

Irrigation Scheme Development and Management Strategy for Conflict Affected Northern and Eastern Province of Sri Lanka

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Abstract— The Northern and Eastern Provinces comprises the whole of eight districts, namely Jaffna, Mannar, Vavuniya, Kilinochchi, Mullaitivu, Trincomalee, Batticaloa, and Amparai and covers an area of 18,881sq.km. The population is 2.9 million Agriculture, including fisheries, has been the principal economic activity in the province. Over 50% of the total work force in the province depends on agriculture for their livelihood. With the increase in population, industrialization and urbanization, demand for water has increased. The domestic and industrial water use has to be given due consideration than the agriculture water use. The industrial sector's share of the Gross Domestic Product was 23% in 1996, compared to about 19% for agriculture, forestry and fisheries in whole country. Preliminary calculations based on per capita water use for domestic needs, water requirement for the irrigation sector and projections for industrial and commercial water needs show a trend of increasing water demand. Even though the Government has been developing water resources (surface irrigation facilities as well as ground water extraction facilities) for the economic and social wellbeing of the community, it has found that the scope for further development is reducing gradually. Water resource augmentation is a limited option. Since new projects tend to be less technically feasible and less economically viable. Therefore the importance of conservation and efficient management of available water resources should be addressed properly. Groundwater is used in the domestic, agriculture, commercial and industrial sectors. Several government organizations, non-governmental organizations, commercial enterprises and private sectors are promoting the extraction of ground water without any control or restrictions. This problem of unregulated groundwater use has led to over-exploitation of shallow aquifers and water quality problems. The major demand management consideration with respect to groundwater is that groundwater use is unregulated and controlled only by natural occurrence, recharge and the degree of impact by other groundwater uses. This paper analyse little on overall potential of North-East and specific research finding on few Northern river basins and recommend some strategies for the water sector development. In the mean time a complete study on all the river basins in North is going on.

Index Terms— Water resource, Semiarid regions, Rainfall intensity, Flood plain Gross Domestic Product, Groundwater, Over-exploitation, Aquifers.

1 INTRODUCTION

Both the Northern and Eastern provinces are having an area of 18860 Sq. km. Out of this 586 Sq. km is impounded by water that can be utilized for irrigation, domestic and industrial use. The total population of the province is 2602640. All most all the population of this area got affected due to the conflict prevailed during last three decade. There is an urgent need for rehabilitation and development of all existing irrigation schemes and re-planning the usage of water resources in Northern and Eastern Provinces, to get maximum benefit from the water resources to produce more food to up lift the living standard of the poor people in this area.

Several Irrigation Bund and Channel System are covered with jungle, damaged and breached in some places. The displaced farmers are fully depending on the farming activities of this area and they are facing severe problem for their irrigation issues to the cultivated crops economically

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2 GENERAL PROBLEM

Owing to poor maintenance and prevailed conflict situation in this area, all the Major, Medium and Minor Irrigation Systems are in dilapidated condition.

Since no systematic holistic Water Resources system rehabilitation or development was taken place for the past three decade in this area, people are finding difficulties for consuming their water requirements for domestic & Economic purposes. Even after the rehabilitation of the existing irrigation systems, it is only possible to utilize 50 - 60 % of the average effective water yield by the communities. Hence it is the time to consider.

- The full rehabilitation of the existing Irrigation system to bring back the system as normal, which was on before three decade
- The possibility for additional water storage facilitates, to cultivate crops in high intensity to fit with the existing population growth.

3 RIVER BASINS AND YIELD ANALYSIS

North East Province is covered with fifty one Major River Basins. The Major River Basins are as follows

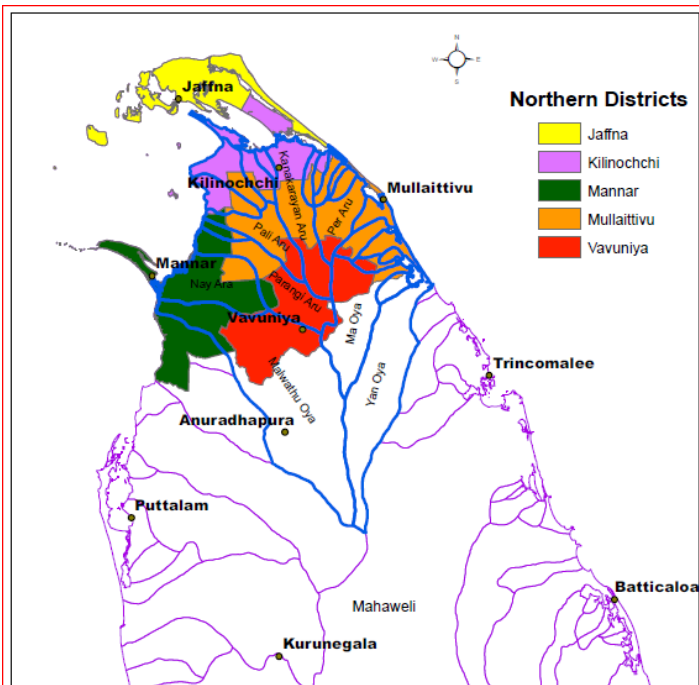


Fig.3.1 River basins in Northern Sri Lanka

Table 3.1 River basins in North East Sri Lanka

Basin No	Name of the River Basin	Catchments Area in (Sq. km)
33.	Girikula Oya	16
34.	Helawa Aru	52
35.	Wila Oya	490
36.	Heda oya	611
37.	Karanda oya	427
38.	Semana aru	52
39.	Tandiadi aru	22
40.	Kangikadichi aru	57
41.	Rufus Kulam	35
42.	Pannel Oya	106
43.	Ambalam Oya	117
44.	Gal Oya	1813
45.	Andella Oya	528
46.	Tumpan Oya	9
47.	Namakada Aru	12
48.	Mandipattu Aru	101
49.	Pathantoppu Aru	101
50.	Vett Aru	26
51.	Unnichchai	350
52.	Mundeni Aru	1295
53.	Miyangolla Ela	228
54.	Maduru Oya	1559
55.	Pulliyampota Aru	53
56.	Kirimechchi Odai	78
57.	Bodigolla Aru	166
58.	Mandan Aru	13
59.	Makarachchi Aru	38
60.	Mahaweli Ganga	10448

61.	Kantalai Aru	451
62.	Palampotta Aru	70
63.	Panna Oya	145
64.	Pankulam Aru	381
65.	Kunchikumban Aru	207
66.	Palakutta Aru	21
67.	Yan Oya	1538
68.	Mee Oya	91
69.	Ma Oya	1036
70.	Churiyan Aru	75
71.	Chavar Aru	31
72.	Palladi Aru	62
73.	Monal Aru	189
74.	Kodalikallu Aru	75
75.	Per Aru	378
76.	Pali Aru	85
77.	Maruthapillay Aru	41
78.	Theravil Aru	91
79.	Piramanthal Aru	83
80.	Methali Aru	122
81.	Kanakarayan Aru	906
82.	Kalwalappu Aru	57
83.	Akkarayan Aru	194
84.	Mandekal Aru	300
85.	Pallavarayan Kadu	161
86.	Pali Aru	456
87.	Chappi Aru	67
88.	Parangi Aru	842
89.	Nay Aru	567
90.	Aruvi Aru	3284
91.	Kal Aru	212
92.	Moderagama Aru	943
Total		782.50

About 60% of the Average effective yield is being used by the present irrigation system. It is very much necessary to consider the Water Resources Development of each basin, which is coming entrails under one Province as one Water Resource Development Project. For inter provincial river basin in north and the east as individual schemes.

3.1 Development of Churiyan aru river basin (70)

The catchment area is 75.9 Sq. Kms. The development of this basin may create adverse environmental effects in clearing the virgin jungle. But the construction of a medium reservoir has to be considered, for storing water for animals and other purposes other than cultivation. Tanks under Churiyan aru river basin given below

There are no major medium tanks under this basin other than one minor tank called Stamban Kulam

Utilization of Water Resources = 10 %

3.2 Development of Chavar Aru river basin (71)

The total catchment of the basin is 31 Sq. Kms. No major or medium tanks are available in this basin. There is a possibility of augmentation of one of the minor tank to a major or medium tank. Tanks under Chavar Aru river basin and the yield are given below

There are no major medium tanks under this basin

Table 3.2 Minor Tanks of Chavar Aru river basin

Name of Tank	Capacity (Ac.ft.)
01. Amayan Kulam	3 x 100
02. Maruthamadu Kulam	
03. Maruthanaimadu Kulam	
Total	300

Utilization of Water Resources = 7.16 %

3.3 Development of Paladi Aru river basin (72)

The total catchments area of this basin is 62 Sq. Kms. The possibility of augmentation of Neethukaikulam has to be included in to this project. Tanks under Paladi Aru River Basin and the water yield are given below

Table 3.3 Major Tanks of Paladi Aru river basin

Name of Tank	Capacity (Ac.ft.)
01. Neethukai kulam	1,944
Total	1,944

Table 3.4 Minor Tanks of Paladi Aru river basin

Name of Tank	Capacity (Ac.ft.)
01. Kankerny Kulam	3 x 100
02. Puttun Kulam	
03. Pakiandan Kulam	
Total	300

Utilization of Water resources = 26.9 %

3.4 Development of Tanikal (Manal) Aru river basin (73)

The total catchments area of this basin is 73 Sq. Miles. Rehabilitation of Thannimurippu Scheme is very much essential including the possibilities of augmentation of the tank. Tanks under Tanikal Aru river Basin and the yield are.

Table 3.5 Major & Medium of Tanks Tanikal (Manal) Aru river basin

Name of Tank	Capacity (Ac.ft.)
01. Thannimurippu Scheme	15,000
Total	15,000

Table 3.6 Minor Tanks of Tanikal (Manal) Aru river basin

Name of Tank	Capacity (Ac.ft.)
01. Nedu Kulam	18 x 100
02. Chalanman Kulam	
03. Malai Kulam	
04. Veepan Kulam	
05. Velady Vayal	
06. Periya Kulam	
07. Attthimootai Kulam	
08. Maruthan Kulam	
09. Irumpai Kulam	
10. Kurukanpallaru Kulam	
11. Iddimuruichan Kulam	
12. Pennaichi Kulam	
13. Tarachi Kulam	
14. Mamade Kulam	
15. Puthu Kaddu Kulam	
16. Mandan Kulam	
17. Chullipy Kulam	
18. Udaikan Kulam	
Total	1,800

Utilization of Water Resources = 65.7 %

3.5 Development of Kodallikallu Aru river basin (74)

The catchment area of the river basin is 75 Sq. Kms. Two medium tanks and seven minor tanks to be rehabilitated for effective utilization of water yield. Tanks under Kodallikallu Aru river basin.

Table 3.7 Major & Medium Tanks of Kodallikallu Aru river basin

Name of the Tank	Capacity (Ac.ft)
01. Kannukerny Kulam	2,100
02. Madavalasingam Kulam	4,020
Total	6,120

Table 3.8 Minor Tanks of Kodallikallu Aru river basin

Name of the Tank	Capacity (Ac.ft)
01. Koodali Kallu Kulam	7 x 100
02. Amuthan Kulam	
03. Kunchu kodalai Kulam	
04. Arachchimurippu Kulam	
05. Neervy Kulam	
06. Kanchiramodai Kulam	
07. Palaikattaran Kulam	
Total	700

Utilization of Water Resources = 67.4 %

3.6 Methodology Used for Yield Analysis

Similarly during the research all water bodies within the river basins are identified and mapped out. Each catchment area is marked and possible yields are calculated. The other parameters of each water bodies are obtained from relevant authorities and used for the computation

4 RESULTS AND DISCUSSION

A complete water yield analyses was carried for each river basins considering all the water bodies within the river basin such minor irrigation schemes, medium irrigation schemes and major reservoirs.

This analysis was carried out using the iso yield curves developed by Irrigation department for calculation of yield of catchments. The yield generated upon water utilization as percentage is taken as the mutilation of available water resource in some of the river basins are given in table 4.1.

This is part of the ongoing study and it is planned to compute for all the river basin in future.

Table 4.1 River basin water utilization

Basin No	Name of the River Basin	Water Utilization %
70	Churiyan Aru	10.00
71	Chavar Aru	7.16
72	Palladi Aru	26.90
73	Monal Aru	65.70
74	Kodalikallu Aru	67.40
75	Per Aru	86.00
76	Pali Aru	12.50
77	Maruthapillay Aru	12.50
78	Theravil Aru	
79	Piramanthal Aru	
80	Methali Aru	
81	Kanakarayan Aru	
82	Kalwalappu Aru	39.70
83	Akkarayan Aru	91.04
84	Mandekal Aru	35.82
85	Pallavarayan Kadu Aru	89.85
86	Pali Aru	
87	Chappi Aru	
88	Parangi Aru	39.00
89	Nay Aru	14.36
90	Aruvi Aru	
91	Kal Aru	13.50
92	Moderagama Aru	

4 CONCLUSION

This is an on going research programme and this technical paper is prepared based on the results obtained so far. Due to the urgent need of a policy document for Irrigation Scheme Development and Management Strategy for Conflict Affected area like Northern and Eastern Province of Sri Lanka the following strategy is strongly recommended based on this ongoing research.

RECOMMENDED STRATEGY

- Rehabilitate the tank and augment capacity and raising spill level impounding the yield in wet years and used during the dry years
- Rehabilitate canal system by modernizing ie. Line the canal with concrete and install automatic control structures, to preventing wastage.
- Introduce scientific water management and rotational issue system.
- Persuade concerned organization to adopt cropping patterns according to new strategy.
- Block out land above canals for lift irrigation and allocate to second generation cultivators adopting new cropping pattern.
- Introducing micro irrigation system.
- Those tanks that can be easily restored and are economically viable have to be identified, planned and estimated by Rapid Appraisal Methods.
- Groups of agricultural families (from among displaced refugees preferably) have to be settled under the minor tanks by the Provincial Land Authority.
- In the medium sized tanks, in addition to peasant farmers who will cultivate export oriented cash crops on contract. Entrepreneur Agricultural Organization can be given a sizable extant of land on short term lease. The tank will be restored by that organization using their own resources and with assistance they can obtain from donors on their own initiative.
- Cultivators in a cluster of minor village tanks will grow cash crops, on contract with the entrepreneur

scale surface water resource system to develop ground water system for the improvement in food productivity in Dry Zone of Sri Lanka. Proceedings of Workshop on Challenges in Groundwater Management in Sri Lanka. P63-72 (2011)

[9] Sivakumar, S.S., Conjunctive Use of Surface and Groundwater to Improve Food Productivity in Restricted Ares. 2008, University of Moratuwa, Sri Lanka.

[10] Sivakumar, S.S., Policy alternatives of the management of minor and medium irrigation schemes to develop groundwater system in restricted catchments for the improvement in food productivity in the dry zone of Sri Lanka. Proceedings of National Conference on Water, Food Security and Climate Change in Sri Lanka Vol. 3, Page 73-88 (2009) IWMI Publication ISBN 978-92-9090-720-6

[11] Sivakumar, S.S., Post Conflict Development Strategies. 2012: Emergency Northern Recovery Project.

[12] Sivakumar, S.S., Reclamation of Land and Improve Water Productivity of Jaffna Peninsula of Northern Sri Lanka by Improving the Water Quality of the Lagoons. RJSITM. 2(08): p. 20-27.

[13] Sivakumar, S.S., Water Resource and Agriculture Development Strategy-North East Province 2002/2012. Vol. 2. 2002: Irrigation Department.

[14] Sivakumar.S.S, 2002, Water resource development strategy of north east.

[15] Thiruvengadesamy K.R. Percolation Ponds, 13th AICEME proceedings Association of Engineers India, Calcutta, Pages 14-24 March-July 84.

[16] Yoganarasimhan G.N. and Chand J.P. 1979. "Integrated Planning of Surface and Groundwater" proceeding of workshop on "Conjunctive use of Surface and Groundwater" at WRDIC University of Roorkee

REFERENCES

- [1] A.J.Ponraja, " Design of Irrigation Schemes for Small Catchments"
- [2] Administration report of Department of Agriculture 1999, 2000, 2001, 2002, 2003, North East Province. Trincomalee.
- [3] Arumugam.S, 1956, River basin Development of Ceylon
- [4] Chatuvedi MC. Water Resource Systems Planning and Management Tata McGraw-Hill Publication New Delhi.
- [5] Corey, P G, 1984. An introduction to the geology of Sri Lanka, Colombo, National Museum of Srilanka, 1984
- [6] S.S.Sivakumar, "Water Resources and Agriculture Development Strategy North East Province Volume 1 & 2,"
- [7] Sivakumar S S, 2008, Conjunctive Use of Surface and Groundwater to Improve Food Productivity in a Restricted Area
- [8] Sivakumar, S.S., Alternate management options of small