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Title : " ***Water Conservation in the dry regions of India for sustainable Agriculture***

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Vidharbha gets very scanty rainfall which is very erratic. The average land holding is below four hectares. The farmers are mostly dependent on the meager income they get from their holding. With this income he has to meet Children's education, illnesses, social needs . Naturally, he has to look at other sources to meet his needs and tthis results in barrowing. In the long run he gets frustrated and the final out come is suicide. This region is much in news as around 1000 suicide cases of farmers are recorded from this region alone. More over, there is a big crop of Agricultural Advisors who never go in to the field or cultivate land but are experts in organizing farmer's days, workshop, group discussion, organic farming and other aspects of agriculture. Their main aim is not to educate the farmers but to earn political support of farmers for a particular party, get publicity and if possible earn some side income.

The farmer will not achieve any thing through such gimmicks; to be self sufficient he has to be his own master. He need not look to get help from outside to improve his farm and get more income but he must master the different techniques for water conservation, multiple cropping, relay cropping and have some supporting income by keeping cows or goats on his farm. In this paper different on farm water conservation techniques, multiple cropping patterns relay cropping are discussed with sole attention to minimum water use.

INTRODUCTION

India's present population of one billion and above mayl grow to the level 1.45 billion by 2035, at the rate of average 2% growth. Though presently self sufficient in respect of food, it will result in crisis for food, if the food production is not increased in future and the water resourses are not managed well, for our food security, in the WTO regime. The availibilty of fresh water shall be reduced to half and consuption of water will be doubled. The land and water resourses have limitations and can not increase as of population does. Hence, only alternative to our need is to increase the area under irrigation by developing water resourses and secondly by cutting down the demand and increasing water use efficincy by adopting efficient methods of irrigation, i.e. the use of drip and sprinlers , where the losses are only 1 to 5%, where as in convential methods of irrigation the lossess are even up to 50%.

SOIL & WATER MANAGEMENT NEED IN AGRICULTURAL DEVELOPMENTS in INDIA
Table –I.

INDIAN AGRICULTURAL BASIC FACTS	
Total Geographical Area	**329 million hectares**
Net Area sown	**141million he.**
Gross cropped area	**190 million he.**
Cropping Intensity	**134 %**
Area Under Irrigation	**40 %**
Operational holdings	**116 million**

*** source: Agriculture Statistics At a Glance**

Water is essential to life on our planet. The availability of sufficient amounts of good quality water is fundamental to all biological processes, for maintenance of biodiversity and ecosystems and for primary and secondary production functions. Natural ecosystems and agriculture are by far the biggest consumers of the Earth's freshwater. Competition between them has intensified with human population growth and the expansion of agriculture, to the point where agriculture is often seen as jeopardizing the ecosystem's sustainability. But it is equally important to underline that such threatened ecosystems can no longer provide their water purifying and regulating services to sustain agricultural production and livelihoods.

Although the competition for water by agriculture and ecosystems is often stressedy to successful implementation.

TABLE –II. India's population Trend in Millions

YEAR	MILLIONS
1862	220
1947	400
1998	980
1999	1000
2035 projected	1450

There is an urgent need, therefore, to reconcile water demands both for increasing population and for agricultural crop production in India and for maintaining ecosystem functions and for producing food. Finding this balance is particularly important in developing countries, where agriculture and the natural environment are often the principle potential "growth engines", and the key to alleviating poverty and reducing hunger, in the WTO regime.

Of all freshwater use sectors, agriculture in most cases shows the lowest return on water in economic terms. As the stress on water resources increases, competition grows between agriculture (fighting to retain its water allocations) and drinking water in cities needed to satisfy the needs of their rapidly growing populations. Water stress and the pressing need to renegotiate inter-sectoral allocations are usually factors that force changes in the way water is managed between different sectors.

With technical and research support such as WATERSHED development, ground water recharging and water harvesting , waste water reclying, curtailing irrigation losses during transit, reducing evaporation lossess by adopting suitable cropping patterns and mulches, the demand of water can be reduced to 50%. And additional rainfed area can be brought under protective or limited irrigation thereby increasing cropping intensity .

TABLE - III.

TOTAL UTILISABLE SOIL & WATER RESOURCES IN INDIA

Total Geographical area		**329 M Ha.**
Average Annual Rainfall		**1170 mm**
Total Water Received Annually		
From rain and Snow		**4000 cu km**

HOW IT IS UTILISED

Runoff	**52%**	**2080 cu km**
Evaporation	**30%**	**1200 cu km**
Soil & Sub		
Soil ret.	**8%**	**320 cu km**
Ground		
Water Rec.	**10%**	**400 cu km**
Total	**100%**	**4000 cu km**

The water availability reduced by 40% during the last 50 years and it will be further reduced to 40 to 50% in the next 50 years. The demand will be doubled in the next 50 years and the present utitilisable water limilt is 1086 cu km .

TABLE IV.

WATER USES IN DIFFERENT SECTOR

Agriculture	**84%**
Domestic	**4%**
Industry	**12%**
Thermal	
Power etc.	
Total	**100%**

TABLE – V.

Percentage and number of Households by size class of land owned

(All India – rural areas)

Size of land owned	Percentage of households
Landless	**10.2**
0.01 – 0.04hectares	**48.7**
0.41 – 1.00	**18.8**
1.01 – 2.00	**11.2**
2.01 –4.00	**7.1**
4.01 hectares and above	**3.9**
Total	**100**

Source: Economic Survey, 2005	

NEED FOR EFFICIENT SOIL & WATER USE

1.Water harvesting and Ground water recharging

2. Use of Efficient Methods of Irrigation

3. Change of Cropping patterns

4. Waste water reclying

5. Reducing water Transportation losses – water shed management

6. In-situ – water harvesting , Ground water recharging and use(and thus 50% losses can be reduced)

7. Restriction on Cropping pattern

8. Compulsory water harvesting according to water requirement for Crops/Domestic use and Industry

Over exploitation of groundwater to be regulated and the River Linking may be considered and where ever feasible and possible, to be given priority. Beside population control and use of fallow land, water logged and salt affected land could be utilized, with proper water management.

THE SCOPE: Soil and Water Management

Population growth and rising levels of per capita water consumption place increasing pressure on the availability and quality of water resources which, in turn, compromises ecosystems that are vital to water regulation, supply and purification.

The scope and need exist therefore for rapid increase in agriculture's water productivity. Carefully designed water management strategies, associated with programmes aiming at improving the efficiency and productivity of water use need to be put in place. Pressurized irrigation conveyance systems, associated with localized irrigation technologies and the promotion of high return agricultural produces should be part of

such strategy, under the WTO regime in India. Systematic collection, treatment and re-use of urban wastewater for agricultural production, associated with the development of enhanced monitoring, health protection and education programs for wastewater reuse in agriculture offer new opportunities for irrigation in conditions of water scarcity.

Water use in agriculture

As cities draw on more water resources for their rapidly growing populations, agriculture must significantly improve its water use efficiency. Improved equity and security in access and rights to land and irrigation resources matter for larger poverty impacts: where land and water equity exists, irrigation has greater poverty-reducing impacts.

Evidence shows that the poverty-reducing impacts of irrigation-related interventions are larger when they are implemented in an integrated framework - for example, integrated approaches for managing surface water and groundwater (conjunctive use, developing systems that allow multiple uses of irrigation water, new investments in improving irrigation infrastructure and irrigation management, and provision of inputs, technologies, information, finance and marketing. Investments in irrigation improvement that allow for multiple uses - such as domestic water supply, irrigation, and other farm and non-farm uses of water - may have higher positive impact than separate investments. These multiple uses bring significant benefits and contributions to livelihoods, especially for poor households.

Where opportunities for irrigation with affordable technology exist, a priority option is private sector marketing of technologies. There is a range of irrigation application and resource conserving technologies, and improved production practices that offer promise for improving productivity and returns to farming by the poor. These include, for example, improved system of water delivery and control, micro-irrigation systems, adapted water lifting technologies, and on-farm water conserving technologies like zero tillage, water harvesting, or runoff farming.

Drip Irrigation System For Sustainable Use of farming System and Irrigation

About 97% of earth's water is in sea and its desalination is very expensive. Only about 1% water is readily available for use and the irrigated agriculture consumes over 70% of water used by people and 8% for Industry and about 8% for households uses.

Micro Irrigation and Fertification Management for Intensive Soil Cultivationn

Efficient utilization of all inputs agriculture is necessary to enhance the agricultural producity. In India, the area under drip irrigarion is only 0.25 M Ha,

which is very meager. Drip irrigation is the best available technology for the judicious use of water for, growing crop in large scale on sustainable basis.

Table – VI.

RICHNESS OF BIODIVERSITY – In INDIA
Accounts for 12% plants; and 17% Animal genetic resources of the globe
30,000 rice cultivars out of 1,20,000 documented in the world
1000 mango types are in field
Wide range of medicinal / aromatic plants about 10,000 exists
32 breeds of cattle's; 14 of buffaloes; 40 of sheeps; 20 of goats; 8 of horses and 6 of camels along with several types of other animals
48,000 plants species and 89,000 biotic species and Marines species; birds; Insects and micro organisms particularly saprophytes , Insects species

TABLE-VII. LIVESTOCK SECTOR – STRENGTHS of INDIA.
India has 16 % of cattles; 57 % of buffalo; 17 % of goats and 5 % of sheep population of the world;
Largest producer of milk in the world with 84.6 million tones during 2002;
Rank 5th in egg production in the world with 34 billion in 2002 and
India ranks 4th. In fish production and 2nd. In aquaculture in the world with coastline of 8118 kms. * Source: Agriculture Statistics at Glance – 2003.

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Table – VIII. INDIA STRENGTH –in Agriculture
In India 52 % of total land is cultivable as against 11 % in the world;
All 15 major climates of the world are in India. Snow bound Himalaya to hot humid southern peninsula; Thar desert to heavy rain areas;
There are 20 agro- climatic regions in the world;
Sunshine hrs and day length ideally suited for round the year cultivation of crops;
Largest Technical / trained manpower and well organized Research & Education System;
Agriculture contribute 24.2 % GDP; 15.2% of total export and provides employment to 58.4 % of country's work force;
* Source: Agriculture Statistics at Glance – 2003.

• **TABLE – IX.** • **CURRENT PRESSURE and CHALLENGES**
• Population growth –likely to reach 120 crores by 2011-12
• Stagnant Resources base
• **Diminishing and deterioting water and land resources**
• Increasing biotic / abiotic stresses
• LOSS OF BIO DIVERSITY
• Decline in productivity
• Globilization and liberilization
• Slow pace of mechanization
• CHALLENGES?
• Production, Productivity and Employment
• Regional Imbalances
• **Sustainable Use of natural Resources –** • **Land; water and Protection of BIO_DIVERSITY**
• Infrastructure support at Rural levels
• Risk management and Increase Income etc.

CONCLUSION:

In INDIA, there is an urgent need, therefore, to reconcile soil and water demands for maintaining ecosystem functions and for producing food. Finding this balance is particularly important in developing countries, where agriculture and the natural environment are often the principle potential "growth engines", and the key to alleviating poverty and reducing hunger.

Of all freshwater use sectors, agriculture in most cases shows the lowest return on water in economic terms. As the stress on water and soil resources increases, competition grows between agriculture fighting to retain its water allocations and cities needing to satisfy the needs of their rapidly growing populations. Water stress and the pressing need to renegotiate inter-sectoral allocations are usually factors that force changes in the way water is managed in agriculture.

Declining water quality adds to the stress on supply. In developing countries, water diverted to cities is often released after use without adequate treatment. In arid areas, return flow from agriculture itself and multiple reuses of water lead to a rapid degradation in quality. In many islands and coastal areas, the development of tourism adds to the burden on scarce water resources, but it also bring new market opportunities for diversified and high value production, including fresh vegetables and fruits.

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(Knowledge can be communicated but not wisdom - and what -" Swami Vivekananda said -- Neither numbers, nor powers, nor wealth, nor anything else will prevail but purity, living the life, in one word, anubhuti, realization"….).