SAVING WATER

# More crop per drop

## A village in Maharashtra farms almost fully with drip irrigation

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AURANGABAD, JULY 22

JARANDI GETS barely 750 millimetres of annual rainfall, well below the national average of 1,175 mm. Yet, this village in Soegaon taluka of Maharashtra's Aurangabad district has the unique distinction of almost its entire cultivable area being under drip irrigation.

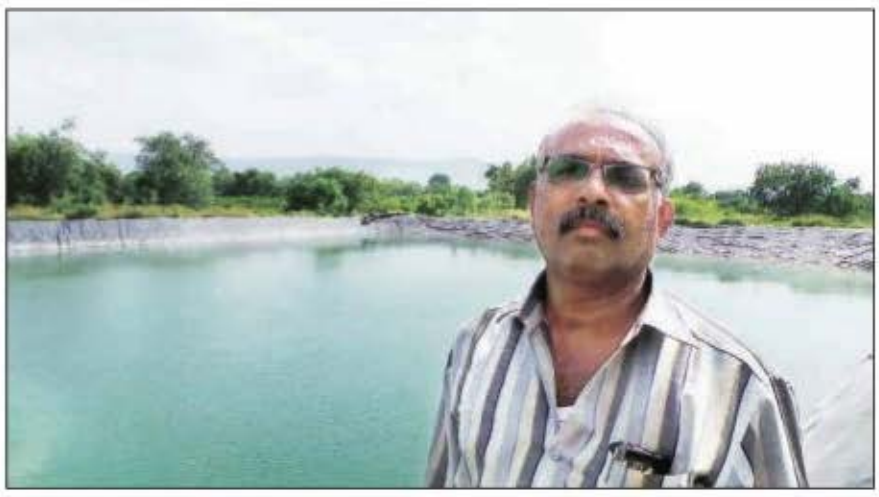
That perhaps makes it a model worth looking at, just when the current government has launched the Pradhan Mantri Krishi Sinchai Yojana that aims at delivering water to every field (*Har Khet Ko Pani*) with a Rs 50,000 crore budget outlay over five years.

"Drip irrigation coverage extends to over 3,500 acres out of our total agricultural area of around 4,000 acres. That includes 3,000 acres under cotton and 500 acres under horticultural crops like banana, pomegranate, *mosambi* (sweet lime), *haldi* (turmeric) and ginger. Only the balance 500 acre area, where jowar, maize and other coarse grains are grown, is rainfed," says Rajendra Patil, a 125-acre farmer of Jarandi.

In drip irrigation, the water pumped out from a well is first sent through sand separators and media/screen filters to remove silt and impurities such as algae or dead plant matter. This filtered water is, then, applied to the crop via a network of mainline and sub-mainline pipes, valves (that turn on or off the water flow) and smaller diameter polytubes or 'laterals', which have pre-installed emitters at spaces corresponding with the placement of each plant. These ensure delivery of water directly to each plant's root zone (where it is really required) and at discharge rates as low as one litre per hour. Drip irrigation systems also have provision for 'fertigation' — application of fertiliser, in liquefied form from a separate tank, along with the water.

"Drip irrigation works well in cotton, where only one litre of water per plant per day (pppd) is needed for the first 40 days. Taking a plant population of 5,000 per acre, it comes to 5,000 litres or operating a 5-horsepower motor power for just 15 minutes daily," notes VB Patil, senior manager (agronomy and agriculture extension) at Jain Irrigation Systems Ltd (JISL).

The irrigation requirement is higher in the subsequent stages of bud or square initiation (40-60 days: 2-3 litres pppd), flowering (60-90 days: 5-5.5 litres pppd), boll development (90-120 days: 7 litres pppd), maturation (120-150 days: 4-4.5 litres pppd) and boll bursting (150-170 days: 3 litres pppd). But even with 500 mm of monsoon rainfall, the entire 800-900 mm water need of cotton over 180 days can be comfortably met through drip irrigation.



Rajendra Patil at his farm pond.

Small cotton farmer Madhukar Sonawane.

"With drip, I can irrigate 10 acres using the same quantity of water that could previously cover hardly one acre through flood irrigation," claims Rajendra Patil.

Patil has 20 open wells and two farm ponds of 40x40x8.5 metres capacity each for harvesting rainwater in his 125 acres holding. In addition, he has a well four km away at Tingapur, housing a minor dam fed by streams from the nearby Ajanta hills. Patil and 29 other farmers, who have also sunk similar wells at the dam site, lift the water from there using 5-7 hp motors and convey it through pipelines to their respective fields.

"The pipeline water is required mainly during March to mid-June before the monsoon rains. For the rest of the year, I can make do with the water from the wells and ponds in my field using drip irrigation," adds Patil.

Patil and his 29 fellow farmers — who together own 1,500 acres — are relatively rich though, compared to the bulk of Jarandi's 750-odd families, who are either landless or cultivate much smaller plots. Like, for instance, Madhukar Shankar Sonawane, a two-acre Dalit cotton grower. But he, too, has an open well for giving water to his field through drip irrigation. Sonawane was able to invest in drip irrigation in 2011, partly because of a subsidy of Rs 12,000 per acre on a system otherwise costing Rs 35,000 and also good realisations on *kapas* (un-ginned raw cotton).

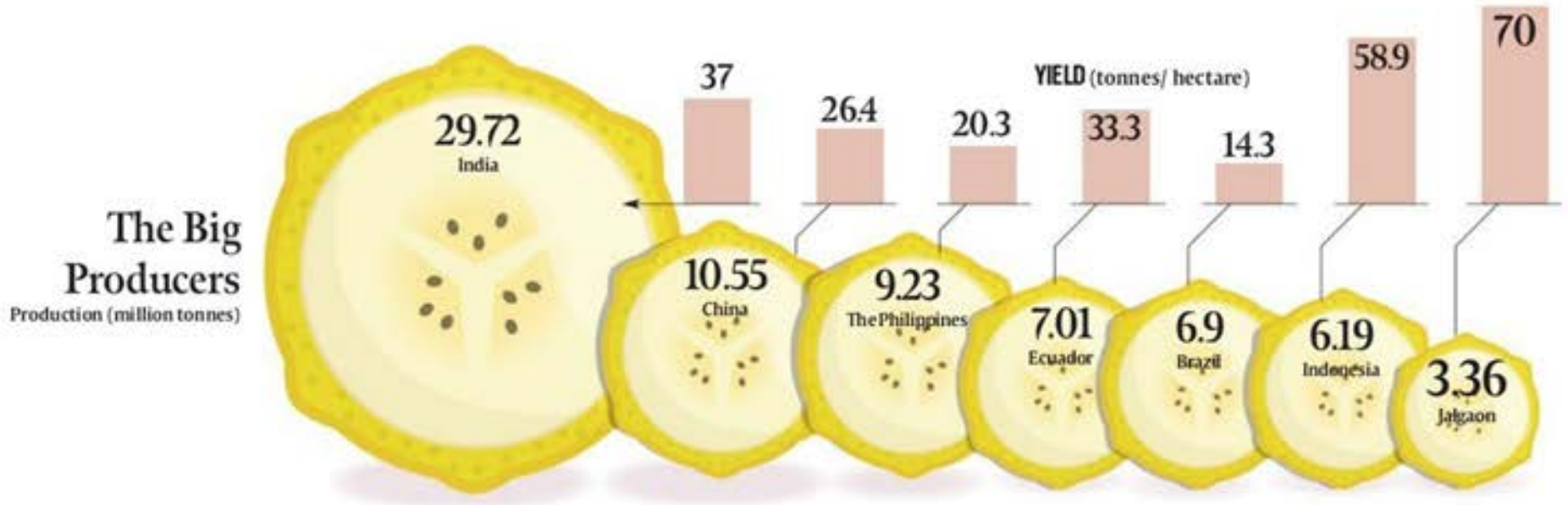
"Prices were then Rs 5,500-6,000 a quintal, as against Rs 3,900-4,000 now. I am managing only on account of not engaging any hired labour, reducing my production costs by Rs 10,000 to Rs 35,000 per acre. Also, my yields have risen thanks to drip irrigation," he states.

Most farmers in Jarandi are harvesting 17-18 quintals of *kapas* per acre, due to drip irrigation allowing them to take a second 'ratoon', growing from the stubbles of the main crop and yielding 5-6 quintals from fresh pickings during January-April. This again wasn't possible with flood irrigation, which could only assure water for the main crop whose yields were also lower at 7-8 quintals per acre. Drip irrigation, apart from saving water, contributes to higher yields. The reason for it is that the water (and fertiliser) is applied only at the plant's root zone and remaining soil area gets enough air to maintain an optimum air-water-nutrient balance. But is the Jarandi model replicable?

Yes, believes JISL's Patil: "You can build a 30x30x3 metre pond for every farmer at Rs 75,000 covering costs of excavation and plastic lining material to control seepage loss. This pond, on one-fifth of an acre, can accumulate 25 lakh litres of rainwater in the monsoon. Even after percolation and evaporation losses of 10 per cent each, the balance 20 lakh litres can fulfil the cropping requirement for 5 acres using drip irrigation till the next season. Alternatively, you could have a larger one-acre pond for 10 farmers with combined 25-30 acres holding."

According to Bhavarlal Jain, chairman of the Rs 6,050-crore JISL — the world's second largest micro-irrigation company after Israel's Netafim — water harvested through building of check dams and ponds, extracted by bore/tube-wells, and delivered to crops using drip irrigation will cost five times less than that from large storage dams.

"But it is the only way to provide assured irrigation to every farm, more so when large dams take 15-20 years to build and entail huge land acquisition and community displacement costs. Ultimately, water has to be measured, metered, priced and managed along with proper crop planning, in order to cover more area and maximum number of farmers," he points out.




# A different banana republic

The story of how Jalgaon district in Maharashtra has become the world's seventh largest producer of the fruit if it were a 'country'

HARISH DAMODARAN

A farmer watching labourers load his freshly harvested banana bunches on to a truck. *Express Photo*

BANANAS are generally grown in tropical coastal regions with high annual precipitation of 2,000 millimeters and more.

That explains why the global banana majors — Chiquita (the erstwhile United Fruit Company), Dole (formerly Standard Fruit Company), Del Monte, Noboa, Sumifru and Tadeco — produce all their fruit from large company-controlled plantations in Mexico, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Ecuador, Colombia or Philippines.

It also accounts for some of the Central American countries becoming 'banana republics', a pejorative term referring to the all-pervasive influence that United Fruit and Standard Fruit wielded over their economies, extending to politics and effecting regime changes.

Jalgaon is an exception to the rule — of a district located over 300 km from the west coast and on the northern edge of the Deccan plateau — receiving an average yearly rainfall of only 750 mm, and still the world's seventh largest banana producer if it were a country. And its bananas are wholly produced by independent growers.

Jalgaon's emergence as a 'new' banana republic with none of its negative connotations owes primarily to technology and entrepreneurial farmers, especially from the Gurjar and Leva Patil communities.

While the district was for long known to cultivate bananas — thanks to its strategic location and the Bhusaval railway station enabling access to the North Indian market — the real breakthrough, however, happened with the spread of drip irrigation that made efficient use of scarce water possible.

"Under normal flood irrigation, a 15-horsepower motor pump could at best water 10,000 plants even with 24-hour electricity supply. Through drip irrigation, you can cover 15,000 plants using the same 15-hp motor even with 8-hour power. The effective water savings is 60-70 per cent," says Premanand Hari Mahajan, who farms bananas in 50 out of his 80-acre holding in Tandalwadi village of Jalgaon's Raver taluka.

The second innovation was high-density planting — at 1,200-1,500 plants per acre, as against the 800-1,000 plants norm in coastal regions. Jalgaon's major disadvantage was its dry weather and lack of humidity required by bananas. This was overcome by close planting. The dense canopy from it created the right humid microclimate inside the farm, by arresting moisture evaporation as well as blocking hot air from outside. Simultaneously, drip irrigation ensured that the plant roots got enough water.

Hot and dry weather now turned into an advantage, as the crop was less susceptible to sigatoka leaf spot and fusarium wilt fungal diseases. "These have wreaked havoc across plantations in Central America and Philippines, with high humidity and round-the-year rainfall actually conducive to their spread. It has forced aerial spraying of fungicides, accounting for up to 40 per cent of total production costs," notes KB Patil, vice president (Tissue Culture & Agricultural Services) at Jain Irrigation Systems Ltd (JISL), which introduced drip irrigation to India in 1989.

Jalgaon's entire 48,000-hectare (1,19,000 acres) banana area is currently under drip irrigation. "That is yet another reason for less of disease incidence. With flood irrigation, the likelihood of soil-borne pathogens migrating from plant to plant and field to field goes up," he claims.

The third significant intervention, besides drip irrigation and high-density planting, came via tissue culture. In normal banana cultivation, the 'suckers' or lateral baby shoots developing from the stem (rhizome) of the mother plant — which dies after producing bananas — are what the farmers uproot and transplant as 'seed' for their next crop.

In tissue culture, a mere 1-1.5 mm part from a disease-free sucker is taken, inoculated and placed in an artificial growth medium (containing minerals, vitamins, amino acids, sugar and hormones) for enlargement to 10-15 mm over roughly 12 weeks.

The enlarged tissue is then cut into pieces and each of these transferred to separate media for multiplication and production of shoots, followed by root initiation. The micro-propagated rooted plantlets are further sent for primary and secondary hardening, before being ready for field planting.

The main advantage with tissue-cultured banana plants, apart from being based on disease-free and genetically pure material, is that the individual plants are of uniform age. This is not so with suckers, where each plant may have a 12-month lifecycle, but there's no guarantee all would mature and yield fruit at the same time. Non-uniform growth also affects yields, as the smaller plants are denied light by the larger surrounding ones.

"Under flood irrigation and sucker planting, it takes 18 months for an entire acre to be harvest-ready and yields are only 15-16 kg per plant. Even with 1,300 harvestable plants per acre, banana yields cannot cross 21 tonnes. But with drip irrigation and tissue culture, I can harvest an acre within 12 months and yields are easily 30 kg per plant or 39 tonnes/acre," explains Mahajan, who has himself harvested a world record of 53 tonnes an acre (130 tonnes/hectare).

The pioneer here again was JISL, which, in 1994, imported a few thousand primary hardened plants from Rahan Meristem, an Israeli biotechnology company.

These included that of a banana variety called Grand Nain, originally developed in Honduras and commercialised by Chiquita. After three years of field trials, JISL launched a micro-propagation programme and taking tissue culture banana cultivation to farmers' fields.

In 2014-15, JISL sold six crore tissue-cultured Grand Nain banana plants — more than any other company in the world — across Maharashtra, Gujarat, Andhra Pradesh, Madhya Pradesh, Tamil Nadu and Karnataka. "Our target this year is 7.5 crore plants and 30 crore over the next five years," states Patil.

Farmers like Mahajan grow tissue-cultured Grand Nain banana using drip irrigation and fertigation, i.e. applying fertilisers in liquid form along with water that drips slowly to the roots of the plants through a network of valves, mainline pipes, submains, polytubes/laterals and emitters.

"My total cultivation cost comes to Rs 1,10,000-1,15,000 per acre. Even at 39 tonnes/acre and an average Rs 500/quintal realisation, there is enough profit to be made," adds Mahajan.

Since the advent of drip irrigation in 1989, Jalgaon's banana production has risen almost three-fold from 1.2 million tonnes to 3.4 million tonnes. Not only is the district today the world's seven largest producing 'country', but its average yields at 70 tonnes per hectare are way above global levels (see chart). That makes for a different banana republic.