International Journal of Management, IT & Engineering
Vol. 7 Issue 7, July 2017,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gate as well as in Cabell's Directories of Publishing Opportunities, U.S.A

Management of Water Resources in Bihar : A Tool to Empower Rural Population

Prof. (Dr.) Sanjay Kumar Jha
Dept. of Economics
T.N.B. College, Bhagalpur, Pin-812007

ABSTRACT

Water is the most vital natural resource available on this planet. It is an indispensable, finite and vulnerable resource. It needs to be managed scientifically. This can be achieved by augmentation of water resources on one hand and conservation and judicious utilization on the other. This article examines the role of water in removing poverty among rural poor households in Bihar. The article highlights the role of water in promoting income generation opportunities for the poor. For its purpose, effects on account of size of employment, real wage rates and inter-regional migration of male and female population are studied.

Key words : Water, Conservation, Poverty, Income generation opportunities, Wage rate.

Introduction

Effective use of land and water is fundamental to growth and sustainable development. The increasing human as well as livestock population coupled with widespread incidence of poverty and current phase of economic growth are exerting heavy pressure on India's limited land resources to meet various demand. Over 120 mha area has been declared degraded or problem soils (Maji, 2007;NRAA, 2011) in India. Water and social resources are finite, non-renewable over the human life time frame and prone to degradation through misuse and management (Lal, 2000). Scarcity of water for agricultural and domestic purpose remains a major problem and has led to low crop productivity and environmental degradation. Decline in agricultural production has seriously affected food security and livelihood of people.

The mismanagement of water resource is the most important cause of food security problems especially at the household level and also environmental degradation. On the one hand, vast tracts of irrigated land are suffering from serious problems, viz, water logging and increasing salinity and desertification resulting in reduced productivity and on the other hand the growing population is further diminishing the per capita availability of land. To fulfill the rising demand for agricultural products, it is extremely essential to increase crop yield, cropping intensity and cultivation of high value crops which can be done through adoption of HYV seeds, chemical fertilizers and improved agronomics practices along with the most crucial input irrigation water which should be provided in a dependable, predictable and convenient manner without any uncertainty in its quantum of delivery and timing. Moreover, production and productivity and impact of irrigation water is critically dependent on the way water is applied and utilized in agricultural fields. This is but natural that in recent years proper utilization of natural resources like land and water has become a matter of great concern for policy makers and planners. Access to land is certainly a major constraint due to

its skewed distribution but access to water is more skewed distribution when compared with land especially in the fragile resources regions where land productivity leads to zero in absence of access of water. Therefore, there is an urgent need to address the issue of scientific and efficient water resource management.

According to National Irrigation Administration, ADB, Water Resource Management refers to an important involvement of integrated process of diversion and application of a rational account of water at the appropriate time and removal of excess water from farms. Thus, efficient management of water resources can be ensured by augmentation of water resources on the one hand and its conservation with judicious utilization on the other. In this way, not only supply is to be increased but the demand for water resource should also be properly managed.

According to the projections made by the National commission for Integrated Water Resource Development Plan, the requirement of water for irrigation in India will grow by 50 percent in the next 50 years. The water requirements for household consumption and industry would rise even faster. So, the frontline challenge is not just supply side innovations but to put into operation a range of corrective mechanism. In fact, in India and even in South Asia the irrigation process is in the "Development mode" treating water availability to be unlimited and so in the name of development of water resources the extraction of ground water and expansion of costly surface water facilities are going on unabated. It has always been water resource development that gives rise to anachronistic situations like water hungry sugarcane being grown in the dry lands of western and central India and trillions of hectares of agricultural land being waste due to over- irrigation induced water logging and salinity. Thus, there is an urgent need of transitions from water resource development to water resource management mode.

Methodology :

The universe of study is the Koshi region of Bihar. The study has been undertaken in two flood affected zone. The first sub-zone of Koshi River Basin in the north-western region of the basin and similarly the second sub-zone is the north eastern region of the Koshi basin. The total sample size is 480 comprising of male and female from the sample block. Sample have been taken from the six blocks of the Koshi Division i.e. form Sharsa, Supaul and Madhepura district. 40 male and 40 female from each block have been selected. Hence, the total sample size is 480:

3 district x 2 block 80 respondents = 480

Period of study : Jan. 2016 to Dec. 2016

Research Procedure :

The research procedure followed for the study consisted of the methods used in the collection of relevant evidences and informations, secondary data from Fisheries Department of State level, District level, Block level, Co-operative Societies, Panchayats and NGOs

International Journal of Management, IT & Engineering
Vol. 7 Issue 7, July 2017,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gate as well as in Cabell's Directories of Publishing Opportunities, U.S.A

operative in the sample area. The primary data obtained from the sample respondents pertaining to the period of study Jan. 2016 to Dec. 2016.

Result and Discussion

Fluorosis and non-fluorosis disease manifestation due to consumption of fluoride rich water affect population of the sampled area. Agriculture crops also have a diminution of linear growth and dry matter accumulation due to irrigation with fluoride contaminated water.

Table :1

Classification of Age Groups to the Sampled Respondents According to educational status

	Educational Status							
	Illiterate	**Just Literate**	**Up to Primary**	**Secondary**	**Inter**	**Graduation & above**	**Technical Education**	**Total**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Up to 25 years	30 (6.25)	20 (4.16)	20 (4.16)	15 (3.12)	05 (1.04)	05 (1.04)		95 (19.79)
26-40 Years	65 (13.54)	10 (2.08)	12 (2.50)	28 (5.83)	11 (2.29)	13 (2.70)	01 (0.20)	140 (29.16)
41-55 Years	63 (13.12)	05 (1.04)	10 (2.08)	27 (5.62)	06 (1.25)	20 (4.16)	-	131 (27.29)
56 and above	48 (10.00)	05 (1.04)	08 (1.66)	25 (5.20)	08 (1.66)	20 (4.16)	-	114 (23.75)
Total	206 (42.96)	40 (8.33)	50 (10.41)	95 (19.71)	30 (6.25)	58 (12.08)	01 (0.20)	480 (100.00)

Note : Figures in the bracket indicate percentage.

The history of human civilisation reveals that water supply and civilisation are almost synonymous. Several cities and civilisation have disappeared due to water shortage originating from climatic changes. Millions of people all over the world, particularly in the developing countries, are losing their lives every year from water-borne disease. An understanding of the economics of water is the basic of knowledge of the multi-dimensional aspects of aquatic environmental economics today.

International Journal of Management, IT & Engineering
Vol. 7 Issue 7, July 2017,
ISSN: 2249-0558 Impact Factor: 7.119
Journal Homepage: http://www.ijmra.us, Email: editorijmie@gmail.com
Double-Blind Peer Reviewed Refereed Open Access International Journal - Included in the International Serial Directories Indexed & Listed at: Ulrich's Periodicals Directory ©, U.S.A., Open J-Gate as well as in Cabell's Directories of Publishing Opportunities, U.S.A

The Future Scenario Requirement of Fresh Water in India

The water is needed in almost every sphere of economic activity. It is required for direct consumption or indirectly for washing, cleaning, clothing, transportation. We shall be requiring almost thrice as much water as we did in 1947 AD.

Demand-Side Management :

Under demand side management of water resources, efforts are made to contain the increasing demand for water and even to reduce water demand by taking appropriate steps like increasing the efficiency of irrigation, raising the productivity of water, changing the cropping pattern, adopting appropriate pricing policy for water, popularizing conjunctive irrigation etc.

Supply-side Management :

A very important aspect of water resource management is the supply side management. The supply of each type of irrigation water namely, rainfall, surface water and groundwater should be managed in such a way that their optimum utilization is ensured not only for irrigation and livestock development but also for household and industrial usage. Some of the options are as under :

(a) Watershed Development-Watershed projects should be strengthened in such a way that a large section of the society gets benefitted based on equity and ecological principles.

(b) Rainwater Harvesting-Studies conducted by the Central Ground Water Authority (CGWA) show that rainwater harvesting potential in India is enormous. If India harvest rainwater over 0.5 m sq km. of land, 15% of India's total land area can meet its water needs. Management of Rain-run off involes harvesting of excess rain falling on land surface by creating a storage facility either in the field or in a constructed structure. Apart from traditional structures and practices several new scientific methods have been developed for rainwater harvesting. Some of these modern methods are Check Dam, Roof water harvesting, Recharge pits, Trenches, Recharge wells, vertical recharge shafts and lateral trench with bore wells. These methods require certain scientific measure before incorporation. Today, we can work wonders with our modern scientific devices. The tools that are available now will not only harvest water in large quantities but also provide better quality water. Efforts are being made by several state governments to make harvesting of roof water mandatory in urban houses which exceed 100 sq. ft. in area.

Food, Water and Environment :

Provision of water for food security has been the dominant concern so far. A greater proportion of water, about 70% is used for irrigation, this goes up to 90% in many developing

countries. It is also estimated that need for irrigation would increase further by 15 to 20 per cent in the coming 25 years to meet food demand of a growing population.

On the other hand, a view has been emerging that the share of water going to irrigation should decrease rather than increase because the world's ecological systems are already under pressure on account of increasing water diversion for human activities. Wetlands are being threatened. Some of the world's great rivers, the Nile, Colorado and Indus discharge very little water into their final destinations. Underground water tables are also declining. Fresh water aquatic species are in peril. The picture, of course, varies from country-to-country and from one river basin to another. In Nepal, most water remains in nature. In South India, the picture is completely different. There is, however, a global trend towards increasing diversion and overuse of water. Hence, the need to allow water that nature itself requires to maintain itself purifying power and protect aquatic eco-systems for future generations to flow through these rivers and groundwater basins.

The conflict between the two objectives was highlighted during the Second World Water Forum, which took place in March, 2000 at the Hague (Netherlands). Resolution of the conflict, however, raises complex issues which are examined below.

Less water for irrigation might undermine the food security unless there are significant improvements in irrigation efficiency as highlighted by Kofi Annan's famous word of "more crops per drop". But as pointed out by International Water Management Institute (IWMI) in its podium model, meeting food requirements while decreasing allocations to irrigation by 10% would require and increase in productivity of water by 60% on irrigated lands and by 30% on rainfed lands for the period 2000 to 2025. Several methods and approaches suggested in this respect have been summarized by IWMI and are given in Table 2.

Table : 2 Means for saving water and increasing the productivity of water

1. Increasing the productivity per unit of water consumed	• Change to crop varieties that provide increased yields for each unit of water consumed or the same yields with fewer units of water consumed. • Switch from high-to less-to water-consuming crops, or to crops with higher economic or physical productivity per unit of water consumed. • Use deficit, supplemental, precision irrigation or other irrigation strategies that increase the returns per unit of water consumed. • Improve water management to reduce stress at critical crop growth stages for increased yields or increased water supply reliability so that

	farmers invest more in other agricultural inputs leading to higher output per unit of water. • Optimise non-water inputs such as land preparation and fertiliser to increase the return per unit of water. • Reduce evaporation form irrigated fields (drip irrigation, use of mulching, changing planting dates etc.)
2. Reducing non-beneficial depletion	• Reduce irrecoverable deep percolation and surface runoff. • Reduce flows through saline soils or saline groundwater. • Shunt polluted water directly to sinks to avoid the need to dilute with freshwater. • Reuse return flows. • Reallocate water form lower to higher value uses can have serious legal, equity and other social considerations that must be addressed.
3. Reallocating water among uses	• Improve management of existing facilities. A number of policy design, management and institutional interventions like water pricing, improved distribution practices may allow for an expansion of irrigated area, increased cropping intensity or increased yields within the service areas.
4. Taping uncommitted outflows	• Reuse return flows through gravity and pump diversion to increase irrigated areas. • Add storage facilities of different forms like reservoirs, small tanks, ground water aquifers, etc., to allow release of more water during drier periods.

Vicious circle of water and poverty :

Water resource projects are generally presumed to have a benign effect on the poor. But sometimes these cause or accentuate poverty if adequate cause is not taken as has happened in the past :

(i) Excessive exploitation of groundwater by rich farmers or water sellers may result in drying up of dug wells or shallow tube wells of small and marginal farmers, thereby adversely affecting their income and employment.

(ii) It is a frequent complaint in many mismanaged canal irrigation systems that tail-enders do not get water when they need it and get it when they do not need it.

(iii) Poor farmers are usually at a disadvantage in getting canal water, since they have neither money nor influence to prevent richer farmers cornering a larger share of water when it becomes scarce.

(iv) Embankments to control flood on one bank of a river might increase incidence of flooding on the other bank or downstream.

(v) Embankments create problems of drainage congestion or the landslide as can be seen in the case of Koshi embankment in Bihar. As a result, cultivable land belonging to farmers becomes useless.

(vi) The reduction in soil moisture and stoppage of fertilising value of silt due to an embankment has the effect of reducing agricultural productivity whose incidence is specially felt by the poorer farmers since the better ones can afford to invest on irrigation and fertiliser.

(vii) The worst impact is the displacement of poor farmers and landless labourers due to construction of large dams. Thousands who get uprooted and dispossessed of their habitats and permanent sources of income become poorer than before. This is an example of development induced poverty. It is true that compensation is paid, but as is well-known, its amount has been far from adequate. This calls for serious rethinking with respect to the entire methodology and approach of planning and implementing a major water resource project.

Apart from the general scarcity of water, the poor are also adversely affected by society's inability to deal appropriately with water related natural disasters like flood and drought which affect the economy of Bihar at frequent intervals. It may be said that floods are physical phenomena which might not distinguish between the rich and the poor. But the habitat pattern is such that it is the poor who are affected more because it is they who generally inhabit the low lying areas which suffer the most. Moreover, the poor also suffer because their houses are made of mud which tend to collapse when floods hit them where as the dwelling units of the rich are made of bricks, stone and mortar which have better chances of withstanding the flood fury. As a result of flood, fertilisers get washed away from the agricultural fields. Hence, farmers in flood prone areas have little incentive to use fertiliser which is an essential input for higher agricultural productivity. Flood-prone areas as in Bihar continue to have low agricultural productivity. Floods have an adverse effect on quality of drinking water resulting in frequent outbreak of diseases. Further, frequent occurrence of flood in Bihar leads to damage to roads which became full of potholes and broken patches to

such an extent that they hardly fulfill the purpose for which they are constructed. Power lines are similarly affected. Frequent repairs of these roads and power lines result in diversion of resources which could have been spent on poverty alleviation measure.

Floods as well as droughts result in loss of daily income of the poor, who are daily wage earners, for the days for which economic activities remain dormant due to flood or drought. The plight of the poor is further compounded by inadequacy or absence of social safety nets that would protect their income and consumption during water related disasters like flood and drought. The quantum of flood or drought relief provided by the government has been found to be quite meager. Hence, water management designed to moderate the incidence of both flood and drought would have a favourable effect on the poor.

Conclusion and Suggestions :

Water is the basic need of a living organism. No one can live without water. The conservation of water is an absolute necessity of today. The following suggested steps for conservation of water are as follows:

(i) Water economy re-use and recycling.
(ii) Development of an efficient distribution system.
(iii) Reduction of pollution and recycling of water.
(iv) Enhancement of surface storage capacity.
(v) Improvement of underground storage capacity.
(vi) Desalination of sea water.
(vii) Artificial of rain making.
(viii) Population growth rate must be reduced.

While water has unique role in providing food and water security, it shares this role with several other sectors in providing income and livelihood security. It is the income generating power of water which is most important for poverty alleviation since it helps in attainment of both water and food security and enables them to be self sustaining over a long period without any resort to subsidy. A breakthrough in productivity and income in poverty concentrated areas can take place by creating water harvesting structures through exploiting both rain water as well as river water. Water reservoirs of all types and sizes, watershed management, recharging underground water storage, etc, should be taken up with renewed vigour but without losing sight of the environment and human aspects. Technologies and institutions appropriate to small farmers may receive special encouragement. Development of power would be needed for exploiting the ground water potential and operation of grain storage facilities especially the refrigerated ones. Flood moderation measures specially big dams supplemented by non-structural measures like flood resistant and flood escaping cropping pattern would be needed for boosting agricultural product. In areas suffering from flood drainage congestion should be needed to take care of low agricultural productivity in areas suffering from drainage congestion. At the same time, output form permanent water bodies like tanks and ponds with respect to fishery and other aquaculture products like

'makhana' and 'singhara' in Bihar should be raised by appropriate methods including regular desilting and deepening. These measures taken along with those for strengthening institutions of marketing, credit and grain storage would bolster agricultural production in poorer areas. These measures should be taken in integrated and holistic manner rather than piecemeal manner and on a wide scale to produce visible impacts in future. The scale of efforts is as important as the components. At the same time, the known adverse effects of water resource projects may be avoided by appropriate policy measures. Strengthening the role of water in poverty alleviation would require a sharper focus on water of the poor which would include according priority to water needs of small producers in both rural and urban areas along with other complementary inputs. An appropriate pricing strategy to ensure long term susceptibility would be an integral part of the strategy. A variable mix of technological and institutional interventions should be considered for adoption depending upon location-specific situations.

References

1. Maji, A.K. 2007. Assessment of degraded and waste lands of India. J. Ind. Soc. Soil Sci., 55 (4) : 427-435.
2. NRAA. 2011. Challenges of Food Security and its Management 2011. National Rainfed Area Authority, Government of India.
3. La, Ratan, 2000. Integrated Watershed Management in the Global Ecosystem. Soil and Water Conservation Society of America, CRC Press Boca Raton USA.p. 395.
4. Modern, David, Upali Amarsinghe and Imtizar Hussain, 2001. Water for Rural Development, Working Paper 32, Colombo, International Water Management Institute, 2001, p.7.
5. Bose, Devabrata. Looking Ahead the search for water. Capital. 193(4793), 12 Nov. 1984.
6. Bose, J.L. Water Pollution, Civic Affairs. 36 (12), July. 1989, p.19-21.
7. Briz-Kishore, B.H. Save Water-the Ten commandments. Bhagirath. 39 (1), Jan-Mar, 1992, p.1-12.
8. Chitranshi, U.B. and Pawan Kumar. Reliability analysis of water distribution network. Indian Journal of Environmental Health. 41 (3), Jul. 1999, p. 159-69.
9. Datar, Chhaya and Shruti Joshi. Rural Women and Piped Drinking Water Project: Challenges and experiences of a community development consultancy, Indian Journal of Social Work. 58(4), Oct. 1997, p.616-27.
10. Dhawan , B.D. Water Resouce Management in India. Indian Journal of Agircultural Economics. 44(3), July-Sept. 1989, p.233-41.
11. Dhawan, Sunil K. Water Supply in a fluoride-affected area. Mainstream. 23(38), 18th May 1985.
12. Knees, Allen V. The Economics of Regional Water Quality Management. Baltimore: Johns Hopkins, 1964. p.215.

13. Narayan, Deepa. Participatory Evaluation : Tools For Managing Change in Water and Sanitation. Washington D.C. : The World Bank, 1993. p.122.
14. Narayan, Deepa. Towards Participatory Research. Washington, D.C. : The World Bank, 1996. p.265.
15. Sharma, V.K. 1985. Water Resources Planning and Management. Bombay : Himalaya 1985. p.234.
16. Singh, Chhatrapati. Water Law in India. New Delhi : Indian Law Institute, 1992. p.398.
17. Water Harvesting In Desert. New Delhi : Manak. 1997. p.70.
18. Fresh Water For India's Children and Nature. New Delhi:WWF and UNICEF, 1998. p.82.
19.

----------o----------
----------o----------