Report on a visit to

Indore and Maikaal BioRe Ltd., (Bio-cotton)

for Micro-Irrigation

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(with Armon Hartmann and Guru Naik)

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"More crop per drop"

Visit to Indore and to Maikaal BioRe, Ltd. (Bio-cotton) for Micro-Irrigation

Summary

Guru Naik from IDE, Armon Hartmann (from SDC Berne) and Urs Heierli (from SDC New Delhi) went to Indore to visit the results of the tests for the micro-irrigation project under the "Natural Resources Management Sphere" of SDC India (Small Action COOF) and to Maikaal Bio Re, Ltd., to see the low-cost drip irrigation system for cotton farmers.

Water scarcity and drip: some facts!

- The next century will see large parts of the world having acute water shortage;
- 80 % of the water is used in irrigation;
- Drip irrigation saves up to 60 %; sprinkler irrigation up to50 of water% compared to flood irrigation;
- Only 2 % of agricultural soils are under drip, mostly in Israel and USA;
- Conventional drip systems are costly: approx. 1'000 US $ per acre;
- IDE has developed a range of affordable systems for landless people and for small farmers; they cost a fraction of this, starting at 5 $. The average cost is 250 $/acre;
- IDE would like to launch a global drip initiative.

Overall, the impressions from these visits were the following:

1. Both the drum and the bucket kits have a high social and economic value for the families using them in semi-arid zones: the reactions to these water saving technologies are extremely positive and have a considerable impact on their vegetable consumption and on their cash income.
2. The social and economic returns from the drip systems in cotton are also very high: the low-cost drip systems are not only economically viable (although the up-front investment of Rs. 10'000.- per acre may create a problem) but good for the soils (farmers are aware of the benefits of drip to the soil compared to flood irrigation) and reduce considerably the stress on scarce water resources.
3. IDE has done an excellent R&D job in adapting in a very short time (less than one year) the bucket kit idea to the local conditions. IDE has come up with very good and simple technical solutions and has established a very good cooperation with NGOs involved in watersheds.

4. If an appropriate marketing system can be identified and a market channel can be set up by involving manufacturers, large dealers as stockists, small dealers as installation agents, and (for the small systems) Self-Help Credit and Savings groups as profitable agents and micro-dealers, the dissemination of these - desperately needed - technologies can be very fast and far reaching.

Drip irrigation saves up to 60 % of water

Bucket kit drip irrigation

In Tarpura village, near Indore and near an industrial zone (Bajaj and other industries), the Lyon's Club of Indore has provided 27 bucket kits to very poor landless families. The cost of the bucket kit is Rs 200.- In Tarpura, there are roughly 80 families which live mostly as daily wage labourers. Only some of them have a small piece of land, but most of them have a minuscule garden plot around their house .

Two testimonies from Tapura about the social impact of the bucket kit:

Mary and Hemant Kumar with their kitchen garden

- From the **village leader**: Mary was selected because of her status as a school teacher and village leader. She may be in a position to influence other women of the village. Her husband Hemant Kumar is a medical assistant in an Ayurvedic clinic nearby. They are not the poorest, but even they are most happy to have the bucket kit: they have had it for only a few weeks and have installed it in their garden of approximately 20 m^2. As water is very scarce in the village, they are buying water from a tanker and pay 125 Rs for 5000 litres which they use in 10 days to cover all their different family uses.. This means the water cost of the family is 12,5 Rs/day, which is almost what they spend for milk (one litre of milk costs more or less the same).
  A pump in the village has dried out and since then, water has been very scarce: if they did not buy the water, they would have to walk for 15 - 30 minutes, which is not even so much, compared to many other villages.

Mary and Hemant expect to grow tomatoes and eggplants on their small plot and to save some 300 Rs in the course of the coming months, in vegetables which they can consume themselves. The initial investment of Rs. 200 for the bucket kit can be paid back. For their garden, they fill the bucket twice a day (40-50 litres), which means they spend 1 Rs per day on irrigation.

- From **Amit Bai and her family of 6**: Amit Bai has a small pan and tea shop, her husband is a wage labourer who earns 30-35 Rs/day. From her bucket kit she also expects to get vegetables for the value of approximately Rs 300 in the coming months. She finds the bucket kit practical so that her daughter (picture on cover page) has to carry less water.

Amit Bai, owner of a small pan shop and her bucket kit

Comments and reflections on the bucket kit

We first installed a "Chapin bucket kit" in the garden of the Swiss embassy in Delhi, one year ago. It was then decided to start a demonstration and testing project in some watershed areas where SDC India had partners (NGOs). As we were wondering whether the bucket kit would be considered as a kind of "toy", we thought the drum kit (200 litres) would be more suitable for the needs of small and marginal farmers. However, in hindsight we should recognise that there are many landless people who may have to carry the water from a long distance and cannot fill a 200 litre drum

every day; they also do not have enough land. For them, a bucket kit may already make a considerable difference.

IDE's version of bucket kit with microtubes

IDE has improved the original "Chapin bucket kit" which used a sophisticated drip tape. The combination of drums and buckets with microtubes has several advantages:

- the first advantage is that one line can feed many plants due to added flexible microtubes which are used as drippers and also extend the range of irrigation. Originally, the drip tape could only water plants directly under its passage. Its bucket kit therefore needed two tapes, whereas the IDE model needs only one drip line.

- the second advantage is that the drip line is flexible and can easily be placed in a circle to suit the shape of the kitchen gardens (whereas, as we have seen above, the original bucket kit was connected to 2 parallel drip tapes which could not be bent).

For these reasons, the bucket kit should not be neglected in a large-scale dissemination programme: although its impact may be very little in terms of water conservation, its social impact on the very poorest may be considerable. In terms of social returns, the bucket kit is a marvelous simple device. Linking the bucket kit with social programmes like that of Lyon's clubs in rural areas, or to similar programmes even in urban slums, may be a promising avenue. It should only be assured that the bucket kits are not given away free of cost. It would be worth supporting businesses managed by women dealing with the assembly and distribution of bucket kits to other families.

Drum kit irrigation

Then, we visited a watershed which was initiated by a women's NGO adjacent to the village where the landless people live. Most of the villagers are small and marginal farmers and at the same time wage labourers in the local industry area which is close-by. Sometimes, husband and wife alternate as wage labourers; they earn Rs 30 - 35 per day. There, IDE has sold drum kits in collaboration with the women's NGO.

Sajan Bai and her son with her drum kit

Three examples of drum kit use:

- **Sajan Bai and her drumkit**: Sajan Bai is a widow; she has 5 sons who are all marginal farmers. She owns 2,5 acres of land and was having a pump but somebody had stolen her motor and she cannot pump now. If she had a pump, she would prefer to have sprinklers to grow wheat.

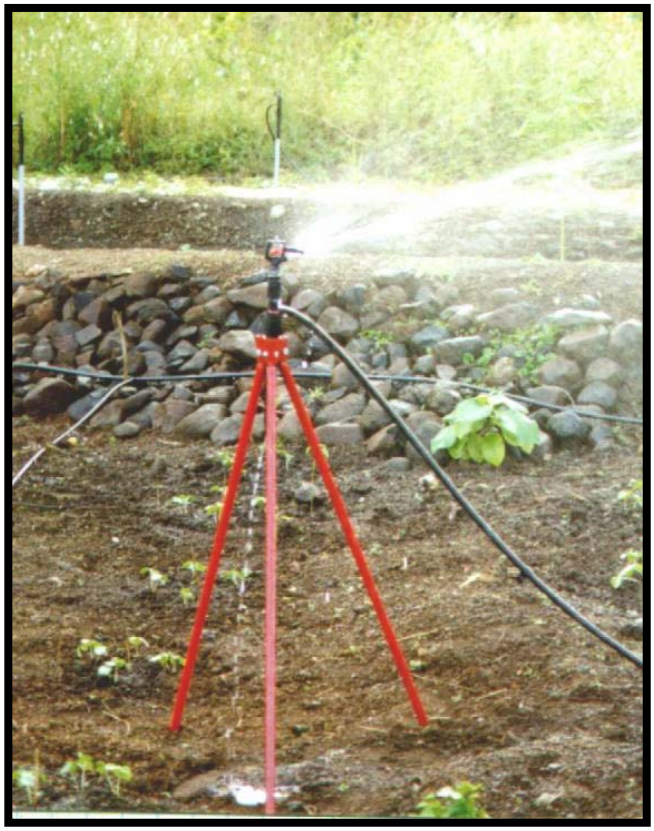
  Now, with the drum kit, she can irrigate 500 plants (300 tomato plants and 200 eggplants). She expects to get one kilogram of yield per plant of tomato or eggplant, in total 500 kilograms and will be able to sell the tomatoes at Rs. 5-6/kg and the eggplants at Rs. 4 - 5 per Kg. Her total harvest will yield **Rs 2000.- to Rs. 3000.-** in the coming 3-4 months. She paid Rs. 500.- for the kit and Rs. 250 for the drum.

  Her 2 sons also have adopted drum kits at their own house.

Sampat Bai with her drum kit

- **Sampat Bai, her sprinklers and her drum kit:** Sampat Bai has a family of 7 people to feed (3 sons, one daughter). Her husband, Somaji, is a wage labourer and earns 30 Rs/day. They have one acre of land on which they grow wheat and soybean. She has a pump (5 hp) and bought two moveable sprinklers from IDE; the whole installation costs Rs. 2500 and each sprinkler can irrigate a radius of 40 feet. If she moves the two sprinklers in 8 shiftings (16 sprinkler points), she can irrigate the whole acre of land. She saves 50 % water and would in any case not have enough water to irrigate the land with flood irrigation.

  She has also installed a drum kit with 5 drip lines and



Two of these sprinklers can be shifted and irrigate one acre of wheat or pulses

irrigates roughly an extra 100 m^2. She expects to sell two baskets of tomatoes and eggplant every week at Rs. 100 each for 10 to 16 weeks in addition to their home consumption. The overall income from the drum kit is therefore Rs. 1000 to Rs. 1600 in cash, but she saves another Rs. 100 per week as she does not have to buy vegetables any more (she used to buy vegetables for Rs. 100 per week.). She says that the drum kit saves work for her as the garden is very close to her house.

- **Nirmala and her drum kit:** Nirmala also has to feed a family of seven and is alternating with her husband as wage labourer (mostly in the construction industry to carry bricks) where they earn Rs. 35 per day. She has bought a drum kit for Rs. 500 and Rs. 250 for the drum. Now, close to her house, she can produce vegetables worth Rs. 3000 (mainly for family consumption, but also some for the market), and she has to work less, because she does not have to go to the small field where they also grow some wheat.

  They have access to water through a pump, but the electricity is unreliable and the well is frequently drying up.

The social impact of the drum kits in the words of Sampat and Nirmala

When we asked the two women what the drum kits have brought to their lifes, they said:

The drum kit has changed Nirmala's life

"Three things have changed our life considerably in the last few years:

- First: when industries came here and we could get some work as wage labourers;
- Second: when the NGO introduced watershed management, so that we could get enough water to grow wheat and pulses;
- Third: when we got drum kits and could start producing vegetables. This has brought us some quality of life above sheer survival"

Water conservation on a large scale: visit to the cotton farmers of Maikaal Bio Re Ltd.

The tests at Maikaal and the views of cotton farmers

Maikaal Bio Re (India) Ltd. is a private company owning a large spinning mill and is specialised in producing **organic cotton**, mainly for the Swiss market (COOP Natura Line). Over the last few years, Maikaal has been able to increase the production of organic cotton to over 6'000 acres involving 888 farmers who produce over 20'000 quintals of cotton per year.

Maikaal Bio Re, Ltd. Uses pheromone traps and other organic methods to grow cotton

Maikaal has excellent extension services to these farmers and procures cotton at a slightly higher price than conventionally grown cotton. Cotton crops usually require very high amounts of pesticides (up to 20 sprayings) and are very risky crops. In the last year, over 100 cotton farmers in Andhra Pradesh have committed suicide after a crop failure, because of heavy debt with money lenders. In their despair, they drank the pesticide to kill themselves. Out of an average income earned from cotton of Rs. 12'000 per acre, input costs in conventional cotton growing areas amount to Rs. 2'000 for fertilisers and Rs. 5'000 for pesticides, a total of Rs. 7'000

First, we asked the farmers why they had joined the Maikaal Bio Re programme?

All said that they had joined because of considerable savings, since the inputs are costly. They

also claimed that they can control the crops better and that they can make use of their neem trees, cow dung and other local resources which are available to them without paying cash.

Cotton irrigated with microtube drip system

IDE and SDC have been in touch with Maikaal for the testing of the low-cost drip irrigation system for the last two years. Tests in the demonstration fields of Maikaal have shown considerable water savings (use of 12'000 litres of water per acre compared to 27'200 litres with flood irrigation), equivalent to roughly 60 %. Drip systems also offer other advantages: higher yields per acre and reduced threat of damages due to soil deterioration. Maikaal arrived in its demonstration fields at a total income per acre of cotton seed crop of Rs. 55'200 compared to Rs. 40'400.- with flood irrigation. This represents an increase in income of 36 %.

A few months ago, Maikaal's tests were extended to 6 farmers fields, where between 0.3 and 0.7 acres were put under drip. Their opinions about drip were the following:

- Rameshwar Yadeo has 6 acres of land and 3 acres under bio-cotton. He has a 3 hp pump but the water lasts only for 2.5 hours of pumping in the summer. He wants to go for drip in order to be able to grow a summer crop (the earlier he can sow, the better the yields are in early monsoon). He is convinced that saving of water could increase his yield and increase his area almost 4 times compared to flood irrigation.

- Prakash Patidar is a large farmer with 40 acres of land, of which 20 acres under bio-cotton. He says that his PH value of the soil has gone up to 9 due to flood irrigation. He feels, he can save water and increase his cotton holding up to 8 acres

for a summer crop. He has more control over the amount of water with the drip system and expects a very high yield of 800 kgs per acre.

- Kailash Gangaram owns 14 acres of land and has put 6 acres under bio-cotton. It must be said that bio-cotton requires other crops in rotation. He feels, he can save water which would otherwise be insufficient to grow a summer crop. He has never sown a summer crop before, as he has access to only 2 hours of water in summer in a 50-feet deep well. He expects a good yield of 600 kgs per acre and will be able to

Kailash Pratidar, a small farmer, can grow 4 times as much cotton with drip compared to flood irrigation

sow 3 acres thanks to drip.

- A fourth farmer whom we visited in the field has had one acre under drip since last year and expects additional yields, so that he can increase the drip every year by one acre. He will invest Rs. 10'000.- a year in drip irrigation equipment to increase his coverage.

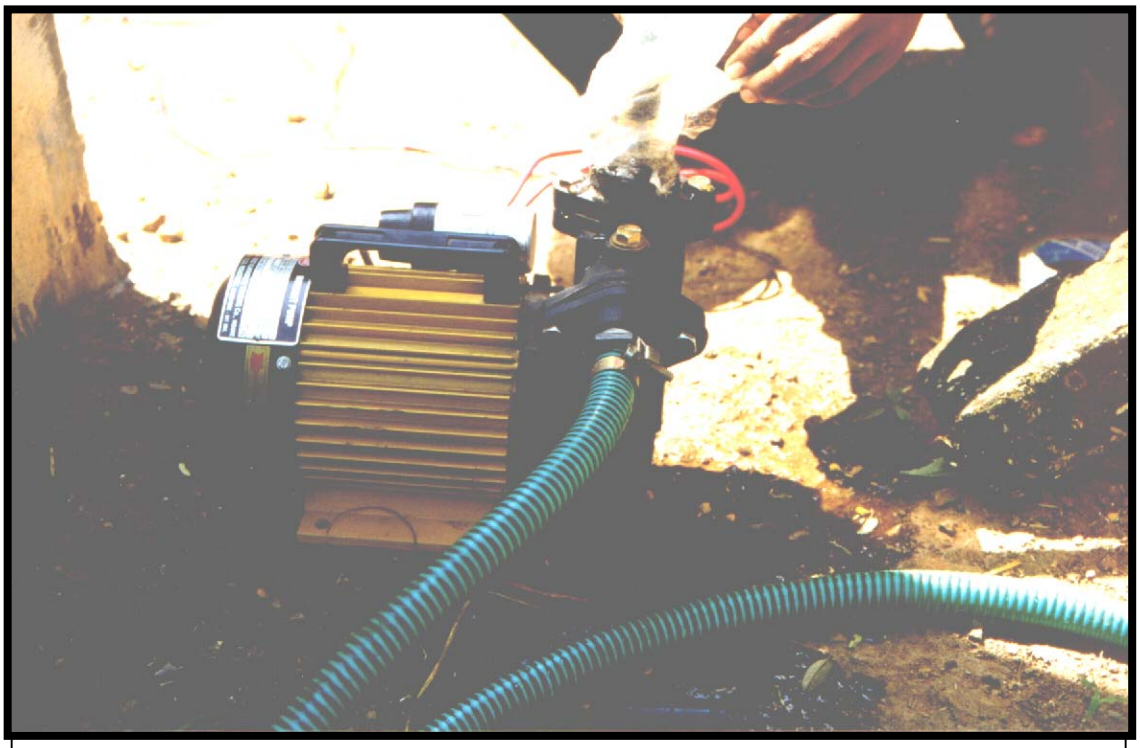
The future: larger tests on 40 acres

The encouraging results and the positive feedback from the farmers are good enough reasons to proceed further with a larger implementation. At present, it is planned to cover an extra 40 acres during the season 1998/1999. If these tests confirm positive responses, one could aim at a larger dissemination. In order to get all the 6600 acres

under drip, an investment of Rs 660 laks would be required (US $ 1.65 million). This seems to be a realistic target for a period of 4 to 5 years.

Is drip a "factor 4 technology" or even more?

"Factor 4 technologies" are technologies which are at least 4 times more efficient than conventional technologies (See the book by von Weizsäcker/Lovins: "Factor 4"). Usually, it is assumed that drip irrigation saves up to 60 % of water compared to flood irrigation. There are indications by the farmers that these savings are underrated: they were all referring to the fact that they could irrigate 4 times more with drip. This is a hypothesis which needs to be proven.



One 0,5 HP pump can operate two sprinklers (see page 7) at a time and replace a 5 hp pump

Interestingly, IDE also introduced the first model of a sprinkler kit which can be operated by a very small pump of 0,5 HP and can irrigate one acre at a cost of Rs. 5000 **including the pump**. Normally, the farmers have 3 to 5 HP pumps at subsidised rates. The sprinklers cost roughly Rs. 2500 and a 0,5 HP pump costs another Rs 2500.

If that new combination of sprinkler with a low energy pump proved to be feasible, it might revolutionise the access to irrigation by small farmers. Sprinkler irrigation still saves50 % of water compared to flood irrigation. Another advantage of that small pump is that it does not require 3 phases and can be operated on the electricity which is provided for lighting.

Marketing through Self Help Groups (SHGs) and micro-dealers

Market barriers for low-cost drip systems

There is no question that the marketing of such cheap devices as bucket kits (200 Rs including the bucket) and the drum kit (Rs. 500 for the microtubes plus Rs. 250 for the drum of 200 litres) is not and will never become a mainstream business activity of the drip manufacturers from the corporate sector.

It sounds like a paradox: there is a clear demand for such devices, they are highly profitable and the response is enthusiastic even shortly after launching of the product, whereas farmers are usually very conservative buyers. And still, there is no supply chain for low-cost drip systems in rural areas. To understand this, one has to know that, in India, the drip irrigation industry is **not a market-driven business**: although it counts more than 60 manufacturers by now (most of them in Maharasthra). These manufacturers are **subsidy-driven** (Government subsidies in some areas are in the range between 50 and 90 %) and cater to a high cost market. Nowhere is there a marketing channel which would cater to the needs of small farmers or even less to household gardens. Government policies are even openly opposed to the creation of such marketing channels: for instance for the drip systems in sericulture, the Government explicitly does not want dealers to be part of the marketing chain and provide the subsidy only to the manufacturer directly.

Marketing small sytems through SHGs

If the small items (bucket kits and drum kits) were becoming available in rural markets at affordable prices, the only way would be to identify a more innovative marketing channel which is more interested in dealing with small margins and can do simple adaptations of the systems locally. IDE is therefore looking at two new channel partners for the tail-end distribution: SHG (Self Help Credit and Savings Groups) could play a challenging role for the watershed items like drum and bucket kits. and small local dealers for the farmers kits (which IDE has also put into kits of 1000 m2 for Rs. 2500; four such kits are needed for an acre).

A first calculation shows that assembling and marketing bucket and drum kits could be a profitable business for an SHG (assumption is that a SHG assembles and sells 100 bucket kits and 100 drum kits in one year):

Some estimates for the economics:

1. Raw material cost for 100 drum kits	Rs. 35'000.-
2. Raw material cost for 100 bucket kits	Rs. 15'000.-
Total raw material cost	Rs. 50'000.-
3. Sales value of the 100 drum kits	Rs. 50'000.-
4. Sales value of the 100 bucket kits	Rs. 20'000.-
Total sales value	Rs. 70'000.-
5. Gross Profit	Rs. 20'000.-
6. of which labour for assembling	Rs. -5'000.-
Net profit	Rs. 15'000.-

This means that if the drum and bucket kits are sold at 50 % down-payment and the rest after 3-4 months, one SHG with a fund of Rs. 35'000 could sell 100 bucket and drum kits every year. These kits could generate an additional income of Rs. 400'000 per year, under the assumption that one drum kits generates Rs. 3'000 per year and one bucket kit Rs. 1'000 per year.

Marketing channels for large scale but low-cost systems

IDE's kit for 1'000 m^3 (1/4 of an acre) at Rs 2500

The same market distortions are prevalent for larger systems. Drip manufacturers only cater to the subsidised market of large and high cost systems. The largest manufacturer in India, Jain Irrigation, has only one dealer in a large area around Indore, and concentrates on large farmers. Usually, it is the horticulture officer of the State Government who provides the subsidies. No manufacturer would send a technician to any farmer who installs a drip system on less than one hectare and for less than Rs. 50'000.

For the cotton drip systems, IDE would need to identify a marketing channel through local "micro-dealers" who receive training to install kits for 1000 m2 in the farms. They would play a similar role as the mistries do in installing the treadle pump.