INTERNATIONAL DEVELOPMENT RESEARCH CENTRE

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CANADA

MEMO TO EDITORS February 1981

The 1980s have been designated the International Drinking Water Supply and Sanitation Decade by the members of the United Nations. This package of *IDRC Features* was specially prepared to mark the beginning of the Decade. Articles from Africa, Asia, and Latin American present an overview of the global problems, and put them in perspective with reports on some of the people and the projects.

--Indian journalist and environmentalist Anil Agarwal prepared a 150-page briefing on the Decade for Earthscan and the International Institute for Environment and Development. A summary of his report puts in clear focus the aims of the Decade and the difficulties it must overcome to achieve those goals.

--From Argentina, development writer André Van Dam examines the need for a global system of water management to prevent a water crisis that could make the energy crises of the seventies seem like the good old days.

--Author and journalist Clyde Sanger travelled to Zimbabwe after independence, and discovered that 15 years of virtual isolation have not dulled the inventiveness of that country's scientists, at least not in the water and sanitation field.

--Perhaps nothing is more important to rural water supply than the pump. On a visit to East Africa, *IDRC Reports* associate editor, Rowan Shirkie, sees some new style pumps in action, and assesses their impact on the rural people.

--Inadequate sanitation is the cause of much of the disease in the developing world -- yet properly managed waste disposal can improve not just health, but food production too. Editor Bob Stanley reports on projects with different approaches to the problem in Asia and Africa.

--*Science World* is a regular *IDRC Features* column. This month the focus is on water and water technology..."pump doctors" in India, how to make the best of bamboo pipes, and how to make the most of a good rainstorm.

IDRC Features are articles by reputable writers from around the world, dealing with topics related to science and technology for development in a popular style. The service is published 10 times a year by the Communications Division of the International Development Research Centre, and distributed free of charge, primarily to news media in Third World countries.

No fee is charged for the use of any of this material, but editors are requested to send one clipping of each article used to IDRC. Your comments and suggestions would also be appreciated.

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FEATURE

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MAKING NATURE YOUR PARTNER

by CLYDE SANGER

If there really is to be clean water and sanitation for all by 1990, the developing countries have to find technologies that are both practical and economical. This search for simplicity has led some of their scientists to look at the problems from a different point of view.

One of the most inventive among them is Zimbabwe's Peter Morgan, a marine and freshwater biologist. He has to his credit a paddle-wheel water pump that raises water to a remarkable height, another water pump that is "worked" by children at play, and a ventilated toilet that is virtually fly-proof.

Yet British-born Dr. Morgan did his original biological research on shellfish off the Yorkshire coast. He went to Malawi to study bream in a lake that inconsiderately dried up for a year, and moved on in 1972 to the Blair Research Laboratory in Salisbury to do research on the snail that is the host of schistosomiasis. This led to an interest in basic health care and clean water supplies that was intensified when he was called up for reservist duties. His job was to check on health conditions in some of the 140 "protected villages", where at least 220,000 Africans had been herded from tribal areas to remove them from guerilla influence.

Whatever else was bad about these "keeps", he found that women and children there benefited from the cleaner water provided from wells, compared with polluted river sources they often relied on at home. He resolved to try to improve those home conditions.

He believes with quiet fervency in "making nature your partner, studying it and making use of natural forces". These forces, he says, are very dependable and technology using such basic principles requires the minimum

of maintenance and attention.

Modern technological man, he says, tends to fight nature -- and is successful only for a time. The ancients were wiser. He recalls the great Roman waterwheels of Hama in Syria, which have raised water for more than 1000 years, and calls them "superb examples of a technology so elegantly simple that it becomes totally dependable".

Yet they only raised water to spill into troughs just below the full height of the wheel; and some had therefore to be built to huge proportions, 30 metres or more in diameter. Attempts to raise the water higher than the rim -- by chains, valves, pistons or levers -- destroyed the wheel's simplicity and thereby its dependability.

Peter Morgan has done better. At the Henderson Research Station near Mazoe he built a small paddle-wheel two metres in diameter across a small canal and coiled 5 cm plastic tubing around it near to its rim. One end of the spiral collects water from the canal as the wheel turns, the other is joined to the axle. The water travelling along the coils compresses the air in them, and both air and water are expelled under pressure at the central point. The wheel is so simple that only one part -- a water seal at the axle -- can wear out.

An improved 4-metre wheel with two sets of three coils each can pump 90,000 litres a day into a storage tank 8 metres higher than the level of the canal. The pump is cheap to build, and the cost savings compared to a diesel-powered pump are considerable.

Morgan says much larger savings can come from bigger wheels placed across the two-metre-wide irrigation canals in the Zimbabwean lowveld, where a good deal of African land resettlement may well be concentrated. He speculates that a wheel that might cost $1000 to erect could pump, perhaps 1 million litres a day.

His main interest now is in water purification and storage. Noting that the ancients often stored water in copper vessels and seem to have avoided gastroenteritis, he has experimented by passing the tank water down a 6 metre length of copper tubing, and also in another experiment through copper ore. He found that a slow drip through the tubing -- enough to provide drinking water for a family at 30 litres a day -- made it free of bacteria.

He has also applied the natural biological process that occurs when water passes slowly over sandy riverbeds and the pathogenic bacteria are

destroyed during the filtering. Very polluted water which he passed slowly through sand and gravel in a 200 litre drum showed dramatic drops in the coliform count. Even more impressive are results from his larger sand filters. One of them containing 10 cubic metres of sand held inside a large plastic bag, produces 3600 litres of pure water a day.

His storage experiments involve taking the canal water through four large tanks -- the first three for purification, the last for storage -- with connecting pipes at different levels. He points out that the highest quality of water is near the top of a tank, although it is usually tapped from the bottom. Normally a modest man, he says of this experiment: "It should be a winner. It is the ultimate for water in rural areas."

Dr. Morgan already has several established winners. One of the most popular is his "swing pump" -- a way of using the energy of children at play to raise water. He has adapted a conventional lift pump so that it is worked by children on a playground swing. A chain coiled round the lintel of a swing rises and falls as a child swings to and fro.

Another success is his model of a ventilated privy, properly called a Bioflu, but also known as "cottonblossom" because its tall chimney resembles the smokestack of a Mississippi river boat!

He developed this toilet for rural areas where little water is available, but it is anyway more dependable than most waterborne systems. He had to overcome the two main disadvantages of a pit latrine: being the source of offensive odours and a breeding place for flies. Dr. Morgan decided once again to use natural forces -- in this case, the fresh wind and sunlight.

The toilet has no door, and no covering over the hole. There is another aperture, leading up a 15 cm diameter vent pipe, about three metres high. He found that by placing the pipe on the sunny side of the toilet and painting it black, it absorbed most heat, and the wind across its top combined to produce a good upward draught.

As for flies, after they enter the pit through the uncovered hole, they are attracted towards the sunlight at the top of the vent pipe, only to find their exit blocked by a fibreglass screen. Eventually they expire there, and drop back into the pit.

A corrugated iron mould is normally used to make up to 100 of these cylindrical units out of cement stiffened with chickenwire. Total cost, with pipe and a plaster-mix chickenwire roof, is about $50. They can also be

made with bricks. Health assistants have been building them in thousands in tribal areas.

Peter Morgan has sought no patents for any of his inventions, and has done his best to stop anyone else patenting them by publishing details at an early stage.

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