

## IARI BEST PRACTICES

### **1. Title of the Practice**

Pusa decomposer technology for agri-waste management of ICAR-IARI

### **2. Objectives of the Practice**

India generates about 62 million tons of bio-waste every year. Not only the waste has increased in quantity, but the characteristics of waste have also changed tremendously over a period. The present practice is usually to burn these residues or to leave them to decompose in open. There is an urgent need for rapid degradation of all types of crop residues generated like paddy straw, maize stalks, sugar cane trash, flower waste, garden waste and kitchen waste as an alternate to burning. Some microbial formulations have been developed to overcome this problem but these are not easy to use under field conditions.

At IARI, New Delhi, Pusa decomposer, a consortium of seven fungi, has been developed on the basis of their lingo cellulolytic enzyme production potential. Since composting technology has been recognized as the most suitable means to convert agro-wastes into nutrient-enriched product that conditions soil and nourishes plants, this technology has great significance in the present scenario. The methodology is also tested at large scale at IARI farm for bioconversion of farm agro wastes. Currently Pusa decomposer is being provided in the form of capsules and liquid formulation and able to decompose the agri residue in-situ within 25 days. The present practice is abridging the technological gaps of fast decomposition by way of generation of data base on advancement of science for in-situ and ex-situ accelerated decomposition along with advancement of technology in terms of integration of mechanical accelerator and effective consortium for degradation. This practice is also providing economical and effective solution of menace of rice straw burning and management of agri -horti residues.

In-situ and ex-situ bio-degradation of crop residue and farm waste helps in improvement of soil health by increasing the organic carbon in soil and reduces air pollution by preventing farmers from burning of crop residue. Whenever people use synthetic chemicals, fertilizers, and manure, they estimate the cost and benefit which comes out from the investment. Manures are not so costly as compared to other synthetic materials in terms of soil health and the overall performance

of crop plants. When we use manures developed from agri-waste, there will be no cost on pesticide purchasing. Use of locally produced manure for the purpose of rehabilitation of damaged lands increases farmer income and enhances performance of crop growth and development.

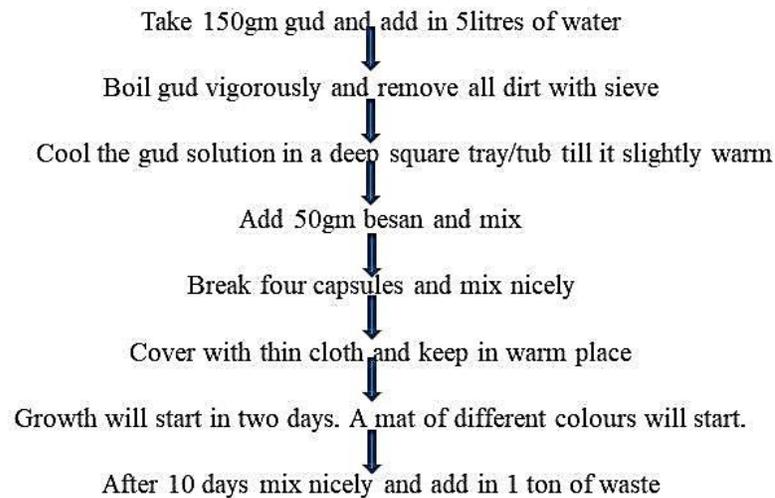
### **3. The Context**

Burning of crop residue causes damage to other micro-organisms present in the upper layer of the soil as well as its organic quality. Due to the loss of friendly pests, the wrath of enemy pests has increased and as a result, crops are more prone to disease. The solubility capacities of the upper layers of soil have also been reduced. According to a report, one tonne stubble burning leads to a loss of 5.5 kilogram nitrogen, 2.3 kg phosphorus, 25 kg potassium and more than 1 kg of sulfur — all soil nutrients, besides organic carbon. Therefore, development of fast degrading, easy to use pusa decomposer technology is giving a permanent solution to the farmer community. Farmers and entrepreneurs are relieved of disposal of paddy residue within 25 days time without burning and polluting the environment and also enhanced decomposition of paddy waste into a value added product i.e, compost would help as source of income. Industry is highly benefitted to get eco-friendly, low cost technology for farmer acceptable as well as entrepreneur adaptable Pusa decomposer formulation. This formulation is an easy to apply, appropriate formulation of the decomposer consortium which is being scaled up for manufacture and used by farmers for ex situ as well as in situ degradation of agricultural waste especially paddy straw the most highlighted waste in India. So, the current issues of air pollution caused by mass burning of crop residues is being resolved to an extent.

### **4. The Practice**

Pusa Decomposer: Division of Microbiology, ICAR-IARI, New Delhi, has developed an effective microbial solution Pusa Decomposer (both in liquid and capsule form) for accelerated decomposition of paddy straw. Four capsules of this product can be scaled up to 25L liquid formulation which can be applied in- situ to 1.0 ha of rice field having 5- 6 tonnes of paddy straw.

### Step by Step Procedure:



•If you want to upscale culture in good medium, after full growth you can add another 5litres of good and mix nicely and keep for growth for 7 days.

•During composting, once you have prepared compost, say 100 kg compost is ready, take 20 kg and mix in next 100 kg and prepare another lot of compost. Repeat this step till you get compost in same period as the first one. This means if your compost is ready in 90 days so keep on mixing compost starter till you prepare compost in 90 days but once the time changes to 100-120 days please add fresh compost inoculum.

#### **Dosage:**

- 5 litres -1ton of agri-waste
- 10 litres/acres for paddy field

Pusa Decomposer plays an important role in in-situ and ex-situ decomposition of paddy straw. For In-situ management, harvesting paddy with combine followed by chopper plus mulcher and spraying Pusa Decomposer followed by rotavator and light irrigation to keep the field moist has shown accelerated decomposition of the paddy straw and enabled the farmer to do timely wheat sowing. This was widely demonstrated in Punjab, Haryana, UP and NCR Delhi. Use of Pusa Decomposer does not provide any machine substitution. It accelerates process of paddy straw decomposition and makes the field ready for wheat sowing in 25 days. Use of Pusa Decomposer enhances chemical, biological and nutritional profile of soil.

## SOPs

- ❖ Can be applied *in-situ* to 1.0 ha of combine fitted with SMS harvested rice field having 5-6 tonnes of paddy straw
- ❖ Accelerates process of paddy straw decomposition and field ready for potato, peas and wheat sowing in 20-25 days following conventional tilling (CT) practices
- ❖ Solution for management of paddy straw in conjunction with CT, Happy Seeder and Super Seeder options.



Spraying



Rotavator



Irrigation



Sowing of wheat

### 5.Evidence of Success

Last two years in 2020 and 2021 Delhi Govt. had the Pusa Decomposer solution sprayed on farmlands (1,935 acres) in the capital and found it decayed the crop stubble in around 20-25 days in time for the farmers to make the fields ready for next crop sowing. 90% of the farmers said the stubble and straw decomposed within 15-20 days when earlier it took 50-60 days. The farmers were happy that the wheat crop benefitted, as the yield increase was found to be 8-10%. In 2021, ICAR-IARI in collaboration with a company is preparing to bring about >6000 acres under the Pusa Decomposer spray in Punjab alone for which 25,000 farmers have been selected to participate. UP Govt. is planning for 5000 ha to be brought under Pusa Decomposer. The technology has been licensed to 10 companies and each of them is keen to help the farmer to curtail the straw burning by mass production of the Pusa Decomposer product and making it readily available. Its use enriches the soil with organic carbon (OC), nutrients and soil biological and physical properties also improve. In contrast, burning of paddy straw kills beneficial microorganisms and in addition causes air pollution. Therefore, Pusa Decomposer is a long term sustainable solution for management of paddy straw in conjunction with machinery.

**This technology has been licensed to the following companies:**

<b>S.No.</b>	<b>Name of the Firm</b>
1	MD Biocoals Pvt. Ltd. Haryana
2	IPL Biological Ltd. Gurugram, Haryana
3	Vijay Sales Corporation, Sudershan Park New Delhi
4	OM Agro Organics, Yavatmal, Maharashtra
5	Krishi Vikas Sahakari Samiti Ltd., Hanumangarh, Rajasthan
6	Agrella Crop Science Pvt. Ltd, Panchkula, Haryana
7	Global Management & Engineering Consultants International, Jaipur, Rajasthan
8	Balaji operation and maintenance service Private Limited, Gurugram, Haryana
9	Grassroots Energy Technology India Pvt. Limited, Bangalore
10	Ankur Organics Biofertilizers, Lucknow
11	Microplex India
12	Parashar Agrotech Bio. Pvt. Ltd. Varanasi, Uttar Pradesh
13	Citrus Estate Hoshiarpur, Punjab
14	SRL & CO, Lewis Road, Bhubaneshwar
15	Sanguine Novaseed Pvt., Ltd. Maharashtra
16	Indore Biotech Inputs & Research Pvt Ltd., Indore, M.P
17	WStelematics
18	Maa Bhagwati Biotech & Chemicals, Maharashtra

## **6. Problems Encountered and Resources Required**

The very first problem is due to different farms sizes mainly small < 5 acres to large > 100 acres, the exact following of SOP for Pusa decomposer is not being maintained by all the farmers. Secondly, availability and accessibility of machinery for proper dissemination of technology at farmers field is utmost important. Custom hiring of spray machines like boom sprayer should be provided at village level. Thirdly, results may vary due to difference in soil texture of different areas .