take steps to organise Village Panchayats and endow them with such powers and authority as may be necessary to enable them to function as units of self government."

There have been any number of instances where City Corporations and Municipalities have remained under a bureaucratic regime for a decade or more. The most striking example is the City of Madras where the Corporation which is celebrating its tercentenary this year (1987) is without an elected body for the 14th year running.

The Veeranam Project has been investigated and declared most viable both by a high power team of the government of India and by a World Bank team and the World Bank had offered to give all the money required to the Government of Tamilnadu to complete the scheme to take drinking water to the people but the ruling party was determined to scuffle the scheme because it was launched by the opposition party when it was in power and that party should not take the credit. This is no secret but an open declaration.

Equally with dirty politics, corruption to the core is weakening the people's base for

development in most Third Countries. Said Prof. B.S. Minhas, who delivered the sixth J.P. memorial lecture on "Planning and the poor in India" organised by the Jayaprakash Foundation. "The anti-poverty programmes had been over centralized, the basic model of development for the removal of poverty shorn down to its essentials, have been reduced to schemes for dispensing of political and bureaucratic patronage on an individual basis."

The UN journal cited earlier says "The Villagers must be willing and able to contribute financially atleast to the maintenance and operation of the water supply scheme and preferably even to its construction to avoid distortion between alternatives." This is said in spite of facts reported in the New York Times in September 1987 which reads: "Most labourers in El Salvador, Nicaragua, Honduras, and Gautemala earn little more than one dollar a day in economies that require atleast that much, at the most marginal level of existence, to feed a family of four. Businessmen ignore the official labour codes regulating working conditions and Governments seldom appear to enforce them!

With economies in ruine, and inflation at an all time high in most Countries, even a raise

offers no more than temporary respite. "Wage increases, although often granted, have not kept up with the upward price spiral", says the official United States embassy report on labour conditions in Guatemala, where most workers earn about a $ 1.50 a day. "This has brought growing misery to the most marginal sectors of the population", the report concludes.

"In Nicaragua, a Country caught up in a socialist revolution and war, workers are also badly off. With inflation at 700 percent, food rationed, and most trade unions controlled by the State, making strikes almost impossible, most Nicaraguan workers have never had so little to live on." Can water experts expect Nicaraguans to contribute anything to sink bore wells or maintain hand-pumps?

Economic conditions are appaling in almost all LDCs and most of the DCs. UNDP says, "One thousand two hundred and fifty million human beings do not have adequate shelter. One hundred million people have no housing whatsoever. Some have never had a proper place to live; others have been made homeless by disasters. In urban areas they dwell on the pavement. stake out a few square feet under bridges or in vacant plots, sleep in doorways, subways or the

recess of public buildings" (Development Forum). These are the people who need water urgently, James Grant, Executive Director of the UNICEF reported that 1985 was the sixth Consecutive year in which the developing Countries as a whole recorded a drop in the per capita income. Apparently poverty level is falling year after year. Yet International water experts say that the poor should try and pay for the construction and maintenance of hand pumps? wither reality!

We are one with planners and policy makers when they talk about people's participation, training local leaders, promoting welfare associations, maintenance committees, cooperatives etc. But one has to be pragmatic and look at situations as situations are and take water to people who are dying, in approaches that are feasible instead of talking of how people and rural communities should behave and dirty politicians should conduct themselves.

The World Watch Institute and several other International fact finding agencies have said in many of their reports that most of the calamities in Africa are not natural or climatic, but political. In view of this finding development approaches will have to be changed. Governments and human life-style and behaviour cannot be

changed overnight but certainly we can change our policies and plans to safe alternatives. For appropriate management philosophy which explains how set-up and approaches can be altered to make human nature behave in a desired manner, please see PEMBA (Personal Management by Alterations) by this author which was published by the Hindu and then as a booklet.

Whether it is hardware or software, appropriate technology has to be very specific to the economy, custom, culture, politics, and lifestyle of a given community. Just because of VLOM (Village Level Operation and Maintenance) of hand pumps succeeded in Livulezi Valley of Malawi or in San yuyo in Guatemala, we cannot generalise and say that it will by and large work in any God-forsaken or trouble ridden rural area. Taking an overview of the water pump arrangements made so far, their success and failures, the input and expenditure, one must feel convinced that the less expensive "open system" is better suited and more economical for most of the poor communities, groups or tribes, than the "more expensive" closed system where atleast 80 percent total breakdown or non-functioning is common within a year or two after installation. There is no doubt that the national and international

agencies which are now assiduously promoting hand pumps will sooner or later come to this conclusion and thereafter give more importance to the "open system" than to the "closed." Have they not given up promoting and financing large scale dams and hydro-electric projects after burning their finger and now saying "small is beautiful". Experts of the Inter-American Development Bank have rated 39 of 40 large dams in the Third World as failure.

National and International Governments will also turn to using abundantly available sea water as explained in the earlier paper "Pumps without Water."

Already the Gujarat State Fertilizer Corporation, India, is installing a desalination plant at an estimated cost of Rs. 4.50 Crores or US $ 45 million near Jamnagar to face the water crisis. The plant with a capacity to convert half million gallons of sea water into potable water is being imported from USA. The State of Tamilnadu has also placed an order for a similar machine with Japan. With increasing population and depleting inland and subsoil water and repeated monsoon failure the only alternative is to resort to sea water: However, solar evaporation system like the ones set up in Somalia or Gujarat should

be prefered to the system of importing costly machines from USA or Japan. It is possible for the man in the street to convert sea water into pure vaporised water. The family size solar still designed by this writer will not cost more than US $ 30 and it is very practical. (pages 37 to 40).

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 cristals 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 extents of lands can be brought under fresh water irrigation and

perhaps organic fertilizers can be mixed in the water flowing to the fields.

In conclusion the UNDP 1986 Annual Report (A Better Environment for Development), may be cited: "There is only a finite amount of fresh water circulating throughout the planet. More than 97 percent of the earth's surface water belongs to the oceans, leaving only a small percentage for drinking water and irrigation. Without ways to bring this finite resources to those who have no access to it, more than nine million people a year will continue to die from a combination of factors related mostly to contaminated water.

"Competition for water is fierce; crops, industry, livestock and people depend on it. Agriculture, however, claims the largest single share of all water used. Poor irrigation wastes precious water and can have adverse environmental effects".

(*Author, Felix Ryan, a Third World Development Economist, has been a consultant to the UNIDO and ILO and has authored the books, Appropriate Management Technology for the Third World and Better Life Technologies for the Poor.*)

Questionnaire to be answered by those advocating hand pumps

1 How long does it take to install a deep bore well hand-pump in a remote village of a poor Country?

2 How much does the pump cost?

3 In which Country is it made and to which Country is it taken? And what is the insurance and cost of transporting?

4 How much is the cost of installation?

5 How much is the cost of taking the heavy pump to a remote village, say 300 Kms, from the State Head Quarters or the port of a Country?

6 How much is the expenditure on staff, labour and supervision?

7 Who is responsible for maintaining the pump?

8 Who gives training and tools for the maintenance mechanic and how much do all these cost?

9 If the washer, piston or chain breaks or gets worn out, which happens once in three months, who repairs them and who meets the cost?

10 From where is that remote village to obtain the spare parts and how? Is there a quick transport and is ready cash made available?

11 Who pays for the spare parts and how much?

12 Who pays for the mechanic and how much?

13 What happens when the mechanic is sick or out of the village or quarrels with the Community?

14 What happens if one community, caste, tribe, linguistic, religions or political group monopolizes the pump and does not allow others to go near it as is usually the case in India and several other Countries?

15 What happens when the water table goes down due to over pumping and there is no more water in the tap as it is happening in many Countries now?

16 Has any Agency done a survey to record the number of pumps in working order out of the total number installed in any particular LDC — after 3 months, after 6 months, after one year, after 2 years?

17 What has been the average working life of hand pumps in L.D.Cs? Are atleast 50 percent of the pumps installed 2 years back working now?

18 How many give potable water?

19 How many families, on an average, are supposed to use the pump and how many pots of water can each family have?

20 Should they pump water only for drinking and cooking or also for bathing, washing clothes and cattle? How is all this controlled and regulated without quarrels?

21 Who watches that children don't fill stone, sand and sticks into the pump?

22 If a woman shouts at a child filling sand into a pump will the mother of that child keep quiet or kick up a row?

23 If a time limit is fixed for each household, who administers the time limit and what does she/he do if somebody exceeds the time limit?

24 What happens if the village headman, politician or chief himself monopolizes the pump?

25 Supposing all goes well with the pump, what happens to the traditional source of supply?

26 Who removes the silt from tanks of catchment areas and keeps the bund in good condition during the rainy season?

27 Will not water hyacinth and weeds spread in catchment areas and ponds that are not in use and multiply mosquitoes?

28 What happens to underground plastic parts if they are eaten by bandicoots as it frequently happens in India even in cities?

29 Is it easy to join metal parts with plastic parts?

30 If the Community abandons the hand pump as commonly done, does it result in development or destruction?

PART - THREE

Ideas For Action

FAMILY SIZE SOLAR STILL

ATIC Handout 198 Maximum cost US $ 30 only

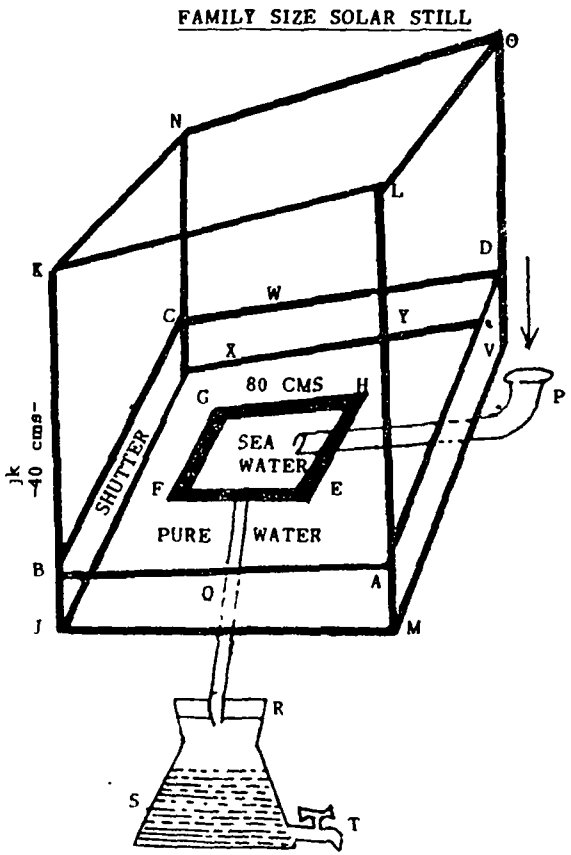
Solar stills are now becoming popular in countries with bright sun. There are very cheap and small bachelor size stills like the one invented and displayed for demonstration by the Murugappa Chettiar AT Research Centre at Taramani, Madras and large scale village community type like the one installed with UN aid in Somalia. The diagram here is of a still designed specially to meet family requirement of pure and potable water.

INSTRUCTIONS FOR CONSTRUCTION

ABCD is a one sq. meter galvanised tin tray. 16 cm deep/ EFGH is a smaller gal. tin tray of the size 80 sq. cm. 15 cm deep/ JK, GN, OV, & LM are .5 cm rounds welded to the 4 corners of the larger tray/ KL, LO, & ON are all .5 cm rounds welded to the 4 pillars as shown/ Rod KN may be a PVC coated electric wire/ Roads on one side may be 15 cm longer than the rods on the other side as shown

A high density transparent PVC cloth may be cut to size and stuck with rubber glue, to cover side ABKL, KNOL & CDON/Another similar sheet my be cut to size to cover the side BCKN, LONK & LODA/The sheets must be

pulled and fixed as stiff as possible (should not sag) and the chamber thus covered must be air tight. If necessary here and there stitches may be put to make the fixing stiff./ All the sheets should be stuck on the inside walls of the big



tray and not on the outside walls/ Side JBCG must be a shutter, either with sliding arrangement or with hinges so that the small tray can be removed and cleaned every week. If sea water is used, salt will collect in the small tray which can be scraped and used in the kitchen. If impure and brownish the salt may be cleaned and purified as explained in ATIC handout 64./ If the roof KNOL alone can be of glass there will be quicker evaporation and more condensed water will come out of the still every day. The glass must be 1¼ × 1¼ mt. If the two rods JK and GN are made to project an inch or two on top the projection will hold the glass placed on the frame KLON/ If the glass is in two parts the joint must be sealed by a cellophane tape or hand-made paper.

OPERATION

The still may be kept permanently in one's back-yard, frontage or terrace. It can even be kept in the balcony of residential flats provided sun enters there. Trees or buildings should not obstruct the fall of the sun. Four buckets of sea water or brackish well water may be poured into funnel P to fill the small tray. By evening most of the water which evaporates and condenses will role down the smallest side in beeds and fill the bigger tray and from there flow into the container SRT. The lid of this container must be tight to prevent

further evaporation. The water that can be drawn out through tap T will be absolutely pure and fit for human consumption without boiling. For more water two stills is the answer.

Issued by the Appropriate Technology Information Centre, No. 8 West Mada St. Srinagar Colony, Saidapet, Madras–600015, India,
The poor will remain poor if they depend on the technology of the rich.

RURAL LIGHTING BY SEA WATER

ATIC Handout 214

(*for diagram see handout* 215 P. 40)

This is a simple idea of connecting a dry lake or catchment area of coastal villages by cement or metal or fibre-glass water pipes of about 60 cm diameter to let sea water in. The lake or catchment area may be at a distance of one to ten kms from the sea. At the outlet end in the lake or catchment area one or two mini generators may be installed. The entry of the sea into the pipes may be controlled and regulated by lock and sluice arrangement. For safety sake, an additional locking arrangement may be made somewhere in the middle of the pipe-line. In case the head-lock gets stuck or breaks, the middle lock can stop the water from flooding into the land.

The lock may be lifted at 6 PM and closed at 6 AM and throughout the night the flowing

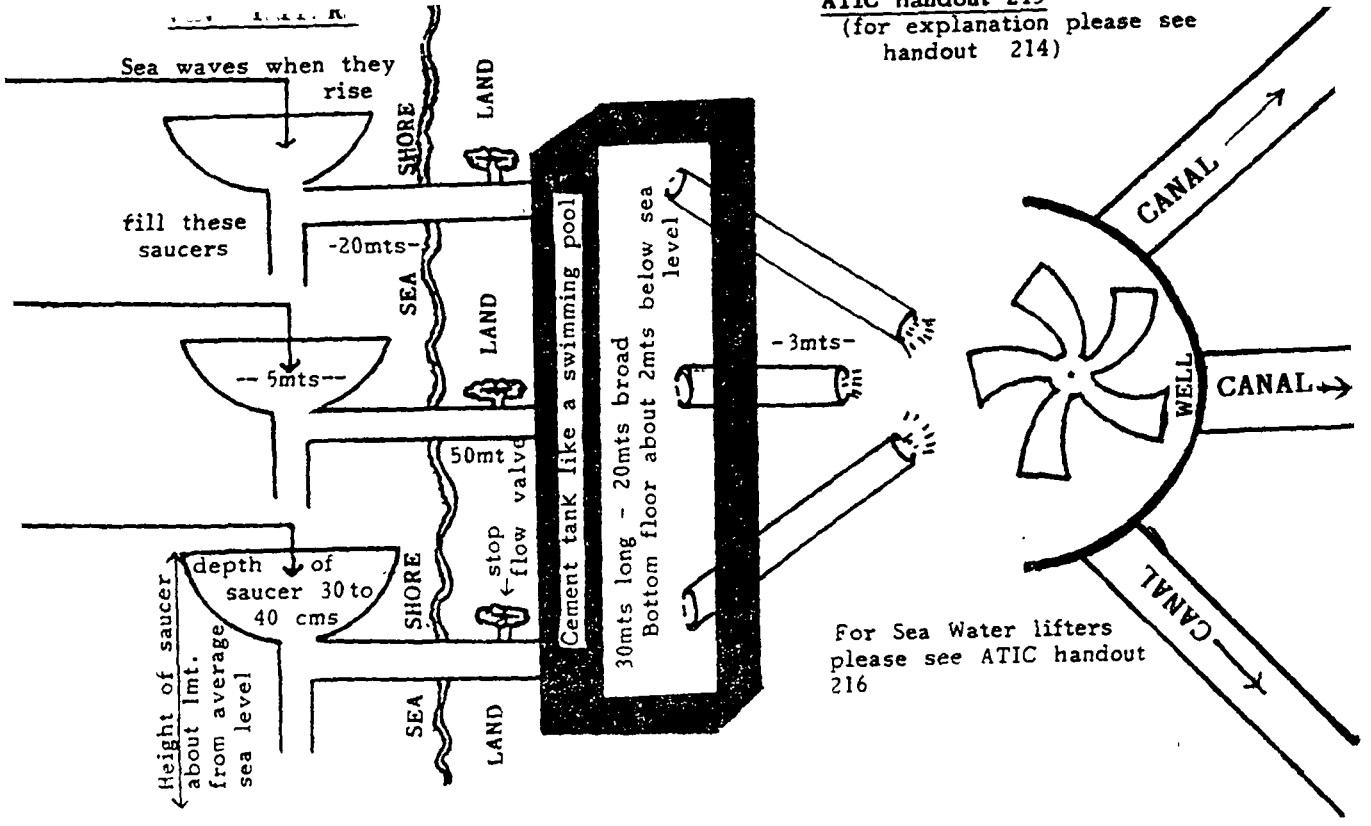
water will generate electricity. If the receiving capacity of the tank or catchment area is small the flow may be allowed only from 6 PM to 10 PM every day when people really need light.

From the lake or catchment area the water may be led by small canals into interior villages and connected to lakes and catchment areas in those villages. Mini generators may be installed at the end of these canals also.

This scheme will not only provide street lights for the poor villages but also make their baren dry lands wet and there can be inland sea water fishing and growing of saline soil trees, shrubs and fuel wood. Names of some saline soil and sea water plants and trees are given elsewhere. Land locked interior villages will have atleast sea water to cool their surroundings and to wash their cattle, clean their clothes and to soak their fibre plants for fibre extraction. They can also have salt pans and make salt for their domestic needs. Fodder for cattle can be grown.

When drinking water becomes scarce in summer they can use the solar still shown in page 35 and convert the sea water into potable water. People who have no water to bathe and keep clean can take a dip in sea water ponds and pools and there will be less disease and more cheer.

ATIC Handout 215
(for explanation please see handout 214)



For Sea Water lifters please see ATIC handout 216

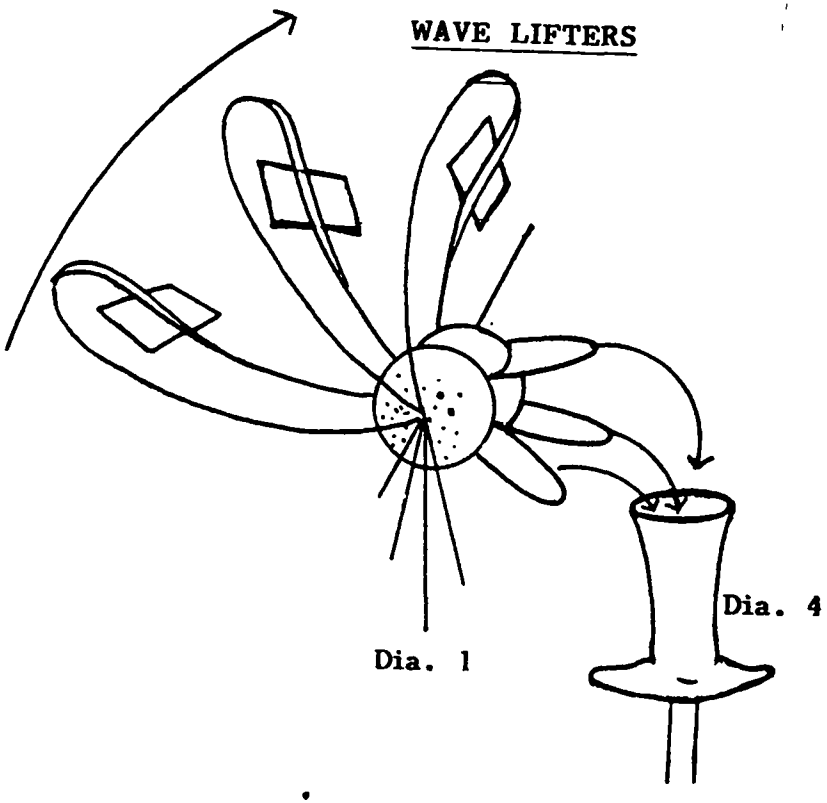
WAVE LIFTERS ATIC Handout 216

While handout 215 explains how to tap waves in the sea this handout explains how to lift the waves.

The buckets and the collapsible flaps are the special features of the windmill designed for the purpose. Each bucket wing seen in dia. one is 2 m long and each wing has 30 cm × 15 cm flaps on either side fixed on hinges to work like butterfly wings. When folded towards the axle of the mill the flaps will fold only to a certain extent (to form about 90 degrees with the bucket wing as shown in dia 2) as there is a block (stop) in the rear of the flap to prevent it from folding further. Thus, when the wind blows the flaps will be in open position as shown in dia 2. But this will happen only when the buckets with water move upwards and make the buckets move faster.

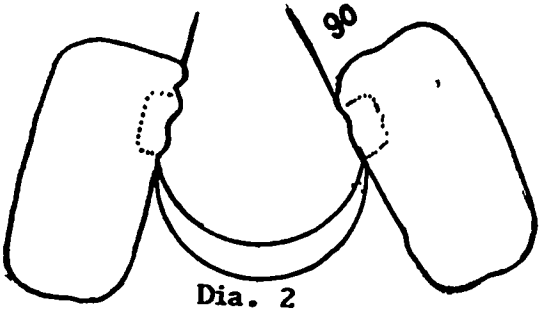
After the buckets empty the water in the receiving tank as shown in dia 4 and move downward empty the flaps will collapse and hang downward as shown in dia 3. In other words, when the buckets pick up the waves (water) and move upwards the opened out flaps will face more of blowing wind and move faster and when they return empty downwards the collapsed flaps will not offer wind resistence. By this arrangement the mill will operate efficiently.

WAVE LIFTERS

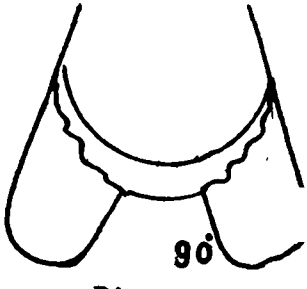


Dia. 1

Dia. 4



Dia. 2



Dia. 3

The buckets and the collapsible flaps may be made of aluminium or fibre glass. The mill may be installed 30 to 50 mts away from the shore and in such a position that the bucket wings dip 15 to 30 cms into the water at normal water level in the sea.

Receiver (dia 4) built on Saucer collectors which are explained in handout 215 should also be positioned to collect the water dropping from the buckets. The site for installing the mill must be selected with care. There must be enough wind in the area and the shore level should not be more than two meters. above sea level.

COMMUNITY WATER SERVICE

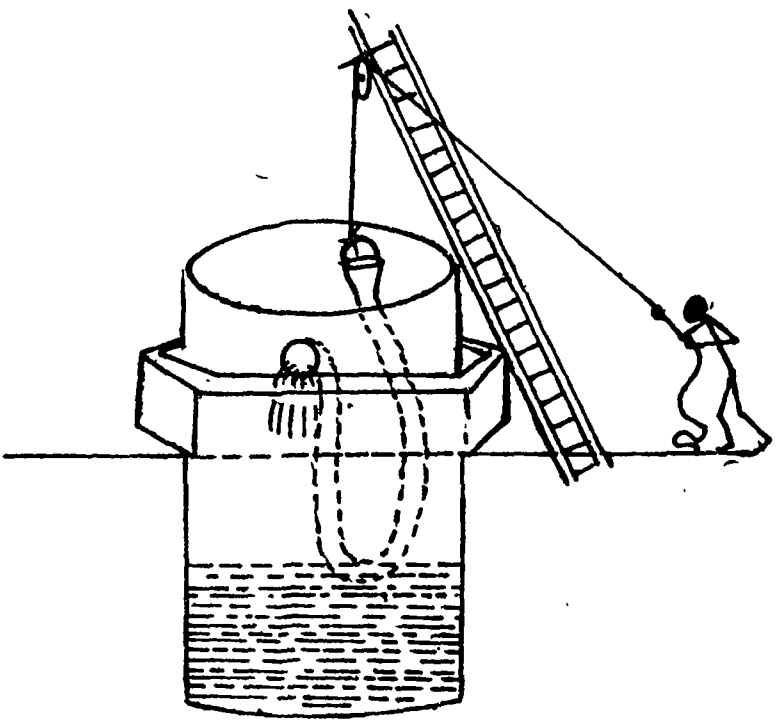
ATIC Handout 218

Water is an eternal problem in Third World Villages. Bore wells are inoperative and often give saline water. However, there are some good open wells here and there and the village women gather round these wells and wait for their turn The waiting is long and often the queue is broken resulting in quarrels.

Diagram shows an arrangement in which a water tank is built around the wall of the well.

A hole is made on the existing wall of the well just above the tank as shown.

A pair of Causarina poles may be tied like a ladder 10 to 12 meters long. Two or three poles may be joined and tied together. One end of the ladder must be buried half a foot into the ground slanting on the well wall as shown.



The other end must come almost in line with the middle of the well and on the very top cross bar (rung) a pulley may be tied or hooked.

Water-proof canvas cloth (rain coat cloth) may be cut and stitched in the form of a long tube of 15 cm diameter. Out of the same material a bucket may be stitched without the bottom. The bucket may be 40 cm long, 30 cm in top diameter and 15 cm. in bottom diameter. The open bottom end may be attached to one end of the long canvas tube as shown and the other end pulled out from the inside of the well through the hole that was made and a metal rim of 18 cm diameter fixed to the delivery end of the canvas tube so that the delivery end does not fall back into the well.

The total length of the canvas tube should be equal to the length between the delivery hole in the wall and the water level in the well. (plus 1½ mts. in case the water level goes down.)

A quarter cm. thick metal ring is fixed to the opening end of the bucket and a semi circular ring attached to that ring as shown. when the two cm thick nylon rope or fibre rope tied to the bucket and taken round the pulley is let loose the bucket dips into the water and picks up water and when the rope is pulled back the water in the tube gets emptied into the storage tank around the well.

Every day two families may fill the tank in turns and the others asked to take three buckets of water from the tank. This will save time, trouble and labour for the village and there will be happy community participation. The system can very well be introduced as a first step in community co-operation and people's participation in rural areas.

NOTE : From 1982 ATIC (International has been releasing one handout every week of the type printed in this booklet under Part III and they relate to various aspects of rural development. Hundreds of them have been printed and published. While the handouts are sent free to ATIC members, others way obtain them at Rs. 3 each which includes postage. Those outside India may please send US $ one to cover foreign postage. They will be sent only on receipt of payment.

Better Life Technologies for the Poor

(Review)

This 112-page book written by Felix Ryan who has been working for the UNIDO and the ILO as an Advisor on rural community development and extension methods in several countries contains one hundred grass-root development ideas to help the very poor to help themselves and their neighbours to live better, economically, socially, and hygienically. All the ideas can be implemented even in God-forsaken villages with local raw materials, strictly speaking with their own resources and without any financial or technical aid from outside.

Some of the ideas don't require any money at all to be put into practice and many of them can be implemented with about ten to twenty Indian rupees on each idea (about US $ 2 only) on material cost. Usage of metal parts, even simple items such as nuts, bolts, washers, nails, screws and binding wire are avoided as far as possible, because they are not easily available

in most Third World Countries which don't manufacture but import them.

If an NGO (non-government organization) takes up the implementation, Indian Rs. 10,000 or US $ 1000 would be more than adequate, including transportation, supervisory charges and contingencies to implement all the 100 ideas in a selected village or Growth Centre and they can give direct employment and a family living wage or additional income to atleast 1000 families. The same idea may be given to several families in the same village depending on the population. Some projects require plants and trees to be grown to produce the raw materials. Even by implementing 50 selected ideas a model-cum-demonstration Growth Centre can be established for others to copy.

Every detail is explained in simple language with diagrams and it is an ideal guide book for grass-root workers to bring about development without delay and dependence and to help human beings to live like human beings. Appropriate technology, self-help, waste utilization, development of one's own raw materials, people's participation, learning on the job, employment of women, children and unemployed youth in particular, is the keynote of the book to relieve

poverty, hunger and the burden of living. In particular, the book is written for refugee settlements, interior villages, small underdeveloped islands, tribal areas and the urban informal sector.

The book may be obtained from CARITAS INDIA, CBCI Centre, Ashok Place, Gole Dakhana, New Delhi–110001, a non-profit seeking organization which enjoys consultative status with the United Nations. With numerous diagrams, it can be had on advance payment for actual cost of printing plus handling charges which comes to Rs. 10 in India. Postage extra.

Volume Two will be out in 1988.

By the same author

1. Efficiency for Small Manufacturers. – Asia Publishing House, London.
2. Appropriate Management Technology for the Third World – Wheeler & Co. 755, Mount Road, Madras – 600002
3. Trade Training – some new Thinking – Centre for Research on new International Economic Order. No. 1. Haddows Road, Madras-600034

4. Co-operation as it should work (compiled) Ryon Training Institute, 56 Catholic Centre, Armenian St, Madras-1

5. Rural Co-operatives (co-author) Indian Social Institute, N. Delhi.

6. Better Life Technologies for the Poor. Vol. I.- Caritas India. CBCI Centre, Ashok Place, New-Delhi 100011

7. Better Life Technology Vol. II

8. First Aid to Sick Chicken OYDEC, Mission St. Pondicherry-605001

9. Spinning Rs. 6000 PM from rabbits, - ATIC (International) 8. West Mada St., Srinagar Colony, Madras - 600 015 and Rotary Club of Madras (South)

10. Pumps without Water (Misconceived Water Policy), published by Satprakashan Sanchar Kendra Bhanwarkua Chowraha, Indore - 452 001. MP. India.

11. PEMBA (Personnel management by Alternatives). ATIC (International).

PUMPS WITHOUT WATER

— "About 97 percent of the total water available in our planet is in the salty sea and out of the remaining 3 percent of fresh water that is available for human consumption 2.9 percent is in the form of polar icecaps and only 0.1 percent fresh water is really available to sustain life in our planet."

— "Before the end of this century humanity will be sucking the earth dry and drinking water will become a rationed and taxed commodity under political, national and international control and wars will be fought between countries, not for the land, gold or power but for drinking water."

— "It is the prediction of this author that water is bound to become more scarce and costly in the 21st century–costlier even than oil and many nations that errect rigs and drills for oil will soon be drilling for water off shore."

— "**Author, Felix Rayan,** a Third World Development Economist, has been a consultant to the UNIDO and ILO and has authored the books, Appropriate Management Technology for the Third World and Better Life Technologies for the Poor.

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