RESEARCH FRONT

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MODERN AGRICULTURAL PRACTICES: FERTILIZERS USE IN THE CASH CROP ZONE FARMING IN THE MAHARASHTRA STATE

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ABSTRACT

The study area of a Maharashtra Chemical fertilizers and pesticides are continuously being applied to agricultural fields for past many years boosting the agricultural yield and increasing chemical fertilizer consumption. In cash crop, modern agriculture tools and techniques have enriched farmers. The chemical pesticides and fertilizers (agrochemicals) are commonly used in Maharashtra agriculture The requirement of agricultural product (sugarcane, bajra, onion, vegetables, polyhouse agro, grapes, pomegranate, food & fodder for animals) to cater to the domestic and industrial needs, have made farmers to use fertilizer and pesticide beyond the prescribed dosage.. Farm productivity is directly proportional to use of agrochemicals observed from the first green revolution. Proper and safe use of these agrochemicals and pesticides are increasing the crop efficiency and productivity. For present study Maharashtra state were selected for drawing the facts of increasing fertilizers in farming. For the present study data resources were collected from fertilizer industry and selected agro-chemical shops, also cash crop taking farmers.. To make this study more authentic, data from the agro shop of respective villages were collected from department of Tahsil and District centers. Soil analysis is required to every village of Maharashtra carried out the surplus or deficit of NPK in the agri. Region. The soil pH varied between from 7.46 to 8.9 and soil was found to be moderate alkaline. The soil is found to be free from salt accumulation.. Available Nitrogen was found to be low in about 80% of agro zone, indicating lack of nitrogen status and the need for adequate application of nitrogenous fertilizer.50% of the agri area revealed very low Available Phosphorous content, remaining with moderate to low content. More than 80% of soil agro zone high value of Available Potassium as high as 963.2kg/ha, remaining have moderate to low values. Micronutrients, Zn, Cu, had moderate to low value and Fe showed very low value, but about 48% of agri zone had Mg higher value.. Literacy among the farmers and they developed our own modern intensive farming is greatly responsible for proper handling and application of the fertilizers. The present work offers suggestions for reducing the benefit and deficiency of fertilizer in farm zone.

Keywords: agrochemical, productivity, agri. soil zone, soil available NPK, Micronutrient, crops, production, utility

Introduction:

The study region covers 307,713 sq. km. of the state and a population of the 112,372,972 of the state in 2011 census. Along with the modern technology which should be utilized in agriculture the market and transport facilities plays also vital role in the development of agriculture. The supply of electricity and connectivity to each settlement through road networking insufficient in the District but the facilities regarding agro services centre, agricultural market and cold storages are inadequate in study area (Gatade, 2012). A, Nagar

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

districts of Western region of Maharashtra their agricultural modernization for production increase has become all the more important as the scope for increasing land under agriculture is very low (Patil and et.al, 2007,Sunil Kumar and et.al, 2012), found that long term effect of organic materials. Along with fertilizers increased the soil organic carbon, saturated hydraulic conductivity, available N.P.K. grain and straw yield of wheat and decreased the soil bulk density, soluble salt, concentration and PH. long term integrated nutrient management by applying organic manures and inorganic fertilizers has potential for improving the soil. Physical and chemical fertility status for increasing the crop yield for sustainable agriculture (Rajbirsingh and et.al, 2009). The high level of performance is largely confined to Satara District. This zone has been characterized by assured supply of water mainly from lift and canal irrigation, sugarcane cultivation, dominance of cash crop etc., As result of this zone possesses high level of agricultural performance (Shinde and et al, 2011, Singh J. 2005) used the approach to determine the levels of mechanization of India. The approach to determine the levels of mechanization of India Along with the modern technology which should be utilized in agriculture the market and transport facilities and connectivity is sufficient in the tahsil. Hangaragi, S. S. (2011) concluded that cropping pattern of the district has not changed significantly in spite of population growth. In the present scenario needs to strengthen the irrigation facilities, soil and moisture conservation, adoption of biotechnology, a forestation, changing in the cropping pattern, agronomic practices, and livestock.

Suresh Phule and Abhijeet Bodade (2003) stated that Marathwada with western Maharashtra in the sense of agricultural development it is supposed to be very low developed due to lack of irrigational facilities. The farmers are choosing the verity of crop combination in their fields. According to Andeshahana N. J. and Khunt K. A. (2011), the factor determining the use of fertilizers needs to be critically analyzed to narrow the gap in nutrient supply capacity of soil and nutrient requirement of the plant for sustainable productivity of the crops. They also mention that in their study the gap between actual use and recommended doses of fertilizer and to identify the factors determining the fertilizer use in major crops grown in the study region.

The intensity of irrigation is not uniform in any agricultural region. Irrigation is control by various factors such as source of irrigation, quality and quantity of water supply, density of network of channel, cropping season, types of crops grown etc. The irrigation is major input for agricultural production. Where irrigation facility is adequate there are maximum the cropping intensity are found. Cropping intensity refers to the practice of raising more than once crop from the same field during one agricultural year. In technical terms it can define as representing the percentage of gross cropped area to the net sown area. (Magare, P .Y and Suryawanshi, D.S, 2010) The farmers are growing grapes, pomegranate and other fruits also. Consequentthe economic condition of farmer is improved. This variation has several dimensions – spatial, temporal and societal also has repercussion on productivity (Farmer B.H., 1979) and (Sharma S.K.1992). Modern agriculture is highly dependent on irrigation. Even the use of Hyv and fertilizers are directly related with the extent of irrigation. It raises the crop productivity even without the use of Hyvs. (Sharma, S.K. 2003)

Objectives : In the cash crop zone N:P:K and other fertilizer contribution to farm crop.

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

Study area:

Maharashtra longitudinal extension 15degree 44'to 22degree 06'North and 72degree 56'to 80degree 54'East longitude. Maharashtra is the third largest state in area and second largest state in population of India. It has an area of 307,713 sq. km. with 35 districts, 358 blocks and 43711 villages and a population of 112,372,972 (2011 Census) . Urban 41.02 million (42.4%) Rural 55.73 million (57.6%)Average PopulationDensity314 persons per km2 .All the districts of Maharashtra are grouped into six divisions: Aurangabad Division, Amravati Division, Konkan Division, Nagpur Division, Nashik Division and Pune Division. Sahyadri, the hilly ranges running parallel to the coast at an average elevation of 1,200 meters (4,000 ft) divides Maharashtra in two parts geographically, (i) Konkan coastal plains, 50–80 kilometers in width and around 720 km in length to the west and (ii) Deccan Plateau (Western Ghats) to the east

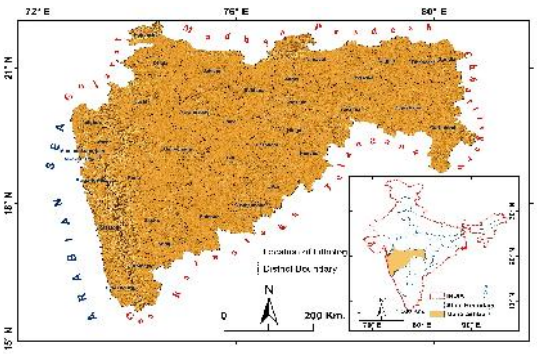


Fig. 1 Location Map of Study Area.

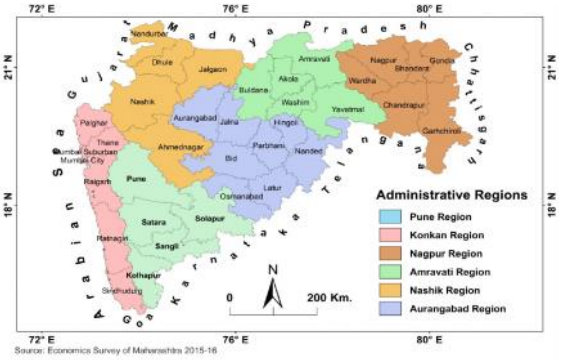


Fig. 2 Administrative Division of Maharashtra.

Source of Data: primary data

Sample Collection: Field survey and collect the sample from selected District. Visit to selected farmers categories i.e. small (up to 2 ha.) medium (up to 3 to 10 ha.) and large farmer (above 15ha.) who take cash crop and use the organic and chemical fertilizer for more yield crop production. Collect the data from District agriculture fertilizer centre and selected agriculture village shop centre.

Secondary data: collect the data from agriculture production centre publish book, some data are gather from journals that mention in reference .District level agriculture center publish the fertilizer consumption magazine.

Discussion

Major horticulture crops are Mango, Cashew, Pomegranate, Orange, Grapes, Banana Onion and Vegetables, Sugarcane, Playhouse flowers; Cotton, Rice. Around the Developed cities surrounding farming area mainly Vegetables crops are taken in Maharashtra. The major strengths include-Large production of fruit & vegetable (onion, mangoes, grapes, pomegranates, oranges etc.) present tremendous export potential; onion stores for storing onions and avoiding distress sales by farmers; Agricultural Export for grapes, grapevine, pomegranate, onions, mangoes etc.; Large number of agro-processing units; Infrastructure to support the growing floriculture industry; Major producer of milk (7.4 thousand tons). The major developments of Agriculture in Maharashtra are - Acceptance of latest technology by

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

Grape farmers. Concept of contract farming & corporate farming is in the way of promotion, an area of 13.66 lakh hectares under horticultural and 4 lakh ha under vegetables largest producer of seedless Grapes (78%) banana (75%) Mandarin oranges (75%) Onion (63%), Tomatoes (42%) of the total production in Maharashtra. Alphanso Mangoes accounts for 90% of Maharashtra's export in mangoes. The highest number of poly houses around 500 owned by small farmers for cultivation of flowers. Leads the sugar industry sector with productive cooperative sugar mills, 7% turnover of the seed industry in the Maharashtra. As the sugarcane crop produces huge quantity of biomass, its nutrient requirements are also very high. It could be found from Table that IS farmers used 355.86 kg N, 127.54 Kg P, and 80.87 kg K per ha for their sugarcane crop. This is quite high when compared with the levels of 110.10 kg N, 44.70 kg P and 30.10 kg K per hectare for irrigated sugarcane crop in the country (GOI 2000). Pomegranate farmers used 18.65 per cent more quantity compared to others crop farmers.

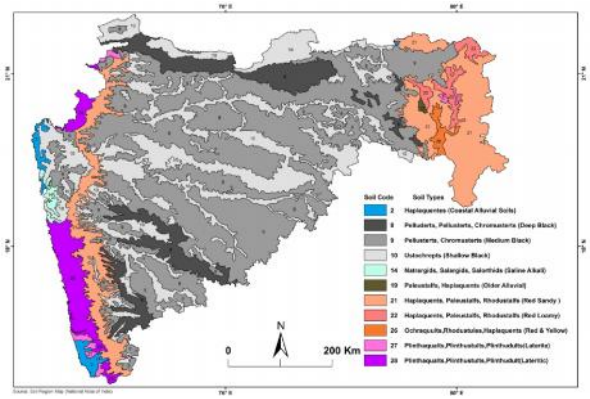


Fig. 3 Soil Region Of Study area

AGRICULTURAL FERTILIZERS: NITROGEN, POTASSIUM, ANDPHOSPHORUS –USE IN CASH CROP ZONE

Nitrogen from Ammonium Phosphates and Urea; Phosphoric Acid from Ammonium Phosphates; Potash from Muriate of Potash; Boron from Sodium Borate; Chelated Copper from Copper EDTA; Manganese from Manganese Sulphate; Molybdenum from Sodium Molybdate; Chelated Zinc from Zinc EDTA; Chlorine max. Available 14%.Among the macronutrients are nitrogen, phosphorus, and potassium. These three elements are those most rapidly removed from the soil by plants. Therefore, many commercial plant fertilizers supply these three essential elements. The amount of each element is indicated by N-PK numbers. The analysis information at right (taken from a package of garden fertilizer) showsan N-P-K rating of 15-30-15. These numbers indicate the percent by weight of nitrogen, diphosphorus pentoxide, and potassium oxide in the fertilizer. The 15-30-15 rating indicates that15% by weight of the fertilizer is nitrogen (N). Italso indicates that the weight of phosphorus in the fertilizer is the same as it would be if the fertilizer contained 30% phosphorus pentoxide (P_2O_5).The amount of potassium in the fertilizer is the same as it would be if the fertilizer were 15%potassium oxide (K_2O).

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

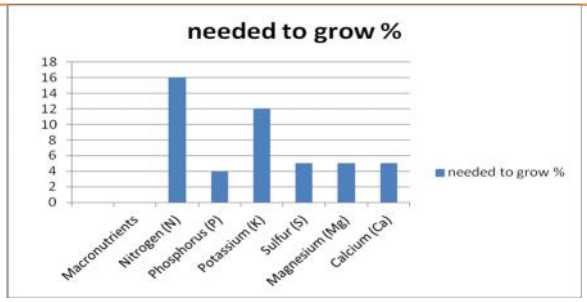


Chart. 1Fertilizer need to Cash Crops zone,

plant grow: Bio fertilizers - For example in a sample of 411 field trials carried out across districts, plant responses to inoculation with Azotobacter in irrigated wheat was observed to be significant in 342 cases and ranged from 34 to 247 Kg./Ha. (Hegde and Dwivedi, 1994). Legume inoculation by Rhizobium is the most long established practice but the responses

Use of fertilizer in selected District for crop seedling (per hector/Kg)				
	A. Nagar		**Kolhapur**	
Crops	O.F.	C.F	O.F	C.F
Rice seedling	2.5	29.12	0.13	3.64
Wheat seed	1.5	34.37	0.75	2.58
Oilseeds seed	0.2	34.37	0.01	0.34
Groundnut/Soyabean seed	1.5	30.89	0.07	2.26
Maize/Sorgum seed	0.5	29.12-34.37	0.025	0.73-0.86
Potato soil/tuber	4.5	34.37	0.225	7.73
Vegetables seed	0.5	29.12-34.37	0.25	0.73-0.86
Sugarcane soil	4.5	34.37	0.225	7.73
Cotton seed	0.8	34.37	0.04	1.37
Flowers seedling	1.75	29.12-34.37	0.09	2.55-
Chemical Urea soil	1.0	4.8	2.17	7.96

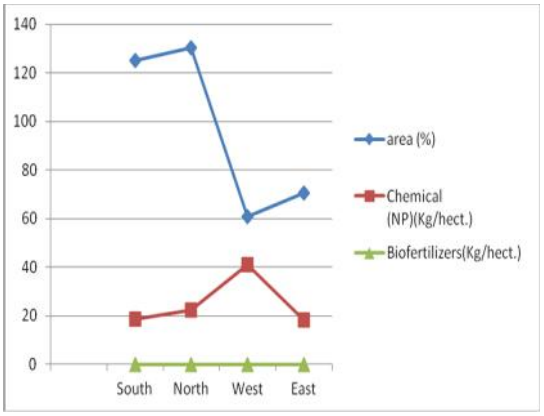
Table. 1 Use of fertilizer in selected District for crop seedling O. R-organic fertilizer. C. F-chemical fertilizer.

Use intensity of Bio fertilizers (BF) and Chemica fertilizers in Maharashtra Agriculture

Region Chemical (NPK) (Kg/hect.)

Region	Area (%)	Chemical (NP), (Kg/hect.)	Bio fertilizers (Kg/hect.)
South	125.21	18.46	0.05
North	130.43	22.32	0.01
West	60.82	40.91	0.06
East	70.63	18.32	0.01
Total	90.04	100.00	0.04

Source: Computed from FAI data. Bio fertilizers distribution data reported by units are used.



ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

Table. 2 Use of wise Use of Chemical fertilizer and Bio Fertilizer.

Chart. 2 Region wise Use of Chemical fertilizer &Bio Fertilizer.

Sr. No Fertilizer(000) M tonns	**1991-92**	**2000-01**	**2012-13**	**2013-14**	**2014-15**
1. Nitrogenous(N)	80.46	109.2	168.21	167.50	169.46
Phosphatic(P)	33.21	42.15	66.53	56.33	60.98
Potassic(K)	13.61	15.67	20.62	20.99	25.32
Total (N+P+K)	127.28	167.02	255.36	244.82	255.76
2.Consumption of Fertilizer,(Kg/Ha)	69.84	89.63	131.36	118.55	128.08

Source: State Government

Table. 3 Consumption of Fertilizers (NPK Nutrients, thousand tonnes)

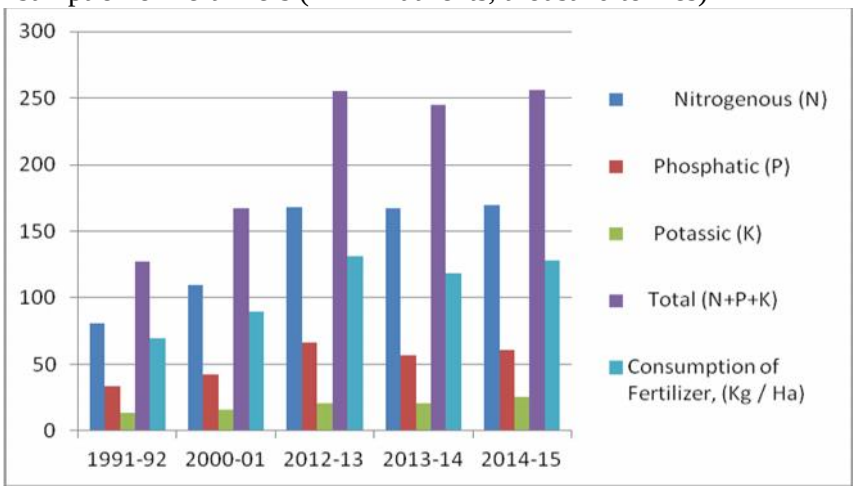


Chart. 3 Consumption of Fertilizers in Maharashtra (thousand Tonnes)

Sr. No.	District	Fertilizer consumption kg/ha.	Sr. No	District	Fertilizer consumption kg/ha.
1	Thane	121.6	17	Beed	76.3
2	Raigad	98.1	18	Parbhani	80.6
3	Ratnagiri	104.1	19	Hingoli	26.7
4	Sindhudur	106.2	20	Nanded	142.1
5	Nashik	164.5	21	Osmanabad	30.2
6	Dhule	149.6	22	Latue	107.5
7	Nandurbar	120.6	23	Buldhana	94
8	Jalgon	212	24	Akola	81.3
9	Ahmednagar	123.3	25	Washim	50.9
10	Pune	138.7	26	Amrawati	65.1
11	Solapur	115.5	27	Yeotmal	77.8
12	Satara	129.2	28	Wardha	74.9
13	Sangali	205.7	29	Nagpur	82.9
14	Kolhapur	275.8	30	Bhandara	111.9
15	Aurangabad	106.3	31	Gondia	121.2
16	Jalna	106.9	32	Chandrapur	82.3
			33.	Gadchiroli	74

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

Table. 4 District Wise Fertilizers Consumptions (2007-2008)

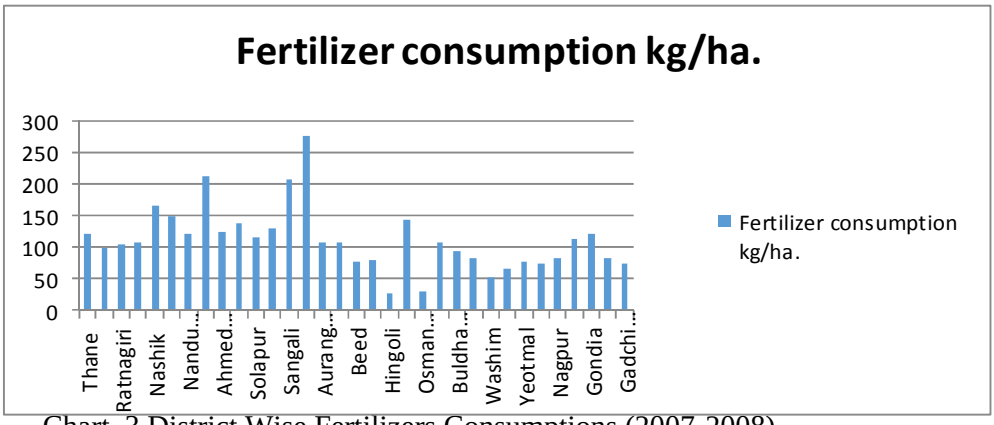


Chart. 3 District Wise Fertilizers Consumptions (2007-2008)

Pattern of potash consumption in Maharashtra

Annual consumption of potassium was meager i.e. around 3to 6 thousand tones in early 1950s and it took about 20 years to reach consumption level of 0.3 million tones. Between 1971-72 and 1991-92, potash consumption increased from 0.3 to 1.36million tones. Subsequently, decontrol of P and K fertilizers by Govt of Maharashtra in August 1992, affected consumption of phosphatic and potassic fertilizers. Due to sharp increase in prices due to decontrol, potash consumption dropped from 1.36million tones in 1991-92 to 0.88 million tonnes in 1992-93 and marginally increased to 0.91 million tonnes in the next year. With sharp decrease in potash consumption, NPK consumption ratio distorted from 5.9:2.4:1.0 in 1991-92 to9.5:3.2:1.0 in 1992-93. Realizing the gravity of the problem, the government of Maharashtra had to introduce concession scheme to increase K consumption by lowering maximum retail prices. Thereafter, K consumption has maintained pace of growth and has touched a record of 3.33 million tonnes in 2009-10.

Potash fertilizer use in Maharashtra

A small fraction of the total nutrient consumption in the country comes from use of Sulphate of potash, which is also imported. In 2009-10, Maharashtra consumed 55.1(000) tonnes of MOP of which 42.3(000) tones was used as MOP fertilizer while 12.7(000) tones was used through complexes. All Maharashtra consumption of potash as K2O nutrient and break up of potash consumption Through direct MOP, SOP and Complexes from 2001-02 to 2009-10 .Potash consumption in Maharashtra during last five years (2004-05to 2009-10) has increased by average growth rate of 10%.Average growth rate between 2001-02 and 2009-10 is 9%.

District	Ahmednagar			Kolhapur			Average Operations of both Districts		
Fertilizer	OS	IS	% over IS	OS	IS	% over IS	OS	IS	%over IS
Organic Manures (Tonnes)	11.40	6.36	79.25	12.65	7.18	76.18	11.76	6.68	75.99
Bio-fertilizers (Kg)	178.70			258.50			201.46		
Chemical Fertilizers (Kg)	-	-	-	-	-	-	-	-	-

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

Nitrogen (N)	-	341.37	-	-	378.45	-	-	355.86	-
Phosphate (P)	-	110.25	-	-	154.50	-	-	127.54	-
Potash (K)	-	77.42	-	-	86.25	-	-	80.87	-
Insecticide/ Pesticide (kg)	2.03	2.50	18.80	2.21	2.65	16.60	2.08	2.56	18.65
Irrigation (Number)	21.45	26.51	19.09	20.96	24.73	15.24	21.31	25.81	17.45

OS –organic sugarcane, IS-Inorganic sugarcane

Source: Field Survey.

Table. 5 Input Use Pattern on Organic and Inorganic Sugarcane Sample Farms are selected Districts of Maharashtra for Study (Units per ha)

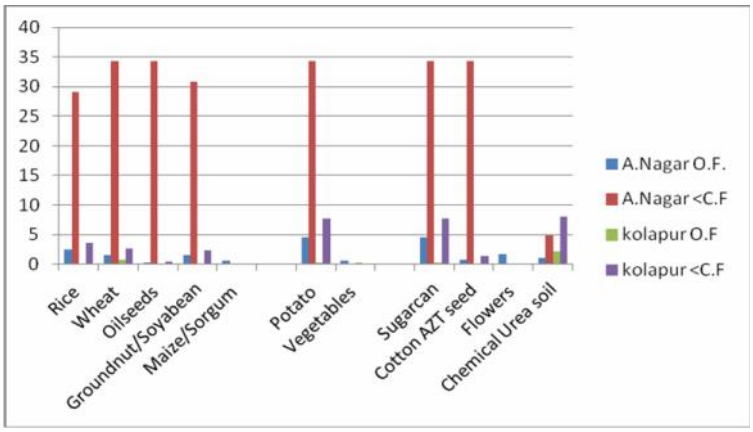


Chart. 4 Fertilizer use in selected District for crop

Conclusion

The findings of several studies indicate that excessive use of chemical fertilizers results in degradation of soil, water and environmental resources (Ghosh 2003, Pachauri and Sridharan1998, Singh et al 1987). On the other hand, the organic farming had beneficial effects on human health, sustainability of soil, water, and environmental resources and crop yields in the long run (Blaise 2006, Gareau 2004, Rahudkar and Phate 1992, Rajendran et al 2000, Singhand Swarup 2000, Thakur and Sharma 2005). It is recognized that the results of these studies are valuable to understand the benefits of various practices followed under fertilizer use in farming. However, A. Nagar and Kolhapur District for the sugarcane farming chemical fertilizer use more than organic fertilizer, the impact of organic farming on economics and other aspects of sugarcane cultivation in Maharashtra. In fact, we have not came across a single comprehensive study of that crop but also more crop are taking and impact of fertilizer on cash crop zone farming. Initial good precipitation facilitated Kharif sowing operations in full swing. During Kharif 2015,consumption of nitrogen (N) and phosphate (P2O5)increased while potash (K2O) consumption fell. During the following Rabi 2015-16 season, consumption of Nand K2O fell while P2O5 showed some improvement. Total nutrient consumption (N+ P2O5+ K2O) increased to 27 (ooo) metric tonnes (MMT) during full year2015-16 from 25.58 MMT in the previous year, registering an increase of 5.6%.Higher fertilizer consumption was met adequately by carry over inventory, indigenous production and imports. Production of fertilizers registered a growth of almost 7% in terms of nutrients in 2015-16. In terms of products, urea production increased significantly Based on

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

living microorganisms these inputs can make nutrients abundantly available in atmosphere and soil accessible for plant use without the adverse impact that chemical fertilizers have on soil, water, and air. The national scheme sought to spread the new bio fertilizer based technology through field demonstration, research, and financial assistance to investors. Based on the data provided by the Fertilizer Association of Maharashtra this study finds that despite efforts the use of the input as indicated by the distribution has not grown steadily over time, has been way below projected levels and the three has been practically no diffusion across states, with about 90% of use accounted by western and southern regions. There has been entry of new units and significant capacity built up but average capacity has come down with a marginal improvement in capacity utilization. Neem coated urea (NCU) was notified as a provisional fertilizers under the FCO, 1985 in the year 2003. In January 2015, the Government of Maharashtra removed the cap/restriction of 35 per cent on the production of neem coated urea and the indigenous producers of urea, allowed to produce neem coated urea up to maximum of their total production of subsidized urea.

• In March 2015, the Government of Maharashtra decided to make it mandatory for all the indigenous producers of urea to produce 75 per cent of their total production of subsidized urea as neem coated urea.

• In May 2015, the Government of India decided to make it mandatory for all the indigenous producers of urea to produce 100 per cent of their total production of subsidized urea as neem coated urea.it is fine to degradation of soil to chemical pollution.

References

1. Anonymous, Fertilizer Statistics, Fertilizer Association of India, New Delhi. 2008-09, 2009-10
2. Rahanul Hasan and Tiwari, K.N. Available potassium status of soils of India. Fert. Knowledge No. 1. 2002,
3. Rahanul Hasan, Potassium Status of Soils in India. Better Crops Int., 16, No 2, pp. 3-5.
4. Tandon, H.L.S.and Tiwari, K.N, Fertilizer use in Indian Agriculture- An Eventful Half Century, Better Crops India, pp. 3-4. 2007
5. Tandon, H.L.S. Soil Nutrient Balance Sheets in India: Importance, Status, Issues and Concerns Better Crops India, pp. 15-17. 2007
6. Tewatia, R. K., Potassium Nutrition for Balanced Fertilization in India: Need of appropriate policy intervention from Govt. and Fertilizer Industry, Fert. Assoc. India, New Delhi. 2010,
7. Berch, Berberogue, (ed.) Class, State and Development in India 1, 2, 3 and 4 Chapters, Sage Publications, New Delhi, 1992.
8. Karalay, G.N., Integrated Approach to Rural Development, Concept Publishing Company, New Delhi, 2005.
9. B.K. Swain, „Changing Occupational Structure in Vidarbha, India", Himalaya Publishing House, Mumbai. 1998.
10. Bhattacharyya, P. and G. Chakraborty, Current Status of Organic Farming in India and Other Countries, Indian Journal of Fertilizers, December, 1(9):111-123,2005.

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

11. Blaise, D. Yield, Boll Distribution and Fibre Quality of Hybrid Cotton (Gossypium hirsutum L.) as Influenced by Organic and Modern Methods of Cultivation, Journal of Agronomy and Crop Science, 192: 248-256,2006.
12. Dahama, A.K. Organic Farming for Sustainable Agriculture, Agrobios (India), Jodhpur, 2002.
13. Das, S. and B.C. Biswas Organic Farming-Prospects and Problems, Fertilizer News, December, 47(12): 105-118, 2002.
14. Gareau Stephen E. Analysis of Plant Nutrient Management Strategies: Conventionaland Alternative Approaches, Agriculture and Human Values, 21: 347-353, 2004.
15. Ghosh, Nilabja Organic Farming in North–East Hill Region in India, 3rd BiennialConference on "Biodiversity and Quality of Life", 18-20 December, Calcutta, 2003.
16. Goswami, S.N., N.C. Khandare, T.N. Hajare and T.K. Sen Growth Trend of Principal Crops of Maharashtra: An Analytical Approach, Journal of Maharashtra Agricultural Universities, Vol. 26, No. 1, pp. 90-93,2001.
17. GOI All India Report on Input Survey 1991-1992, Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India, New Delhi, pp. 12-28, 2000.
18. A Agricultural Statistics at a Glance, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi, 2005.
19. GOI b, Reports of the Commission for Agricultural Costs and Prices, Commission for Agricultural Costs and prices, Ministry of Agriculture, Government of India, New Delhi, 2005.

Kumar, A. and R.P. Tripathi Effect of Continuous Use of Manures and Fertilizers on Physical Properties of Soil under Paddy-Wheat-Cowpea Cropping System, Crop Research, 3: 7-13, 1990.

20. Pachauri, R.K. and P.V. Sridharan Looking Back to Think Ahead: Green India, Tata Energy Research Institute, New Delhi, pp. 346,1998.
21. Rahudkar, W.B. and P.B. Phate Organic Farming: Experiences of Farmers in Maharashtra, in Proceedings of National Seminar on Natural Farming, Rajasthan College of Agriculture, Udaipur, Rajasthan, 1992.
22. Rajendran, T.P., M.V. Venugopalan and P.P. Tarhalkar Organic Cotton Farming inIndia, Central Institute for Cotton Research, Technical Bulletin No. 1, Nagpur, 2000.
23. Samui, R.P., P.S. Kulkarni and N.G. Vaidya On Growth and Fluctuations of Production, Area and Yield of Sugarcane in the Districts of Maharashtra, Agricultural Situation in India, LXII (3): 41-52, 2005.
24. Sen, Abhijit and M.S. Bhatia, State of the Indian Farmer: A Millennium Study, Costof Cultivation and Farm Income, Vol.14, Ministry of Agriculture, Government of India, New Delhi and Academic Foundation, New Delhi, 2004.
25. Singh, G.B. and A. Swarup, Lessons From Long Term Fertility Experiments, Fertilizer News, 45 (2): 21-24.Indian Journal of Agricultural Economics, Vol. 60, (2): 205-219, 2000.
26. Vaidyanathan, A., Depletion of Groundwater: Some Issues, Indian Journal of Agricultural Economics, Vol. 51, No. 1 and 2, January- June, pp. 184-192, 1996.

ISSN
(Print) 2320 – 6446, (Online) 2320 – 8341

27. World Bank, India: Promoting Agricultural Growth in Maharashtra, Report No. 25415-IN, Vol. 1: Main Report, South Asia Region, World Bank, June, 2003.
28. Ardeshana N. J. and Khunt K. A., Gap in Fertilizer use and its Determinants among major selected crops in selected district of Maharashtra, 2011.
29. Dasguptasatpal, Diffusion of Agricultural Innovation in village India,Delhi, wiley Eastern Limited, 1989.
30. Bane Ratnadeep and Kamble H. N., Sustainable Rural Development withinclusive approach, in sight publications, Nashik, National level conference, Pp15-19, 2012.
31. Gatade, D.G., Agricultural problems and Prospects of Drought Prone Area: A case study of kavathemahankal Tahsil, Sangli District, Maharashtra. Golden Research Thoughts, Vol- I, Issue-VII. Pp- 1-4, 2012.
32. Hangaragi S. S., Spatio-temparal Changes in Cropping Pattern in Bagalkot district, Karnataka. The Deccan Geographer, Vol.49, No-1, ISSN-0011-7269. Pp-27- 40, 2001.
33. Kumbhar T. E, Viability of Krishna Lift Irrigation scheme, Takari Section, Maharastra Bhugoal ShastraS anshothan Patrika. Pp -35-46, 2011.
34. Majid Husan, Systematic Agricultural Geography, Rawat publication Jaipur and New Delhi, Pp- 357-417, 2002.
35. N. N. Firake, R.L. Takte, A.B. Bhosele and D. D. Jagtap, Effect of Drip Irrigation and Fertigation Leveal on Growth and Yield of Gerbera under Polyhouse Conditions, Journal of Agriculture Research and technology. Vol-37, No-2, Pp- 285-288, 2012.
36. Patil, B.D. and Patil, Y.V., Agricultural modernization in Dhule and Nandurbar District: A Geographical Analysis; National Geographical Journal of India, Vol-53 (3,4), Pp-57-64, 2007.
37. Magare P. Y and Suryawanshi D.S., Irrigation Intensity and their change in Jalgaon District (Maharashtra) Maharashtra Bhugoal Shastra Sanshothan Patrika, Vol-XXVII, No-1, Pp-38-46.Ibid……Pp- 40-41, 2010.
38. Rathod, H.B. and Naik, V.T., Agricultural land use cropping pattern in yavatmal district, Journal of ShodhSamikshaaurMulyankan Vol. II, Issue-6. Pp-780-782, 2009.
39. Sangar Santu, Social and Economical Change in NiphadTahsil (Nashik) By Drip irrigation, Maharashtra BhugolshastraParishad , Vol.XIX,No.1, Pp-14-18, 2005.
40. Shinde T. P., Vinod R. Veer and Sontakke, Levels of agricultural performance in satara district, Maharashtra state, Social Growth, vol. II, Pp 44-48, 2011.
41. Singh J. and Dhillon S.S., Agricultural Geography, Tata McGraw hill publishing compony, Ltd. New Delhi, Pp-113-123, 2000.
42. Sunil Kumar, Rita Dahiya, Pawankumar, B. S. Jhorar and V. K. Phogat, Long- Term Effect Of Organic Materials and Fertilizers on Soil Proparties in Pearl Millet- Wheat Cropping System, Indian Journal of Agricultural Research, Vol.46 No-2, Pp-161-166, 2012.
43. Tupe, Babasaheb K., Godekar Deepak J., Mhaske P.H and Lawande Gangadhar B. Agricultural Landuse and cropping pattern in Rahata Tahsial of Ahmednagar District in Maharashtra State. Bhugolshastra Parishad, Vol-XXVII, No.1, P-30, 2010.