

Income and employment generation

through ecofriendly utilisation of paddy straw for mushroom and vermicompost production

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Being one of the leading crop of the world, rice has played a major role in meeting the calorie demand of the population. Regardless of this fact, there are many major issues related to rice production. After crop production, the crop residues are burnt in the fields which has a negative impact on environment and human health. To make this production more usable, the by-products of rice crop can be reused or recycled for production of mushroom and vermicompost. Economically, sustainable and effective use of paddy straw will provide income and generate employment. So, the available paddy straw can be used as a substrate for production of different species of mushroom, which is often known as a nutritional food for the poor people and can be considered as one of the cheapest and economically viable biological processes to convert the organic residues to human food. The article discusses the economics, income and employment generation through ecofriendly utilisation of paddy straw for mushroom and vermicompost production with a successful case study.

Keywords: Employment generation, Paddy straw mushroom, Rice production system, Straw burning, Vermicomposting

AGRICULTURE is the primary source of livelihood for about 58% of the total population. As per FAO World Agriculture Statistics, India is the 2nd largest producer of wheat and rice which are the world's major food staples, and world's largest producer of staples such as millets and castor oilseeds, fresh fruits like banana, mango, guava, papaya, lemon, vegetables, major spices like chilli pepper and ginger, and fibrous crops such as jute. Rice is the most widely consumed staple food for over half of the human population in the world especially in Asia and Africa. Rice is the most useful crop related to human nutrition and intake of calories. It provides more than one-fifth of the calorie consumed. So in order to make the rice production system more feasible and to escalate the income and profit in rice cultivation, the by-products of rice crop are to be reused and recycled effectively. In India, production of rice-straw which is a major by-product is around 220 million tonnes by an average harvesting index of 0.45%. However presently due to lack of frugal options of utilisation of rice straw especially from the north-western states namely Punjab, Haryana and western Uttar Pradesh, the rice-straws were subjected

to blaze on field. Around 16% of crop-residues are subjected to burning in field in India, out of which 60% is rice straw. The farmers get very small time window, that is, around 20–30 days only between harvesting of *kharif* rice crop and sowing of *rabi* wheat crop during the months of October–November to prepare their fields, and therefore they opt for mass scale *in situ* burning of huge quantity of rice straw.

The problem escalates as majority of the rice cropping areas are now-a-days being harvested using combined harvester machines which cut into pieces and spread the rice residues in the fields making it very difficult to handle. Most of the farmers do not have the essential machineries like mould board plough, super seeder, happy seeder etc. to handle the chafed straw. For *in situ* management of paddy straw, farmers are left with a very limited time for land preparation for next *rabi* crop due to which rice-straw burning is spreading rapidly at an alarming rate in India, which has yielded various harmful environmental effects including air pollution and greenhouse gas emission. The emissions include poisonous gases like carbon monoxide (CO), sulphur dioxide (SO₂), nitrogen oxide (NO₂), gaseous

Table 1. Comparative analysis of economic returns of paddy-straw mushroom cultivations (4000 beds per annum)

Particulars	Quantity	Local rate (₹)	Amount (₹)
Paddy straw bundles	64000 nos.	1.00/bundle	64000.00
Mushroom spawn	4000 bottles	16.00/bottles	64000.00
Polythene sheet	25 kg	180/kg	4500.00
Gram/Chokad flour	700 kg	60/kg	42000.00
Labour cost	160 man days	370/day	59200.00
Miscellaneous (bag, tags, rose cane etc)			10000.00
Total cost			243700.00

Yield: Mushroom 3400 kg; Gross return: 3400 kg @ ₹160.00/kg = ₹5,44,000.00; Net return : ₹5,44,000.00– ₹2,43,700 = ₹3,00,300; B:C ratio : 2.23.

hydrochloric acid (HCl) etc.

Effective management and economic utilisation of paddy straw can add additional income and create scope for employment generation for rice farmers (Table 1). The available paddy straw can be used as a substrate for producing different species of mushroom which is known as a nutritional food for the people and can be considered as one of the cheapest and economically viable process for the bioconversion of lingo-cellulosic wastes. Mushroom spawns can convert paddy straw, which has less nutritional value, into a valuable and nutritious human food and animal feed. It is very popular due to its very short production period, high market demand, gender friendliness, high biological efficiency, and rich source of protein, vitamins and minerals. Our research and extension efforts did not restrict only to mushroom production, rather went ahead with the economic use of 'mushroom spent' (partially decomposed discarded paddy straw after mushroom harvest) for vermicomposting and evaluate its economics. Following aspects have been discussed here.

- Economic utilisation of paddy straw for mushroom and vermicompost production and its upscaling.



Sh. Ranjan Kumar Behera explaining and demonstrating to the visiting officials from ICAR-NAARM, Hyderabad and NRR-FFP team in his mushroom production unit

Table 2. Comparative analysis of economic returns of vermicompost production (6 beds with 3 cycles per annum)

Particulars	Quantity	Rate (₹)	Amount (₹)
Vermicompost bed	6 beds (2 year lifespan)	24000	12000.00
Cost of the shed	One shed (5 year life span)	6000	12000.00
Mushroom spent	20 tonnes	Own sources	
Cow dung	5 tonnes	1000	5000.00
Earthworm	50 kg	400	20000.00
Labour	80 man days	370	29,600.00
Miscellaneous			15,000.00
Cost of production			93,600.00

Yield: Vermicompost: 15 tonnes and Earthworm 200 kg; Gross return : ₹2,30,000; Net return : ₹1,36,400; B:C ratio : 2.45.

- Computation of economic and employment generation from vermicompost and mushroom production.

Location and technological interventions

Four cluster villages, viz. Satyabhamapur, Biswanathpur, Laxminarayanpur and Ganeswarapur of Salipur block in Cuttack district of Odisha where the ICAR-sponsored NRR-First Farmer Programme is being implemented since 2016 were selected. Out of about 1800 farm families in cluster, over eight hundred farm families were chosen accordingly for technological interventions as per the objectives of the programme. In order to learn and start mushroom production, about 200 farmwomen and educated rural youths were provided with skill training and demonstrations followed by mushroom spawn bottles, gram flour, polysheet etc. as critical inputs. Farmers got an average yield of 0.6–1.5 kg per bed in just 12–14 days. The yield and profit from mushroom followed by vermicompost cultivation encouraged unemployed youth to undertake mushroom cultivation on commercial basis. About 10 such motivated youths having entrepreneurial qualities were therefore further promoted for commercial





Sh. Ranjan Kumar Behera examining and taking care of his vermicompost beds



mushroom farming followed by economic utilization of mushroom spent, vermicomposting and market linkages.

Case study of a successful adopter of Mushroom farming and Vermi-composting

The mushroom farmer Sh. Ranjan Kumar Behera from Biswanathpur village, aged about 48 years, has successfully established himself as an entrepreneur in mushroom production and vermicomposting. He grows about 4000 beds of paddy straw mushroom per annum in his small mushroom unit by taking up 25 beds per day for 160 days in a year. He produces about 20–22 kg of mushrooms and gets a net income of ₹1500–1660 per day with a Benefit: Cost (B:C) ratio of 1: 2.23. Through mushroom production, he generates 150–160 man days/annum. Besides, he utilises the mushroom spent for vermicompost production and produces about 15 tonnes of vermicompost per annum which helps him for gainful management of residues to produce valuable farm inputs. The learnt lesson was that a mushroom farmer can earn a net additional income of ₹28000–30000 per month by growing only 25 beds per day for at least 160 days in a year and vermicomposting of 2 beds for 3 cycles per annum (Table 2). More importantly, he can contribute to massive reduction in environmental pollution caused due to straw burning.

Way forward

- There is enormous opportunity of expanding mushroom and vermiculture farming throughout the country. Considering the country's limited land,

over and unemployed population, strengthening the production of mushroom and vermicompost could be one of the sustainable options for the development of rural economy.

- Through these feasible options of utilizing rice by-products, the country can achieve socio-economic wellbeing of its people, while addressing the issue of straw burning and environmental pollution.

SUMMARY

The enterprise-based module of NRRI-Farmer FIRST Programme has improved the livelihood as well as nutritional security of the several families by adopting production of mushroom and vermicompost. Mushroom cultivation has ensured enhancement of family income with less investment and high returns. By growing paddy straw mushroom 4000 beds/annum, a farmer is getting a net return of ₹300000.00 and 160 mandays employment per year. Mushroom farming has been introduced and propagated as an enterprise in the cluster which has resulted in additional family income adding to family nutrition. Besides, producing vermicompost by utilising mushroom spent generated from 4000 beds, a farmer can earn additional net income of ₹136000.00 and 80 mandays employment. The available surplus paddy straw can be used for commercial production of mushroom and vermicompost.

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Coco hybrid 'VTLCP-9'

Cocoa VTLCP-9 is a promising hybrid (I-56 × III-35) with 3 kg dry beans/tree/year yield. The hybrid is suitable for chocolate industry with 12–13% shelling, 87–88% nib recovery and 50% fat content. It is tolerant to black pod rot and tea mosquito bug.

Source : ICAR Annual Report 2020-21

