

INNOVATION

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NOT ENOUGH WATER

Israelis were greatly encouraged (by) unusually plentiful rainfall at the beginning of this winter. After about three years of near drought conditions, this was the rainiest November ever recorded since meteorological observations began here. In most parts of the country, rainfall so far this season already has reached 50% of the average annual total — and that even before winter has really begun.

The weather's very satisfactory performance, so far may have eased some of the most serious worries, about this country's fresh water supply. However, even if the rest of this season — from now until some time in March — is consistent with what happened until now, there obviously is no room for complacency. With virtually all available fresh water sources already harnessed, much remains to be done if Israel is not to be left high and dry in just a few years.

Perched on the edge of the desert, this land has always known periods of intermittent drought. The Bible tells of such episodes, and more recent records abound with tales of crop failures and starvation, because the rains failed to come.

Modern Jewish settlement met that problem by a concerted engineering effort: wells were dug and all major springs were diverted into the national water distribution network. This program has essentially been completed: virtually all of "conventional" sources have now been integrated

into a single national production and supply network, which draws on the Jordan and the Lake of Galilee, on the springs that used to feed the Yarkon River, and on hundreds of wells in all parts of the country.

At first, that constituted a solution, but demand quickly grew, to match and exceed the supply. Various estimates place the quantity of fresh water available for annual consumption — precipitation plus inflows, less evaporation and runoff — at approximately 1,800 million cubic meters (on the order of 1.5 million acre/ft of about 450 billion gallons).

That, however, is only an average figure, and an educated estimate at that. In years of sparse rainfall, considerably less "new" water is added, while consumption tends to rise. With more land than water to irrigate it, with a growing urban population and with rapid industrialization, Israelis are constantly pressing for more water.

Hydrologists warn of the dangers inherent in such a trend. Excessive pumping of underground reserves could result in their exhaustion. In many places, that would allow saline water from the sea to invade fresh water aquifers, making them unfit for consumption for years to come.

Aware of those dangers as fully as they understand the need for more water, Israelis approach the problem by a typical multi pronged effort. Obviously so fundamental a difficulty does not admit of a single magic solution; only consistent efforts in many different directions can provide a viable answer.

A number of measures already taken, and some still under study, aim at the enhancement of fresh water resources. A successful cloud seeding program has been in operation for several years, effectively increasing rainfall in critical areas by something like 15%; at the same time, various engineering projects — earth dams across some stream beds, for instance — reduce the quantity lost to runoff.

Other efforts propose to produce potable water by "unconventional" means. Sea water desalination (see, for instance, *INNOVATION* 130, September 1986) is only one such technology, even though Israelis seem to be among its leading exponents anywhere. Much work is also being done towards

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recycling sewage effluents, and for the desalination — mainly by means of reverse osmosis systems — of the brackish ground water found in the Negev.

Quite as important are the different programs that aim at water conservation. Perhaps a minor, but still significant element are the increasingly popular economy toilet flush mechanisms, which reduce the quantity of water consumed in households. Industry also does its share: wherever possible, process and cooling water is recycled.

Of far greater importance are the more economical irrigation methods, developed by Israel agriculture over the years. The practice of trickle irrigation — a completely new technology, invented and developed here — reduces overall water consumption, while enhancing the benefit derived by the irrigated plant. A still experimental approach, but one with a farreaching potential, aims at the adaptation of various crops to irrigation with brackish, and even with saline water from the sea.

Achievements in all these fields are of major importance for Israel's own water supply. At the same time, many of them also contribute to the national economy through the provision of exportable products and knowhow. It is not at all surprising that this country's sales to customers in places as diverse as Texas and Egypt, Spain and El Salvador include a major element of water use equipment and technologies.

BIOTECHNOLOGY GENERAL REACHES AGREEMENT WITH BRISTOL-MYERS

Rehovot — An agreement recently concluded between Biotechnology General (BTG) here and the Bristol-Myers Company provides for cooperation between the two firms on the clinical and commercial development of a genetic engineering process developed by the Israel company. BTG is one of this country's most advanced firms in its field; Bristol-Myers is a U.S.-based pharmaceuticals manufacturer of world renown.

In the course of its ongoing R&D program Biotechnology General developed a microorganism which produces large quantities of human superoxide dismutase (hSOD). That enzyme, it is believed, offers significant therapeutic potential for the treatment of cardiac ischemia and in connection with kidney transplants. Present as a matter of course in the healthy organism, it neutralizes "superoxides", the toxic oxygen free-radicals produced in the course of cellular respiration.

It has now been demonstrated that abnormally large concentrations of superoxides appear in connection with heart attacks and as a consequence of kidney transplants, that they can result in irreversible cellular damage to those and other vital organs, and that this cannot be prevented by normal levels of hSOD. A key area, in which oxygen free-radicals are harmful is in the resumption of

blood flow to organs, to which the blood supply was blocked — for instance by myocardial infarction, transplant surgery or various shock conditions.

Researchers have demonstrated, in appropriate animal models, that this damage can be prevented, or at least ameliorated, by treatment with hSOD. Now experts are investigating precisely how hSOD can be administered to the human patient, in order to bolster the vital organs' natural protection against superoxide damage.

BTG already has concluded animal toxicology and preclinical trials of hSOD. An investigational new drug (IND) application has been submitted to the Food and Drug Administration, which recently approved trials of hSOD on human patients.

Under the agreement now concluded, Bristol-Myers will sponsor extensive clinical studies on this subject at three major universities in the United States. If and when those efforts are crowned with success, Biotechnology General will manufacture hSOD in commercial quantities, and Bristol-Myers will distribute the final product world wide.

I.T.T. TO MARKET LASER PRINTING SYSTEM DEVELOPED IN ISRAEL

Jerusalem — An agreement for the joint production and distribution of an intelligent laser printing system developed in Israel has been concluded between Kidron Digital Systems Ltd., of this city, and I.T.T., one of America's most important communications and data processing firms. The contract is expected to yield the Israel company at least \$10m. worth of sales over the next three years.

Founded in 1982, Kidron some time ago attracted international attention with its uniquely capable "LaserOCTAVE" system (see *INNOVATION* 117, August 1985). Designed to be driven by up to eight IBM PCs and their compatibles, this laser printing system matches the requirements of a very large potential market.

Under the recently signed contract, Kidron will supply I.T.T. Qume, a unit of the I.T.T. Corporation's Business Systems Group, with the intelligent "brain" of its laser printers, while most of the hardware will be manufactured in the Far East. In this manner extreme technological sophistication will be wedded with the most economical methods of fabrication, to yield an economically priced, but highly advanced product.

Direct exports from Israel, under this arrangement, are expected to exceed \$10m. over the next three years, of that \$1.25m. within the first six months of 1987. Most of that income will recompense the Israel firm for the knowhow generated by its extensive research and development efforts; the component of domestically added value