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International Journal of Current Research
Vol. 6, Issue, 07, pp.7597-7601, July, 2014

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

WATERSHED MANAGEMENT FROM THE RIVER BASIN PERSPECTIVE: A STUDY ON PALAR AND ONGUR RIVER BASIN WATERSHEDS OF TAMILNADU STATE

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ARTICLE INFO

Article History:
Received 07th April, 2014
Received in revised form
23rd May, 2014
Accepted 15th June, 2014
Published online 20th July, 2014

Key words:
River Basin,
Watershed Management,
Palar, Ongur,
Water scarcity and
Total factor productivity.

ABSTRACT

The global water scarcity analysis shows that a large share of world population up to two thirds will be affected over next several decades in Asia and other region. The major reason for such situation is due to neglect of river basin approach and watershed management initiatives over a period of time. The macro level initiative of river basin includes micro molecules of watershed management. In India, watershed programs are implemented across many river basins for over three decades. However, most of the watershed management projects carried out till date have not addressed the "basin perspective" but implemented in isolated manner by different agencies. This paper focuses on impact of watershed program on river basin perspective. The Palar and Ongur river basins 33 watershed have been studied out of 40 watersheds implemented at Kancheepuram District of Tamilnadu state in India. The results show that the Palar basin is better than Ongur in Total factor productivity. The people in Palar basin are adopting technology as well as deriving benefits from watershed leading to benefiting the community at large. However this study has to be done with all river basins in order to maximize the benefits to the people living in the planet earth. The better connectivity between river basin and watershed will be the likely solution for solving water scarcity in the near future.

INTRODUCTION

The need of water for India's rapid development is growing day by day. Despite adequate average annual rainfall in India, still there is large area under the less water availability condition/drought prone. There are many places, where the quality of groundwater is not up to the acceptable standards. Another issue is the interstate nature of distribution of river water. Nearly 90 per cent of India's river water irrigated areas are served by inter-state rivers. As a result, there is growing number of conflicts across the states and to the whole country on sharing river water. Some of the major reasons behind water scarcity are; Population growth and food production (Agriculture), Increasing construction/ infrastructure development activities, massive urbanization and industrialization throughout the country, climatic change and variability- Depletion of natural resources due to changing climate condition (Deforestation etc.) and Lack of implementation of effective water management system. It is estimated that by the year 2030, the mankind has to face many challenges on the water front globally including, Competition for scarce water from multiple uses within a river basin; the role of agriculture for food, feed, fiber and bio energy as a key demand driver for water; the inter link between water and energy, and the role of urbanization in water resource management and Sustainable growth in arid and semi-arid regions By the same token, in 2030, demand for water in India also will grow to almost 1.5 trillion m^3 from the current level of 740 billion cubic meters, driven by domestic demand for rice, wheat, and sugar for a growing population, a large proportion of which is moving towards a middle-class diet. As a result, most of India's river basins could face severe deficit by 2030. Unless concerted action is taken, with some of the most populous—including the Ganga, the Krishna, and the Indian portion of the Indus would be facing the biggest absolute gap. Efficient use of water resources is the need of the hour and cannot be procrastinated as water scarcity is a very real possibility for India. Per capita availability of water in India has reduced to about 33 percent of the level since 1947.However, so far live water storage capacity of about 253 billion cubic meter (BCM) has been created in the country. India is endowed with many rivers of which, twelve are classified as major rivers. The total catchment area is 252.8 million hectare (M.Ha). Of the major rivers, the Ganga - Brahmaputra Meghana system is the biggest with catchment area of about 110 M.Ha which is more than 43 percent of the catchment area of all the major rivers in the country. The other major rivers with catchment area more than 10 M.Ha are Indus (32.1 M.Ha.), Godavari (31.3 M.Ha.), Krishna, (25.9 M.Ha.) and Mahanadi (14.2 M.Ha). The catchment area of medium

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rivers is about 25 M.Ha and Subernarekha with 1.9 M.Ha. Catchment area is the largest river among the medium rivers in the country. River basins are the major source of agricultural production to feed the increasing population. Several basins are facing the problem of reduced surface and groundwater supplies due to change in rainfall intensity, poor catchment management, and poor water distribution practices and increasing inter-sectoral water demand. In order to meet the future water demand, the available supplies should be efficiently used and a way to achieve this will be increasing the efficiency of the river basins.

River Basin and Watershed

The river basin and watershed are two extremes of Infrastructure need of the country at macro level and micro level respectively. More often the watershed programs are implemented by different agencies in isolated manner in different upstream and downstream of river basin. Thus holistic nature of water resource management is not happening in our country. Though this approach creates an impact at the micro level, the combined benefits of all watersheds are not reflected at river basin level thereby losing its sheen on the sustainability of groundwater management. Hence the watershed approach with river basin perspective has to be studied in detail across the country to bring in the necessary policy changes at country level in order to benefit all the end users. With this at the backdrop, the present study was undertaken with the following objectives:

1. To study the Role of watershed in two river basins
2. To study the outcome of watersheds in river basin perspective;

River basin perspective

While it has long been argued that management of land and water resources requires a basin perspective, examples of integrated river basin management are rare (Barrow *et al*., 2000). Although there may not be a central basin manager, this does not mean that river basins are not managed (Schlager and Blomquist, 2000). There are two main trends in basin governance. One trend concerns watersheds, or Sub basins, of a limited size (typically from tens of square kilometers to 1,000 square kilometers), where local stakeholders and agencies attempt to solve their land- and water- related problems. The other trend consists of major river basin and regions involving trans boundary operations where the decision making is carried out by many countries The concept of watershed management has evolved over the past 40 years in response to implementation experiences and changing policies and development paradigms on land husbandry, good governance, and poverty alleviation. Generalizing, the projects of the 1970s and 1980s may be characterized as top-down watershed protection projects aimed at arresting land degradation and securing downstream water supply, using a soil and water conservation engineering approach driven by physical targets. The impact of most of these projects was small and limited to the project period. A lack of people's participation and a technical focus on conservation were broadly identified as major causes of failure (Kerr *et al*., 2002). A new generation of projects, generally referred to as participatory watershed management projects, emerged in the 1990s with a more complex mix of strategic concerns: poverty alleviation, local participation and ownership, collective action and institution building, production system and land husbandry, cost sharing, programmatic approaches with policy linkages, and sustainability (Farrington *et al*., 1999). These projects are generally considered likely to be more successful and are being further developed within the context of political and administrative decentralization, privatization, and the wider perspective of sustainable rural livelihoods to enhance equity, institutional sustainability, and replicability. This evolution parallels that on river basins - the second trend in basin governance - and reflects an adaptation of the watershed management concept from a narrow focus on hydrological linkages to a wider recognition of the human element and interconnectedness of ecosystems. A major lesson, relevant to all scales (field, farm, village, watershed, and basin), is that conservation or environmental objectives can be achieved only in combination with an upstream-oriented development objective: conservation through use (Badenoch, 2002). Watershed initiatives also signal a type of fragmentation of river basin management, and the links between these scattered initiatives and the larger basin remain a crucial question (Fang *et al*., 2007). According to (Palanisami *et al.,* 2011), In Tamilnadu Creation of strong database at basin level is advocated to incorporate the supply and demand details of water, crop, and livestock. Investment made, returns to investment in various activities in the basin should be documented and analyzed periodically for making future projects based on basins current and future potential. He also opined that Climate change will affect the water supplies and it is important to identify and implement the various adaptation measures at both micro (farm) level and macro (basin) level. This will help to improve the overall basin performance.

A profile of the study area

The study area located in Tamilnadu, south India, there are 17 major river basin groups with 34 major river basins which include 127 sub basins spread across the state. Out of the 34 river basins, two sub basins that run through Kancheepuram District viz., LB Palar and Ongur sub basins which are part of Palar and Varahanadhi river basins respectively were selected.

Table 1. Salient Features of Varahanadhi Basin

Name of the district	Area falling in the basin
Chengalpattu	770
Thiruvannamalai (Thiruvannamalai-Sambuvarayar)	306
South Arcot	3138
Total	4214

Source: River basins in Tamilnadu report to state planning commission by TNAU 2011

Table 2. Salient Features of Palar Basin

Name of the district	Area falling in the basin
Vellore (North Arcot- Ambedkar)	4710.58
Thiruvannamalai (Thiruvannamalai-sambuvarayar)	4012.19
Kancheepuram (Chengai MGR)	2187.90
Total	10910.67

Source: River basins in Tamilnadu report to state planning commission by TNAU 2011

Location of the basin

The Palar basin is located in the mid of Kancheepuram district with the cascade drainage to Bay of Bengal and it is close to Chennai metropolitan. The Ongur basin is located near to Pondicherry. It is in the tail end of Kancheepuram and Vilupuram districts.

METHOD OF ENQUIRY

Data sources for the present study include bibliographic research, secondary data sources, analysis of reports, field level observations and stakeholder survey. The survey was conducted in two adjacent sub basins namely Palar and Ongur river basin. The number of watershed studied were 33 of which Under Ongur sub basin 18 (54.5%) watershed and Palar sub basin 15 (45.5%). Totally 380 respondents were selected by simple random sampling method and interviewed using a well structured interview schedule. Out of which 203 and 177 representatives of various peoples Institution like Village watershed committees and user groups of Palar and Ongur river basin respectively.

DISCUSSION

Role of watershed under river basin perspective

Educational status

Totally 380 respondents were interviewed from the two basins. Out of 380 respondents, 203 beneficiaries are from Palar and 177 from Ongur basin respectively. The distribution of respondents based on their educational status in two river basins is presented in Table below:

Table 3. Educational status of Respondents

n=380

Particulars	Palar (%)	Ongur (%)
Illiterate	16.3	25.4
Primary	14.8	15.8
Middle	17.2	22.6
High School	32	25.5
HSC and above	19.7	10.7
Total	203	177

Source: Personnel survey By Author 2013

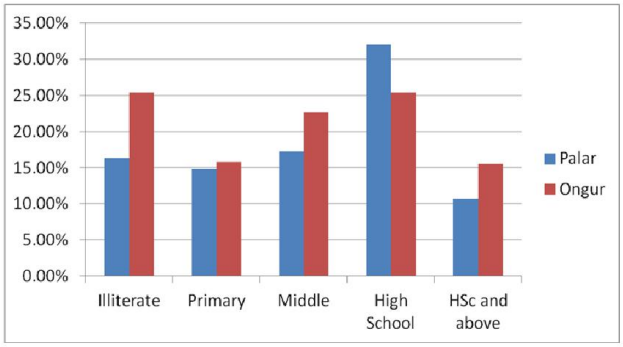

Fig.1. Educational status of beneficiaries

It could be inferred from the above table shows that watershed beneficiaries under Ongur river basin have poor literacy rate than Palar. Similar trend prevailed in different educational categories of primary, high school and higher secondary education wherein Palar river basin beneficiaries had better literacy status than their Ongur counterparts.

Landholding pattern

The following Table presents that land holding pattern of the respondents spread over both the river basins.

Table 4. Land Holding Pattern of Beneficiaries

n=380

Particulars	Palar	Ongur
Agricultural labourers	53 (26.10%)	71 (40.10%)
Small farmers	82 (40.40%)	57 (32.20%)
Marginal farmers	41 (20.20%)	31(17.50%)
Medium farmers	18(8.90%)	13(7.30%)
Large farmers	9(4.40%)	5(2.80%)

Source: Personnel survey By Author 2013

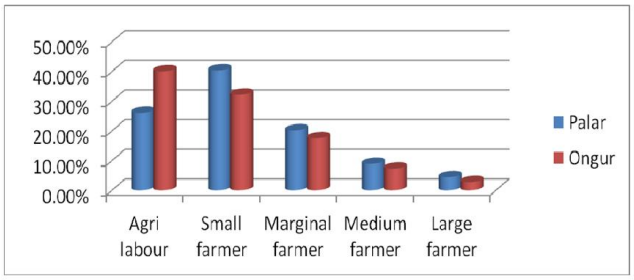

Fig.2. Distribution of Beneficiaries in River Basin

The Table above clearly indicates that ongur river basin had more proportion of landless agriculture labours than Palar river basin whereas the respondents of Palar river basin had high level of farmers with different sizes of land holding viz., small, marginal, medium and large farmers than Ongur basin. This is an important indication of the wealthiness and occupational status of the community and the use efficiency of resources conserved.

Awareness

The following picture shows the level of awareness of the respondents about the watershed activities with respect to river basin perspective.

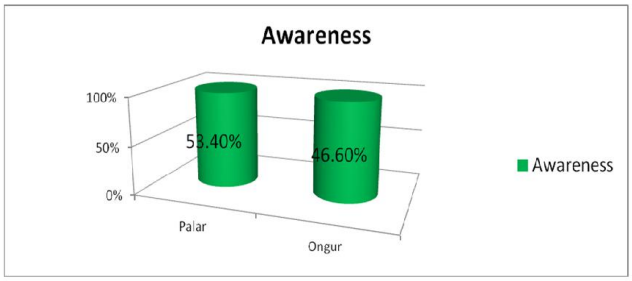

Fig.3. Awareness level of beneficiaries on watersheds

Since watersheds are people participation oriented, the level of awareness of respondents on the importance of watershed program play an important role in rejuvenation of river basin. The level of awareness of repondents with respect to its importannce was significantly higher than ongur river basin. This might be due to the higher literacy levels and land holding pattern of respondents of Palar basin.

Training

It could be inferred from the above discussions that the characteristics like educational status, awareness levels, land holding pattern and training attended by the respondents significantly influenced the efficiency of watershed projects. It could also be inferred that watershed projects in both the river basins were of poor efficiency due to poor level of these characteristics. However, among the river basins, these characteristics were better placed in Palar river basin than the ongur basin which is reflected by relatively better performance of Palar river basin.

Table 5. Watershed Training Participation of Beneficiaries

n=380

Particulars	Palar	Ongur
Training attended	108 (53.20%)	111 (62.70%)
Training not attended	95 (46.80%)	66 (37.30%)

Source: Personnel survey By Author 2013

Outcome of watershed under river basin perspective

Improvement in quality of life of respondents after watershed program

The following table presents the response on the improvement realized under watershed program by the respondents

Table 6. Improvement of quality of life of Beneficiaries

n=380

Improvement after WSM programme		River Basin		Total	%
		Palar	Ongur		
	Yes	55	31	86	22.6
	No	148	146	294	77.4
Total		203	177	380	100

Source: Personnel survey By Author 2013

It could be noted from the table above that only 22.6per cent of the respondents have realized the improvement from watershed management program whereas about 77.4per cent of the respondents have not even realized the improvement due to watershed program. However, among those who had realized the improvement, 64 per cent of respondents belong to Palar river basin whereas only 36 per cent of the respondents belong to Ongur basin. It may due to the fact that better literacy rate is the main reason for realizing the benefits of watershed program under Palar river basin.

Ground water level improvement

The following table presents the response of the interviewees on the level of improvement in ground water status

Table 7. Ground Water Level in Watersheds

n=380

Ground water level improvement		River Basin		Total
		Palar	Ongur	
	Yes	104 (60.1%)	69 (39.9%)	173 (45.5%)
	No	99 (47.8%)	108 (52.2%)	207 (54.5%)
Total		203	177	380

Source: Personnel survey By Author 2013

It could be noted from the table above that 45.5% of the respondents have expressed that ground water level has improved out of watershed program. Among the river basins, majority (60.1%) of the respondents who had expressed ground water level improvement belonged to Palar river basin.

Increase in cropping intensity

The following table presents the details about distribution of respondents based on their level of understanding of increase in cropping intensity from watershed program. Out of the 256 respondents who have landholdings, 33.6% of them expressed that there has been improvement in cropping intensity from 100% to 200% whereas 66.4% of the total respondents did not see any significant increase in cropping intensity. However, among the river basins, palar river basin has significant proportion of respondents (72.1%) who had realized an increase in cropping intensity over their counterparts of ongur river basin.

Table 8. Cropping Intensity improvement in watershed

n=256

Watershed management has increased the cropping intensity		River Basin		Total
		Palar	Oongur	
	Yes	62 (72.1%)	24 (27.9%)	86 (33.6%)
	No	88 (51.8%)	82 (48.2%)	170 (66.4%)
Total		150	106	256

Source: Personnel survey By Author 2013

Summary and Conclusion

Based on the above discussion, the following could be inferred

1. Watershed management programs are not approached under river basin perspective. This has resulted in poor impact on river basin rejuvenation for the investments made and have underperformed.
2. Among the river basin, Palar basin had better watershed impact than Ongur river basin
3. The factors like educational status of the respondents, their awareness level, land holding pattern and occupational status and the training programs attended by them played a significant role in determining the efficiency of watershed.
4. The significantly higher levels of characteristics like educational status of the respondents, their awareness level, land holding pattern and occupational status as well as the training programs attended by them had positively influenced the performance of watersheds in Palar river basin than the Ongur river basin.
5. The outcome of watershed programs were significantly

and positively experienced under Palar river basins by increased cropping intensity, improvement in ground water level improvement as well as improvement in quality of life of the participating community.

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