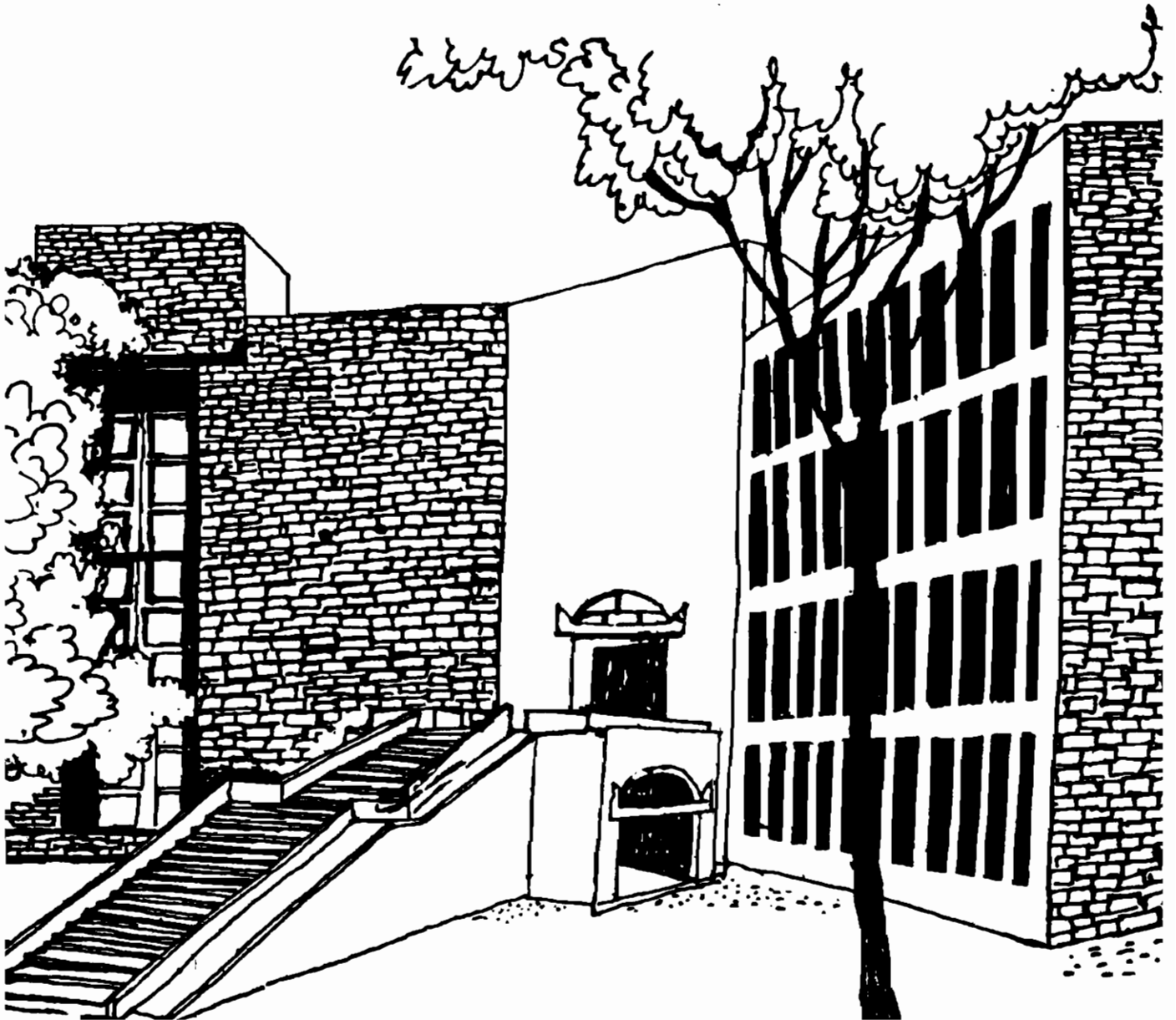




Working Paper



**JATROPHA CURCAS L. : A PROMISING
NON-EDIBLE OIL SEEDS**

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Jatropha curcas L. : A Promising Non-edible Oil Seeds

Abstract

Gurdev Singh
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Jatropha curcas L. is a non-edible oil seeds which grows widely in some areas in Gujarat, Madhya Pradesh and Rajasthan where it is also grown as live fence on the boundaries of fields. Being hardy in nature it can survive in harsh soil and climatic conditions and is a suitable species for wastelands and marginal farm lands. To augment the supply of non-edible oils for industrial uses efforts were made to promote this species as a plantation crop among the farmers in Madhya Pradesh, Maharashtra and Rajasthan through public, cooperative and corporate sectors. However, so far success eluded every where. It was found that though the crop has shown a promise at experimental farm, it failed at the farmers level. Being a new crop, it warranted more intensive follow up by the promoters. The average yield obtained in the initial years by some farmers was less than one-third of the expected. As a result, many growers uprooted the crop after 2-3 years experience. As a result neither the cost of cultivation nor its economics could be established. Whether the cause for failure was improper package of practices or incompatibility of soil could not be ascertained. Whether it would give better results if propagated through cuttings needs to be established. Nevertheless it is potential source of non-edible oil and needs to be promoted for wastelands development. The strategy to promote the crop should include evolving optimum agronomic practices under irrigated and rainfed cultivation. The yield potential may be recorded for direct sowing of seeds and using cuttings. Proper extension service would be crucial especially in the new areas. To realise better returns marketing support at least in the initial years would be necessary. Some arrangements need to be made to ensure disposal of crop produce. Finally, supply of healthy seeds/cutting would be an important factor for the successful adoption and diffusion of this new plantation crop enterprise.

Jatropha curcas L. :
A Promising Non-edible Oil-seeds

Gurdev Singh
S.P. Seetharaman
S.N. Chokshi

1 Background

Vegetable oils are grouped under edible and non-edible. Non-edible vegetable oils are put to many industrial uses say in the manufacture of lubricants, soaps and other cosmetics. As edible oils can be and are being used in place of non-edible oils, augmenting the supply of non-edible oils will release some of the edible oils for consumption. Jatropha oil is one such non-edible oil obtained from seeds of Jatropha curcas L. The plant has long productive life of about 30 years. Being perennial, it ensures ecological security and environmental stability in addition to supplying non-edible oil. Further, being hardy in nature with capacity to survive in harsh soil and climatic conditions, it is a suitable species for social forestry schemes to cover marginal farm lands and waste lands. It grows wild in some areas of Gujarat, Rajasthan and Madhya Pradesh and was grown on boundaries of fields as live fence. In Rajasthan collection of Jatropha seeds was organised by the Tribal Area Development Cooperative Federation through LAMPS. The LAMPS procure seeds collected by the tribals for the federation at a predetermined price on commission basis. Where LAMPS were not active agents were appointed on commission basis.

Because of these characteristics of the plant, one Agro-Forestry Federation in Maharashtra got interested and made

certain efforts to propagate its cultivation among the member farmers. A couple of corporate giants, namely, Hindustan Lever Limited and Godrej Limited started organising cultivation of the crop in Madhya Pradesh and Maharashtra respectively. In this background this study was taken up to understand production and marketing of jatropha seeds and to develop a strategy to augment production of jatropha seeds.

2 Early efforts in introducing jatropha cultivation

The Nasik District Nilgiri Utpadak Sahkari Sanstha was established in 1983 to help the farmers in the area to take up tree plantation. In 1988 the cooperative society started promoting plantation of jatropha locally called Jangli Eranda or Van Eranda.

As stated earlier, the manufacturers of cosmetics and soaps started taking interest in this non-edible oil. This had become necessary because of high price of edible oils used by them. Godrej Ltd. wrote to its dealer at Nasik to assess the potential of cultivation of jatropha. The dealer in turn contacted Agro-Forestry Federation. Godrej with the help of the federation contacted the farmers in the district to arouse their interest in this crop. They were explained the potential of Jatropha as a commercial crop even on marginal soils. The cultivational practices of Jatropha were explained to them. The Company supplied seed to the farmers at the rate of Rs 7 per Kg. and promised to buy jatropha produce at the rate of Rs 3 per Kg. In the initial stage the federation succeeded in motivating about 1450 farmers to take up cultivation of jatropha. About 10,000

hectares were reportedly brought under jatropha cultivation from 1988-89 to 1991-92.¹ Agro Forestry Federation got seed from the company at the rate of Rs. 10-12 per kg. and sold it to the farmers at Rs. 18 per kg. Later the federation arranged jatropha seed from Dahod in Gujarat and Banswara in Rajasthan.

In the meantime Godrej carried out experiments on cultivation of jatropha on their own farm to arrive at a package of inputs for increased productivity. It got very encouraging results. Seed was supplied to interested farmers with the assurance to buy the produce at pre-determined price. However, the experience of the growers was reportedly unsatisfactory. While the germination and vegetative growth were good, flowering and fruit setting were unexpectedly poor. Disappointed from the shock, many of the growers uprooted the crop. The company withdrew and stopped supplying seed. Because the supply was not adequate to run the mill on jatropha seed, the company stopped procurement of jatropha. The experience of Godrej shows that there is need to investigate the reasons for poor performance of the crop at field level.

Though Godrej withdrew, Agro Forestry Federation continued their efforts to motivate the farmers to grow Jatropha. It contacted Hindustan Lever and secured one year contract for supplying jatropha seeds at predetermined price.

About 30 tonnes of seed was purchased from Dahod in Gujarat, but since cultivation of jatropha was new to the area some seed

¹ Putil Vinayak and Singh Kanwarjit, Oil Glace to Oil Boom - Jatropha Curcas. Agro-forestry Federation, Maharashtra, 1991. pp. 13-14.

remained unsold which was crushed locally and about 2.50 tonnes of oil was extracted. One lot of 1.50 tonnes of oil was sent to Hindustan Lever and the remaining 1.00 tonne to Indian Institute of Technology, Madras, Bhartiya Agro-Industrial Research Centre, Pune and Sri Kalidas Patel Farm, Ahmedabad for experimentation purpose. Subsequently the federation purchased seed from a dealer in Banswara, Rajasthan at Rs. 7-8 per kg. Good seeds were separated, mixed with fungicide and packed in cloth bags of 1 kg. for sale to the farmers. The cost of packed seed was computed at Rs. 24.25 per kg. It was sold at Rs. 35 per kg.

The Federation procured the produce from the farmers at Rs. 4 per kg. and sold it to Hindustan Lever at Rs. 4.25 per kg. The carriage charges were borne by Hindustan Lever. Payment by the Federation to the farmers was made on the spot. The Federation was to supply about 35 tonnes of seed to Hindustan Lever every year but only one consignment was supplied. Though the payment for the first lot was received within 15 days it took three weeks for the payment for the second lot and eight weeks for the third. The payment for the fourth (last) lot of the consignment was pending. Similarly payment for Jatropha oil delivered to Hindustan Lever was not received till February 1992. The oil cake extracted at Hindustan Lever plant was purchased by the Federation at Rs 1500 per tonne and sold to the farmers at Rs 2200 per tonne for use as manure.

A look at the office records showed that on an average a farmer purchased 2.25 kg of seed for sowing an acre of land. Nasik district has 13 tahsils and in each tahsil 18 20 farmers

purchased seed every year. In four year period since 1988, about 1000 farmers in the district had purchased jatropha seed from the federation. In 30 districts of covered by the Federation in the state under its forestry programme, between 25,000 to 30,000 farmers must have started cultivation of jatropha by 1991-92. However, it was not known whether the farmers actually had grown jatropha or not. No record of acreage under Jatropha was available. Nor the records of procurement of output (seeds) from the farmers were available.

As cultivation of jatropha was started in June 1988 in Nasik district, it is the fourth year of growth for the first year crop. Normally, the trees are supposed to start fruiting from the second year itself with a substantial increase in yield in the successive years to reach the optimal level in the fifth year. The case studies, however, revealed that the yield was less than expected. The actual production in the second year was only 10 per cent of the expected. The realisation for the third year was 35 per cent of the potential yield. In some cases the trees did not bear fruit because of disease attack. Some farmers uprooted the crop. The remaining farmers were in two minds whether to wait for few more years. It is perhaps too early to conclude on the basis of the case studies whether the cultivation of jatropha was an economically viable proposal. Its comparative advantages over other crops under different situations was not possible yet. Nevertheless, it did not enthuse the farmers.

In 1988, the Rajasthan Tribal Areas Development Cooperative Federation Limited, Udaipur, came out with a proposal for

promoting intensive cultivation of *Jatropha curcas* (Ratan Jyot) on government and private lands. The idea was to make judicious use of available land resource and labour force for sustainable economic development of tribals specially those below the poverty line. Out of the total proposed area, only 65 per cent could be used for *jatropha* cultivation and other seasonal oil seeds like Castor. Nearly 45 per cent of the available area was to be put under *jatropha* cultivation, 30 per cent through cuttings and 15 per cent through seeds. For this purpose, about 724 hectares from 7 villages of Girva Panchayat Samiti and 479 hectares from 8 villages of Gogunda Panchayat Samiti were examined for the purpose. However, as the planting was not carried out with the first monsoon showers, the results were not encouraging. Moreover it took 6-7 days to plant the cuttings. It should not have taken more than two days to plant once cuttings were made. Another effort was made in 1991 when the federation planted 88,000 *jatropha* cuttings on boundary of a community plot measuring 76 acres in village Debari near Udaipur. All the 26 tribal families of the village participated. Nearly 20 per cent of the plants died because of disease. Another 24,000 *Jatropha* cuttings were planted in the monsoon season of 1992. To prevent the recurrence of the disease, pesticides were applied. However, only one of the 26 tribal households planted *Jatropha* on the boundary of his field three years ago and was expecting some harvest this year.

3 Major observations

The discussion in the preceding chapters revealed that some serious efforts have been made to popularise jatropha among the farmers in Maharashtra and Rajasthan. However, success eluded the promoters in the public, cooperatives and corporate sectors. Though at experimental farms jatropha has shown some promise, it has not succeeded at field level. The experience of Godrej and Agro Forestry Federation has been disappointing. As such sufficient field level information could not be generated to establish jatropha as a field crop.

Though some package of cultural practices is available, it has not been developed through rigorous experimentation and trials. Whether the disappointment at farm level was due to faulty package of practices could not be ascertained.

Since jatropha can be grown on almost any soil and under a range of climate, it is not known on which soil and what particular climate suits it best and gives high productivity. Similarly how productivity behaves if it is grown from seed or from cuttings. Though some experimentation was done at Godrej farm the package of practices developed did not prove suitable at farm level. Because of failure of crop at farm level, the cost of cultivation could not be established. What is needed therefore is rigorous agronomic experimentations and trials to determine the optimal package of practices and field trials to come up with reliable data on cost of its cultivation to establish its financial viability and comparative economics with respect to competing crops/species.

Another lesson for the promoters (extension personnel) to learn from the experience of Godrej and Agro Forestry Federation is that promoting an unestablished crop enterprise is highly risky. It rebounded and not only their efforts have gone waste, farmers have lost faith in the promoters. Godrej did not have any solution to the disease appeared in the field. It could not explain why the crop did not flower adequately. Federation's case was more disappointing. There was no monitoring or follow up after the distribution of seed to the farmers. It did not have even the record on the area covered under the crop. Their strategy of distribution of seed for promoting the crop was not at all successful. Some of the growers had uprooted the crop in the second or third year. The federation did not have knowledge of this. It boiled down to the conclusion that unless the optimum package of practices is evolved it is not advisable to venture into promotion of a new crop enterprise such as Jatropha.

The Tribal Area Development Cooperative Federation in Rajasthan was not successful in generating tribals' interest in the crop. In fact the procurement figures revealed that jatropha seed collection was not an important activity for them. Even at marketing level the Federation had not become an important instrument. A large proportion of jatropha seed collected by tribals found its way to traders who paid higher price than the Federation. The LAMPS being not quite active, the intervention did not serve the purpose. It seemed unnecessary especially in areas having no or small forest area and collection was primarily from live fence at the boundaries of fields, etc.

4 Suggested strategy

Popularising a new crop enterprise among farmers is definitely a difficult task. The following four are the important considerations in the adoption of a new enterprise by the farmers, i) First thing the farmers must be convinced about is its economics i.e. net return it would generate. If the net returns are more than the net returns obtained from some of the existing crops without any increase in the resources employed such crops might get replaced by the new crop; ii) The second important condition is that the cultivational practices for the new crop should not be very different from the crops the farmers already grow; iii) The third considerations is its financial implications i.e. the new crop should not warrant a major investment in farm machinery, etc. for which external finance becomes necessary; iv) Finally, the farmers must be made aware of the salient feature of the new crop and cultivational practices that have to be followed before seeking their commitment.

As we know net returns are the function of input package, cost, yield and output price. While the farmers may have some degree of freedom and can manipulate inputs package to adjust costs, yield and price of output are two uncertain variables. And in case of *Jatropha*, especially yield remains the major handicap in the sense no reliable expectation can be ensured. Thus, the strategy to popularise this crop would have the four components as discussed below.

4.1 Agronomic practices

Though a package of agronomic practices was arrived at, it was not based on rigorous agronomic research. There is, therefore, a need to evolve a package of desirable practices to realise the potential productivity under rainfed and irrigated conditions. How productivity would behave when seed is sown or cuttings are planted. Productivity response may also be studied for different soil types. The data so generated may be analyzed for arriving at package of practices and optimum level of inputs using current prices for inputs and the output. The cost of cultivation of the crop for initial five years - the time taken for the yield to stabilise, and net returns realised may be compared with the competing crops.

4.2 Extension service

Once the economics of the crop is available and its superiority is established among the extension strategy for adoption and spread of the crop could be developed. It would include the crop which might get replaced by the adoption of new crop. In the areas for which the crop is new awareness about the nature of the crop, its uses, inputs requirements, yield potential and likely net returns under specific situations need to be created. Since it is a perennial crop, extension methods useful for diffusion of plantation crops could be helpful. The economics of the crop would be worked out by applying capital budgeting technique as for the first few years the net benefits would be negative.

4.3 Marketing support

Efficient marketing ensures steady returns through stable prices. As has been seen a half hearted intervention by the Cooperative Federation through LAMPS in Rajasthan or assurance by the Agro Forestry Federation in Nasik of a price did not succeed. Whether there was need for any intervention when adequate demand existed or supply was less than demand is a relevant question. In fact, any quantity of Jatropha seeds may be absorbed under the deficit production of vegetable oils. Thus, it is advisable to leave the market to open competition. Market intervention should not be used to protect forests as forest exploitation could be directly monitored. Further, since the aim is to cover some farm land under the crop, jatropha seeds should be treated as agricultural produce and trading in this commodity need not be subject to licensing.

4.4 Supply of seed/cuttings

Especially, in the new areas, supply of seed/cuttings would be crucial. As cuttings must be planted within two to three days, these cannot be transported over long distances. Thus, good seed have to be managed. Seed may be treated with fungicides to check seed borne diseases. Seeds may be used to grow nurseries where plants may be allowed to grow for 2-3 years. These plants may be used to have cuttings for local plantations.

