ISSN- 2350-0530(O) ISSN- 2394-3629(P)
IF: 4.321 (CosmosImpactFactor), 2.532 (I2OR)

INTERNATIONAL JOURNAL OF RESEARCH – GRANTHAALAYAH
A knowledge Repository

Management

WORLD WATER WEEK, STOCKHOLM SERIOUS WATER ISSUES FOR SUSTAINABLE AGRICULTURAL GROWTH

Dr. Amrit Patel [*1]
[*1] Former Deputy General Manager, Agricultural & Rural Credit Department, International Bank of Baroda, INDIA

DOI: 10.5281/zenodo.61177

ABSTRACT

The Prime Minister of India Shree Narendra Modi on 8th June 2015 said, "India must quickly expand its irrigation network and improve water usage to offset the impact of less monsoon rainfall than usual and asked officials to ensure quick results for farmers by reviewing administrative mechanisms, financial arrangements and technology use in irrigation" He also pushed for a brief, intensive effort to increase the number of farm ponds, adding that falling groundwater levels in some Indian states could force an urgent shift in crop patterns". Over the years, there has been a manifested lack of attention to water legislation, water conservation, water use efficiency, water harvesting and recycling and infrastructure. Current scenario exhibiting number of incomplete projects accompanied by low utilization of irrigation potential already created shows that return on capital invested in creating irrigation facilities is inordinately delayed or almost lost. All incomplete projects need to be completed by 2020 by drawing a suitable road map indicating specifically the role, responsibility and accountability of officials, department and ministry concerned. It is indeed apt that the Stockholm-based International Water Institute has focused "Water & Sustainable Growth" as its theme during the World Water Week commencing from 22nd August to 2nd September 2016. It is in this context this article briefly highlights the serious issues of water for sustainable agricultural growth in India when droughts and floods are annual features in one or the other parts of the country.

Keywords:
World Water Week, Agricultural Growth, Water & Sustainable Growth.

Cite This Article: Dr. Amrit Patel, "WORLD WATER WEEK, STOCKHOLM SERIOUS WATER ISSUES FOR SUSTAINABLE AGRICULTURAL GROWTH" International Journal of Research – Granthaalayah, Vol. 4, No. 8 (2016): 110-117.

1. INTRODUCTION

The Sweden-based Stockholm International Water Institute [SIWI] convened Stockholm Water Symposium annually from 1991to 2000. Since 2001the SIWI has been arranging the World

ISSN- 2350-0530(O) ISSN- 2394-3629(P)
IF: 4.321 (CosmosImpactFactor), 2.532 (I2OR)

Water Week annually in August/September in Stockholm to focus aspects of world's escalating water crises. It aims to help link practice, science, policy and decision-making and enables participants of around 130 countries to exchange their research studies and field experiences on global water challenges. It is indeed apt that the SIWI has focused "Water & Sustainable Growth" as its theme during the World Water Week commencing from 27th August to 2nd September 2016. It is in this context this article briefly highlights the serious issues of water for sustainable agricultural growth in India that the Government of India along with all other stakeholders should consider during the proposed World Water Week when droughts and floods are annual features in one or the other parts of the country.

2. DISMAL AGRICULTURAL GROWTH

The share of agriculture in India's GDP progressively declined from 23.4% in the 9th five year plan[1997-02] to 17.60% in 2014-15 but population depending on agriculture as the main source of livelihood declined to 48.9% from 59.9% between 1999-00 and 2011-12.Agricutural growth rate during 2014-15 is estimated to be 0.2% as against country's 7.3% economic growth rate. Food output in 2014-15 is estimated to be 251.12 million tons [MT] significantly less than 257.13 MT and 265.14 MT in 2012-13 and 2013-14 respectively. Despite 68 years of India's independence, monsoon rains still continue to dictate/influence the agricultural growth. About 55% of net cropped area is rain-fed or unirrigated which is critical in terms of security of food, fodder, feed and farm income and even responsible for farmers' distress. About 80% of horticulture-based livelihoods and 100% of forest products are realized without assured irrigation. Productivity in rain-fed areas ranges from one to two tons of food grains compared to four tons in irrigated areas per hectare which itself is low. India's 44% food grains come from 56% unirrigated land.

Deficit in rainfall even in the assured irrigated regions has far reaching consequences in terms of low level of surface water supplies, over- exploitation of groundwater, excessive power consumption and lower crop production. Indian sub-continent is predominantly characterized by a tropical monsoon climate and entire region is distinguished mainly by the differences in the quantity and distribution of rainfall. While south-west monsoon accounts for 80% and north-east 20% of rainfall, there is a large variability in the monsoon rainfall on both space and time scales. Consequently, country experiences drought or flood in some parts almost every year. In past, country has experienced 24 large-scale droughts in 1891,1896, 1899, 1905, 1911, 1915, 1918, 1920, 1941, 1951, 1965,1966, 1972,1974, 1979, 1982, 1986, 1987,1988, 1999,2000,2002,2009 and 2012 with increasing periods in 1891-1920; 1965-1990; and 1999-2012. Even 2015 is a drought year affecting 330 million people in 313 districts of 12 major States [Uttar Pradesh, Karnataka, Madhya Pradesh, Andhra Pradesh, Telangana, Maharashtra, Gujarat, Odisha, Jharkhand, Bihar, Haryana, and Chhatisgarh].More importantly, 1,58,205 villages & 4,44,281 dwellings have been hit hard drying up traditional sources of drinking water for human beings & cattle. For the first time in the history of independent India, the Supreme Court has to issue policy directives to the Government to mitigate the adverse impact of recurring drought through initiating five specific actions under the National Disaster Mitigation Act, 2005. Recurrent drought in some parts of the country in each year brings into sharp focus the critical significance of water coping with water scarcity.

ISSN- 2350-0530(O) ISSN- 2394-3629(P)
IF: 4.321 (CosmosImpactFactor), 2.532 (I2OR)

3. WATER SCENARIO

India's water scenario is now fast changing as a result of increasing population, rising demand for irrigating agricultural land, rapid urbanization and industrialization, electricity generation, impact of global warming and erratic rainfall.

As against the ultimate irrigation potential of 140 million hectares [MHA] estimated in 1997, currently irrigation facilities of 102.8 MHA are created and 45% of country's net sown area [63.36 MHA]is irrigated leaving 55% at the mercy of monsoon rains. According to World Development Indicators [1998] in the mid-1990s, the percentage of irrigated area in India was less than that in Bangladesh, Nepal and China and less than half that in Japan and Korea. Crop-yields in India are relatively lower than that in East Asia and have almost stagnated despite a holding size that is lager on an average than in China. Rice yields in India are almost half that in Japan, an economy of smallholder agriculture.

According to the Report of the Economic Advisory Council to the Prime Minister of India [2007], India has very low levels of irrigated area by international standards. Water for Life Decade [2005-15] and the annual World Water Day being held on March 22 every year reminds all stakeholders about the fact that water is finite, scarce, costly and precious and, therefore, should be efficiently managed for country's sustainable development. During the World Water Week [August 27 to September 2] the electronic and print media can critically discuss and publish the policy, programs, performance and issues identified during the previous years and present the framework to pursue the unfinished tasks to accomplish the objectives of the National Water Mission.

The United Nations World Water Assessment Report [2015] has estimated that the world would require 60% more food [India 100% more] between now and 2050 to meet the demand of an eventual population of more than nine billion people. The report, further, says," It is possible to produce the food, but is probable that today's food production and environmental trends, if continued, will lead to crisis in many parts of the world. Only if we act to improve *water use* in agriculture will we meet the acute fresh water challenges facing human kind over the next 50 years. Business as usual is not an option. Real changes are needed in the way in which *water is governed and use*d if transient and long-term crisis are to be averted"

The Prime Minister of India on 8th June 2015 said, " India must quickly expand its irrigation network and improve water usage to offset the impact of less monsoon rainfall than usual and asked officials to ensure quick results for farmers by reviewing administrative mechanisms, financial arrangements and technology use in irrigation" He also pushed for a brief, intensive effort to increase the number of farm ponds, adding that falling groundwater levels in some Indian states could force an urgent shift in crop patterns.

4. DEMAND-SUPPLY

India has as much as 15% of the world's population but has only about 4% of the world's fresh water resources. Much of these are unevenly distributed. Average annual rainfall in the country is about 1,170 mm, which corresponds to an annual precipitation [including snowfall] of 4,000

ISSN- 2350-0530(O) ISSN- 2394-3629(P)
IF: 4.321 (CosmosImpactFactor), 2.532 (I2OR)

billion cubic meters [BCM]. Nearly 75% of this [3000bcm] occurs during the monsoon season, confined generally to three to four months [June to September] a year. According to the Planning Commission of India, country has so far created a total of about 225 BCM of surface storage capacity. However, per capita storage capacity in India at 190 cubic meters is very less compared to USA [5,961], Australia [4,717], Brazil [3,388] and China [2,486]. This necessitates creation of large storage facilities for maximum utilization of the run-off.

In 2010, total water demand was estimated at 761 BCM which would reach 900 BCM by 2050. India has about 1030 BCM water potentially available from internal renewable resources which can be harnessed through adoption of better rainwater-harvesting and conservation techniques. Research reveals feasibility to harvest a surplus run-off of 114 BCM of water from 28.5 million hectares of cropped land in 225 predominantly rain-fed districts in the country.

Though the average water availability remains more or less fixed according to the natural hydraulic cycle, per capita availability is reducing progressively because of increasing population. In 1991, average per capita availability was around 2,200 cubic meters [cm], which declined to 1829 cm and may further fall to about 1340 cm and 1140 cm a year by 2025 and 2050 respectively.

The situation in some of the river basins is worrisome. According to international agencies, a region with per capita water availability of less than 1700 cm is considered ***'water stressed'*** and that with less than 1000 cm '***water scarce'***. Already six river basins in India fall in the '***water scarce'*** category, and five more basins are likely to be '*water scarce'* during 2025-50. Only 3-4 basins will be '***water sufficient'***. Water availability in quantity and quality has been declining over the past 3-4 decades because of inappropriate management of the available water resources and environmental degradation. Former Prime Minister of India on August 18, 2009 in the conference of Environment Ministers said, '*Climate change is threatening our ecosystems; water scarcity is becoming a way of life and pollution is a growing threat to our health and habitat and rivers all over India are still being degraded'*. Not only per capita availability of water is already low but also there is enormous wastage, growing pollution and contamination of surface and groundwater.

5. WATER FOR AGRICULTURE

In 1947, when India got independence, the effects of country's geographical partition and drought caused a massive deficit in food production. Acknowledging the importance of irrigation for increasing food production, Government prioritized creation of irrigation facilities right from the first five year plan [1951-56]. Since then Government has been creating irrigation facilities through major, medium and minor irrigation projects exploiting surface water resources and farmers promoting lift irrigation schemes and extracting groundwater through sinking shallow/deep tube wells.

GROUNDWATER

Groundwater facilitates farmer to source water where and when he wants it. Storing and replenishing groundwater is cost effective than building and maintaining surface irrigation

ISSN- 2350-0530(O) ISSN- 2394-3629(P)
IF: 4.321 (CosmosImpactFactor), 2.532 (I2OR)

structures. Around 70% of India's irrigation needs and 80% of its domestic water supplies are sourced from groundwater. A large part of agriculture is dependent on non-renewable groundwater. In 1960-61, the share of groundwater through tube-wells which was just 1% of total irrigation resources increased to 30% in 1900-91 and further to 45% in 2011-12. As against this, share of canal irrigation declined from 36% in 1990-91 to 25% in 2011-12. Erratic monsoon affects farmers owning tube-wells compelling them excessive extraction of groundwater whereas most small and marginal farmers [accounting for about 85.9% of the total holdings and cultivating 42.8% land] who are not having their own tube-wells and pump-sets have to buy water at substantial cost.

MICRO-IRRIGATION SYSTEM

In June 2010, Government established National Mission on Micro Irrigation to increase water-use efficiency by promoting drip and sprinkler irrigation systems. Since mid-1990s use of micro-irrigation comprising Drip and Sprinkler irrigation system has been encouraged as it is the most efficient method to save water and increase water use efficiency as compared to the conventional surface method of irrigation, where water use efficiency is only about 35%-40%. Water saving due to Drip is between 12%and 84% depending upon crops, sources of lifting water, etc. Studies reveal that water saving including water use efficiency and productivity gains are higher in those crops cultivated under Drip as compared to Sprinkler. Around 80 crops can be cultivated under Drip and Sprinkler. While Drip is most suitable for wide spaced horticulture and other crops, Sprinkler is for closely-spaced crops. Micro-irrigation enhances input use efficiency and crop productivity; reduces energy consumption, weed infestation, soil erosion and cost of cultivation. Researches have established that investment in micro-irrigation is financially/economically viable. The internal rate of return (IRR), which varies across States and categories of farm-sizes, was ranging from 3% to 35% for marginal farmers, 14% to 88% for small farmers and 15% to 128% for large farmers. The IRR was higher among large farmers in Kerala and Maharashtra because of diversified intercropping pattern in orchard/plantation crops. Micro-irrigation promises farmers not to over-exploit groundwater. The study in nine promising States in 2010 revealed that area covered under Drip and Sprinkler was 14,28,460 hectares[12.25%] and 24,42,430 hectares [7.99%] as against potential of 1,16,59,000 hectares and 3,05,78,000 hectares respectively. Thus, after two decades, total area under Micro-irrigation was only 38,70,860 hectares[9.16%] as compared to potential of 4,22,37,000 hectares. Out of this, about 30 million hectares are suitable for Sprinkler irrigation for crops like cereals, pulses, oilseeds and fodder crops and a potential of around 12 million hectares under Drip for cotton, sugarcane, fruits, vegetables, spices, condiments; and some pulse crops like red gram, etc. Only a few states like Andhra Pradesh, Maharashtra and Tamil Nadu have expanded area under micro-irrigation. Factors attributed to low adoption rate include high investment cost, complex technology and socio-economic issues such as, a large number of small and marginal farmers, fragmented landholdings, cumbersome procedure to access institutional credit and Government subsidies, farmers' limited knowledge in operating and maintaining systems as often the system is facing problems of clogging of filters and drippers, besides the required pressure from the pumps not being maintained due to the poor conditions of the pump sets resulting in low pump discharge. The 12th five year plan targets bringing about 10.1 million hectares under macro-irrigation [4.8 MHA under drip and 5.3 MHA under sprinkler systems]

ISSN- 2350-0530(O) ISSN- 2394-3629(P)
IF: 4.321 (CosmosImpactFactor), 2.532 (I2OR)

On 22nd July 2006, while addressing the Advisory Council on Artificial Recharge of Ground Water, former Prime Minister of India Dr Manmohan Singh said "We have to minimize our water use and invest in science and technology to ensure that we can grow crops which use less water. In other words, find ways of valuing the crop per drop". The expert committee on More Crop and Income per Drop of Water embodied in its report several proven technologies developed by the Indian Council of Agricultural Research centers and State Agricultural Universities for minimizing water use and improving water use efficiency in agriculture that yield high returns under different agro-ecological regions.

6. ISSUES OF SERIOUS CONCERNS

While the Government has invested significant resources to develop irrigation, following are the issues that have substantially constrained the harnessing of full potential of irrigation resources, full utilization of available water, increase in irrigated cropped area and water use efficiency impacting on crop productivity per unit of water resources, farmer's income and employment generation. During the World Water Week [27th August to 2nd September] the policy makers and program implementers need to consider these issues seriously and demonstrate their political will, administrative skill, capability and commitment to formulate and implement a time-bound result-oriented program to achieve the mandated tasks in five years.

- **Comprehensive assessment of water resources:** In the context of significant changes in the social, economic and technological environment this need for reassessment is already due since it was last attempted in 1999-00.
- **National Bureau of Water Use Efficiency:** The Ministry of Water Resources needs to redouble the efforts to set up a National Bureau of Water Use Efficiency as the National Water Mission has a target of improving water-use efficiency by 20 per cent by March 2017.
- **National Water Framework Law:** In December 2015, a committee was constituted to examine the provisions of the draft National Water Framework Law and suggest changes/modifications therein, taking into account *inter-alia* the emerging challenges in the water sector, reuse of wastewater, the likely impact of climate change on water resources and the importance of river restoration/rejuvenation, among others. This framework law with basic principles for alignment of legislations sounds rational and calls for a consensus among State Governments.
- **Delayed implementation**: According to the Minister's response to a question in the Parliament, despite the central Government provided more than Rs.530 billion during 2004 to 2014 to State Governments for completion of irrigation projects, implementation of 163 out of 297 projects was delayed, including some projects for over 20 years.
- **Incomplete projects:** Between 500 and 600 projects have remained incomplete since 1969-74. Currently, 557 projects are yet to be completed. Andhra Pradesh has completed only 17 out of 105 projects, followed by Karnataka [33/305], Maharashtra [94/186] and Madhya Pradesh [90/242] projects.
- **Time and cost overrun:** Worst impact of the inordinate delays in completion of projects has been the time and cost overruns. A study by the Planning Commission of India on cost overruns revealed that cost escalation was 138% for 12 projects, 500% or more for 24 medium projects and 1000% and more for 24 out of 151 major projects approved earlier than 1980. Average cost escalation was 200% for major projects starting from 1985. .

ISSN- 2350-0530(O) ISSN- 2394-3629(P)
IF: 4.321 (CosmosImpactFactor), 2.532 (I2OR)

- **Underutilization**: The gap between the irrigation potential created [IPC] and the irrigation potential utilized [IPU] has been steadily widening since 1951-56. IPU is 80 MHA [77.80%] of 102.80 MHA of IPC. Factors responsible for low utilization of irrigation as studied by Indian Institute of Management [Ahmedabad, Bangalore, Kolkata and Lucknow] focus on lack of proper operation and maintenance, incomplete distribution systems, non-completion of Command Area Development works, changes from the initially designed cropping pattern and diversion of irrigable land for other purpose, among others. Inadequate provision of budget provision for operation and maintenance of the irrigation system is significantly responsible for underutilization followed by non-completion of distributaries, minors, field channels and on-farm development.
- **Groundwater depletion**: Groundwater through wells has 60.86% share in total irrigation. Almost 70% of groundwater potential has been utilized. Existing irrigated areas have been faced with serious water stress as both reservoirs and groundwater resources have been depleting in several parts of the country. Water table in many regions has been falling at an alarming rate. For decades, farmers in agriculturally-predominant regions of Punjab, Haryana, Uttar Pradesh and Rajasthan were encouraged to sink tube wells to get free water for agricultural purpose. Electricity for pumping out water was supplied virtually free or at heavily subsidized rates. This led to over-exploitation of groundwater and even encouraged farmers to flood crops like rice, wheat and fruit trees with water indiscriminately which impacted on soil and environmental degradation and low crop productivity. Rate of groundwater depletion raced faster than the rate of replenishment in many States. NASA scientists in the US, using satellites to track groundwater loss in India's north-western grain basket have found annual average 33 cubic km drop in the water table in the region, much higher than the estimates of the Government of India. The satellite study has revealed a loss of 109 cubic km groundwater in Punjab, Haryana and Rajasthan between August 2002 and October 2008, twice the capacity of India's largest surface water reservoir, the Upper Wainganga in Madhya Pradesh.
- **Food insecurity:** Water required to meet the foo**d** deficit in India eventually has to be searched in water-scarce regions, which have good endowment of arable land. This puts additional pressure on the water scarce-regions for freshwater. Hence, food crisis is as much a crisis of land in water-rich regions, as crisis of water in semi-arid and arid water-scarce regions. Groundwater over-exploitation problem in the water-scarce regions increases the magnitude of the crisis. In nutshell, problem of groundwater over-exploitation is more serious than what official assessments indicate. If unchecked, its impacts on national food security are likely to be severe as the regions that are experiencing over-exploitation are also the regions producing surplus cereals that are transferred to land-starved water-surplus regions. The alluvial areas of Punjab, Rajasthan and Haryana that experience decline in water levels are the largest contributors to India's wheat stock and the hard rock regions of Andhra Pradesh, Tamil Nadu, Madhya Pradesh, Chattisgarh and Karnataka are the largest contributors to India's rice stock. The food security impacts would be aggravated in the light of issues, viz. [i] depletion shrinks the area under cereals irrigated by wells [ii] when water becomes scarce, and cost of irrigation water rises, the farmers move away from traditional cereal crops that give low returns per unit of water and cultivate cash crops. This can lead to decline in food production impacting national food security. All these could lead to rising prices of cereals, jeopardizing the ability of poor people to purchase food. As the prices of the high valued cash crops are highly sensitive to market fluctuations, the farmer can also

ISSN- 2350-0530(O) ISSN- 2394-3629(P)
IF: 4.321 (CosmosImpactFactor), 2.532 (I2OR)

become vulnerable to income losses, thereby getting exposed to food insecurity. This calls for researches and implementing strategies to [a] improve the surface irrigation in intensively irrigated areas facing over-exploitation [b] improve the efficiency of utilization of green water and the rainwater held in the soil profile [c] reduce the soil water depletion, through reduction in the amount of residual moisture held in soils after harvesting[d] reduce the consumptive use of water (Evaporation Transpiration) through shift to low water consuming crops that are economically more efficient, i.e. crops that give higher net returns per unit of water consumed. But, under the current pricing regime followed in canal water, and the electricity pricing policy for farm sector followed by many states, the marginal cost of using water and electricity is almost zero, except when the supply of energy and water is extremely limited. This necessitates the policy and programs to incentivize farmers of these regions that can encourage them to adopt measures to improve the efficiency of water use and also improves the returns per unit of land. Therefore, what is most important is to introduce reforms in water and energy sector, including volumetric pricing of canal water and consumption based pricing of electricity used in groundwater.

- **Other issues:** Other challenging issues include [i] 90-odd major reservoirs and numerous smaller water bodies are able to hold barely a year's requirement of water as against water storage capacity for two or more years in many countries [ii] available water is not being optimally utilized because of inter-State disputes [iii] upper riparian States are extravagant in tapping river waters and waste these costly/scarce resources whereas those on downstream are frequently denied their legitimate share. At least a dozen of these inter-State water conflicts have defied resolving issues through mutual agreements, high-level political interventions and even adjudication by specially created tribunals. Once in court, disputes stay there for decades. It is, therefore, time now to consider bringing the subject of water under the jurisdiction of the Union Government instead continuing with the State Governments.

7. *REFERENCES*

[1] Anonymous [2000] The Economics of Wastewater Use in Agriculture, FAO Water Report, Rome.
[2] Anonymous [2014] Annual Report, Department of Agriculture & Cooperation, Union Ministry of Agriculture, New Delhi.
[3] Anonymous [2014] Annual Report, National Bank for Agriculture & Rural Development, Mumbai.
[4] Anonymous [2014] Annual Report, Union Ministry of Water Resources, New Delhi.
[5] Anonymous [2015] Water for Food Security & Nutrition, Rural 21, Vol. 49,No.3, Frankfurt, Germany.
[6] Kalkoti, G. Kalkoti, K [2012] Managing Water Resources for Agriculture, Bank Credit to Agriculture in India, Pp,43-52, Manan Prakashan, Mumbai.
[7] Water-World Water Week in Stockholm, Sweden, Wikipedia.