

Economics of *Pleurotus sajor-caju* (Fr.) Singer cultivation and rural development of West Bengal

M. K. BHATTACHARYA AND N. SAMAJPATI*

*Department of Botany, The Australia National University, G.P.O. Box 4
Canberra, ACT 2601, Australia*

In this paper on the basis of available information the economics of *Pleurotus sajor-caju* (Fr.) Singer cultivation have been evaluated. The possible role of the cultivation of this mushroom on the development of the rural economy of West Bengal has also been discussed.

Key words : Economics, cultivation, *Pleurotus sajor-caju*, rural economy, West Bengal

In developing countries like India, pressures of the continuously expanding population, associated with protein deficiency and limited energy supply, have led the food scientists to seek new sources of protein. In recent years attention is being paid to the use of mushrooms as a source of protein to enrich human diets (Flegg and Maw, 1976; Hayes, 1978; Chang, 1980). Fortunately mushrooms have traditionally been considered as a food of high quality with a pleasant flavour and appealing texture (Bano and Rajarathnam 1982; Crisan and Sands, 1978). So the cultivation of tropical mushrooms is becoming commercialised and simple techniques applicable to rural sectors are being developed (Bano and Rajarathnam, 1978-79, Bano *et. al.*, 1979, Bhattacharjee *et. al.*, 1989; Jandaik and Kapoor, 1974). In West Bengal, the economy is still basically agricultural, consequently there is an abundance of cheap agricultural waste products like rice straws which can be effectively utilised for growing tropical mushrooms. Although rice straws are mainly used in West Bengal for the construction of thatched houses and as fodder, a large amount of surplus straws either remain unutilised or burnt

*Department of Botany, Calcutta University, Calcutta-700 019, India

in the fields. This is undoubtedly a terrible waste of energy and poor utilisation of straws. Recycling these straws for the production of protein rich mushroom such as *Pleurotus sajor-caju* will be of great value to the poor farmers enabling them to raise their annual income.

In the present paper attempt has been made to evaluate the economics of *Pleurotus sajor-caju* cultivation and its place in the rural economy of West Bengal.

In the rural areas of West Bengal, for any farmer to start the cultivation of mushrooms it is desirable to start initially at small scale with provision of further expansion as and when needed.

With this idea, an approximate income and expenditure analyses of a small sized mushroom farm is presented here for cultivation of *P. sajor-caju* by three different systems (Tables 1, 2 and 3).

Table 1. *Small sized mushroom farm (for cultivation in earthen trays)*
500 trays, each tray of 56.4 cm radius

A. Running cost		
Paddy straw 750 kg. @ Rs. 0.60 per kg. of straw	...	Rs. 450 00
Spawn bottles 1000 @ Rs. 2.00 per bottle	...	Rs. 2000.00
Wheat grain 250 kg. @ Rs. 2.50 per kg of wheat grain	...	Rs. 625.00
NPK fertiliser 21.50 kg. @ Rs. 6.00 per kg. of NPK	...	Rs. 129.00
Miscellaneous (water, fungicides, insecticides etc.	...	Rs. 500.00
B. Capital cost		
Earthen trays 500 @ Rs. 6.50 per tray	...	Rs. 3250.00
Polythene sheets 800 sq.m. @ Rs. 3.00 per sq.m	...	Rs. 2400.00
C. Interest on loan @ 10% on the capital cost	...	Rs. 565.00
D. Total expenditure	...	Rs. 4269.00
E. Expected yield @ 3 kg/sq.m		
—1500 kg.		
Income @ Rs. 10.00 per kg.	...	Rs. 15,000 00
F. Net income	...	Rs. 10,731.00

The data provided in Tables 1, 2 and 3 have been drawn up for three different systems of cultivation, respectively: cultivation in earthen trays, cultivation in soil beds, and cultivation in nylon bags. The same quantities of rice straw and wheat grain substrates are used in each case as the basis for the comparison. The prices of these and others requirements are as at 1985.

Table 2. *Small sized mushroom farm (for cultivation in soil beds)*
500 beds, each bed of 1 sq.m. size

A. Running cost		
Paddy straw 750 kg @ Rs. 0.60 per kg of straw	—	Rs. 450.00
Spawn bottles 1000 @ Rs. 2.00 per bottle	—	Rs. 2000.00
Wheat grain 250 kg @ Rs. 2.50 per kg of wheat grain	—	Rs. 625.00
NPK fertiliser 21.50 kg @ Rs. 6.00 per kg of NPK	—	Rs. 129.00
Miscellaneous (bamboos, water, insecticides, fungicides etc.)	—	Rs. 800.00
B. Capital cost		
Cost of the land for cultivation @ Rs. 5,000 per 720 sq.m.	—	Rs. 5,000.00
Polythene sheets 1500 sq.m. @ Rs. 3.00 per sq.m.	—	Rs. 4500.00
C. Interest on loan @ 10% on the capital cost	—	Rs. 950.00
D. Total expenditure	—	Rs. 4954.00
E. Expected yield @ 3.53 kg sq.m.-1765 kg.		
Income @ Rs. 10.00 per kg	—	Rs. 17650.00
F. Net income	—	Rs. 12696.00

Table 3. *Small sized mushroom farm (for cultivation in Nylon net bags)*
500 Nylon net bags, each bag of 100 cm.x50 cm. size

A. Running cost		
Paddy straw 750 kg @ Rs. 0.60 per kg of straw	—	Rs. 450.00
Spawn bottles 1000 @ Rs. 2.00 per bottle	—	Rs. 2000.00
Wheat grain 250 kg @ Rs. 2.50 per kg of wheat	—	Rs. 625.00
NPK fertiliser 21.50 kg @ Rs. 6.00 per kg of NPK	—	Rs. 129.00
Miscellaneous (bamboos, water, fungicides, insecticides etc.)	—	Rs. 800.00
B. Capital cost		
Nylone net bags 500 @ Rs. 6.00 per bag	—	Rs. 3000.00
Polythene sheets 800 sq m. @ Rs. 3.00 per sq.m	—	Rs. 2400.00
C. Interest on loan @ 10% on the capital cost	—	Rs. 540.00
D. Total expenditure	—	Rs. 4544.00
E. Expected yield @ 4.32 kg per nylon bag-2160 kg.		
Income @ Rs. 10.00 per kg.	—	Rs. 21600.00
F. Net income	—	Rs. 17056.00

It can be seen by comparison between the tables that, based upon these estimations, cultivation in nylon bags offers the best potential return: Rs. 17056 for a crop compared with Rs. 12,000 for soil beds and Rs. 10,751 for earthen trays.

Further more, with the gradual increase in the rural population there has

been a gradual decline in the area of available agricultural land and simultaneously the cost of land has gradually gone higher. So, for landless labourers and marginal farmers the cultivation of *P. sajor-caju* in soil bed will neither be feasible nor economically suitable. In case of earthen tray system the major constraint is the same i. e., for keeping the trays space is required. Again the cost of a tray is more as compared to the cost of a nylon net bag.

But in case of nylon net bag system, the nylon net bags can be kept in hanging condition on bamboo frames or wooden frames in the huts or thatched houses of the poor farmers. Again with the gradual expansion of small scale cottage industries in the rural areas the hand made nylon net bags are durable, cheaper and easily available. So, it is possible to make the cultivation of this mushroom by nylon net bag profitable and economically viable which is further evidenced by the fact that it is possible to make a net income of Rs. 17056.00 per annum i.e., a monthly income of Rs. 1421.33 per month from a small sized mushroom farm with 500 nylon net bags. This income is beyond the expectation of any farmer in West Bengal at present.

Improvement of Rural Economy

In spite of vast sums of money invested for the development of the rural areas, the economic standard of life in the villages has not improved much. So a programme for the rural development is thus urgently needed. According to the rural statistics of West Bengal as given in Table 4 more than 73.51% of the people are residing in the rural areas. As the cultivators and agricultural labourers which constitute a large section of the rural population are suffering from poverty so rural development based on scientific utilisation of all our resources is basically required. It is now seriously realised that to prevent the increasing trend of migration of people and resources from the rural to urban areas, the financial condition of our cultivators should be improved. This vital problem can be solved to a significant extent by the cultivation of *P. sajor-caju* in the rural areas by our cultivators.

The potential of mushroom production in the rural areas of West Bengal considering the total number of cultivators, total number of nylon net bags (estimated at 50 bags per annum per cultivator), estimated production of mushroom and the estimated value of mushroom from sale are presented in the Table 5. The data given in the Table 5 show that there exists high potential of mushroom production in the rural areas of West Bengal and thereby the cultivators can increase their earnings and raise their standard of living.

In West Bengal rice is the principal crop followed by wheat. The rice and wheat straws are mainly used as fodder and for the construction of huts in the villages. The surplus straws from fodder and other needs can be utilised

Table 4. Rural statistics of West Bengal*

1. Total area of West Bengal (in hectares)	— 8785300
2. Total population	— 54485560
3. Rural population	— 40052074
4. No. of cultivators	— 4751647
5. No. of agricultural labourers	— 3848852

*Data obtained from Census report 1981 and Socio-economic And Evaluation Branch, Directorate of Agriculture, Govt. of West Bengal.

profitably for the cultivation of *P. sajor-caju*. The estimated surplus of rice straw and wheat straw from fodder and other needs, the potentials of mushroom production from surplus straws and the estimated values of mushrooms from sale are presented in the Table 6 and the Table 7 respectively. If the fodder situation and the housing problems in the rural areas improves then it will be possible to divert more straws for mushroom cultivation.

Table 5. Potential of mushroom production in the rural areas of West Bengal

1. Total number of cultivators	— 94635
2. Total number of nylon net bags (estimated at 50 bags per annum per cultivator)	— 4731750
3. Estimated production of mushrooms (average of 4.2 kg/bag*)	— 19,873,350 tonnes
4. Estimated value of fresh mushrooms (Rs. 10 per kg. of mushrooms)	— Rs. 19,87,33,500

*Estimated on the basis of data in Table 4.

Since the income of the majority of cultivators is poor, they have to borrow money even at high rate of interest as their total income are insufficient for their up keep through out the year even at the lowest standard of living. So a solution to this vital rural problem is the development of small scale mushroom farms in the rural areas for the cultivation of *P. sajor-caju* as because its economic potentialities are very bright as revealed by the Tables 5, 6 and 7. This will help them to supplement their present income.

Table 6. Data on the resource for cultivation of *P. sajor-caju* in West Bengal

1. Total area under rice cultivation*	— 5176.2 hectares
2. Total quantity of rice grains produced*	— 7465.6 tonnes
3. Estimated amount of rice straw produced	— 11198.4 tonnes
4. Estimated surplus of rice straw from fodder and other needs (at 20%)	— 2239.68 tonnes
5. Potential of mushrooms production from surplus rice straw (estimated at 1228.7 kg. per tonne)	— 2751.89 tonnes
6. Estimated value of fresh mushrooms (Rs. 10 per kg. of mushrooms)	— Rs. 2,75,18,900

*Data obtained from 'Estimates of area and production of Principal crops in West Bengal 1980—1981'.

Table 7. Data on the resource for cultivation of *P. sajor-caju* in West Bengal

1. Total area under wheat cultivation*	— 283 hectares
2. Total quantity of wheat grains produced*	— 473.2 tonnes
3. Estimated quantity of wheat straw produced	— 613.16 tonnes
4. Estimated surplus from fodder and other needs (at 20%)	— 123.03 tonnes
5. Potential of mushroom production from surplus wheat straw (estimated at 662.85 kg tonne*)	— 81.55 tonnes
6. Estimated value of fresh mushrooms (Rs. 10 per kg of mushroom)	— Rs. 8,15,500

*Data obtained from 'Estimates of area and production of Principal crops in West Bengal 1980—1981'.

CONCLUSION

Pleurotus sajor-caju Offer us one of the best prospects for producing food rich in proteins and vitamins from rich straws. We can do so with a minimum of energy demand and in a minimum space. Moreover, mushroom cultivation in the rural areas also labour oriented and this state with lot of agricultural labourers and unemployed people in the rural areas, the cultivation of *P. sajor-caju* under small scale farms is economically feasible and since the cultivation techniques are simple, requires less finance but yields lucrative profits and the easy availability of rice straws substantially establish that by improving and increasing the cultivation of *P. sajor-caju* in rural areas the rural development could possibly be promoted.

REFERENCES

- Bano, Z. and Rajarathnam, S. (1978-79). Studies on the nutrition during fructification of *Pleurotus sajor-caju*, *Annual Report, Central Food Technology Sesearch Institute*, Mysore, India.
- Bano, Z., Nagaraja, N., Rajarathnam, S. and Patwardhan, M. V. (1979). Cultivation of *Pleutotus* species in a village model hut. *India Fd. Packer* 38(6), 19-25.
- Bhattacharjee, M. K., Samajpati, N. and Chilvers, G. A. (1989). Studies on the effect of different amounts and methods of applying spawn on the yield of *Pleurotus sajor-caju* (Fr.) Singer. *Indian J. Mycol. Res.* 27,
- Bano, Z. and Rajarathnam, S. (1982). *Pleurotus* mushroom as a nutritious food. In *Tropical mushrooms-biological nature and cultivation methods*, edited by S. T. Chang and T. H. Quimio, pp. 363-377, The Chinese University Press, Hongkong.
- Crisan, E. V. and Sands, A. (1978). Nutritional value of edible mushrooms. In the *Biology and Cultivation of edible Mushrooms*, edited by S. T. Chang and W. A. Hayes, pp. 137-168, Newyork : Academic Press.
- Chang, S. T. (1980). Mushrooms, as human food. *Bioscience*. 30, 399-401.
- Flegg, P. B. and Maw, G. A. (1976). Mushrooms and their possible contribution to World protein need. *The Mushroom Journal*. 48, 396-405.
- Hayes, W. A. (1978). Mushroom growing in the third world—its significance and possible consequences. *The Mushroom Journal*, 68, 244-251.
- Jandaik, C. L. and Kapoor, J. N. (1974). Artificial cultivation of *Pleurotus sajor-caju* (Fr.) Singer. *The Mushroom J.* 22, 495.

(Accepted for publication 5th May 1991)