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COW DUNG FOR ECOFRIENDLY AND SUSTAINABLE PRODUCTIVE FARMING

Environmental Science

KEYWORDS : Bio-fertilizers, biogas, cowdung, organic manure and green house gas.

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ABSTRACT

Cows dung is a most important source of bio-fertilizer and used in many developing countries for generating energy. It is very effective's alternatives to chemical fertilizers by enhancing productivity in long term with maintaining the soil health and enhances the microbial population. Cowdung manure and vermicompost increases soil organic matter content, and this leads to improved water infiltration and water holding capacity as well as an increased cation exchange capacity. It is one of the renewable and sustainable energy resources through dung cakes or biogas which replace the dependence upon charcoal, fuel wood, firewood and fossil fuel etc. Beside it, application of cowdung in proper and sustainable way can enhance not only productivity of yield but also minimizing the chances bacterial and fungal pathogenic disease. Therefore, improper use of cowdung should be stopped and use as organic manure for maintaining productive and sustainable farming system.

Introduction:

Cows dung is a most important source of bio-fertilizer but at the same time cow's urine, cow's horn and a dead body of a cow can be used for preparing effective bio-fertilizer. Animals can play an important role in the provision of energy either in negative way where livestock keeping contributes to deforestation in large parts of forested area or in positively, such as by transforming plant energy into useful work or by providing dung used for fuel through dung cakes or biogas to replace charcoal, fuel wood, firewood etc. Most livestock products in mixed farming systems are derived from animals that are fed on local resources such as pasture, crop residues, fodder trees and shrubs. The farm animals (cows, bullocks and milk buffaloes) provide dung and urine to enrich the soil, while crop residues and fodder form the bulk of the feed for these animals (Kesavan and Swaminathan, 2008). In our country, farming and agricultural cultivation, as per the traditional age-old system, used to be done, with cow dung amongst others serving as manure. There are a variety of cow dung and cow's urine products, which can be used as fertilizers and pest repellent respectively in agricultural practice. These products are very popular and are using day by day. Low soil fertility is one of the greatest biophysical constraints to production of agroforestry crops across the world (Ajayi, 2007). Cow dung is a very good source for maintaining the production capacity of soil and enhances the microbial population. But due to increasing population pressure and demand of food resources, there is a need of introducing a chemical fertilizer, pesticides and insecticides to the soil, which are disturbing the soil physiochemical properties including soil texture, porosity, and water holding capacity and also disturbed the soil microbial population. Therefore, improper use of cow dung should be stopped and should only be applied in the farmland instead of chemical fertilizers, so that the productivity and sustainability of soil could be maintained which will increase the production capacity of food treasure (Bargali, 2004).

Cow dung and soil productivity:

Soil provides numerous essential ecosystem services such as primary production (including agricultural and forestry products); regulation of biogeochemical cycle (with consequences of the climate); water filtration, resistance to diseases and pests and regulation of above ground biodiversity (Jhariya and Raj, 2014). Soil fertility depletion is the single most important constraint to food security. Manure is an important input for maintaining and enhancing soil fertility. As per Fulhage (2000) manure contains the three major plant nutrients, nitrogen, phosphorus and potassium (NPK), as well as many essential nutrients such as Ca, Mg, S, Zn, B, Cu, Mn etc. That, in addition to supplying plant nutrients, manure generally improves soil tilth, aeration, and water holding capacity of the soil and promotes growth of beneficial soil organisms. The application of cowdung manure and vermicompost increases soil organic matter content, and this leads to improved water infiltration and water holding capacity as well as an increased cation exchange capacity. As per Mandal *et al.* (2013) integration of inorganic, organics and biofertilizers can produce 50-92% more yield in Aonla. According to Adegunloye *et al.* (2007) C: N ratio in cowdung manure is an indication that it could be a good source of protein for the microbes which involved in decomposition of organic matter. Manure and urine raise the pH level and accelerate the decomposition of organic matter and termite activity (Brouwer and Powell, 1995, 1998). If inorganic fertilizer, especially nitrogen, is combined with manure, the manure reduces soil acidification and improves the nutrient buffering capacity and the release of nutrients (Williams *et al.,* 1995). The soil productivity is also related to available nutrient source in either through manures (dung) or chemical fertilizers (superphosphate etc). Dung increased pH, CEC, total N, organic C, loss on ignition, and exchangeable Mg and Ca. It decreased sulphate sorption. Moreover, cowdung manure plays a significant role in maintaining the nutrient status of the plant. Vermicomposting of cow manure using earthworm species *E. andrei* (Atiyeh *et al*., 2000b) and *E. foetida* (Hand *et al.*, 1988) favoured nitrification, resulting in the rapid conversion of ammonium-nitrogen to nitrate-nitrogen. Therefore it improves the nutrient cycling and helping to convert unavailable nitrogen in available forms to plants. The soil biological attributes are also responsible for determination & maintenance of physical properties of soil. The physical properties of soil in its own turn control not only the quantum of chemical properties, but also the rate of their release and availability to plants essential for metabolic processes. Thus, it may be said that soil biology is the door to maintenance of soil health (Kumari *et al.* 2014). As per Dinesh *et al*., (2000) there is a positive relationships between relevant soil properties and enzyme activities and suggested that addition of organic matter increased microbial activity/ diversity and turnover, which subsequently leads to greater enzyme synthesis and accumulation in the soil matrix. The effects of cattle dung on soil microbial biomass are also studied and compared to controlled condition of soil (no any dung application). When dung was mixed with grassland soil under controlled conditions the size of the SMB increased ($P < 0.001$). Respiration rate also increased ($P < 0.001$) and specific respiration was higher ($P < 0.05$) in soil treated with beef cattle dung than in that treated with dairy cow dung (Lovell and Jarvis, 1996).

Cowdung and Environment:

The over-dependence on fossil fuels as primary energy source has led to myriads of problems such as global climatic change, environmental degradation and various human health problems (Aremu and Agarry, 2012). Global warming caused by energy generation from fossil fuel has accelerated the deployment of renewable fuels such as biogas. Biogas is one of the renewable and sustainable alternative resources that significantly reduce greenhouse-gas emission compared to the emission of landfill gas to the atmosphere (Murphy *et al*., 2004). Biogas is produced by the anaerobic digestion or fermentation of such biodegradable materials as biomass, manure, sewage, municipal waste, green waste, plant material and crops (NNFCC, 2013). Biogas is also generated by converting cow manure via anaerobic digestion into methane biogas. One cow can produce enough manure in one day to generate three kilowatt hours of electricity whereas only 2.4 kilowatt hours of electricity is needed to power one hundred watt light bulb per one day (State Energy Conservation Office, 2009). It also has the advantage of contributing to the solution of environmental problems, because it substitutes fossil fuels (Lora and Aandrade, 2009).

Cowdung as energy resource:

Shortage of fuel wood is a major problem which forces the rural people to use a cowdung for their fuel purpose, which effects on the productivity status of cultivated land. Cowdung is a good resource for maintaining the productivity status and enhance the beneficial microbial population of soil. The share of the Indian population relying on traditional biomass for cooking stands at 72% per cent (IEA, 2011b). In the states of Bihar, Haryana, and Punjab, the percentage distribution of rural households using dung cakes as the primary cooking fuel is reaching 22%–33% per cent (TERI, 2010). This practice has a negative effect on the soil nutrient balance and consequently affects agricultural productivity. As per Bekele *et al.* (2013) annually 1999, 943, 11, 34 and 229 metric tonnes of wood, dung, charcoal, crop residue and tree residues, respectively were used by the studied households. As a result, 17.3, 4.3, 20.6, 15.6, 5.4, and 10.2 tonnes of N, P, K, Ca, Mg and Fe nutrients were lost per year in burning dung and crop residue. This improper use of cowdung should be stopped and use as organic manure for maintaining productivity and health of soil.

Cowdung and disease prevention:

Cowdung is very effective's manures for reducing the bacterial and fungal pathogenic disease. It showed positive response in suppression of mycelial growth of plant pathogenic fungi like *Fusarium solani, F. oxysporum* and *Sclerotinia sclerotiorum* (Basak and Lee, 2002). Similarly as per Mary *et al.* (1986) cowdung extract spray was also reported to be effective for the control of bacterial blight disease of rice and was as effective as penicillin, paushamycin and streptomycin. As per Pammel (1889) cowdung as organic manure increase vigour of plant and reduce the disease incidence of root rots in cotton caused by *Phymatotrichum omnivorum*. Similar investigation was done by Abawi and Widmer (2000), Akhtar and Malik (2000) and Gamiliel *et al.* (2000) and reported that organic manure reduce disease incidence caused by a wide range of plant pathogens including bacteria, fungi, and nematode species. Therefore, application of cowdung in proper and sustainable way can enhance not only productivity of yield but also minimizing the chances of disease.

Conclusion:

Due to increasing prices of chemical fertilizer and non-efficient role in long term to sustainable production, there is a need of application of organic manure including cowdung for enhancing maximum productivity in sustainable way with better soil health. It is a effective tools to improves physico-chemical and biological properties of the soil with higher yield of plants in sustained basis without deleting the fertility of soil. Cow dung is of similar importance due to its use as primary source of energy notably for cooking. Rural farmers are keen to use dung as a source of energy due to unavailability of other sources which affect the productivity. It can be also productively used for basic energy, biogas, electricity and fertilizer and has a strong socio-economic dimension. The effective use of dung would contribute to increase energy security and reduce environmental degradation and greenhouse gases.

REFERENCE

Abawi, G.S. and Widmer, T.L. (2000) Impact of soil health management practices on soil borne pathogens, nematodes and root diseases of vegetable crops. Applied Soil Ecology 15: 37-47. | Adegunloye, D.V., Adetuyi, F.C., Akinyosoye, F.A. and Doyeni, M.O. (2007) Microbial analysis of compost using cowdung as booster. Pakistan Journal of Nutrition 6: 506-510. | Ajayi, O.C. (2007) User Acceptability of Sustainable Soil Fertility Technologies: Lessons from Farmers' Knowledge, Attitude and Practice in Southern Africa. Journal of Sustainable Agriculture 30: 21-40. | Akhtar, M. and Malik, A., 2000 Roles of organic soil amendments and soil organisms in the biological control of plant – parasitic nematodes, a review. Bioresource Technology 74: 35-47. | Aremu, M.O. and Agarry, S.E (2012). Comparison of Biogas production from Cow dung and Pig dung under Mesophilic condition. International Refereed Journal of Engineering and Science (IRJES) 1(4): 16-21. | Atiyeh, R.M., Subler, S., Edwards, C.A., Bachman, G., Metzger, J.D. and Shuster, W. (2000b) Effects of vermicomposts and composts on plant growth in horticulture container media and soil. Pedobiologia 44: 579–590. | Bargali, S.S. (2004) Cow Dung Burning is a Threat to Sustainable Agriculture. National Seminar on Ecology and Environment Management: Issues and Research Needs, Department of Botany, Kurukshetra Uniersity, Kurukshetra. | Basak, A.B. and Lee, M.W. (2002) In vitro inhibitory activity of cow urine and cow dung of Fusarium solani f. sp. Cucurbitae. Microbiology 30: 51-54. | Bekele, K., Hager, H. and Mekonnen, K. (2013) Woody and non-woody biomass utilization for fuel and implications on plant nutrients availability in the Mukehantuta watershed in Ethiopia. African Crop Science Journal 21(3): 625-636. | Brouwer, J. and Powell, J.M. (1995) Soil aspects of nutrient cycling in manure experiment in Niger. In: Powell, J.M., Fernandez-Rivera, S., Williams, T.O., Renard, C. (Eds.), Livestock and Sustainable Nutrient Cycling in Mixed Farming Systems of Sub-Saharan Africa. Technical Papers, Vol. II. Proceedings of an International Conference, Addis Ababa, Ethiopia, November 22–26, 1993. ILCA, Addis Ababa, Ethiopia, pp. 211–226. | Brouwer, J. and Powell, J.M. (1998) Micro-topography, water balance, millet yield and nutrient leaching in a manuring experiment on sandy soil in south-west Niger. In: Renard, G., Neef, A.,Becker, K., von Oppen, M. (Eds.), Soil Fertility Management in West African Land Use Systems. Proceedings of a Workshop, Niamey, March 4–8, 1997. Margraf, Weikersheim, pp. 349–360. | Dinesh, R., Dubey, R.P., Ganeshamurthy, A.N. and Prasad, G.S. (2000) Organic manuring in ricebased cropping system: effects on soil microbial biomass and selected enzyme activities. Curruent Science 79(12): 1716-20. | Fulhage, C.D. (2000). Reduce environmental problems with proper land application of animal manure. University of Missouri Extension. USA. | Gamiliel, A., Austerweil, M. and Krizman, G. 2000. Non-chemical approach to soil-borne pest management-organic amendments. Crop Protection 19: 847-853. | Hand, P., Hayes, W.A., Frankland, J.C. and Satchell, J.E. (1988) Vermicomposting of cow slurry. Pedobiologia 31: 199–209. | International Energy Agency (IEA) (2011b) Technology development prospects for the Indian power sector. | Jhariya, M. K. and Raj, A. (2014) Human welfare from biodiversity. Agrobios Newsletter 12(9): 89-91. | Kesavan, P.C. and Swaminathan, M.S. (2008) Strategies and models for agricultural sustainability in developing Asian countries. Philosophical Transactions of the Royal Society B 363: 877–891. doi:10.1098/rstb.2007.2189. | Kumari, P., Mathanker, G.K., Sharma, B. and Maurya, B.R. (2014) Effect of organic amendments on microbial population and enzyme activities of soil. Journal of Crop and Weed 10(1): 64-68. | Lora, E.S. and Aandrade, R.V. (2009). Biomass as energy in Brazil. Renewable and sustainable energy- Review, Oxford.; 13: 777-88. | Lovell, R.D. and Jarvis, S.C. (1996) Effect of Cattle Dung on Soil Microbial Biomass C and N in a Permanent Pasture Soil. Soil Biology and Biochemistry 28(3): 291-299. | Mandal, K.K., Rajak, A., Debnath, S.W. and Hasan, M.A. (2013) Integrated nutrient management in aonla cv A-7in the red laterite region of West Bengal. Journal of Crop and Weed 9: 121-23. | Mary, C.A., Dev, V.P.S., Karunakaran, K. and Nair, N.R. (1986) Cowdung extract for controlling bacterial blight. International Rice Research News 11: 19. | Murphy, J.D., McKeogh, D. and Kiely, G. (2004) Technical/economic/environmental analysis of biogas utilization. Applied Energy 77: 407–427. | National Non-Food Crops Centre (2013) "NNFCC Renewable Fuels and Energy Factsheet: Anaerobic Digestion", Retrieved on 2011-02-16; Assessed on 1st June, 2013. | Pammel, L.H. (1889) Root rot of cotton. Texas Agriculture Experimental Station Bulletin 7: 1-30. | State Energy Conservation Office (Texas). "Biomass Energy: Manure for Fuel." 23 April 2009. Web. 3 October 2009. | The Energy and Resources Institute (TERI) (2010) Energy Data Directory and Yearbook. | Williams, T.O., Powell, J.M. and Fernandez-Rivera, S. (1995) Manure availability in relation to sustainable food crop production in semi-arid West Africa: evidence from Niger. Quarterly Journal of International Agriculture 34(3): 248–258.