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Integrated nutrient management through organics for crop production under rainfed areas

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ABSTRACT

The term "Organic" means living thing and farming with the philosophy of organic is to make production system living for long life. Organic agriculture/ horticulture are holistic approach for food production which promotes and enhances agro-ecosystem health including quality and healthy food. The use of chemical fertilizers efficiency of soil is going away to be deteriorating. Because little of knowledge of the farmers in using excess dose of fertilizer. To avoid such side effect of chemical fertilizers, use of organic sources of nutrients in integrated manner is today's need. Moreover, chemical fertilizers, organic fertilizers also supply the all nutrient, without upsetting of soil health. Integrated Organic Nutrient Management involves suitable combination of organic manure, crop residues, N_2 fixing crops fitting to the system of land uses and natural, social and profitable conditions. Vermicompost, farmyard manure, green manure and biofertilizer should be useful every year to supply of the plant nutrients. Since of organic fertilizers microbial movement of soil increases, improves in soil structure, aggregate stability, water holding capacity, soil aeration and increase in organic matter in soil. Plant nutrients, soil nutrients, compost, soil amendments and crop residues, farmyard manure, biological nitrogen fixation, biofertilizers are the major component of INM.

Integrated organic nutrient management refers to the maintenance of soil fertility and plant nutrient furnish at an optimum level for sustaining the preferred productivity through optimization of the benefits from all possible sources of organic and biological apparatus. The cropping system rather than an individual crop, and farming system relatively than an individual field, is the focus of awareness in the integrated organic nutrient management approaches. Organic farming has emerged as an important right of way area in view of the growing demand for safe and healthy food and long term sustainability and environmental pollution associated with more use of agrochemicals. The use of chemical inputs in horticulture is inevitable to meet the growing demand for food in India, the opportunities in selected crops and slot areas where organic production can be encouraged to tape the domestic export market. Bio-fertilizer is a substance which contains living microorganisms which, when applied to seed, plant surfaces, or soil, colonizes the rhizosphere or the interior of the plant and promotes expansion by increasing the supply or availability of primary nutrients to the host plant areas with the increasing number of such microorganisms and go faster than those microbial processes which add to the availability of nutrients that can be easily assimilated by plants. Bio-fertilizers play a very significant role in improving soil health and quality of soil by adding nutrients through the natural processes by nitrogen fixation, solubilizing phosphorus, and stimulating plant growth through the synthesis of growth-promoting substances. They are detail information being promoted to harvest the nature available, biological system of nutrient enlistment.

Common constraints in farmers : The non-availability of farmyard manure, difficulties in growing green manure crops, lack of knowledge in soil testing, non-availability of biofertilizers, high cost of chemical fertilizers, non-availability of water in kandi and undulating topography, non-availability of improved seeds, soil conditions, non-availability of credit facilities, lack of knowledge and poor not compulsory services are the major constraints in the farmers.

Integrated organic nutrient management : The major challenge in organic agriculture is the accessibility of huge quantities of organic inputs for satisfying the farmer field demand. It involves proper combination of organic manure, vermicompost, crop residues, N_2~fixing crops, other pulses and oilseeds crops. The biofertilizers are suitable to the system of landuse systems and biological, social and profitable conditions. It also involves recycling of crops residues, crop rotation and inclusion of pulses in system either in sequence or as intercrop, green manuring and off-farm waste recycling. The sustainable production in the horticulture crops maintaining natural resources and

environmental quality.

Manures : Manures are plants and animals wastes are used as sources of plant nutrients. Release nutrients after their decomposition. It can be grouped into bulky organic manures and concentrated organic manures based on the meditation of the nutrients.

Bulky organic manures : Bulky organic manures contain small percentage of nutrients and are applied in large quantities. Farm yard manure (FYM), compost and green manure are the most important and widely used bulky organic manures. They provide macro and micronutrients nutrients in soil. It can be improve soil physical properties like structure, soil aggregation, water holding capacity and bulk density etc. They are increase in the availability of nutrients to plants in soil.

Farmyard manure : Farmyard manure refers to the decomposed mixture of dung and urine of animals along with leaf litter and left over material from roughages or fodder fed to the cattle. On the average well decomposed farm yard manure contains 1.00 per cent N, 0.50 per cent P_2O_5 and 1.10 per cent K_2O. Urine, which is shattered, contains 1.00 per cent nitrogen and1.30 per cent potassium.

Compost : Rotted organic matter which is finished from waste is called compost. Compost made from farm waste like bajra straw, maize straw, paddy straw, sugarcane trash, weeds, crop residues other plant biomass and other waste are called farm compost. Nutrient values of farm compost can be increased by application of rock phosphate or superphosphate at 10 to 15 kg/t of raw material at the initial stage of filling the compost pit. The average nutrient contents of farm compost are 0.5 per cent N, 0.15 per cent P_2O_5 and 0.5 per cent K_2O. The compost made from town refuses like night soil, street sweepings and dustbin refuse is called town compost. It contains 1.5 per cent N, 0.90 per cent P_2O_5 and 1.5 per cent K_2O.

Green manure : Green manuring can be defined as a practice of ploughing or turning into the soil un-decomposed fresh green plant tissue for the purpose of improving soil health and quality, soil aggregation, physical structure and water holding capacity of the soil.

Green manuring *in-situ* : Green manuring crops are grown and buried in the same field which is to be green manure, either as a pure crop or as intercrop with the main crop. The most common green manure crops in this system are Sunhemp (*Crotolaria juncea*), Dhaincha (*Sesbania aculeata*, *Sesbania rostrata*) and cluster bean (*Cyamopsis tetragonoloba*). The common grain legumes such as cowpea, lupine and horse gram are also widely used as green manures. To make the green manuring more economical and affordable, it is also being recommended to grow legumes such as cowpea, French beans and rice beans and incorporate them after collecting the two harvest of green pods for vegetable purposes.

Introduced green leaf manuring : It refers to the collection of leaves and tender twigs, roots from shrubs and trees growing on bunds, wasteland and nearby forest areas and then incorporate them into cultivable field. They are common shrubs and trees used for introduced green leaf manuring are *Glyricidia sepium*, *Sesbania speciosa*, karanj (Pongamia glabra), Jatropha gossipifolia etc.

Potential of green manuring : Farmers can be chosen the green manure crop according to their local availability and agro-climatic conditions. Dhaincha (*Sesbania aculeata*) is commonly used and is ideal green manure crop for rice fields. Usually after the harvest of *Rabi* crop, Dhaincha is sown with the receipt of summer showers and it is ploughed and incorporated 6-8 weeks after sowing. Among the green manure crops, Sesbania aculeata is the one, which can supply highest amount of biomass and nitrogen. It is fairly drought tolerant and resistant to water logging. It is suitable for sandy loamy and clayey soils. One crop of dhaincha can add 10-20 tonnes per hectare of biomass. For sowing one ha area, 20-25 kg of seed is required. It can fix about 75-80 kg N per ha depending on the environmental conditions.

Sheep, goats and poultry manure : The excreta of sheep and goats contain higher nutrients than farmyard manure and compost. On the average, the manure contains 3 per cent N, 1 per cent P_2O_5 and 2 per cent K_2O. It is applied to the field in two ways. The sweeping of sheep or goat sheds are placed in pits for decomposition and it is applied later to the field. The excreta of birds ferment very quickly. But the left exposed, 50 per cent of its nitrogen is lost within 30 days. The average nutrient content is 3.02 per cent N; 2.63 per cent P_2O_5 and 1.4 per cent K_2O. It contains higher nitrogen and phosphorous compared to other bulky organic manures. Availability of most nutrients in poultry manures is fairly consistent, except N_2.

Bio-fertilizers :

Bio-fertilizers are the manufactured goods containing

cells of different types of micro-organisms that have an ability to mobilize nutritionally important elements from non-usable to usable form through biological development. These are the renewable sources of energy. They are environment friendly and cost effective supplement to the chemical fertilizers, laying a significant role in improving nutrients availability to the crop plants. Some biofertilizers are *Azolla*, blue-green algae (BGA), *Rhizobium*, *Azotobacter* and *Azospirillum*.

Azolla : *Azolla* can be used both as a green manure before transplanting and as a twofold crop after transplanting of rice. Both practices are feasible in India, but dual cropping is more practicable. Fresh *Azolla* is superior to dry *Azolla* if we concern N release capacity.

Blue green algae (BGA) : They are a free living N fixer that is distributed worldwide and contributes to the soil fertility in many agricultural ecosystems. Judicious use of BGA could provide nitrogen to the country's entire rice acreage as much as that obtained from 15-20 lakh tons of urea.

Phosphate solubilizing micro-organism : Phosphorus solubilizing micro-organism includes various bacterial, fungal and actinomycetes that help to convert insoluble inorganic phosphate into simple and soluble forms. Members of these groups are *Pseudomonas*, *Micrococcus, Bacillus, Flavobacterium, Penicillium, Fusarium, Sclerotium* and *Asoergillus* are some of the phosphate solubilizing micro-organisms.

Vermicompost : Vermicompost is an organic manure (bio-fertilizer) produced as the vermicast by earth worm feeding on biological waste material; plant residues. Vermi casts are popularly called as 'Black Gold'. This compost is an odorless, clean, organic material containing adequate quantities of N, P, K and several micronutrients essential for plant growth. The prime market for vermicompost is in agriculture and horticulture. Farmers are already using vermicompost in large quantities. Vermicast, also called worm castings, worm humus or worm manure, is the end-product of the breakdown of organic matter by an earthworm. It also improves soil aeration, enriches soil with micro-organisms, increase microbial activity, attracts deep-burrowing earthworms already present in the soil, improves water holding capacity and thus, enhances germination, root growth and structure of plant growth, and crop yield.

Crop residues : Crop residues can be converted to bio-composts for its effective conversion and utilization by crop plants. Study revealed that incorporation residues improved the productivity of crops. Improvements in the soil fertility might stabilize long-term yields. Mulching should be done for conserving soil fertility and reduce soil loss in kandi area.

Conclusion : Biofertilizer is to prevent pollution and to make this world healthy in a natural system. Farmers often try to use chemical fertilizers in the field for better crop production, but they are not environment friendly and responsible for water, air and soil pollution and can spread cancer causing agents. Moreover, they were destroy the fertility of the soil in a long term way. Organic residues, grasses and others when incorporated into the soil not only improve the soil properties but also improve the soil microbial life. The addition of organic residues like straw not only retards humus depletion but also enriches the nitrogen status of soil by fixing atmospheric nitrogen. As the soil organic matter is a steady supplier of available nitrogen, phosphorus, potash, calcium and other plant nutrients, lands rich in human population can support increased production without the use of chemical fertilizer.

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