Vol 3 Issue 12 Jan 2014 ISSN No : 2230-7850

International Multidisciplinary Research Journal

Indian Streams Research Journal

Executive Editor
Ashok Yakkaldevi

Editor-in-Chief
H.N.Jagtap

Welcome to ISRJ

RNI MAHMUL/2011/38595 **ISSN No.2230-7850**

Indian Streams Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial board.Readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

International Advisory Board

Flávio de São Pedro Filho
Federal University of Rondonia, Brazil

Kamani Perera
Regional Center For Strategic Studies, Sri Lanka

Janaki Sinnasamy
Librarian, University of Malaya

Romona Mihaila
Spiru Haret University, Romania

Delia Serbescu
Spiru Haret University, Bucharest, Romania

Anurag Misra
DBS College, Kanpur

Titus PopPhD, Partium Christian University, Oradea,Romania

Mohammad Hailat
Dept. of Mathematical Sciences, University of South Carolina Aiken

Abdullah Sabbagh
Engineering Studies, Sydney

Catalina Neculai
University of Coventry, UK

Ecaterina Patrascu
Spiru Haret University, Bucharest

Loredana Bosca
Spiru Haret University, Romania

Fabricio Moraes de Almeida
Federal University of Rondonia, Brazil

George - Calin SERITAN
Faculty of Philosophy and Socio-Political Sciences Al. I. Cuza University, Iasi

Hasan Baktir
English Language and Literature Department, Kayseri

Ghayoor Abbas Chotana
Dept of Chemistry, Lahore University of Management Sciences[PK]

Anna Maria Constantinovici
AL. I. Cuza University, Romania

Horia Patrascu
Spiru Haret University, Bucharest,Romania

Ilie Pintea,
Spiru Haret University, Romania

Xiaohua Yang
PhD, USA

......More

Editorial Board

Pratap Vyamktrao Naikwade
ASP College Devrukh,Ratnagiri,MS India

R. R. Patil
Head Geology Department Solapur University,Solapur

Rama Bhosale
Prin. and Jt. Director Higher Education, Panvel

Salve R. N.
Department of Sociology, Shivaji University,Kolhapur

Govind P. Shinde
Bharati Vidyapeeth School of Distance Education Center, Navi Mumbai

Chakane Sanjay Dnyaneshwar
Arts, Science & Commerce College, Indapur, Pune

Awadhesh Kumar Shirotriya
Secretary,Play India Play,Meerut(U.P.)

Iresh Swami
Ex - VC. Solapur University, Solapur

N.S. Dhaygude
Ex. Prin. Dayanand College, Solapur

Narendra Kadu
Jt. Director Higher Education, Pune

K. M. Bhandarkar
Praful Patel College of Education, Gondia

Sonal Singh
Vikram University, Ujjain

G. P. Patankar
S. D. M. Degree College, Honavar, Karnataka

Maj. S. Bakhtiar Choudhary
Director,Hyderabad AP India.

S.Parvathi Devi
Ph.D.-University of Allahabad

Sonal Singh,
Vikram University, Ujjain

Rajendra Shendge
Director, B.C.U.D. Solapur University, Solapur

R. R. Yalikar
Director Managment Institute, Solapur

Umesh Rajderkar
Head Humanities & Social Science YCMOU,Nashik

S. R. Pandya
Head Education Dept. Mumbai University, Mumbai

Alka Darshan Shrivastava
Shaskiya Snatkottar Mahavidyalaya, Dhar

Rahul Shriram Sudke
Devi Ahilya Vishwavidyalaya, Indore

S.KANNAN
Annamalai University,TN

Satish Kumar Kalhotra
Maulana Azad National Urdu University

Address:-Ashok Yakkaldevi 258/34, Raviwar Peth, Solapur - 413 005 Maharashtra, India
Cell : 9595 359 435, Ph No: 02172372010 Email: ayisrj@yahoo.in Website: www.isrj.net

Indian Streams Research Journal
ISSN 2230-7850
Volume-3 | Issue-12 | Jan-2014
Available online at www.isrj.net

IMPACT OF BORE WELLS ON GROUNDWATER TABLE IN DROUGHT PRONE AREA: A CASE STUDY OF VILLAGE MEDSHINGI IN SOLAPUR DISTRICT

Arjun Nanaware , R. Patil and B. M. Bhanje

Dept of Geography & Research center, Shri Shivaji Mahavidyalaya, Barshi. Dist Solapur (Maharashtra state)
K. N. Bhise Arts, Commerce & Science College, Kurduwadi.
Principal S. B. Patil College, Mandrup. Tal . S. Solapur Dist.- Solapur.

Abstract:-In the opinion of Reed (1964) agricultural geography deals with the description and explanation of regional differentiation of agricultural characteristics. Irrigation is one of the major determinants of agriculture particularly in drought prone area. The surface irrigation and sub surface irrigation are the major two types of irrigation. Subsurface irrigation is totally depending on wells or bore wells. Bore wells play important role in drought prone areas where surface irrigation facilities are totally absent. Due to non availability of surface irrigation facility and decline water table, the formers are digging bore wells instead of wells. with the growth of bore wells and exploitation of ground water, the water table is declining day by day and year by year. This decline of ground water table is serious environment hazard. Therefore attempt is made here to study the impact of growth of bore wells on groundwater table in drought prone area. The paper is mainly based on primary data sources. To examine the impact of growth of bore wells on decline of ground water table the coefficient of correlation, Coefficient of determination and regression equation technique of has been employed. The study reveals that increase of one bore well causes for decrease of 0.18 meter groundwater table in village Medshingi.

Keywords: Bore wells, Groundwater table, Correlation, regression.

INTRODUCTION:-

Agricultural Geography is the description of the arts of large scale soil cultivation with reference to natural environment and human circumstances (Singh & Dhillon, 1987). In the opinion of Reed (1964) agricultural geography deals with the description and explanation of regional differentiation of agricultural characteristics. (M. Husain, 2002) Agricultural land use and productivity are the most obvious aspects of Agricultural Geography. The agricultural productivity is function of number of factors including physical, socio-economic and technological organization (N. Mohammad A Majeed,1992). Irrigation is one of the major determinants of agriculture particularly in drought prone area. Irrigation is identified as a decisive factor in Indian agriculture due to high variability and inadequacy of rainfall. Irrigation is imperative for successful agriculture particularly in arid, semi-arid and sub-humid areas which are prone to drought and famine conditions due to partial failure and delayed arrival or early withdrawal of the monsoons. (Reddy and Reddy 1992). The surface irrigation and sub surface irrigation are the major two types of irrigation. The farmers have to depend on subsurface irrigation in those areas, where surface irrigation facilities are not available. Subsurface irrigation is totally depending on wells or Bore wells. A water-well is an excavation or structure created in the ground by digging, driving, boring or drilling to access groundwater in underground aquifers. (Wikipedia, the free encyclopedia). Bore-holes means a small diameter well drilled especially to obtain water (Merriam-Webster's Collegiate Dictionary,2004).

Bore wells play important role in drought prone areas where surface irrigation facilities are totally absent. Due to increasing wants, increasing population and development of technology number of bore wells are increased. Indian agriculture is depending on monsoon rainfall, which occurs mainly during the period of June to September. The Distributing feature relating to the Indian agriculture is the adverse consequence due to erratic behavior of the monsoon and frequent occurrence of drought (Reddy & Ramanaiah, 1992). The intensity of such erratic behavior of the monsoon and frequent occurrence of drought is high in drought prone area, which resulted into increases of the numbers of bore well day by day and year by year. With the development of irrigation and other technological factors commercial crops like sugarcane and Horticultural crops are gradually occupying land under such cash crops. To servile these cash crops farmers digging bore wells.

Due to non availability of surface irrigation facility and decline water table, the formers are digging bore wells instead of wells. This growth changed agricultural land use and productivity considerably. But, with the growth of bore wells and exploitation of ground water, the water table is declining day by day and year by year this decline of ground water table is become serious environment hazard. Therefore attempt is made here to study the impact of growth of bore wells on groundwater table in drought prone area.

The Study Area:

The village Medashingi is located 170 23' 56" North latitude and 750 15' 14" East longitude. It lies in Eastern part of Sangola Tahsil on Sangola Mangalvedha State highway. The village is just 12 km away from Sangola Tahsil head quarter. The geographical area of village is 2918.4 hectare with 3384 population as per census of 2001. The average height of village is 500 meters from mean sea level.

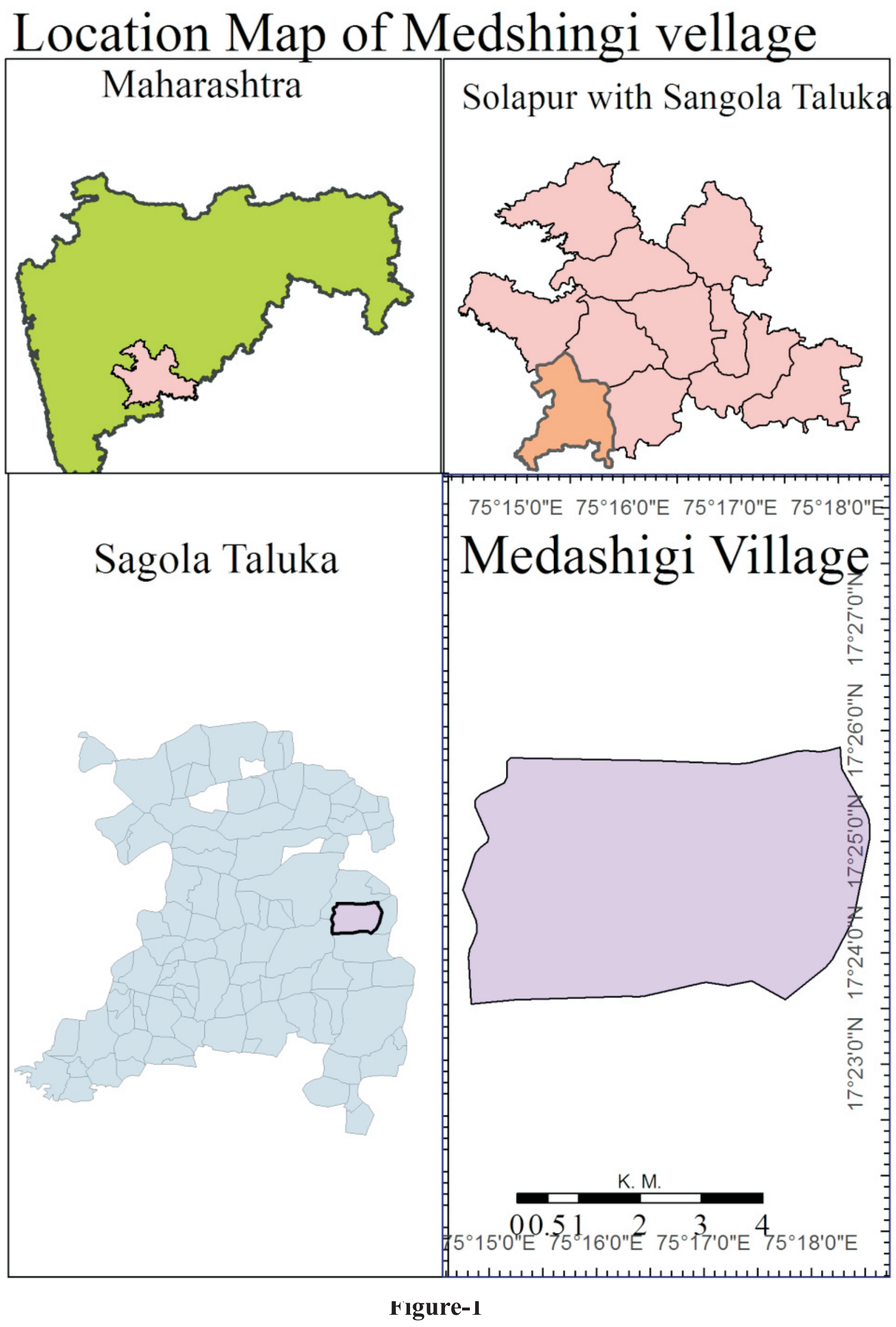

Figure-1

OBJECTIVES:

The main objective of this paper is to examine the impact of growth of bore wells on the groundwater table and to estimate the rate of change in ground water in relation to growth of bore wells.

DATA COLLECTION AND METHODOLOGY:

In order to meet these objective the relevant information and data regarding growth of bore wells, working period of bore well irrigated area by bore well and groundwater table, cropping pattern & productivity are collected and used for the year of 2012-13 are mainly based on primary sources. The primary data is the first hand data collected through different sources for which special questionnaires (schedule) were designed and field survey have been made.

During field survey 228 farmers out of 684 bore well holder farmers are assessed. Systematic sampling method is applied for the collection of primary data, every third bore well holder farmer is considered for village Medashingi. It has helped to understand the growth of bore wells and decline of water table and expenditure on individual bore wells. Information also collected from Talathi office. The information regarding physiography and drainage system also been obtained from Toposheet.

After the collection of data different statistical techniques have been employed. To examine the impact of growth of bore wells on decline of ground water table the Karl Pearson coefficient of correlation technique of has been employed.

The functional form of linear relationship has been measured by using regression equation 'Y' on 'X' i.e. $Y = a + bx$. The rate of change in dependant variable has been estimated with the help of 'b' coefficient, which is the line of best fit. The 'T' test is used with the view to understand the confidence level. The analysis of the study has been made with the help of the statistical techniques and on the basis of this techniques result and conclusions are drawn.

Bore well growth in Medashingi village:

The table-1 indicates that The first bore well was drilled in 1987 in the village Medashingi. In 1987 there was only two bore wells in the village. During the span of five years the number of bore wells increased i.e. up to 10. In 1996 the there are 35 bore wells in the village. In next five year this number is increased up 82 bore wells. In the year of 2006 the number is increased up to 168 bore wells and it was 349 in 2001, while in 2013 there are 406 bore wells in the village Medashingi.

Table 1 growth and density of bore wells in village Medashingi.

Sr. No	Years	No of Bore wells	Density per '10' hectares	Sr. No	Years	No of Bore wells	Density per '10' hectares
1	1987	2	0.03	15	2001	82	1.23
2	1988	3	0.04	16	2002	98	1.47
3	1989	4	0.06	17	2003	110	1.65
4	1990	7	0.1	18	2004	122	1.83
5	1991	10	0.15	19	2005	151	2.26
6	1992	13	0.19	20	2006	168	2.51
7	1993	17	0.25	21	2007	188	2.81
8	1994	21	0.31	22	2008	228	3.41
9	1995	31	0.46	23	2009	255	3.82
10	1996	35	0.52	24	2010	310	4.64
11	1997	39	0.58	25	2011	349	5.22
12	1998	48	0.72	26	2012	386	5.78
13	1999	55	0.82	27	2013	406	6.07
14	2000	74	1.11				

Source: Compiled by Authors based on Field Survey March 2013

DENSITY OF BORE WELLS:

Attempt is made here to find out growth in density of bore well is only 0.03 bores per Ten hectare area in 1991 it become 0.15 per 10 hectare and increased by 0.12 bore well per 10 hectare area. In 1996 the density of bore well was 0.52 bore wells per 10 hectare area. In 2001 it is 1.23 bore wells per 10 hundred hectare, It is 2.51 bore wells in 2006 and in 2011 it was

5.22 bore wells per 10 hectare area while in 2023 it is 6.07 bore wells per 10 hectare area. During the span of 26 years density of bore wells increased from 0.03 to 6.07 bores per 10 hectare geographical area. This growth is tremendous because the village Medashingi is located in the heart of drought prone area where rainfall is uncertain unpredictable and inadequate.

Number of bore wells and decline of water table:

In village Medashingi first bore was drilled in 1987. In 1987 the water table 21 meters below the surface. in 1997 there are 39 bore wells and water table is 27 meters bore well the surface, in 2001 the number of bore wells are 82 and water table was 73.27 meters below the surface, In 2006 the bore wells are increased up to 168 and water table is 75 meters below the surface. In 2011 number of bore wells are 349 and water table is 81.68 meters below the surface and in 2013 the bore wells are increased up to 406 and water table is declined up to 100 meters below the earth surface. The Table-2 indicates that as the bore wells are increased the water table is declined in successive year. But there are some exception that bore wells are increased but water table is not decreased. During the span of 27 years the water table is declined by 79 meters in village Medashingi.

Table -2 Number of bore wells and water table

Sr. No	Years	No of Bore wells	Water table below the surface in Meter	Sr. No	Years	No of Bore wells	Water table below the surface in Meter
1	1987	2	21.02	15	2001	82	73.27
2	1988	3	21.02	16	2002	98	58.86
3	1989	4	27.03	17	2003	110	86.49
4	1990	7	12.01	18	2004	122	71.77
5	1991	10	21.02	19	2005	151	75.08
6	1992	13	21.02	20	2006	168	84.98
7	1993	17	30.93	21	2007	188	69.67
8	1994	21	15.02	22	2008	228	72.67
9	1995	31	57.96	23	2009	255	76.58
10	1996	35	40.24	24	2010	310	93.99
11	1997	39	27.03	25	2011	349	81.68
12	1998	48	51.95	26	2012	386	87.39
13	1999	55	45.35	27	2013	406	100.00
14	2000	74	64.56				

Source: Compiled by Authors based on Field Survey March 2013

In the context of objective the following findings have come to light.

1) The positive relationship between the number of bore wells (X) and decline of groundwater table (Y) has been observed in the village. The coefficient of correlation in this regard is at r = + 0 .8370. It indicates that a very good positive relationship between the variables 'X' and 'Y'. The degree of linear association between these two variables obtained by using the coefficient of determination (r2) is found to be at 0.6950, which reveals that the independent variable (X) i.e, the number of bore wells are explaining 69.50 percent of the total variations in dependent variable (Y) i.e. the decline of groundwater table of farmers in the village. It is a good explanation because more than 69 percent of the variations in (Y) decline of groundwater table to be influenced by the variable (X) number of bore wells and about 31.5 percent of the variation is left to be influenced by other variables i.e. amount of rainfall, ground water recharge by different ways .

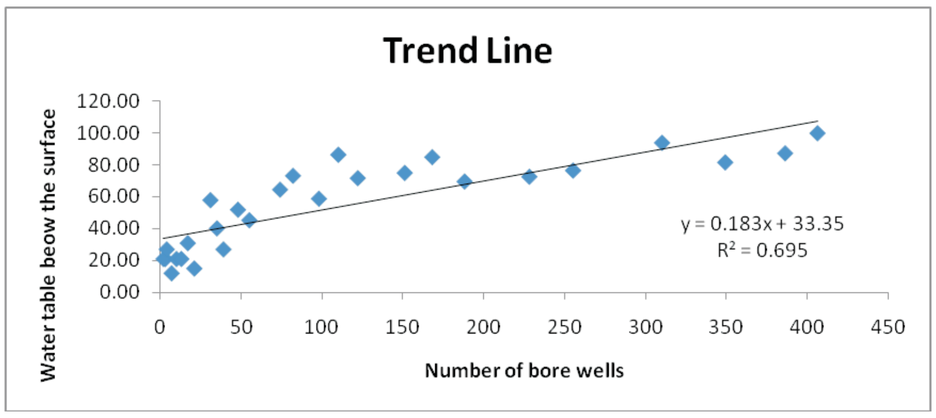

Figure-2

2) The functional form of linear relationship computed through the regression equation of Y on X found to be at Y = 33.35 + 0.183x. The line of best fit is shown in the figure-2. The regression coefficient indicates that increase of a bore wells causes for decline of 0.18 meter groundwater table. By testing the significance of regression coefficient (a test of significance), the validity of this causal relationship has been confirmed,

The equation used t = (b-β) $\sqrt{n-2}$)Σ(Xi-X?) 2 ? Σ (Yi-yi) 2

The calculated value of 't' in this exercise is found at 7.54. It is observed that this calculated value is higher than the tabulated value of 't' (2.79) at the 25 degree of freedom (df = n –2, where 'n' is 27) even at 1 per cent level of significance.

3) In order to understand the degree of fit of regression equation and the accuracy level of predicted values (y) for the states of India the standard error (SE) of estimate is being done with the equation SE (Y) = SY $\sqrt{1\text{-r2}}$, where SE (Y) is the standard deviation of residuals (Y-y); and 'SY' is the standard deviation of 'Y'.

The confidence interval of the predicted values are worked out at Y = Y ± SE (Y) (The SE (Y) for the present exercise is 15.26 and SY is the 27.63). Thus it is assumed that if the values of 'Y' (Y-y) lie within the range of Zero to ± SE, the prediction could be expected to be accurate. In other words, the role of independent variables in explaining the change in dependent variable can be accepted as correct.

Table -3 Residuals from regression of infant mortality of cereal crops.

Years	Y	y	Y-y	Years	Y	y	Y-y
1987	21.02	33.72	-12.7	2001	73.27	48.36	24.91
1988	21.02	33.9	-12.88	2002	58.86	51.28	7.58
1989	27.03	34.08	-7.05	2003	86.49	53.48	33.01
1990	12.01	34.63	-22.62	2004	71.77	55.68	16.09
1991	21.02	35.18	-14.16	2005	75.08	60.98	14.1
1992	21.02	35.73	-14.71	2006	84.98	64.09	20.89
1993	30.93	36.46	-5.53	2007	69.67	67.75	1.92
1994	15.02	37.19	-22.17	2008	72.67	75.07	-2.4
1995	57.96	39.02	18.94	2009	76.58	80.02	-3.44
1996	40.24	39.76	0.48	2010	93.99	90.08	3.91
1997	27.03	40.49	-13.46	2011	81.68	97.22	-15.54
1998	51.95	42.13	9.82	2012	87.39	103.99	-16.6
1999	45.35	43.42	1.94	2013	100	107.65	-7.65
2000	64.56	46.89	17.67				

Source: Compiled by Researcher on the basis of field survey

In this context it has been observed that the predicted values (given in table- 3) of 17 years out of 27 years in the present study lie within the range of ± SE, 9 within ± SE to ± 2 SE and 1 above ± 2 SE. Now the obvious inference is that the 62.96 per cent of the total number of observation (n is 27) the regression is a good indicator meaning thereby that the variations of groundwater table in village Medashingi is the function of the variations of borewells. In the case of other years with residuals between > ± SE to ± 3 SE the situation is different because here the regression is a poor indicator. It clearly indicates that these are the years whom the influence of variables other than the independent one. The variations of groundwater table of years in the latter case may be due to the variation in rock types, Variation in groundwater recharge, Variation in water lifting.

CONCLUSIONS:

This study reveals that there is high positive correlation between growth of bore wells and groundwater table in village Medashingi. The coefficient of determination reveals that the independent variable (X) i.e, the number of bore wells are explaining 69.50 percent of the total variations in dependent variable (Y) i.e. the decline of groundwater table of farmers in the village. It is a good explanation because more than 69 percent of the variations in (Y) decline of groundwater table to be influenced by the variable (X) number of bore wells and about 31.5 percent of the variation is left to be influenced by other variables i.e. amount of rainfall, ground water recharge by different ways. The percentage of number of bore wells is found to be more effective than the other variables considering groundwater table. It is found that increase of one bore well causes for decrease of 0.18 meter groundwater table in village Medshingi. Therefore it is to be stated that the artificial recharge of bore well is helpful to control decline of groundwater. Public awareness should make regarding artificial recharge, use of drip irrigation and other means of water saving in the society to maintain ground water table.

REFERENCES

1. Dr. Singh Sukhminder, Dr. SinghT.P.,Dr. Bansal M.L.And Dr.Rakesh Kumar (1986): Statistical Methods for Research Workers, Central publishers , Mahraj Nagar, Ludhiana.pp197-234,284-233
2. Majid Husain (2002): Systematic Agricultural Geography, Rawat Publications, Jaipur and New Delhi Pp.18.
3. Merriam-Webster's Collegiate Dictionary (2004): Merriam-Webster Incorporated Springfied, Mssachusetts, USA. Pp. 144
4. N. Mohammad&A Mafeed (1992): Determinants of Agricultural Productivityin Arid Region, New Dimensions in Agricultural Geography Volume 8 , Concept publishing Company, New Delhi 110059, pp. 103 - 123
5. Singh and Dhillon (2006) Agricultural Geography, Tata McGraw-Hill Publishing Company Limited New Delhi. Pp. 3.
6. Reddy and Ramanaiah(1992): Changing Pattern of Agricultural Land Use inDrought Prone Areas, New Dimensions in Agricultural Geography Volume 5 , Concept publishing Company, New New Delhi 110059, pp. 221
7. Reddy and Reddy (1992): Changing pattern of Irrigation in Andhra Pradesh, New Dimensions in Agricultural Geography Volume 3 , Concept publishing Company, New Delhi 110059, pp. 239 - 262
8. Wikipedia, the free encyclopedia

Publish Research Article
International Level Multidisciplinary Research Journal For All Subjects

Dear Sir/Mam,

We invite unpublished Research Paper,Summary of Research Project,Theses,Books and Book Review for publication,you will be pleased to know that our journals are

Associated and Indexed,India

- International Scientific Journal Consortium
- OPEN J-GATE

Associated and Indexed,USA

- Google Scholar
- EBSCO
- DOAJ
- Index Copernicus
- Publication Index
- Academic Journal Database
- Contemporary Research Index
- Academic Paper Databse
- Digital Journals Database
- Current Index to Scholarly Journals
- Elite Scientific Journal Archive
- Directory Of Academic Resources
- Scholar Journal Index
- Recent Science Index
- Scientific Resources Database
- Directory Of Research Journal Indexing

Indian Streams Research Journal
258/34 Raviwar Peth Solapur-413005,Maharashtra
Contact-9595359435
E-Mail-ayisrj@yahoo.in/ayisrj2011@gmail.com
Website : www.isrj.net