# ASSESMENT OF TRADITIONAL DRAINAGE SYSTEM WITH SPECIAL REFERENCE TO KARNATAKA STATE, INDIA- A CASE STUDY

RAMANA GOWDA, P.[1] KRISHNAMURTHY, N.[2] RANJITHKUMAR, T. M.[3]

## ABSTRACT

Drainage problem is a global phenomenon affecting the production and productivity of agricultural crops. Though, India has the highest irrigated area in the world with least drainage problem due to practice of the time tested traditional drainage system. The causes for ill drainage are: climatic, unscrupulous use of irrigation water, cultivation practices for crops like Sugarcane, Rice, Arecanut, topography, soil type. The causes ultimately lead to environmental and land degradation. Its direct effects are, reduces land value, crop productivity, biodiversity and promotes pollution. The indirect effects of ill drainage are health hazards mainly malaria, phelaria and other water borne diseases, harbouring the weeds and alternate hosts for pest and crop diseases and loss of surface area. The traditional drainage practices are cultural system (Deep tillage, corrugation, mond method of land layout etc.), Mechanical system (sub-surface shallow wells, open trenches, closed with stone or rubbles, broad bedded furrow), Biological system (Growing Eucalyptus, Bamboo, Casurina and *Acacia nilotica*) and appropriate crops ( Banana, Rice, Baje, water melon and buffalo grass) are being practiced either in combination or single practice depending on the drainage severity by the individual or group of farmers. The assessment and impact of a traditional drainage system revealed that on an average drained water from cultural (250 $m^3$ $ha^{-1}$ $annum^{-1}$), Mechanical (698 $m^3$ $ha^{-1}$ $annum^{-1}$), Biological (4107 $m^3$ $ha^{-1}$ $annum^{-1}$), appropriate crops (704.58 $m^3$ $ha^{-1}$ $annum^{-1}$). Thus, improved the environmental conditions, crop productivity and production needs promoted. Social impact thus, resulted in employment generation and better livelihood.

**Keywords:** Irrigation, Land Degradation, Biodiversity, Traditional Practice, Biological, Livelihood.

[1] RAMANA GOWDA, P. Department of Agronomy, College of Agriculture, University of Agricultural Sciences, Bangalore, India Email:drrgbtib45@gmail.com
[2] KRISHNAMURTHY, N. Department of Agronomy, College of Agriculture, University of Agricultural Sciences, Bangalore, India Email: Krishnamurthynagappa@yahoo.co.in
[3] RANJITHKUMAR, T. M. Department of Agronomy, College of Agriculture, University of Agricultural Sciences, Bangalore, India Email: Ranjiththm942@gmail.com

## INTRODUCTION

The Karnataka has two important river basins namely Krishna and Cauvery of this Cauvery command is the oldest dam constructed across Cauvery at Mysore. It provides irrigation Mysore and Mandya district. The total geographical area of the state is 19.04 m ha with 12. 87 m ha under cultivation. While the extent of irrigation was restricted to 4.09 m ha. The major crops grown under irrigation are Rice, Sugarcane, maize, finger millet, ground nut, sunflower, pigeon pea. Drainage is equally important as that of irrigation in agriculture. Generally the emphasis and priority is given for drainage while planning and budgeting. Drainage is inevitable in most of the command areas more so in low lying areas, vertisols, crops and crop management techniques. The problem is more aggravated in arid and semi arid regions due to salinity and other induced associated problems. India ranks first in the total irrigated area (57 m ha) with less area under drainage problem with an area of 5.76 m ha. Other associated problems are loss of nutrients, lack of nutrient availability, lack of oxygen and anaerobic situation leading to degradation of soil health and environment.The main reasons for insignificant drainage problems in India are the practice of time tested traditional drainage systems which are cost effective, eco-friendly and efficient in ensuring the better drainage, fragmented holding and modern irrigation systems. In this case study an attempt was made to assess the traditional drainage systems viz. cultural, mechanical, biological methods practiced by the farmers.

## METHODOLOGY

The investigation was on the traditional drainage system was carried out as on farm study in the farmer's field in the command areas in Karnataka state during 2012-14. Predominant soil type was red sandy loam in all the locations. The location of the study was restricted to mid-reach of the command areas. The observations on various parameters have been collected from 50 farmers through structured questionnaires. Also frequent field visits to these locations to collect data on water drained collected with the help of farmers. From this the drained water yield per day per treatment was worked out and expressed in cubic meter per hectare per year. The cultural operations such as layout, mechanical system including planting tree components under bio drainage were guided with technical support. The crops under cultivation were as per the package of practice. The economic yield of different food crops was collected and worked out and expressed as tonnes per ha.

## RESULTS AND DISCUSSION

The performance of the traditional drainage system in draining the water is presented in table No. 1. The average water drained from 10 $m^2$ area in a day was 0.68 liters by practicing different cultural practices like, deep tillage, ridges and furrow (corrugation) and mond method .It was worked out to be 250 $m^3$ $ha^{-1}$ annually. Among the cultural system ridges and furrow performed better with higher drainage of 328.5 $m^3$ $ha^{-1}$ annually. The cultural system is temporary and meant for a period of 3- 6 months.

In mechanical drainage system on an average of 698 $m^3$ $ha^{-1}$ per annum water is drained by adopting different structures. Among the mechanical drainage system broad bed furrow and closed with stone or rubbles performed well in draining the water (730 $m^3$ $ha^{-1}$ per year).

Among biological system growing of different tree species like Eucalyptus, bamboo etc. drained more water than other traditional method of drainage system with an average of 4107$m^3$ $ha^{-1}$ per year which is nearly fourfold higher than

traditional drainage system. The growing of bamboo in ill drainage areas gave the good result in draining excess water (7300 $m^3$ $ha^{-1}$ per annum) fallowed by eucalyptus (3650 $m^3$ $ha^{-1}$ per annum).

**Table No. 1: Assessment of traditional drainage systems**

| **A. Cultural system** | | |
|---|---|---|
| | water drained | |
| | litres/10 $m^2$/day | Annual $m^3$ $ha^{-1}$ |
| Deep tillage | 0.70 | 255.5 |
| Ridges and furrow (corrogation) | 0.90 | 328.5 |
| mond method | 0.45 | 164.25 |
| Average | 0.68 | 250.00 |
| **B. Mechanical system** | | |
| | water drained | |
| | litres/10 $m^2$/day | Annual $m^3$ $ha^{-1}$ |
| Sub- surface shallow wells | 1.95 | 711.50 |
| broad bed furrow | 2.00 | 730.00 |
| open trenches | 1.70 | 620.50 |
| closed with stone or rubbles | 2.00 | 730.00 |
| Average | 1.92 | 698.00 |
| **C. Biological system (after 5 year planting )** | | |
| | water drained | |
| | litres/10 $m^2$/day | Annual $m^3$ $ha^{-1}$ |
| Eucalyptus | 10.00 | 3650 |
| Bamboo | 20.00 | 7300 |
| Casurina | 6.00 | 2190 |
| *Acacia nilotica* | 9.00 | 3285 |
| Average | 11.25 | 4107 |

The use of appropriate crops in ill drained field play a vital role in draining water with an average of 704.58 $m^3$ $ha^{-1}$ per year (Table No. 2). Among different crops water melon has higher Water draining tendency (912 $m^3$ $ha^{-1}$ per annum) fallowed by banana (839 $m^3$ $ha^{-1}$ per annum). By growing these test crops benefited improving the drainage and gave economic benefits in terms of yield.The water melon yielded higher (2.50 tonnes $ha^{-1}$ $annum^{-1}$) fallowed by banana (2.30 tonnes $ha^{-1}$ $annum^{-1}$)

**Table No. 2: Water drained and crop yield in different crops**

| | litres/10 $m^2$/day | Annual $m^3$ $ha^{-1}$ | Economic yield tones $ha^{-1}$ $annum^{-1}$ |
|---|---|---|---|
| Banana (*Musa paradisiacal.L)* | 2.30 | 839.50 | 2.30 |
| Baje (*Acorus calamus.L)* | 1.00 | 365.00 | 1.00 |
| Rice *(Oryza sativa.L)* | 1.90 | 676.40 | 1.90 |
| Water melon *(Citullus lanatus)* | 2.50 | 912.00 | 2.50 |
| Buffalo grass *(Boutelova dactyloides .L)* | 2.00 | 730.00 | 2.00 |
| Average | 1.94 | 704.58 | - |

## IMPACT OF TRADITIONAL DRAINAGE SYSTEM ON ENSURING BETTER DRAINAGE

- For short term (3-6 months) drainage improvement cultural methods can be adopted.
- For better drainage in mid duration (6-9 months) both cultural and mechanical drainage system are highly suitable.
- The locations with permanent and long duration (> 1 year) drainage problem combination of cultural, mechanical and biological drainage system are more appropriate.
- Locations without options for drainage treatment still crops like Rice *(Oryza sativa.L),* Baje (*Acorus calamus.L),* Banana (*Musa paradisiacal.L),* Water melon *(Citullus lanatus),* Buffalo grass *(Boutelova dactyloides .L).*
- The traditional drainage system resulted in more human energy use for imposing various field operations by creating employment. Thus provide better livelihood.