

Study on Cultivation of Biofuel Crop *Jatropha Curcas* Linn

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Abstract: *Jatropha curcas* Linn. is highly promoted biofuel crop which contains high amount of oil in its seeds which can be converted to biodiesel. Present paper confers details about survey carried out of farmers cultivating *Jatropha*. The objective was to study problems related to *Jatropha* cultivation, to identify and describe the socio-economic characteristics of farmers growing *Jatropha* plant. A total of 200 farmers across four districts were interviewed using a set of structured and unstructured questions (questionnaire). Major problem about *Jatropha* cultivation was availability of market for selling seeds. Among farmers less accept-ability of *Jatropha* as biofuel crop was due to the delay in notifying, publicizing and explaining the government bio-diesel policy.

Keywords: *Biofuel, Cultivation, Jatropha, Policy, Problems.*

Introduction

Biofuel has attracted considerable attention during the past decade as a renewable, biodegradable and non-toxic fuel alternative to fossil fuels [1]. Economic, environmental and energy security concerns resulting from excessive reliance on petroleum are forcing the world over to shift to alternatives like biofuel [2]. Using biofuel reduces the problem of global warming. It provides new market for farmers. If farmers of under developed countries start to produce feedstock for biofuel then their income will change considerably. There are several benefits of biofuel such as, reduced emission of harmful pollutants, increased employment, energy security, improved social well being etc [3][4].

Many biofuel plants are promoted by government of India for cultivation. *Jatropha curcas* Linn. a multipurpose plant, contains high amount of oil in its seeds which can be converted to biodiesel. *Jatropha* is also known as Physic nut belongs to family euphorbiaceae [5]. *Jatropha* production has very high potential to ensure environment-friendly agriculture [6]. *Jatropha* grows without water; drought has no impact on it. Further-more, it requires little maintenance that in turn reduces cost of production [7]. *Jatropha* can be useful for other crops as well because it has capacity to repel other animals and insects [8] [9].

Since *Jatropha* production doesn't require pesticide, insecticide, fertilizer and irrigation, its production will not have adverse impact on soil, water and air [10]. Like other agriculture activity, *Jatropha* production is not dependent on agriculture; it will have no negative impact on forest and biodiversity [11]. Rather its production will improve the soil quality of saline and wasteland and stop desertification. Conversion of wasteland to farmland with some biodiesel crop like *Jatropha* can be viewed as positive impact [12].

In the economy market Konkan is well known for its pad-

dy, mango, cashew & coconut crops. People protest any change in pattern of agricultural crop. Experiencing the affection of inhabitants towards nature, *Jatropha* cultivation can be carried on waste land of Konkan. It is providing economic support to farmers with least maintenance. *Jatropha* is a well known crop in the region locally called as Mougli – Yerand or Ranti –Yerand which is native crop. The specific objective of this study is to study problems related to *Jatropha* cultivation, to identify and describe the socio-economic characteristics of farmers growing *Jatropha* plant.

Methodology

Study area mainly include Konkan region of Maharashtra state comprising of four districts as Thane, Raigad, Ratnagiri and Sindhudurg. It includes Maharashtra's 720-km. coastline and the adjoining area which extends from Dahanu in the north up to Goa in south. Average rainfall is from 300 mm up to 900 mm in the monsoon. Temperature ranges from 15°C to 37°C.

The study was conducted through literature review, interview with *Jatropha* cultivating farmer in part of Konkan designed to understand impact of *Jatropha* cultivation on rural development. Tools utilized on the field study included: site visits, interviews of farmers, nursery owners, intermediaries, government officials and non-governmental organizations. A total of 200 farmers were interviewed using a set of structured and unstructured questions (questionnaire). Across four districts 25 villages have been surveyed. The 200 questionnaires were analyzed on statistical basis. This report is a synthesis of the field study conducted in 2011.

Result and Discussions

By analyzing data different aspects regarding socio-economic status of farmers cultivating *Jatropha* are discussed as follows.

Age of farmers

All farmers were classified in three groups on the basis of age (Fig.1). The age groups were 18-40 yrs., 40-60 yrs. and above 60 yrs. Out of total farmers maximum farmers were in the age group of 40-60 yrs. Followed by 18-40 and minimum in above 60 yrs. age group.

Educational qualification

On the basis of educational qualification Jatropa cultivating farmers were classified in five groups as Uneducated, Primary educated, Higher Secondary educated, Agriculture diploma/degree, graduate, post graduate (Fig.2). Maximum farmers were with Primary education followed by Higher secondary education, graduate, uneducated, post graduate and agriculture diploma respectively.

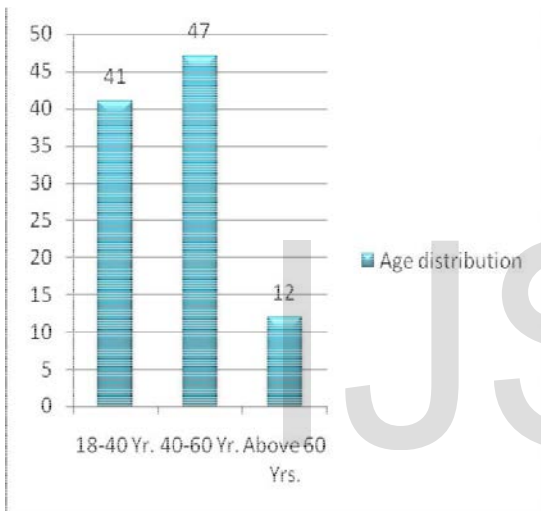


Fig 1. Age distribution of farmers (%)

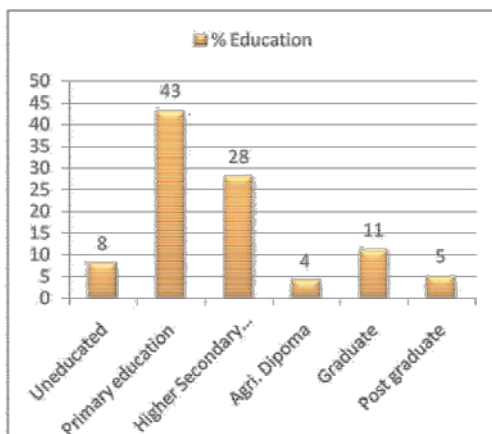


Fig.2 Educational qualification of farmers (%)

Economic Status

On the basis of economic status farmers were mainly grouped into two categories as above poverty line and below poverty line (Fig.3). About 82% farmers growing Jatropa were above poverty level while 18% were below poverty level.

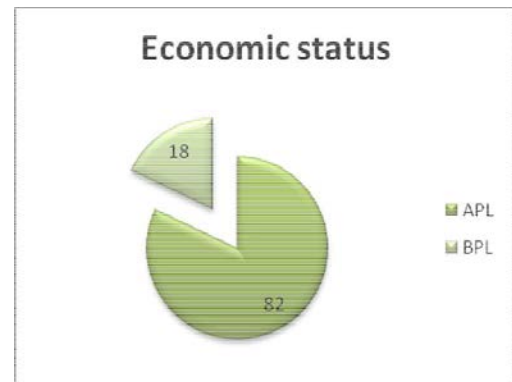


Fig.3 Economic status of farmers (%)

Gender wise bifurcation of farmers

In view of understand gender based ratio in the agriculture, information was collected (Fig.4). The information analysis showed that out of total farmers interviewed women farmers were 14% and male farmers were 86%. It indicates that gender balance in Jatropa agriculture is low and dominated by male.

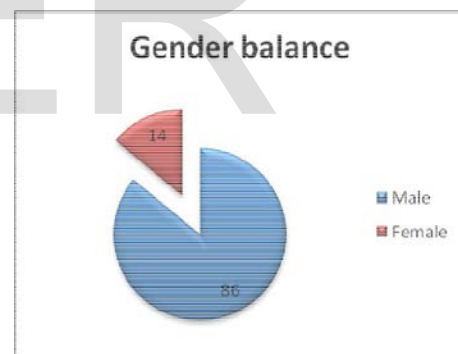


Fig.4 Gender wise bifurcation of farmers

Caste wise bifurcation of farmers

For caste wise involvement in developmental process especially in agriculture field caste wise involvement of farmers was assessed (Fig.5). Based on data analysis it was found that 56% farmers were from OBC category, 19% farmers from SC category, 4% from ST category and 21% from other category farmers were engaged in Jatropa cultivation, so the OBC communities are more engaged in Jatropa cultivation.

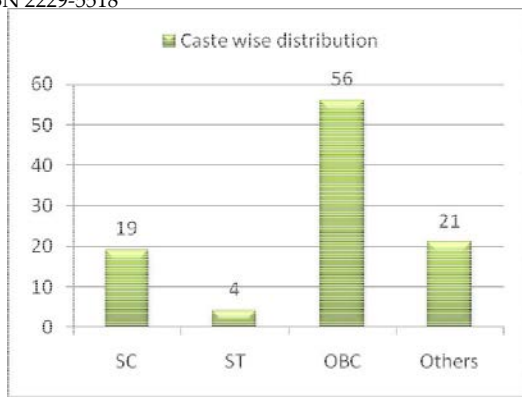


Fig.5 Caste wise bifurcation of farmers

Land holdings pattern of the farmers:

Land is the basic asset for farmers for their livelihood therefore to assess the land holding and ratio of land analysis was carried out for farmers cultivating Jathropa (Fig.6). It was found that 46% farmers holding less than 10 acres land whereas only 7 % farmers holding more than 20 acres land, 29 percent farmers having 10 -15 acres & 18 percent farmers holding 15- 20 acres land. Thus the analysis is in Konkan region small farmers are more engaged in Jethropa cultivation. Jatropa is being promoted as the ideal plant for small farmers [13].

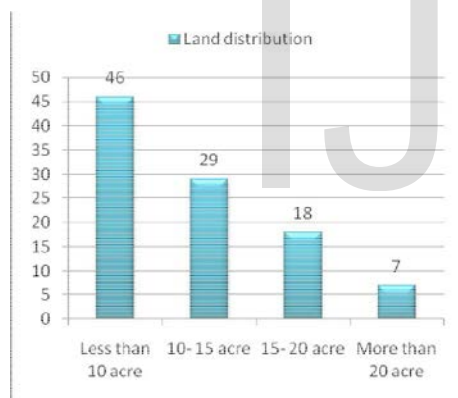


Fig.6 Land holding pattern of farmers

History of cultivation

The following table shows history of cultivation in four districts of Konkan. The major crops which are commonly cultivated on agriculture land are

District	Crops
Thane	Paddy, wheat, coconut
Raigad	Paddy, vegetable, cashew, mango
Ratnagiri	Paddy, Bamboo, mango, cashew
Sindhudurg	Paddy, ground nut, sugarcane, mango

But Jatropa cultivation is carried on waste land mainly and not on agricultural land [14]. As Jatropa is grown in marginal and problem soils, it should have better adaptability to salinity

[15]. Analysis was carried out to recognize that how much amount of money was earned by the farmers before cultivation of Jatropa (Fig.7). From total 64 % farmers were not earning because their land was waste land, whereas 29 % farmers said that they were earning less than Rs.10, 000. 6% farmers were earning Rs.11,000 to Rs.20,000 & only 1% farmers told that they were earning Rs.21,000 to Rs.30,000 from their 1 hectare land.

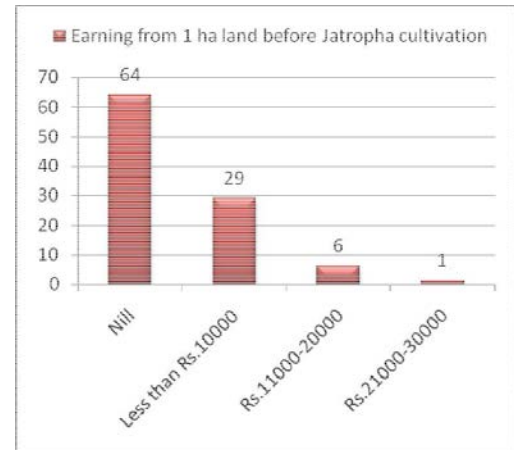


Fig.7 Earning from 1 ha. land before Jatropa cultivation
Complaints of farmers & expectation from government

Jatropa plant is currently receiving a lot of attention as an energy plant [16].The major problems regarding Jatropa cultivation which were appeared by the case study are:

1. Lack of confidence in farmers due to the delay in notifying, publicizing and explaining the government bio-diesel policy
2. No minimum support price
3. In the absence of long-term purchase contracts, there are no buy-back arrangements or purchase centers for Jatropa plantations
4. Lack of availability certified seeds of higher yield containing higher oil content
5. Limited announcement of incentives/subsidy and other benefits proposed to be provided to farmers
6. Non-availability of cultures of Jatropa
7. Lack of technical guidance & scientific information about Jatropa cultivation.

Major problem about Jatropa cultivation is availability of market for selling seeds. Far-mers have to spend much money for transportation of seeds and so it is increasing the in-put cost of crop. Farmers said that proper guidance and help from government regarding the market and other issues is not given. 77 % farmers said government can't come for support

whenever it's required. 23 % farmers said yes. When we ask the important question to farmer is the government help is required that time, 95 % farmers said yes where as only 5 % farmers said not required. Farmers want support from government in the form of Seeds, Crop Loan, providing costs for cultivation, Electricity and water supply, Supply of fertilizers & pesticides. It was reported earlier that reported that application of 20:120:20 kg ha⁻¹ urea, SSP and MOP respectively enables to yield 7500 kg dry seeds ha⁻¹ (3 kg seeds plant⁻¹) [17].

Yield and economics of Jatropha cultivation

From the time of plantation produce can be availed in 2 years and full yield is obtained after 5 years up to 50 years. A single crop provides 5 kg seeds. The price of 1 kg is Rs. 6-9 & the average price of one plant is Rs. 40. The subsidy was also given to the farmers from government scheme of Jatropha cultivation as Rs.10000 per Ha by agriculture department. The loan given by banks was Rs. 10,000 per acre. Nursery plants are provided by agricultural department without any cost. Crop requires least maintenance. Yield of seed per ha in subsequent years is given as follow. The net earnings of farmer cultivating Jatropha on barren land is Rs.15000 per acre.

Productivity Yield / hectare	Barren land	Irrigated
1st year	-	250
2nd year	250	1000
3rd year	1000	2500
4th year	2000	5000
5th year	3000	8000

According to [18] reliable data on the anticipated dry Jatropha seed yield per hectare per year for a given set of environmental conditions and inputs does not exist. However, reference [18] suggests 4-5 metric tons (tonnes) of dry seed per hectare per year as a reasonable yield estimate for a well-managed plantation with good environmental conditions. Even under adequate rainfall, irrigation may be required for the first three years to help plant establishment [19]. If managed properly, Jatropha starts producing 4-5 kg of seeds per tree from the 5th year onwards and the plant has longevity of 40-50 years [20] [21]. (Banapur-math et al., 2008, Singh et al., 2008). Fruit yields average about 3.5 t ha⁻¹, and when grown under rainfed conditions in wastelands, yields of 1-1.25 t ha⁻¹ are common [22].

Conclusion

Jatropha is a multipurpose species with many attributes and considerable potential as bio-fuel plant. Despite considerable national and policy emphasis on Jatropha cultivation, small proportion of Jatropha production was found in Konkan region. The reason behind this situation is improper implementation of government schemes and not the potential of Jatropha. The other reasons are less acceptability of Jatropha crop, lack of confidence in Konkani farmer, due to the delay in notifying, publicizing and explaining the government bio-

diesel policy, No minimum support price given by government, unavailability of nearby market. Negligence of government officials regarding promotion on Jatropha production declines the impact. In Konkan only some NGOs are working for promotion of Jatropha. The authors strongly recommend the need to promote and strengthen Jatropha policies and strategies in not only Konkan region but also other regions of Maharashtra and India. It will recognize the potential of Jatropha to contribute towards socio-economic development, sustain rural income and improve livelihood.

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