

Chemical Fertilizers Excess Usage Effects at Right Bank Bhadra Canal Command Area (Karnataka) -A Case Study

Dr.K.Krishne Gowda¹, Dr.K.Manjunatha² and K.K.Kiran ³

^{1,2} Civil Engineering Associate Professor and UBDTCE,
Davangere, Karnataka, India

³ Civil Engineering Lecturer and UBDTCE,
Davangere, Karnataka, India

Abstract

The studies on chemical fertilizers used over the past six years at study Davangere district irrigated area under Bhadra right bank canal command area been analyzed. From the statistical analysis it has been found that the given data's are not statistically significant since the t-test values to be ± 1.96 for statistical significance whereas the study data value is less than ± 1.96 except complex fertilizer which is significant. The aim of this paper is to present an overview of the basis for the use of organic manure, since the whole world is now much aware towards the use of organic manure as against the inefficient use of chemical fertilizers and pesticides can result in severe human and animal health problems while consuming as food & fodder grown by such chemical fertilizers as against organic manure.

Keywords: *Organic manure, irrigated area, soil fertility and Bhadra Reservoir.*

1. Introduction

Agriculture engineering is the primary and most important Industry in India despite growth in industrialization technology and business, agriculture engineering and water resources engineering and to be an important source of livelihood for millions of Indians. Agriculture is another identity for Indians and with a new technology, newer methods of cultivation and production of agricultural commodity such as food fodder has been bountiful days and years. Indian agriculture is on the brink of a revolution that will modernize the entire food chain as the total food production in India is likely to be double in the next ten years.

As per the recent studies [1], the turn over of the food market is approximately Rs. 2,50,000 crores (US\$69.4 billion) of which value added food production

comprise Rs. 80,000 crore (US\$22.2 billion). The food Industry also assumes significance owing of India's sizable agrarian economy, which accounts for over 35% of GDP and employs around 65 percent of the population. Both in terms of foreign investment and number of joint ventures/foreign collaborations, the consumer of food segment has the top priority.

The annual rain fall ranges from 600 to 850mm of which more than 60% is received in pre-monsoon and the remaining in monsoon and post monsoons. The rainfall is only in Kharif season where as irrigation is under both Kharif and Rabi seasons. In addition to these, soil characteristics of study region are found to be shallow to very deep black soil in 65% major areas, red sandy loams soil in the remaining area. The elevation ranges between 800-900 meters in major areas and 450-800 meters in the remaining area above MSL. The geographical area of Davangere district which includes Davangere taluk is 99,410 hectares, and Harihar Taluk is 49,866. The principal crops grown are Paddy, Jawar, Maize, and Sugarcane in large command area about 70-80% and Ragi, Pulses, oil seeds like groundnut, coconut, areca nut, vegetables and flowers in smaller atchkat area about 20 to 25 percent.

Agriculture is happens to be the predominant occupation in the state of Karnataka as else where in the country. Nearly 50% of the state income is contributed by agricultural output only. In the last 25 years agricultural development too is enormous. The state is endowed with a variety of agricultural situations, which lend themselves for the production of a large number of different crops all through the year. In Karnataka around 80 percent agriculture is rain- fed and depends on the variations in the monsoon.

Hardly 25-27% land is covered under irrigation and hence it becomes a herculean task for produce at the

optimum level. Although the share of the agriculture in the state income points towards decline it still continues to be major economic activity for almost 60% of the population (2), besides, erratic monsoon and limited irrigation resources, other major constrained to growth are, inadequate crops credit, inadequate crop insurance cover, poor marketing facilities, inadequate infrastructure and storage, slow pace of watershed developments, lakh of farmers have small size holdings, low quality land and a little or no access to irrigation or credit. They also have to deal with droughts. The soil quality is essential as it influences economic output of any water harvesting structure by assessing irrigability of soil, fertilizer/manure cowdung, and organic manure etc, requirement, determining cropping and scheduling irrigation for the area.

The significance of soil qualities in respect of executing soil and water management strategies as well as crop planning in watershed have been reported by Narayana et al (1990) and Anonymous (1994). The effect of irrigation and fertilizer application has been tried by Bianchi, et al (1985). However despite Ingram, et al (1986) reported that the N-K use efficiency was greater at 10KPa to 20KPa, soil moisture tensions and water use efficiency was greatest at the higher N-K fertilization rate for irrigated sugarcane. The Davangere district of Karnataka receives medium rainfall (<700mm) but still the productivity of both kharif crop as well as rabi crop even in irrigation comes under Bhadra reservoir is raise significant levels in rice and sugarcane production is concern of state economy. Majority of farmers (>90%) applying chemical fertilizers as well as pesticides tremendously which will make adverse effect of all human beings and living organisms. If the agricultural production has to be increased through sustainable manures, it is essential that our agricultural practices make economical, ecofriendly, environmentally safe and avoids not only all ill effects on human, animal health but also it must be increases local employment through biological pest control. Rainfall at 80 percent probability can safely take as dependable rainfall while that of 50 percent probability level is the maximum limit for taking risk [3].

Several researchers Madhumita et al. (2005), Abdul Fazal et al, (2005) and Nishikant et al, (2007) have worked out the soil fertility sustainable crop productivity with organic manures. The study was undertaken on environment friendly plant protection during crop growth period of Davangere district atchkat area. In this paper, an attempt has been made to study the soil fertility status in the study field due to the reason that the farmers are continuously enormous use of chemical fertilizers and pesticides.

2. Study Area

Bhadra reservoir is constructed across Bhadra River near Lakkavalli village, Tarikere Taluk, Chikmagalur district of Karnataka state at an elevation of 601 m above MSL. The dam is located at Latitude 13⁰ 42' 00" N and Longitude 75⁰ 38' 20" E. The Bhadra River rises from Varaha Hills 'Ganga Moola' in the Western Ghats about 24kms west of kalasa in Chikmagalur district. After flowing for about 190 Kms, it joins the river Tunga at Kudli, 90 Kms west of Davangere city and become 'Tungabhadra' river which is a major tributary of Krishna river basin.

The catchment area at site is about 1968 Sq Km, the command area of whole Bhadra reservoir irrigates is about 1, 05,570 hectares. Out of which 69397 hectares comes under irrigation at Davangere district atchkat area. The Davangere branch channel Supplies discharges of 1130 cusecs to irrigate. 45623 hectares of land where as Malebennur branch channel supplies discharge of 620 cusecs to irrigate about 23774 hectares of land. The total irrigated area comes under Davangere region is about 69397 Hectares. The Davangere is located at a latitude 14⁰ 28' 70" N and Longitude 75⁰ 56'00" E at a levitation of 528.37m above MSL.

3. Availability of Water

The Davangere branch channel and Malebennur branch channel of Bhadra project is being operated on a continuous basis during the two seasons. The water made available to each branch, distributory, minor and outlet field channel is not based on its particular crop water requirement but on allotment procedure in which, each hectare of land would obtain the same amount of water is independent upon its location in the atchkat area. This allotment would differ between two seasons. Table 1 shows the water allotment to irrigate the atchkat area under Davangere region. This availability of water is the controlling factor, for which filling the crop pattern and crop rotation in the study area

Table 1 Land irrigated by Bhadra Reservoir

Canals	Length in Kms	Discharge in Cumecs	Irrigation land Hectares
Left Bank Canal	77.24	10.762	8300
Right Bank Canal	103.00	75.048	1727
Anvery Branch Canal	66.78	4.25/8.5	6319
Davangere Branch Canal	90.12	32.002	45623
Mallebennur Branch Canal	48.00	17.56	23774
Devarabelakere Pickup	-----	Seepage	4280
Total			1,05,570

4. Data Used

To know the various soil nutrients present in the field of Davangere district atchkat area, around 53 soil samples in various places of irrigable region randomly has been collected. These samples were tested in soil and water testing laboratory for soil fertility purposes. In addition to the above samples, further the soil samples of 703 in Channagiri, 303 in Honnalli, 757 in Davangere, 124 in Harapanahalli and 278 soil samples in Harihar taluks have been collected from agricultural office of soil and water testing laboratory of Davangere center for the 2 years as 2005-06 and 2006-07 respectively. The data's tested & collected at study fields have been statistically analyzed.

5. Methodology

First of all, the varies soil major nutrients such as soil pH, soil electric conductivity (EC), available organiccarbon(OC), available phosphorus (P_2O_5), available Potassium (K_2O) and other micronutrients like Zinc (Zn), Copper (Cu), Manganese (Mn) and Iron (Fe) were computed for the soil samples of the study area. The soil fertility map of the study irrigated area is prepared and showing various soil nutrients levels in the study region also analyzed. The studies on chemical fertilizers used over the past six years at study Davangere district irrigated area under BCA have been analyzed. The various data pertaining to chemical fertilizers used at study region from 2005 to 2010 have been collected from district agricultural office Davangere

6. Analysis of Chemical Fertilizers Applied At Study Region

The statistical analysis for these chemical fertilizers data's used at study region from past six years starting from 2005 & Table 3 shows that total quantities of different chemical fertilizers used from past six t years starting from 2005 to 2010 over study field. This statistical analysis has been carried out for various statistical parameters such as total number of years(N), total quantity , mean, stdev, S.E, %E, CV, minimum value, maximum value, median, kurtosis, percentage contribution and t-test for the data to check whether the data are statistically significant or insignificant at 95% & 99% confidence limits. From the statistical analysis it has been found that the given data's are not statistically significant since the t-test values to be greater than ± 1.96 for statistical significance whereas the study data value is less than ± 1.96 except complex fertilizer which is significant. For the insignificant data, the inference drawn for one year of same trend holds for other years and the same inference can be drawn for other years also. But the data of complex manure is increasing faster since it is statistically significant and thereby to conclude chemical fertilizers like complex fertilizer are used by farmers enormously at study area as compared to other chemical fertilizers. Percentage contribution also increases from year to year as observed from the analysis are shown in figures 1 to 4 respectively.

From linear regression analysis, it has been found that utilization of the chemical fertilizers are annually increasing trend since coefficient of determination R^2 tending to more than 0.96 to 0.99% that is R^2 nearly equal to unity ($R^2=1$) as seen from Figures 2 to 4 which shows that pie charts of various chemical fertilizers used since from 2005-10 at study BCA under Davangere District. This clearly shows there must increase in percentage usage of chemical fertilizers especially complex much larger as compared to other chemical fertilizers like urea, dap, potash.

Fig.3 shows pie charts of different chemical fertilizers in percentage contribution & pie chart of coefficient of variation (CV) shows that low values as 19% for complex & 21% for urea chemical fertilizers used at study field area as compared potash & dap. Bar charts shows of various chemical fertilizers used over the study region with year wise with time as increase in trend. The study data's are fitting for the linear regression curve and this statistical analysis as shown in Fig. 4. From these graph it has been observed that the coefficient of determination R^2 is nearly equal to unity ($R^2=1$) which clearly shows that there must be definite increasing trend even from individual statistical analysis as seen from graphs of each chemical fertilizers which are used at study area. Fig.3 shows spatially averaged values of CV used at BCA as against various quantities of fertilizers used at Davangere District atchkat area under BC.

Fig.3 shows CV values of complex fertilizer is less as compared to the values of other types of fertilizers used over study fields. It merely shows that the less value of CV means more value of complex as against other less quantity of fertilizers used in study.

From the above analysis it has been conclude that the chemical fertilizers is used enormously with continuous increase in trend from the past six years (2005-2010) at the study area which causes the soil at study field slowly becomes infertile. Thus care should be taken about the adoption of eco-friendly irrigation crops at the study field by the application of organic manures like cow dung, earthworm manure, green manure, farm yard manure, bio manure with similar other organic manures at the same time farmers are also advised to adopt crop rotation because dam is designed to grow wet crops during Kharif season where as semi dry crops in the summer season as against present situation of farmers are growing wet crops on both the seasons by violating Bhadra dam authority rules and regulations. Further, if farmers are used organic manures in addition crop rotation not only eco-friendly irrigation but also healthy soil fertility can be maintained. Because the food crops and fodder consumed by all living beings which have been grown by using chemical fertilizers and pesticides which are causing slow poisoning which leads as severe health hazardous.

7. Results and Discussions

The major nutrients and macro nutrients from the soil samples has been obtained. Soil fertility status level particularly for Davangere district command area for the two years is drawn. At same time, the comparison of soil fertility map has been made. Some of the values of soil nutrients are lie within the normal where as few soil samples shows deficiency and others have shows more than normal values. This clearly shows that some soil may have either saline or alkaline. This deficiency of soil leads to low productivity. Some of the reasons for low crop productivity are may be due to either natural or operational factors. Natural factors are due to uneven irregular rain characterized by long dry spell, frequent occurrence of drought, limited irrigation/short fall, light soils and on the other hand operational factors are due to limitation of water shed development, soil getting poorer in organic content lack of specific verities with desired performance, lack of balance in fertilizer consumption, increasing means of saline and ill drained soil, in adequate crop loan, lack of increasing expenditure on agricultural production and unfavorable agricultural pricing policy. The irrigation soil fertility of some places low values of certain nutrients such as available carbon OC/Nitrogen in percentage, P_2O_5 and K_2O in kg per hectares. For low nutrients/high nutrients,

increase/ decrease the dose of the nutrients accordingly as recommended by UAS as given in the Table 2.

Table 2 Recommendations of various elements in manures

Nitrogen		P_2O_5		K_2O	
0-20	No change	0-10	No change	0-10	No change
21-40	+ 5 kg /acre	11-30	+5 kg /acre	11-20	+ 5 kg /acre
41-70	+10 kg /acre	31-50	+10 kg /acre	21-40	+10 kg /acre
71-100	+15 kg /acre	-	-	41-70	+15 kg /acre
101-130	+20 kg /acre	-	-	-	-

The non practice of crop rotation and not applying organic manure, the fertility of soil decreases. This leads not eco-friendly environment for the working agricultural labours/workers. At the same time this is an ill effect on human, animal health and surrounding agro, climatic, conditions. Therefore following procedures should be recommended to the environment eco-friendly irrigation crops in the study commend area.

- By crop rotation.
- Using new methods and putting organic fertilizers. A cheap and good quality of organic fertilizer which can be used in the place of chemical fertilizers as vermicompost, crop residues and green manures, farm yard manure are all good organic manures which increases crop production as their addition gives contribution towards the secondary and micro nutrients, improvements in soil physical properties and over all increased soil productivity.
- Other soil improved approaches are efficient use of water resource, crop planning according to agro climatic conditions of region wise crops to be grown in the area.
- Encouraging farmers to grow other profitable crops, increasing seed replacement rate, increase fertilizer use efficiency

8. Conclusions

The major and minor nutrients of the soil samples of the Davangere district atchkat area have been analyzed. Out of 2434 soil samples analyzed in the study area, the 26 samples under acidic range and 234 will shows alkalinity range, according to the soil PH values. According to Electric Conductivity (EC) of soil, 169 samples shows critical and 83 samples shows injurious level, which leads

to unfit for irrigation unless otherwise certain improvement like addition of other fertile soil to spread for 10 cm thick with addition of certain organic manures. Available organic carbon values revealed that 834 samples below normal level, 876 samples are normal level where as 754 samples are above normal level. Available phosphorus (P_2O_5) and available potassium (K_2O) values are revealed that maximum soil are in medium range, 2228 samples shows max then the normal values. From this shortage of (P_2O_5) and high values of (K_2O) in the soil were found. In such type of land farmers are advised to divert towards the use of organic manure instead of using chemical fertilizer and pesticides.

The detailed analysis and discussion of the above study the following inferences can be drawn as explained below.

1. At study area farmers are using more and more chemical fertilizers and pesticides
2. The use of organic manures like cow dung, farm yard manures, earth warm manures, green leaves manures, bio fertilizers discarded by farmers may be knowingly or unknowing .
3. There is deficiency of soil macro & micro nutrients.
4. Eco-friendly irrigation has not been maintained.
5. The crops and fodder so produced is consumed by all living beings there will be slow poisoning which slowly causing serious & sever health hazardous.

9. Reference

1. Abdul Fazal M. Saleh, Khashern Khan, M.A and Mazid, M.A (2005) Analysis of water availability constraint for crop intensification in Rain fed low land Rice systems. In Journal of Indian Water Resources Society Vol: 25, No. 3.
2. Bajwa (2003) In Agriculture turbine, Chandigarh, India.
3. Bianchi, M.L., Burt, C.M and Ruchr, T.A (1985) Fertilization Practices and Soil Permeability. D D I in- action, vol 1. P 357
4. Imliyaz, M., Denis, D.M., Kumar, J.L.G., Srivastava, S.K and Salim, M (2005) Response of strawberry to Drip Irrigation. In Journal of Indian Water Resources Society Vol: 24, No. 4.
5. Mukhopadhyay, S. N (2006) Ecofriendly products through process Biotechnology Recent advances. In a supplement to IEI News, 10-23 March, India.
6. National Bureau of Soil Survey (2000) Publication 47, Bangalore.
7. News India Eco-Friendly Technologies for Rice cultivation (2003) published by the A Supplement to IET News, India.
8. Preet Singh and Narang, M. K (2004). In Agriculture turbine, Chandigarh, India.
9. Perspective Land use plan for Karnataka (2005) Karnataka State Land use Board, GOK, Bangalore.
10. Surveys of Indian Industry (2003) published by the Hindu India.
11. Ingram, K.T and Hilton, H.W (1986) Nitrogen-Potassium fertilization and soil moisture effect on drip irrigation to

sugarcane. Journal series of Exp.stn, Hawaaian, paper No. 613.

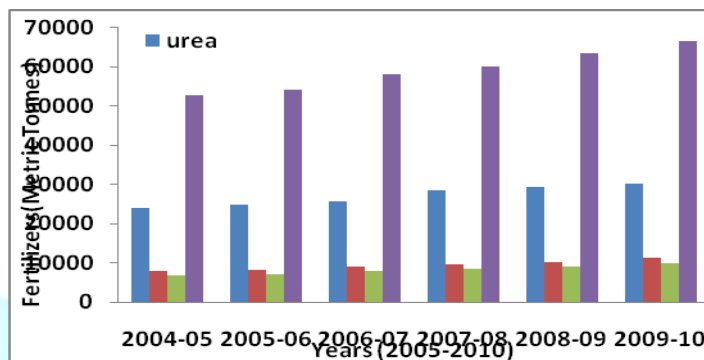


Fig.1: Fertility Map of Irrigated Area 2005-06 & 06-07

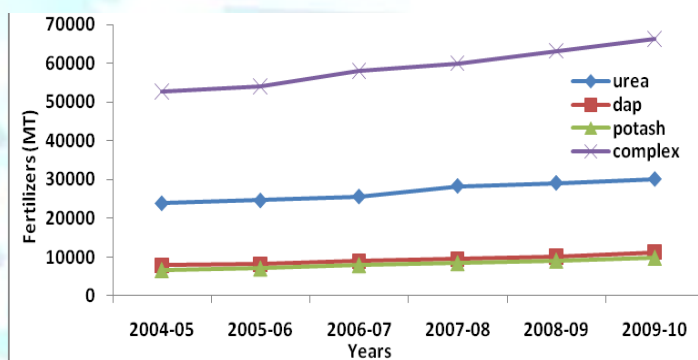


Fig.2: Chemical fertilizers used year wise at study area

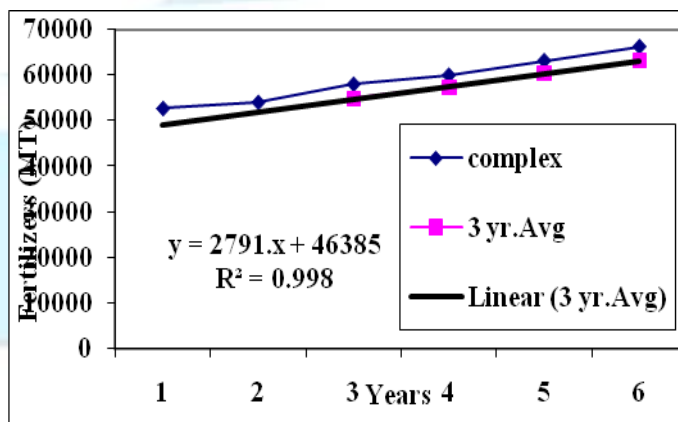


Fig.3: spatially averaged values of % contrib. corresponding to various fertilizers

Table 3: Shows Statistical Analysis of Chemical Fertilizers Used at study

N	6	6	6	6	6	Total
Total	161890	55586	49064	354154	155173.5	775868
Average	26981.667	9264.3333	8177.3333	59025.667	25862.25	129311
STDEV	2628.0975	1289.3505	1188.3782	5257.3332	2590.7899	12954
STDERRO	1072.9163	526.37513	485.15335	2146.2973	1057.6855	5288
%ERROR	3.9764642	5.6817378	5.9329042	3.6362102	4.8068291	24
CV	9.7403084	13.917358	14.532588	8.9068595	11.774279	59
MIN	23860	7866	6664	52654	22761	113805
MAX	30200	11250	9800	66300	29387.5	146938
MEADIN	27015	9175	8200	59000	25847.5	129238
KURT	-2.3465858	-0.6083965	-1.2458014	-1.3094422	-1.3775564	-7
SKEWNE	0.0116506	0.5192502	0.0626273	0.1484396	0.1854919	1
99%CONF	2763.6498	2763.6498	2763.6498	2763.6498	2763.6498	13818
LL	24218.017	6500.6835	5413.6835	56262.017	23098.6	115493
UL	29745.316	12027.983	10940.983	61789.316	28625.9	143129
t-test	1.285282	1.286915	1.306185	1.302243	1.30379	

region Davangere District BCA (2005-10)