Tale of a Watershed: Vision for Tomorrow’s India – Subhajyoti Das (Email:subhajyoti_das@hotmail.com)

India has 141.4 Mha cultivable land, out of which 48.8 Mha is irrigated leaving 92.6 Mha unirrigated and rainfed, which contributes only 45% of the country’s food grains production. In the rainfed areas the marginal and small farmers (land holding <2 ha) account for 78% of landholders. The total food grains production target of 350 MT or so for the country’s burgeoning population (1.3 billion) as projected for the year 2020 against the current annual production of 259.32 MT (2011-2012) will entail a huge shortfall along with a simultaneous shortfall of fodder for the growing population of livestock. India has the highest number of malnourished people in the world. To achieve the target of foodgrains production all the rainfed arable lands need to be brought under irrigation. The productivity, too, has to be increased from 0.8 to 2 tons/ha in the rainfed areas and 2 to 4 tons/ha in the irrigated areas. Further, 60% of the rainfed drylands suffer from soil erosion, loss of soil fertility, decreased productivity, ultimately facing desertification in future.

India’s is an agrarian society. Water management holds key to agricultural prosperity. Beret of food and water security, and leaving 70% of rural poor malnourished or impoverished, economic growth and stability are but a distant dream. India has also a long history of drought- famine syndrome. During 1870-1990 droughts affected 1/5th of the total geographical area once in 5 years, and 1/3rd once in 10 years (IIRR-MYRADA, Rainfed Drylands, 2002). Post-Independence this realisation that agriculture and water conservation are the drivers of rural development and economic resurgence, led to the adoption of several measures such as construction of large reservoirs for irrigation and hydropower generation, soil conservation, various poverty alleviation programs like national drought prone area development, green revolution, technology missions with sustainable safe and pure water availability as the core issue. But, by and large, the benefits did not reach the drought hit rural communities. The green revolution technologies failed to percolate to the rainfed areas and the Southern states in particular. Conscious of the inherent fallacies of the programs like piecemeal planning, non-involvement of the people, benefits not directly reaching the local people, neglect and abandonment of age old traditional knowledge and practices, poor farmer-technology interfacing, and incompatibility of the adopted measures in all conditions (A.P.J. Abdul Kalam et al., Beyond 2020, Penguin/Viking, 2014), planners now favour village plans as the fulcrum of the regional development plans which should take into account the relevance of all the components related to soil, water and agriculture for all inclusive harmonious growth (L.N. Mishra, JGIS, v.70, 2007, p.378). Hence watershed development approach has since been accepted as the National Mandate for the rural development and economic progress in the rainfed areas of the country (G.K. Veeres, Mem.70, GSI, 2008).

The principal objectives of the watershed development are, therefore, defined as optimal utilisation of the land according to its endowments or capability, adequate vegetative and forest cover, conserving every drop of rainwater, controlling soil erosion, increasing soil moisture and recharge, maximising productivity per unit area and per unit water; livestock rearing, increasing cropping intensity; stabilising income of the rural households despite weather adversities; and thus sustainability of the ecosystem in the watershed. Working on this revolutionary concept the spirited leadership of Tarun Bharat Sangh, an NGO of Alwar, Rajasthan, became pioneer in community driven water management and governance in the Arwari basin of Alwar district. Arwari model is now enshrined as National Heritage of community movement and empowerment. It set the trend for drought affected rainfed areas in the country for all round growth through revival of traditional knowledge and practices like construction of johads, check dams, tanks and slew of time tested water conservation measures. This model was followed by several others in different areas, though modified as per local situations as in Ralegaon sidhi (Maharashtra), Gadag (Karnataka), Nidhal (Maharashtra) etc. Now another instance comes to light, the commendable initiative of Jain Hi-Tech Agri Institute in the drought hit, hilly terrain of Jalgaon district, Maharashtra, where planning and implementation of the Watershed development program have provided a shining example of private entrepreneurship in watershed development in water scarce barren wastelands, a pioneering venture in the country. This story, fascinating in many ways, is narrated by the author Bhavarlal H. Jain of Jain Hi-Tech Agri Institute in his book “A Telling Tale”. The highlights of this account may be worth perusing.

Jain watershed spreads over 263 ha, known as “Agri Park of Jain Hills and Food Park & Green Energy Park” in the Jain Valley. A part of the Girna valley, the area is a typically water deficit hilly, undulating wasteland in the Deccan plateau, shorn of vegetation with low rainfall (650 mm), and covered by layers of basaltic flows (Fig.1). Groundwater, the only water source is scarce and overexploited with water levels progressively deeper and deeper. Devoid of soil layer and strewn with boulders and stones, the area enjoyed no agriculture, no economic activities either. The Jain Agricultural Institute at Jalgaon has taken up, as part of their R&D activities, the challenge of transforming the barren wastelands into a productive agroforestry centre through rainwater harvesting, crop water planning, soil moisture and water conservation measures and artificial recharge, combining traditional knowledge
and water conservation, erosion control, soil moisture retention. Afforestation, proper cropping intensity, as also suitable cultural and cultivational practices also promote soil conservation. Equally important is soil health ensured through organic manuring, green manuring, vermicast application, crop rotation practices. Soil health card has been developed to optimise manure and fertiliser application.

From ridge down the valley, the runoff generated has been harvested in percolation tanks, storage tanks, polylined (plastic lined) tanks, or appropriate structures (Fig.2b). Check dams, boulder checks, gully plugs etc. were constructed for water harvesting and groundwater recharging etc. Contour and graded bunding, bench terracing, afforestation, trapezoidal percolation/infiltration open trenches, underground bandharas, bore blast and hydrofracturing techniques were also employed. If in Alwar (Rajasthan) the structures were constructed based on people’s age old ideas/tradition, “gut feeling” or intuition, here in the Jain valley the structures have been sited, designed and constructed based on research and study. Hydrogeology and remote sensing have played an important role.

In the Deccan traps groundwater occurs in the vesicular crust and or jointed core. The alternating geometry and disposition of flows result in horizontal permeability dominating over vertical permeability. Hence understanding the morphology and internal structure of the flows constituting the aquifer system is essential. Duraiswami et al. (2012) have described six aquifer scenarios which occur in various combinations and control success of water conservation. For example, only a combination of simple unconfined aquifer (moderate to high vertical ‘K’) above compound sheet-lobate pahoehoe aquifer (low to moderate vertical ‘K’) has been responsible for success of water conservation in Hivre Bazar and Ralegaon sidhi in Ahmednagar district of Maharashtra.

Following the availability of water in the watershed, agroforestry has been taken up aggressively to enhance productivity of land, water, plants, and human resources, as also for control of soil erosion, proper utilisation of waste and slope lands, and with hi-tech solutions, in short, watershed development and integrated water management charting a course from land levelling, land preparation, and soil conservation to water harvesting. In the words of Bhavarlal H. Jain: ‘The centre promotes modern irrigation methods, organic farming, use of bio-planting mediums and materials...for enhancing productivity.....Energy conservation through use of renewable sources is also (another) focus area. .....Jain Hi-tech Agri Institute (JHAI) ...encompasses full-fledged training centre, Jain Gurukul with state of art teaching and training and extension aids for farmers’. Thus the watershed has been mooted as a demonstration farm providing a packaged module for dryland farmers.

Starting with land levelling and preparation, the boulders and stones have been removed by bulldozers and excavators, and used to plug gullies and for contour bunding. Such measures prevented soil erosion and allowed cultivation of land. Land levelling has been done by bench terracing along the slopes (Fig.2a). Gullies were plugged by contour trenches and bench terraces. Trees have been planted along the slopes to stabilise soil and harness water (Fig.2a). Contour trenching, bench terracing, Grade terracing, contour bunding etc, are some of the other useful measures for soil...
increased human activities in the watershed has resulted in raising water table. Vigorous plantation activities in the watershed has resulted in CO₂ sequestration (estimated to be of the order of 64759 tons of CO₂ eq. at Jalgaon and Udumalpet). Greenhouse gases in the atmosphere are substantially reduced. With increased greenery the watershed has become home to a variety of plants, birds, reptiles, animals. The Jain team has undertaken biodiversity mapping, conservation and restoration work for the hills and valley. A symbiosis has been established among agricultural crops, horticultural plants, many tree species, and livestock rearing. Watershed development and sustainable resource management do need an understanding of the relationships between land, water, soil, crop and environment.

The harvested water is reclaimed through dug wells and bore wells. However, the need for sustainable availability of irrigation and drinking water has prompted adoption of advanced water economy techniques like drip irrigation. The latter has water use efficiency up to 95% and water saving up to 68%. Effective area under Micro Irrigation Systems is 97 ha. In order to meet the energy need for effective use of water, JAINS have established “Green Energy Park”, where state of art technology facilities have been installed such as solar heating, lighting, and pumping systems, solar powered drip irrigation system etc. Aerobic composting unit has been set up to produce organic manure, and biogas generated power generation plants. Further, conversion of wastelands of Jain watershed into cultivable agro-forestry land, has enabled promotion of agro-based industries and hi-tech activities like agro-forestry, horticulture, onion dehydration, fruit processing, livestock rearing, organic farming, green energy etc., providing gainful employment of 2100 farmers and training of 70% people in the watershed in various skills and trades.

Watershed development and water conservation activities in the area since 1989 have transformed the land bringing in a sea-change in the overall environment and socio-economy, - no dearth of water, lush growth of vegetation, afforestation, multi crop cultivation, plenty of food, fodder and drinking water; improved sanitation and hygiene; generation of alternative livelihoods, employment, income and wellbeing. The area has now become self-sufficient in irrigation and drinking water availability. The borewell yield has increased from 70m³/day (1992) to 250m³/day (2002). In a normal rainfall year the water availability is 7.8 lakh cumec, while the peak requirement may be 8.6 lakh cumec. To meet the deficit especially in drought years 10-20% of waste water generated from fruit and vegetable processing is reused after treatment. The total cost of water as created in the watershed works out to 3.8 paise per litre. But for a dryland farmer assured availability of water is a boon.

All these were supported by the Jain Agricultural Institute’s R&D programme. “Vision, modern technology, onsite experiences, trials and scientific experiments as well as economic considerations have worked hand-in-hand at Jain watershed. Our endeavour is to enlighten, guide and demonstrate to the farmers as well as other institutional land holders that one can reclaim and green wasteland with the help of rainwater harvesting combined with drip technology.” The Jain Agricultural Institute supplies to “the progressive farmers his basic needs of hi-tech planting materials, irrigation methods, and a host of other modern technologies and know-how and later buy back from him what he produces. WE then add value to his produce by processing and marketing the same in domestic and international markets….This is the only integrated model of its kind in the country”. It clearly goes to establish that the poverty alleviation program, does not require any big capital investment, or sophisticated planning and imported technology, but what it needs is investment of the people’s will and commitment with locally available skill and resources, traditional knowledge and practices, indigenous research and study, as also a spirited leadership and vision.

This is in short the success story of private entrepreneurship with community participation in transforming barren wastelands into productive agroforestry land as related in the book “A Telling Tale”. This is a rare narrative of the innovative application of science and technology for societal benefits and wellbeing. This is truly an invocation of Man’s struggle and victory over daunting odds of Nature, spurred by his will, sense of commitment, and after all the use of ancient wisdom amalgamated with modern science and
technology. Also the watershed development will go a long way in addressing climate goals of sustainable development, economic, ecological and social. Time has now come to compile, assess, analyse all such cases across the country, scattered and unreported, to develop replicable Prototype models suit different situations. So far, four prototypes have emerged from an appraisal of the reported case histories.


2.Ichallahalla (Karnataka): Undulating basaltic and granitic terrain. K.H. Patil Krishi Vigyan Kendra at Hulkiyot motivated and organised the village community in rainwater harvesting and integrated watershed management, along with linkages with financial institutions and government sponsored poverty alleviation schemes, technical support from the Krishi Vigyan Kendra and direct marketing facilities of the agricultural products. KVK is the first scientific institution and a pioneer in southern India in organising farmers in to self-help groups for technology transfer, sustainable agriculture and rural development, crossing poverty line in the quickest possible time (L.G. Hiregowda et al., Mem.70, GSI, 2008).

3.Nidhal (Maharashtra): Deccan trap terrain. Enlightened District Administration mobilised people’s participation in rainwater harvesting and watershed development as part of the Indo German Watershed Development Program sanctioned by NABARD. Program implemented by Village Watershed Development Committees (VWC). Villagers contributed 20-33% of the Project cost. The first Project in the country without involvement of NGOs, and funds directly released to VWCs. (Chandrakant Dalvi et al., Gond. Geol. Mag., v.27(2), 2012).


These are monuments of community movement and empowerment.

UN’s Millennium Development Goals (MDGs) encompass all these, - poverty alleviation, food and drinking water security, sanitation. These also reflect the broader faces of “Clean India” campaign, as poverty is the greatest polluter. R&D activities of Jain Agricultural Institute could achieve all these through a mix of modernity and spirituality, ancient wisdom and hi-tech inputs. But the one core issue missing in the UN’s MDGs is spirituality, will force, dedication and commitment of the people which can do miracle. JAINS and the motivated community in the watershed have scripted history. Arwari, Ralegaon sidhi, Gadag, Nidhal and Jain Watershed have all crafted a Vision for Tomorrow’s India, setting out several strategic goals.

1. Watershed wise planning to be adopted for all inclusive integrated regional development programs.

2. Agriculture and water to be recognised as harbinger of environmental and socioeconomic resurgence.

3. All arable lands in rainfed areas to be brought under irrigation through micro irrigation systems, drip irrigation etc.

4. Unleashing productivity potentials of lands. Maximising productivity per unit area and per unit water with the adoption of drought proof agriculture, increased cropping intensity, introduction of GM varieties along with integrated and optimal use of waters from all sources.

5. Rainwater harvesting and water conservation based on traditional wisdom and practices, combined with modern science and technology.

6. Improvement of agricultural infrastructure with regard to storage, transportation and marketing.

7. Promotion of agro-food processing and agri-waste processing industries.

8. Application of soil biology to improve degraded or degrading lands.

9. Use of renewable /green energy sources e.g., solar, wind and biogas.

10. Agricultural reforms: consolidation of fragmented lands to be run by corporatized co-operatives or private sector cooperatives.

11. New technology inputs in farming sector with upgradation of farmer’s skill and knowledge through improved farmer-technology interfacing.

12. Involvement of stake holders as also public-private partnership in planning and implementing the watershed development programs.

13. Climate change resistant agricultural processes and resilient technologies.

It is a vision which thrives on “all the advantages of agroclimate and natural resources with the use of right dose of modern technology” (Abdul Kalam et al., 2014), - a vision which recognises green environment, food and drinking water security, as also stable income to live off as basic rights of the people.

Jain watershed, mooted as a demonstration farm, is the brainchild of Bhavarlal Jain, a pioneer water engineer, soil conservationist, agriculturist and a philanthropist combined in one. The watershed now serves as a live model of transformation of wasteland into cultivable agroforestry land with a succinct message: “If productivity per unit of soil and water is to improve, the focus has to shift from crop intensity to soil fertility, from large dams to watershed, from flood irrigation to drip irrigation, and from food security to water security”. The country needs many more water crusaders like Bhavarlal H. Jain.

Jain Watershed beckons one and all to SEE and BELIEVE.

Reference