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Recycling of CO_2 from Vegetable Market Waste Composting into Crop Produce for Circular Economy

Climate change and global warming made drought and flooding disasters. This may be due to industrialization and use of synthetic fertilizers that released greenhouse gases from the storage pool. In agriculture we are doing chemical farming without adding organic manures as compost. The quality available water is also decreasing. Hence are recommending millets. Similar to this we can raise aerobic rice. Moreover we are having endless waste in different sources. Hence market waste can be composted by adopting aerobic heap method. This can be applied to soil at the rate of 5 tonnes per hectare to the aerobic rice without any yield reduction.

INTRODUCTION

Aerobic rice cultivation is a method of rice cultivation followed in upland areas and water scarce low land areas where the land is capable of supplying water between rainfalls or capable of irrigation by the farmer. This requires less water. In this type requires less usage of water. Rice is directly sown in ploughed aerobic soil without puddling. Supplementary irrigation and fertilizers are also applied to grow suitable high-yielding rice crops. Traditional rice crops are grown in puddles with excess of water. It is similar to direct sown crop.

WHAT IS AEROBIC RICE CULTIVATION?

Aerobic rice cultivation refers to a method of cultivating rice crops by

direct seeding using very little water, as compared to the traditional method. Aerobic rice is the viable option where the shortage of water due to climate change does not permit the growing of lowland rice crop. The details about aerobic rice cultivation are as follows:

- The plants may be rain-fed or irrigated fully or partially.
- Geometry of planting in this type of rice cultivation, there may be a spacing of 20-25 centimeters between the seeds.
- Weeds pose problem needs control for successful Aerobic Rice Cultivation.

AEROBIC RICE CULTIVATION IN INDIA

In India, Aerobic Rice Cultivation is done by sowing in month of June and July (summer) and the harvesting is done in November and December.

Aerobic rice is grown as an upland crop in soil that's not inundated, puddled, or saturated. Aerobic rice cultivation differs in traditional puddled fields that are oxygen deficient condition called anaerobic. Aerobic rice cultivation happens on soil that is 'aerobic,' or with oxygen (air) throughout the growing season.

Seed required to raise one hectare of aerobic rice cultivation is 50 kg. Seeds are sown directly during the season. Seeds are planted 20 cm within rows and 15 cm inside rows at a depth of 3 to 5 cm.

IMPORTANCE OF AEROBIC RICE CULTIVATION

Water shortage is expected to be severe by 2025, making management difficult of the limited water for varied uses. Aerobic rice cultivation does not require huge amounts of water and is not a labour-intensive process when compared to traditional methods. Thus, Aerobic Rice Cultivation is a long-term sustainable rice production strategy that addresses water shortages and environmental concerns caused by global warm water.

The main goal of Aerobic Rice Cultivation is to improve farmers' current method of direct seeding rice in watered areas using native rice varieties. The creation of aerobic rice varieties, appropriate agro-techniques and various management strategies are currently being studied.

COMPOSTING OF MARKET WASTE

Market waste are produced in high rate and sent to the land fill for disposal along with municipal waste that creates frequent misunderstanding and even quarrel between municipal workers and market authority in management of waste. Now we are importing fertilizers to compensate nutrient requirement of farmers for crop production and on another side the nutrient are fixed in the waste in high manner. Moreover, the majority of market wastes are compostable organics with some scientific problems. Composting of the market waste will reduce sudden release of greenhouse gases to the atmosphere and also reduce environmental problems due to pollution and provide nutrient for the farmers towards crop production strategies. Literatures revealed advantages of using compost for crops.

FIELD EXPERIMENT

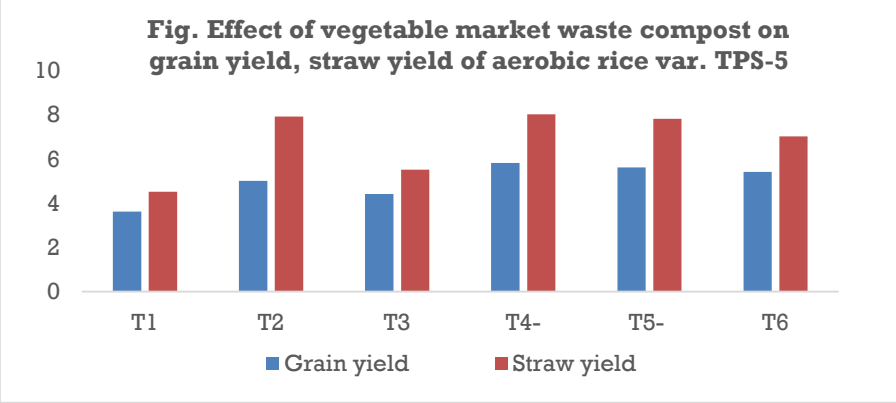
Field experiment was conducted at Agricultural Research Station, Thirupathisaram to study carbon sequestration under aerobic rice due to composted market waste application along with graded levels of recommended dose of fertilizers. Compost was applied as per the treatments. The seeds of high yielding rice variety TPS 5 were sown after ploughing during 2019. Compost was applied before ploughing and fertilizers are applied as per the treatments. Observations on compared with control to study the carbon sequestration in

aerobic rice. The result revealed that application of composted vegetable market waste with recommended dose of fertilizers increased the total carbon stocks by enhancing the carbon stored in the above ground biomass and below ground biomass and carbon stored in the soil, carbon input to the soil and carbon input into the system, straw yield and grain yield at harvest. From this study it is concluded that the market waste composted can be applied to paddy var. TPS 5 at the rate of 5 t ha^{-1} along with recommended dose of fertilizers without any yield reduction with high carbon sequestration potential.

To compost market waste compost yard may be prepared to prevent ground water pollution by leaching of nutrient to ground water. HDPE sheet of 250 GSM thicknesses and size of 4mx4m may be purchased from the market and used. Waste materials may be collected by using tippers. In big markets like APPTA market in Kanyakumari district the managers are arranging their trucks at free of cost. Market waste can compost by adopting aerobic heap method. The waste should be shredded by using shredder. Now-a-days tractor operated shredder and electric operated shredders are also available. Before shredding the metals and plastics, stones should be removed. If it is a municipal waste the waste should be called separately by source separation technique. Otherwise the waste should be composted without shredding and metals and plastics can be removed easily by pulling but it takes much time for composting. The waste may be spread at a dimension of 2mx2mx2m. Bio bio-mineralizer and nutrient N source should be applied to initiate composting. Market waste may be stacked in layers of 7.5 cm thickness on the impermeable HDPE sheet. About 8 kgs of N (17.4 kg urea) may divide into 13 equal parts and one part was sprinkled on the first layer. Similarly, 4 kg of bio-mineralizer (@ 2 kg tonnes-1 of waste) may be mixed with 40 litres of 2 per cent cow dung slurry. The cow dung slurry was divided into 13 equal parts and one part is sprayed in next layer above the first layer as microbial source. Application of bio-mineralizer followed by application of urea may be repeated till it attained 2 m height. After this water was sprinkled to maintain moisture content of 60 per cent. Then the heap may be molded by using locally prepared mud slurry. Adequate aeration holes may be provided. After maturity, the compost heap may be disturbed and the compost may be spread for curing. After about 24 hours the composted material may be sieved through 4 mm sieve to get uniform compost material. Then it should be inoculated with beneficial micro-organisms like azosspilrrum and phospho bacteria. For selling the compost one should meet quality criteris as specified by Fertilizer control order. The procedure for composting of market waste is presented Prabakaran, (2020).

APPLICATION OF MARKET WASTE ON YIELD OF CROPS

Application of compost along with recommended fertilizers increased the straw yield and grain yield.



TREATMENTS

T1-Control in which no manure is applied, T2-100 per cent N as synthetic fertilizers, T3 – Compost alone, T4-Compost +75%N and T5-Compost +50% N.

CONCLUSION

The market was can be composted and applied to the aerobic rice without any yield reduction. Application of organic manure from compost along with recommended dose of fertilizers increased the straw and crop yield. Application of compost alone decreased the crop yield. Application of fertilizers along with market waste compost is necessary to increase carbon recycling as crop produce.

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