An assessment of sustainable development through watershed schemes: A selective study

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***Abstract*— India's population, which was 121 crores as per 2011 census report, is consistently growing. As per the recent estimate, India's population has soared to a staggering 134 crores. There is every possibility of overtaking China's population, which is around 141 crores, very soon. To meet the growing demand for food, the country needs to increase the production of food grains. However, the food production is increasing at a mere rate of 0.2 percent, which is not on par with the growth rate of the population in the country. To meet this demand, the best technological approaches have been adapted in terms of HYV seeds, fertilizers, pesticides, machines (tractors, tillers, threshers, and harvesters), etc. Since agriculture sector is subjected to diminishing returns to scale, further improvement in technology will not help in increasing the productivity levels. Added to this, soil erosion is a widespread environmental problem. Each year, 75 billion tons of soil is removed in the globe due to erosion with most of it from agricultural land. An average rate of soil erosion in Asia is more than 138 tons (ha. year) (Ananda. J and Herath, 2003). This in turn affects agricultural productivity. Thus, there is a need to explore other possibilities of increasing the agricultural production and productivity. In this process, increasing crop intensity, by utilizing the existing water resources is an important area to be explored.**

***Index Terms*—Agricultural productivity, Environmental protection, Food grains, Population growth, Soil Erosion.**

INTRODUCTION

Growing population and related socio-economic developments are placing increasing pressure on the water resources in India. Demand for water, in all the sectors of the country, is increasing, while adequate supply is constantly diminishing. Failure of monsoon rains and the increasing water stress are greater concerns coupled with anthropogenic carbon dioxide emissions, global warming and climate change that lead to the intensification of the hydrologic cycle. Such huge variations are expected to change both frequency and magnitude of extreme events such as floods, droughts, heat waves, snow and ice storms and will therefore have serious implications on future management of water resources systems. Growing convexity of water resource systems and the challenges of its management led the international community to introduce the concept of Integrated Water Resource Management (IWRM). The concept surfaced after a realization that an integrated approach can deliver more efficient ways of addressing complex water resource management problems. Since the daily lives of 600 million people in India depend directly on functioning of watersheds providing drinking water, irrigation, energy, groundwater recharge and inland fisheries, suitable strategies of watershed prioritization and planning is necessary. Failures in watershed prioritization and planning can have serious ramifications.

The balanced ecosystem and human system are vital indicators of a sustainable environment and better quality of human life. In rural areas, livelihoods, and natural resources such as land, water, vegetation, and livestock are interlinked. India's national economy is dependent on agriculture and the magnificence of its natural resources is legendary. With the heavy discharge of water, degradation of the natural resources, biotic pressure on the fragile eco-system with breakdown of traditional local management institution is threatening the entire human population. Water resource development is highly crucial for ensuring food security in many regions of world. Irrigated agriculture has been estimated as a major consumer of water, which accounts for 80 percent at the global and 86 percent of the total water use in developing countries. The rain fed areas are the centres of poverty, malnutrition food insecurity, which are

prone to severe land degradation, water scarcity and poor infrastructure (Rockstom et al., 2007).

Watershed development program is accordingly communicated as an effective device for tending to a considerable lot of those issues and perceived as potential motor for farming development and improvement in delicate and minimal rainfed territories (Joshi et al., 2005). A decent administration of normal assets at watershed scale delivers numerous advantages as far as expanding nourishment generation, enhancing jobs, securing condition, addressing gender orientation and value issues alongside biodiversity are concerned (Wani et al., 2003).

Watershed is a geo-hydrological unit comprised of all land and water within the confines of a drainage divide. Essentially a watershed is all the land and water area, which contributes run off to a common point. Watershed is a land area that captures rainfall and conveys the overland flow and runoff to an outlet in the main flow channel. It may be flat or may include hillocks, hills, or mountains. Each and every water and land area are a part of watershed. Generally, the following distinction is made to know the size of watershed; micro watershed, sub-watershed, watershed, catchment, and river basin with a view to increase the size. The integrated watershed programmes are highly feasible in protecting the environment, vegetative cover, fodder to the livestock, drinking water and making the people involve themselves in income generating activities. The integrated watershed programme can operate to achieve the inclusive growth with the integration of different stakeholders such as SHGs, User groups, Participatory Rural Appraisal (PRA) exercises, awareness camps, exposure visits and programmes on literacy, family welfare, social services and other income generating activities.

NEED FOR THE STUDY

Dry land areas in the country account for about 70 percent of the cropped area and contribute more than half of the country's food grains production. These areas share 60 to 80 percent of the output of coarse cereals, major oilseeds, and fibre crops. Even after realizing the entire irrigation potential in the country, about half of the area still remains un-irrigated. The sheer weight of this in crop economy alone can either suppress or enhance the growth performance of the country. Stagnation of production and productivity has been observed in all the major food crops of dry land agriculture. The Watershed Development Program is the essential requirement for coordinated improvement and administration of the land and water assets which give life support to village groups. Watershed Development Programme ensures supply of water to every field, removes hunger and poverty from poor areas, provide green cover over denuded areas, bring in more rains and improve the environment. In this direction, there is a need to understand and explore the access and impact of Watershed Development Programme at inclusive level from the sustainable point of view.

OBJECTIVES OF THE STUDY

- To review the operating mechanism of integrated watershed programmes at state levels.
- To measure the impact of the watershed works on socio-economic status of farmers.
- To analyze the economic impact of watershed interventions on household income, consumption expenditure and water table.
- To give suggestions for better accessibility of integrated watershed programmes.

RESEARCH METHODOLOGY

Study locale: In order to understand the implementation of watershed programme one watershed project is undertaken under IWMP programmes in Karnataka state, which has been implemented in Kolar district. Since Kolar district is one of the most backward districts in the state where the present programme is being implemented from the formulation of IWMP (2009), the district was selected purposefully. The selection of watershed is made keeping the agro climatic zone, financial allocation, especially the status of water table has come down from 1500 to 3000 ft at Lakshmisagar Gram Panchyat village, whereas other villages nearby have not seen this kind of acute water deficient situation. Lakshmisagara Gram Panchayat at Sreenivasapura taluk in Kolar district covering all villages and all micro watersheds under the jurisdiction of the selected Gram Panchayat were selected.

Sample size: 350 respondents
Sampling method: Random sampling method
Variables of the study: The indicators/variables selected to measure the socio-economic conditions of the sample households are caste, assets which include building, land and other assets; income of the family, expenditure of the family, outstanding loans of the family and savings.

DATA COLLECTION

Primary Data: Has been collected through, Direct personal interview, Method of questionnaire and Method of Schedule
Secondary Data: Journals, Evaluation reports, and Annual reports of different departments including the NGOs, Watershed department and Boards.
Project Cost and the Extent of its Utilization from 2009-10 to 2014 in Sreenivaspur Taluk (IWMP)

Heads of Expenditure	Amount Allocated (Rs. in Lakhs)	% of allocation	Expenditure Incurred Since the inception to March 2014	
			Amount (Rs. in Lakhs)	% of Amount
Administrative Cost	59.21	9.80	34.25	5.70
Institution and Capacity Building	29.61	4.90	19.74	3.30
Entry Point Activities	24.168	4.00	24.17	4.00
Detailed Project Report	6.042	1.00	4.00	0.70
Monitoring and Evaluation	6.042	1.00	0.16	0.03
Watershed Work	362.52	60.00	336.72	55.72
Livelihood Activities for the Assetless Persons	42.294	7.00	25.00	4.14
Production System and Microenterprises	48.336	8.00	51.31	8.50
Consolidation Phase	15.105	2.50	0.00	0.00
Head Office Expenditure	10.876	1.80	0.00	0.00
Total	604.23	100.00	495.35	82.09

Source: Primary Data

The above table clearly reveals that the total project cost and its utilization from 2009-10 to March 2014 in Sreenivaspur taluk. The total project cost was Rs. 604.20 lakh in Sreenivaspur taluk alone. Of the total allocation, about 60 percent has to be spent on watershed works constituting about Rs. 336.72 lakhs. The second highest expenditure is the administrative cost constituting about 9.80 percent amounting to Rs. 59.21 lakhs. This is followed by another head of expenditure i.e. is Production System and Micro Enterprises constituting about Rs. 48.34 lakhs (eight percent) and one more important head of expenditure is livelihood activities for the asset less persons constituting about seven percent amounting to Rs. 42.29 lakhs. There are other heads of expenditure like Institution and Capacity Building, Entry Point Activities etc. The same Table-4.1 reveals the expenditure made from 2009-10 to March 2014. Of the allotted funds so far, 55.72 percent has been spent on actual watershed works constituting Rs. 336.72 lakhs. This is followed by Production System and Micro Enterprises Constituting about 8.50 percent amounting to Rs. 51.31 lakhs. The other major expenditure was on Administrative Cost i.e., 5.70 percent amounting to Rs. 34.25 lakhs. Livelihood activities for the asset less persons were another activity that attracted 4.14 percent of the funds amounting to Rs. 25 lakhs. Like this, so far, 82.09 percent of the funds amounting to Rs. 495.35 lakhs have been spent in the field and the remaining carried forward to the next phase of watershed works. Therefore, per annum Rs. 124 lakhs have been spent on watershed activities constituting about 20.52 percent of the funds.
Financial Target and Achievement across Various Activities in the
First Year of IWMP Project in Sreenivaspur Taluk

Name of the Watershed Committee	Agriculture		Forest		Horticulture		Livestock	
	Target	Achieved	Target	Achieved	Target	Achieved	Target	Achieved
Kodandaramaswamy WS (Yeldur Rs. in lakhs)	38.54	54.72	13.72	4.09	7.19	8.08	0.42	16.28
Percentage of Achievement Beyond Target (+or-)	NA	41.98	NA	-70.19	NA	12.38	NA	3776.19
Sri Ramaswamy WS (Lakshmisagar Rs. in lakhs)	75.49	81.30	24.24	5.06	13.33	19.27	4.84	23.36
Percentage of Achievement Beyond Target (+or-)	NA	7.70	NA	-79.13	NA	44.56	NA	382.64
Sri Chowdeswari WS (Kolathur Rs. in lakhs)	65.69	50.43	11.92	3.27	12.72	11.08	0.04	23.12

Percentage of Achievement Beyond Target (+or-)	NA	7.70-23.23	NA	-72.57	NA	-12.89	NA	52450.00
Sri Eswaraswamy WS (Holur Rs. in lakhs)	46.99	61.11	10.70	3.11	10.38	8.19	3.15	16.69
Percentage of Achievement Beyond Target (+or-)	NA	30.05	NA	-70.93	NA	-21.10	NA	429.84
Total of all the WSs in the Study Areas (Rs. in lakhs)	188.18	247.57	60.58	15.54	43.61	46.62	8.45	79.46
Percentage of Achievement Beyond Target (+or-)		31.56		-74.35		6.90		840.36

Source: Primary Data Note: NA – Not Applicable

Provision of extension services by the Government staff

(Responses in percentage)

Particulars	Landless	Marginal	Small	Medium	Large
Extension services to cultivate crops on scientific lines	NA	27.00	38.00	52.00	82.00
Educating the HH. in the use of modern equipments	NA	26.00	41.00	54.00	84.00
Creating social awareness	NA	12.00	21.00	26.00	32.00
Usage of Pesticides	NA	28.00	34.00	48.00	52.00
Provided basic knowledge of watershed	NA	32.00	45.00	58.00	86.00

Source: Primary Data.

SUGGESTIONS

- There is a need to developing the farm ponds as the water table improves through the farm ponds and in turn increase in the per capita irrigated area.
- To benefit the beneficiaries "Land Reclamation Activities" have to be improved so that they get effective land for cultivation, which helps to improve the production/productivity levels.
- Since funds are given for digging farm ponds the government should not give loan for digging bore wells as the bore wells absorb water from the farm ponds.
- In IWMP the women are not taken into confidence. In the sense, the SHGs have some representation in the WSCs, otherwise they are not actively involved in the decision-making process of the implementation of watershed works. Therefore, women's participation rate is to be encouraged.
- The implementation of integrated watershed works has partly reduced the inequality across various category of farmers. Therefore, to make it effective, these programmes have to be implemented on priority basis.
- With the watershed works there is a change in the cropping pattern. Farmers started cultivating maize and mango, which has increased their return and income.

CONCLUSION

Watershed programmes are successful in controlling soil erosion, in promoting soil conservation. Excessive use of available water resources by the growing population has profoundly affected its availability and its judicious usage. This problem must be addressed immediately for the betterment of beneficiaries. The threat of water degradation in rural areas with breakdown of traditional local management institution can be addressed by effective implementation of integrated watershed programmes.

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