Universal Impact Factor0.9285:2012; 1.2210:2013

Index Copernicus
ICV 2011: 5.09
ICV 2012: 6.42
ICV 2013: 15.8
ICV 2014:89.16

NAAS Rating
2012 : 1.3;
2013-2014-2015:2.69

Received on:
28th March 2016

Revised on:
26th May 2016

Accepted on:
26th May 2016

Published on:
1st June 2016

Volume No.
Online & Print
76 (2016)

Page No.
88 to 93

Life Sciences Leaflets is an international open access print & e journal, peer reviewed, worldwide abstract listed, published every month with ISSN, RNI Free- membership, downloads and access.

TREND OF NITROGEN INFLOW TO SOIL IN TAMIL NADU

R. PARAMASIVAM[1], P. PARAMASIVAM[2] AND R. BALASUBRAMANIAN[3]

[1,2] DEPARTMENT OF AGRICULTURAL ECONOMICS, [3] DEPARTMENT OF MARKET EXTENSION, TAMIL NADU AGRICULTURAL UNIVERSITY, COIMBATORE-641003.

Corresponding author's e-mail: rajesh_2050@rediffmail.com

ABSTRACT:

The present study examined the trend of nitrogen inflow from various source across districts of Tamil Nadu since 1990s. This study used both cross section and time series data from 1990-91 to 2012-13. Inorganic fertilizers were the prime source of nitrogen inflow followed by livestock manure, legumes and green manure. During 1990-99 to 2000-09, growth rate of nitrogen inflow from inorganic fertilizers significantly declined almost all agrarian based districts. Trichy, Madurai, Ramnad, Virudhunagar, Sivagangai, Tirunelveli and Thoothukudi districts accounted positive growth rate of nitrogen inflow from inorganic fertilizers. Trend of livestock manure started to increases almost all districts. Growth rate of nitrogen inflow from livestock manure was positive and larger in Sivagangai and Tirunelveli in all periods whereas lowest growth rate observed in Dharmapuri, Vellore and Dharmapuri districts. Over uses of inorganic fertilizers and competitive uses of cow dung manure would possibly develop an imbalance nitrogen status to soil and negatively led sustainable agriculture. It is suggested that optimal use of inorganic fertilizer and higher amount of cow manures inflow to soil may support for sustainable soil use.

KEY WORD: *Livestock manure, Fertilizers, Nitrogen, Sustainable agriculture.*

INTRODUCTION:

Sustainable soil use in the farming system is to be considered as greater importance in the current decade in order to producing a healthy, quality and nutrient rich food products for the burgeoning India's population. Soil nutrients are depleted through intensive and continuous farming and soil erosion. This process mines significant amount of nutrients from soil and create imbalance status. Managing balanced amounts of soil nutrients are one of prime promises for achievement of sustainable agriculture. Nitrogen, among soil nutrients, is a yield-determining nutrient in the most farming systems as adequate amounts of nitrogen is to be applied for obtaining sustainable yields and maintaining soil organic matter (SOM) (Goulding *et al.,* 2008). Yield mainly depends on soil health, of course, it is maintained through addition of nutrients at proper time. NAAS (2009) estimated that producing a tonne of cereal grains about 20 – 27 kg nitrogen, 8 – 19 kg phosphorus and 24– 48 kg potassium is required. Grain legumes remove much more nitrogen but tiny amount of nitrogen fertilizer was applied, for example, 20 – 25 kg nitrogen per ha during initial period.

The required amount of nitrogen by crops is obtained from organic and inorganic fertilizers sources which expected to bridge nitrogen gap in soil. In additions, natural sources in the form of rainfall, biological nutrient fixation and soil erosion are also helps for nitrogen inflow. Green Revolution was the main factor to increase usage of inorganic fertilizers by the farmers. Apart from that, fertilizer policy also triggered usage rate. The rate of nitrogen consumption increased from 7 to 145 kg per ha from 1966-67 to 2011-12 (FAI, 2013). Continuous application of inorganic fertilizers leads both positive and negative externalities to the environment. The relative cheapness of nitrogen fertilizer and yield incremental character imperatively increased an excessive doses, which paved way for increasing pollutant level (Goulding *et al.,* 2008). Sasmal and Weikard (2013) reported that subsidized fertilizer of nitrogen was one of main instruments for the attainment of imbalance status. Therefore, usage of nitrogen was excessive and adversely affected soil profile and caused scarcity in phosphorus, potassium and micronutrients.

Organic manure has positive externalities and extend to replenish soil nutrient depletions Dikshit and Birthal (2013). There is shortage for organic manure especially farmyard manure (FYM) due to competitive uses of cow dung (Ghosh *et al*., 2004). Other livestock manures namely goat and poultry manure availability is vague in nature. Thus, only a small quantity of cow manure is available (Ghosh *et al*., 2004). With this background, this study pertains to assess trend of inflow of organic and inorganic fertilizers across districts of Tamil Nadu.

METHODOLOGY:

This study used time series data of nitrogen distributions from inorganic fertilizers and livestock population over spatially (19 districts) and temporally (1990-2012). Data collected from department of Economics and Statistics and Statistical abstract of Tamil Nadu in various issues. Dung produced by different categories of livestock and nutrients content of manure (Nitrogen) was collected from Dikshit and Birthal (2013) and Ghosh *et al*., (2004). Estimation of organic manure, only cow, buffalo, goats and sheep manure alone considered for calibration due to availability of data sources. The secondary data, before estimation, was standardized and then proceeds for analysis.

Annual Compound growth rate

The growth rate of nitrogen distribution by different sources such as inorganic fertilizers and livestock manure was estimated using the exponential growth rate.

RESULTS AND DISCUSSION:

Growth rate of nitrogen inflow

Assessment of nitrogen trend over the years would help to understand the status of nitrogen in district wise and elucidate highest and lowest trend rate among districts. Annual growth of nitrogen inflow from inorganic fertilizers and livestock manure across districts of Tamil Nadu is furnished in Table 1. Growth rate of nitrogen inflow from inorganic fertilizers was positive and high in all the districts except Virudhunagar, Tirunelveli and Kanyakumari where the growth rate was found to be negative during the period 1990-99. When compared to the decade of 1990-99, growth rate of nitrogen inflow from inorganic fertilizers was more than double in Trichy, Madurai, Ramnad, Virudhunagar, Sivagangai, Tirunelveli and Thoothukudi during the decade of 2000-09. Increasing trend might be attributable to subsidised fertilizers (Sasmal and Weikard, 2013), easy availability of nitrogen fertilizer (Naidu *et al.*, 2011) and increased growth of vegetables and banana in Trichy and Tirunelveli districts, respectively, during the same period. In contrast, Cuddalore, Dharmapuri and Kanyakumari districts witnessed least growth rate during 2000-09. Supply of nitrogen from inorganic fertilizers in the state was based on their gross cropped area under such criteria, Cuddalore, Dharmapuri, Dindigul and Thanjavur accounted highest share of gross cropped area in the State. It might be noted that growth rate of banana declined from 16.61 to 6.74 per cent per annum in Cuddalore; 41.13 to 7.04 per cent of unirrigated mango area in Dharmapuri and -4.40 to -6.03 per cent of vegetable area in Kanyakumari district in 1990-91 to 2012-13.

Negative growth rate in nitrogen inflow from livestock manure was found in most of the districts in the first decade. However, Cuddalore, Vellore, Thiruvannamalai, Dharmapuri, Erode, Dindigul and Sivagangai had positive growth rate. The reason associated with increasing growth of livestock manure was increased cow population from 4.98 to 5.75 lakhs in Vellore; 6.06 to 7.17 lakhs in Thiruvannamalai; 5.18 to 6.57 lakhs in Dharmapuri; 3.85 to 3.95 lakhs in Erode during 1990-91 to 2012-13. It is interesting to note that, there was positive and highest growth rate in most of the districts during 2000-09. Cuddalore, Vellore, Dharmapuri and Thiruvannamalai had negative growth in nitrogen inflow in the same period. For example, cow population in Cuddalore district has declined from 13.63 to 12.03 lakhs in 1990-91 to 2012-13. Decline of cow population in these districts and higher transportations cost, low nutrient availability, competitive uses of cow dung (Ghosh *et al*., 2004) likely affected growth of livestock manure.

Slow rise of nutrient intensive crops in Trichy, Madurai, Ramnad, Virudhunagar, Sivagangai, Tirunelveli and Thoothukudi districts may accelerates growth rate of nitrogen inflow from inorganic fertilizers positively. Growth rate of nitrogen inflow from livestock manure was positive and larger in Sivagangai and Tirunelveli in all periods as significant rise of cow population. While decline of that population decelerates growth rate in Dharmapuri, Vellore and Dharmapuri districts.

CONCLUSION:

Yield mainly depends on soil health, of course, it is maintained through addition of nutrients at proper time. Inflow of nitrogen from inorganic fertilizers also increased during 1990-91 to 2012-13. Increased nutrient intensive crops in Trichy, Madurai, Ramnad, Virudhunagar, Sivagangai, Tirunelveli and Thoothukudi districts supported to increase positive growth rate of nitrogen inflow from inorganic fertilizers. Similarly trend of livestock manure started to increases almost all districts. Growth rate of nitrogen inflow from livestock manure was positive and larger in Sivagangai and Tirunelveli in all periods as significant rise of cow population. Whereas declined cow population decelerates growth of nitrogen inflow in Dharmapuri, Vellore and Dharmapuri districts. Most of the agrarian based districts showed declined growth of nitrogen inflow from inorganic fertilizer particularly the districts which have larger share of gross cropped area to the state. Despite these districts had positive growth rate from livestock manure inflow in the successive years. Over uses of inorganic fertilizers and competitive uses of cow dung manure would possibly develop an imbalance nitrogen status to soil and negatively led sustainable agriculture. Livestock manure is one of major input for soil fertility. It is suggested that increasing application of cow manures to soil may support for sustainable soil use.

REFERENCES:

Dikshit, A.K. and P.S. Birthal. 2013. Positive environmental externalities of livestock in mixed farming systems of India. *Agricultural Economics Research Review*, 26 (1): 21-30.

Government of Tamil Nadu, Economic Appraisal of Tamil Nadu, Department of Economics and Statistics, Various Issue, Chennai.

Fertilizer Statistics. (2007-08). "The Fertilizer Association of India". New Delhi.

Ghosh P.K., P. Ramesh, K.K. Bandyopadhyay, A.K. Tripathi, K.M. Hati, A.K. Misra, And C.L. Acharya (2004). "Comparative effectiveness of cattle manure, poultry manure, phosphocompost and fertilizer-NPK on three cropping systems in vertisols of semi-arid tropics. I. Crop yields and system performance." *Bioresource Technology*, 95: 77–83.

Goulding, K., S. Jarvis. and A. Whitmore. 2008. *Optimizing nutrient management for farm systems*. Philosophical transactions of royal society B, 363: 667–680.

Naidu, L. G. K., V., Ramamurthy, G. S. Sidhu and D. Sarkar. 2011. Emerging deficiency of potassium in soils and crops of India. *Karnataka Journal of Agricultural Science*, 24 (1): 12-19.

Sasmal, J. and H.P. Weikard. 2013. Soil Degradation, Policy Intervention and Sustainable Agricultural Growth. *Quarterly Journal of International Agriculture*, 52: (4): 309-328.

Table. 1 District wise growth rate of nitrogen inflow during 1990-91 to 2012-13

District	Inorganic fertilizers			Livestock manure		
	1990-99	2000-09	1990-2012	1990-99	2000-09	1990-2012
Kanchipuram	6.23	-2.22	5.55	-4.18	16.59	9.48
Cuddalore	17.49	6.25	22.43	4.79	-10.08	-2.60
Vellore	12.65	12.36	13.86	3.29	-6.75	-1.13
Thiruvannamalai	28.91	23.33	36.25	0.91	-10.72	-6.05
Salem	15.58	19.16	28.61	-2.92	13.95	7.32
Dharmapuri	36.56	-10.35	19.04	14.48	-18.05	-1.94
Coimbatore	1.99	7.88	5.43	-3.44	0.77	-5.53
Erode	18.35	10.21	11.65	0.42	21.05	16.03
Trichy	10.68	22.98	25.16	-5.69	7.11	0.57
Pudukkottai	23.74	17.32	36.86	-9.07	30.66	15.65
Thanjavur	5.28	3.06	6.72	-3.90	12.67	3.64
Madurai	6.15	12.40	8.79	-3.99	22.20	14.06
Dindigul	36.76	21.41	28.86	5.75	0.40	4.27
Ramnad	6.81	14.99	10.23	-13.85	25.22	3.51
Viruthunagar	-11.11	16.14	-7.87	-14.39	21.85	-5.21
Sivagangai	7.26	13.32	12.51	3.54	34.92	32.61
Tirunelveli	-0.31	21.44	10.39	-5.51	55.88	30.42
Thoothukudi	3.97	54.86	15.41	-13.27	23.90	5.39
Kanyakumari	-1.74	-14.06	-10.32	-6.84	23.16	6.59
State	10.92	12.09	16.39	-1.80	10.60	6.29