ABSTRACT

Jharkhand agriculture a rainfed one characterized with ninety percent cultivable area monocropped with rice only. On one hand there is need to enhance productivity of agricultural crop, other hand priority should be given for profit enhancement. Lac is a major source of rural livelihood in Jharkhand. Major lac host species like Butea monosperma (palash), Zizyphus mauritiana (ber) and Schleicheria oleosa (kusum) are available in plenty in forest as well as on own gravel upland which is otherwise not under cultivation and are wasteland. Diversifying the existing agriculture system through inclusion of lac not only enhances the profit margin of the production system but also developed entrepreneurial behavior of the main actor of the system. In this background lac cultivation interventions was introduced in rice based monocropping system. Inclusion of Lac on abandoned tree of Butea monosperma and Zizyphus mauritiana fetch good economic return to the farm families with net return of Rs. 25090 per hectare and Rs. 7480/ha respectively from kusum lac and rangeeni lac, whereas in upland rice net return was only Rs. 3804/ha. The benefit per rupee of investment is lowest in case of growing only rice with Rs. 2.08 and maximum benefit was Rs. 5.14 in case of lac on ber. Lac cultivation on different host trees were compared and it was found that...
1. INTRODUCTION

Over-dependence on monsoon and limited scope for area expansion made agriculture development is critical to generate employment and additional income for the rural poor at the micro-level of the rural economy. Enhanced productivity, profitability and competitiveness surface as the main sources of agricultural growth for the future. The major part of the agricultural population is small and marginal farmers who are economically vulnerable and poor. The consequence of inclement weather on crop production affects even the livelihoods of farmers. In the changing scenario improvements in farmers’ productivity and competitiveness, diversification of agriculture has been acknowledged to enhance profit, generate additional employment for rural masses and to conserve the natural resources.

Integration of different component at farm level is the need of the hour to enhance the profitability of the agriculture production system.

Jharkhand state the resource-rich state playing monocropping in rainfed agriculture with small undulated upland. The rural economy is the mixed type where forest produces particularly lac play an important role. To enhance the rural economy, integration of agriculture with forest-based intervention appears to be a viable option to enhance the profits and productivity of upland which is almost sixty per cent of total cultivable land. Free grazing made imperative the second crop, even though moisture is available. Continuous aberrant weather demands the inclusion of forest resources to be exploited in a diversified and integrated manner as forest interventions require little water.

Biological efficiencies can lead to management options that differ from those in monoculture agriculture.[7] Diversification and intensification of the rice-based system to increase productivity per unit resource are very pertinent. Crop diversification show a lot of promises in alleviating these problems besides, fulfilling basic needs for cereals, pulses, oilseeds and vegetables and, regulating farm income, withstanding weather aberrations, controlling price fluctuation, ensuring balanced food supply, conserving natural resources, reducing the chemical fertilizer and pesticide loads, ensuring environmental safety and creating employment opportunity [1]. Crop diversification has been recognized as an effective strategy for achieving the objectives of food security, nutrition security, income growth, poverty alleviation, and employment generation, judicious use of land and water resources, sustainable agricultural development and environmental improvement[2]. The crop diversification may enhance profitability, reduce pests, spread out labour more uniformly, reduce risks from aberrant weather by different planting and harvesting times and source of high-value products from new crops [3]. In the era of the shrinking resource base of land, water and energy, resource use efficiency is an important aspect for considering the suitability of a cropping system [4]. Hence, selection of component crops needs to be suitably planned to harvest the synergism among them towards efficient utilization of resource base and to increase overall productivity [5].

Lac has been a traditional source of livelihood for thousands of tribal families living in the forest fringes. These families primarily depend on agriculture for their livelihood, which is insufficient to provide them with food security and round-the-year income. Poor families living in forests and forest fringe villages have historically suffered from challenges like an infertile or barren land, low asset base, lack of irrigation facilities, small land holding, poor linkages with the market and their low risk-bearing capacity, forcing them to migrate in search of work. Lac cultivation with host resources readily available within the periphery of their habitat does provide appreciable income. Lac host plants are abundant but Lac which is a traditionally grown enterprise was almost stopped due to non-availability of brood lac at the local level and poor institutional support and inter-institutional linkages.

Keywords: Profit maximization; lac enterprise; lac cultivation.
Considering the above generalization experiments were carried out in two blocks of Saraikela-Kharasan district in Jharkhand with the objective of profit maximization of upland production system through the inclusion of lac production in monocropped area with rice.

2. METHODOLOGIES

The experiments were carried out in the purposively selected state of Jharkhand. Two blocks namely Nimdih and Ichagarh were selected. Fifty respondents on whom field front line demonstration (FLDs) were conducted on lac cultivation were selected from Lakri, Tengadih and Gorangkocha villages. FLDs were carried out on five lac host tree per farm families in and around bund of rice plot. Crop production data for rice were taken for one acre of land.

The data were collected by personally interviewing the respondents through a structured schedule. Apart from the use of schedule, detailed information was collected through informal discussion with the respondents and by critically scrutinizing the practices followed for vegetable production. Use of PRA tool, field observation and non-participant observation techniques were thoroughly used. Field observation was done in the rice field. “Focused Group discussion” of PRA was also followed to gather data on the opinion of respondent’s towards the demonstrated technology.

After collection, the data were systematically arranged and tabulated for analysis and interpretation. The statistical techniques used for the analysis of data under the study included mean yield, the net return, B: C, increase in family income in Rs./year.

For economic analysis, economic evaluation data of crops were used. The gross cost of cultivation was calculated based on different operations performed and materials used for raising the crops.

2.1 Conceptual Background

Lac is the hardened resin, secreted by the tiny lac insect belonging to a coccid group. The widely known Indian Lac insect is Laccifer laca. Lac insect settles on the twigs of certain host trees, suck the plant sap and grow, all the while secreting lac resin from their bodies. Since the insects are closely spaced on the twigs, the resin forms continuous encrustations over the twigs of the host trees.

Two strain of lac insects are cultivated grown in the district i.e. rangeeni on Butea monosperma (palash), and Zizyphus mauritiana (ber) kusmi on ber and Schleichera oleosa (kusum) tree. So ber tree plays an important role in the production of brood lac as it can play as an alternate host for rangini as well as kusmi. Both palash and ber tree are available in plenty and around bund of upland and their economic use had been stopped for many years. Also, gravel upland rice undergoes climatic stress every year so economic utilization of these appears to be a viable option to integrate the resource to cope up climatic stress also.

Recent studies carried out by Indian Institute of Natural Resin and Gums (IINRG), Ranchi revealed that the income form lac cultivation is about 28% of their total agricultural income. And most of the lac growing families are among the poorest of the poor in the state. The cultivation is done extensively in the remote interior pockets of the state. Further, it was also reported that despite the presence of a large number of host trees, lac cultivation is carried only on a few host trees.

Cultivation of lac is simple and investment is very low. It is eminently suited to the farmers living in the vicinity of the forests including women as it demands only their part-time attention. In the district, its cultivation provides an important additional income next only to agriculture. Farmers are also dependent on lac cultivation for their livelihood and Lac is regarded as an important source of cash flow to the marginal, small and large farmers in the district.

While conducting PRA by Krishi Vigyan Kendra, in the study area it was observed that palash, ber tree are available on upland but not utilized for lac and hence farmers take only rice crop. Although is some families still cultivating lac traditionally. Their institutional support very meagre and also lack of institution at the local level is a major constraint in stopping this enterprise to scale up. Although different species of lac host tree are available but poor technical knowledge for its utilization leads to scarcity of brood lac at the local level. If these lac hosts could be utilized for cultivation of lac, it would not only increase the national production of lac and add to the income of the farmers but also help prevent indiscriminate felling of trees for fuel and timber purposes.
3. RESULTS AND DISCUSSION

3.1 The Economic Return of Intervention

The result recorded maximum gross return obtained from kusumi lac on ber tree with Rs. 31150.0 followed by rangeeni lac on palash with 11940.0 followed by upland rice with Rs. 7304.0 (Table 1.) Inclusion of Lac on the abandoned tree of palash and ber fetch good economic return to the farm families with a net return of Rs. 25090.0 and Rs. 7480.0 respectively in kusumi lac on ber and rangeeni lac on palash respectively, whereas in upland rice it was only Rs. 3804.0.

The benefit per rupee of investment is lowest in the case of growing only rice with Rs. 2.08 and the maximum benefit was Rs. 5.14 with per rupee investment in case of lac on ber tree whereas benefit per rupee investment was found Rs.2.67 in production of rangeeni lac on palash tree.

In respect of net return in family income per season (i.e. 4 months) the kusumi lac cultivation on Z. mauritiana was highest (Rs. 21286.0). This is followed by rangeeni lac cultivation on B. monosperma (Rs.3676.0). Thus this net increase for kusumi lac cultivation is around 5.8 fold. This is because kusumi lac is more productive than rangeeni and also the tree of Z. mauritiana is very suitable for kusumi lac and farmers fetch the price from brood lac, they sold. Besides the market price of kusumi lac is around 20 per cent higher than rangeeni lac.

Although labour cost incurred for pruning was at par in both rangeeni and kusumi lac labour cost was more in the harvesting of stick lac of rangeeni but it was lighter for the harvest of sticklac of rangeeni than that of kusumi. Ber tree is more family labour friendly. Even women can harvest sticklac and also it took less time in scraping. Rice cultivation was traditional intervention on upland and palas and ber tree was traditionally grown on the bund of upland. Aberrant weather influences adverse effect on the production of rice over the years but its impact on the yield of lac was not significant.

3.2 Integration of Lac Enterprise in the Existing Crop Production System

The study suggested that inclusion of lac cultivation on host trees available locally in and around bunds of rice plot was found a profitable combination to raise the family income of respondent lac growers. The net return was found Rs. 36374.0, Rs. 28894.0, Rs. 11284. and Rs.3804.0 in rice with lac cultivation on palash and ber tree, rice with lac on ber, rice with lac on palash and only rice crop. Similarly Benefit in per rupee investment was found 3.59, 4.83, and 2.41 and 2.08 accordingly.

It was observed that the highest net return was obtained in rice with lac on palash and ber tree, whereas profit per rupee investment was highest in rice with lac on ber tree. Price of kusumi lac has been always more in the local market than rangeeni lac. Besides sustainability on kusumi lac cultivation is better than rangeeni as revealed by the respondents. Respondent lac growers opined that lac cultivation on ber is profitable and easy than rangeeni lac on palas. The cost involved for the scraping of lac from palas tree is higher than on ber. The recovery of scrapped

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Mean Yield (Rs./season)</th>
<th>Gross return (Rs.)</th>
<th>Net return (Rs.)</th>
<th>Net Increase in family income (Rs./season)</th>
<th>%Increase in family income</th>
<th>B:C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice (q/acre)</td>
<td>4.20</td>
<td>7304.0</td>
<td>3804.0</td>
<td>-</td>
<td>2.08</td>
<td></td>
</tr>
<tr>
<td>Lac on Palash (kg/five tree)</td>
<td>78.6</td>
<td>11940.0</td>
<td>7480.0</td>
<td>3676.0</td>
<td>96.63</td>
<td>2.67</td>
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<tr>
<td>Lac on ber (kg/five tree)</td>
<td>123.6</td>
<td>31150.0</td>
<td>25090.0</td>
<td>21286.0</td>
<td>559.56</td>
<td>5.14</td>
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<table>
<thead>
<tr>
<th>Intervention</th>
<th>Gross return (Rs.)</th>
<th>Net return (Rs.)</th>
<th>B:C</th>
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<tbody>
<tr>
<td>Rice</td>
<td>7304.0</td>
<td>3804.0</td>
<td>2.08</td>
</tr>
<tr>
<td>Rice + Lac on palash</td>
<td>19244.0</td>
<td>11284.0</td>
<td>2.41</td>
</tr>
<tr>
<td>Rice + Lac on ber</td>
<td>38454.0</td>
<td>28894.0</td>
<td>4.83</td>
</tr>
<tr>
<td>Rice + Lac on palash + Lac on ber</td>
<td>50394.0</td>
<td>36374.0</td>
<td>3.59</td>
</tr>
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</table>
lac is more than two times in case of palas and thus adding more income.

4. CONCLUSION

Based on findings of this experiment it can be concluded that under conditions of Jharkhand (rainfed monocropping), upland rice with lac cultivation on ber was more productive, sustainable, resource-use efficient, and remunerative. Since there was abundant of the lac host tree and most of them were on the bund and on upland which otherwise was non-productive if this resource made productive through this intervention it will change the economic situation of villages. Thousand of the tree can be added in the rural economy. It will not only add the additional income to farmers pocket but also bring greenery to the village as the felling of the tree will be checked. It will directly influence the farming ecology and farmers can cope up with aberrant weather. Planting of ber tree on paddy bunds will be more economic farming approach.

It will be proved an effective strategy for achieving the objectives of food security, income growth, poverty alleviation and employment generation, judicious use of resources, sustainable agricultural development and environmental improvement.

A climatic resilient combination of crop and forest product will harvest the synergism among them towards efficient utilization of resource base and to increase the overall productivity of upland, through agro enterprise convergence revolves around the interactive use and efficient utilization of land, labour, capital cum available resources. Economic analysis of the intervention concludes that lac cultivation in upland host tree which otherwise was abandoned can be advocated for the income security and sustainable livelihood support of small and marginal farmers. Low risk and less labour requirement also make it women-friendly. It will raise the village economy at the household level.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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