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An Economic Analysis of the Factors Influencing the Yield of Medicinal Plants

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Abstract

In the sociocultural, spiritual, and medical spheres, medicinal plants play a significant role for Indian rural residents. Their sustainable management and harvesting can help to protect biodiversity, maintain the health of people and the environment, create jobs, increase income, and increase export revenues. The aim of the study is to find out the determinants of the yield of GloriosaSuperba and the resource use efficiency of the factor resources used in the cultivation of GloriosaSuperba. The data for the purpose of the study was collected from primary sources. A multistage random sampling method was used to identify the samples. The sample size is 200. The Cobb-Douglas Production Function was used to identify the factors that influence the production of GloriosaSuperba and the Chow test was used to identify the structural differences between the farmers. The Marginal Value Product (MVP) of each resource was compared to the associated factor cost or purchase price in order to examine resource usage efficiency. The study found that, rhizomes, manure, pesticides and fertiliser are important determinants in the cultivation of GloriosaSuperba. The small farmers used human labour, machine labour, fertiliser and manure more efficiently, while the large farmers used human labour, machine labour, and manure more resourcefully in the study area. Further, there was a structural difference between small and large farmers in the determinants of yield from GloriosaSuperba.

Keywords: Medicinal plants, Production, GloriosaSuperba, Determinants, Structural Difference

Introduction

In the sociocultural, spiritual, and medical spheres, medicinal plants play a significant role for Indian rural residents. Their sustainable management and harvesting can help to protect biodiversity, maintain the health of people and the environment, create jobs, increase income, and increase export revenues.Growth of medicinal plants is affected by the biological and physical factors.

In addition to offering higher economic returns than traditional crops, medicinal plants are becoming more and more in demand on the local and international markets, which may result in higher plant prices. The majority of medicinal plants can withstand drought better than other commercial crops and are difficult for animals to graze on. If the right preservation techniques are used, some plant components may also be kept in storage for a very long period. Additionally, illnesses and insect infestations do not have a significant impact on therapeutic plants. There are comparatively less issues when compared to other conventional commercial crops which lowers the cost of production. The medicinal plants are perfect for dry land farming since they can be grown with little irrigation and can be utilised as intercrops on rain-fed soils as well.

Given these advantages the cultivation of medicinal crops turns out to be attractive for the farmers in India. However, the spread is not so large to meet the demands of the industry. But because of short supply, prices of some medicinal crops have increased considerably in the recent past. However, the cultivation of medicinal plants has become the major concern of the agricultural departments in India because of the over exploitation of these spices in their natural habitat.

Tamilnadu is noted for producing and exporting a variety of medicinal plants, including Senna, Coleus Forskohlii, GloriosaSuperba, Periwinkel, and Aloevera, making the cultivation of these plants profitable. Numerous farmers are engaged in the cultivation of Gloriosasuperba in the state particularly in Aravakurichi, Darapuram, Dindigul, K. Paramathi, Markampatti, Moolanur, and Oddanchatram regions.The profitability of the cultivation of GloriosaSuperba is mainly based the variations in yield.

Objective of the Study

The objective of the study is to find out the determinants of yield and resource use efficiency of the factor resources used in the cultivation of GloriosaSuperba.

Methodology

The data for the purpose of the study was collected from primary sources. Multistage ramdom sampling method was used to identify the samples. The sample size is 200. Multiple linear regression model of Cobb-Douglas production function was used to find out the determinants of yield of GloriosaSuperba. The structural difference between the small and large farmers was analysed using Chow test. The Marginal Value Product (MVP) of each resource was compared to the associated factor cost or purchase price in order to examine resource usage efficiency.

Results and Discussion

I. Determinants of Yield From GloriosaSuperba Between Small and Large Farmers

The estimated regression function is given below.

$$LN(Y) = LN\,\alpha + \beta_1 LN(X_1) + \beta_2 LN(X_2) + \beta_3 LN(X_3) + \beta_4 LN(X_4) + \beta_5 LN(X_5) + \beta_6 LN(X_6) + U$$

Where, Y = Yield (in kg.)
X_1 = Rhizomes per acre (in Rs)
X_2 = Fertilizer per acre (inRs.)
X_3 = Manure per acre (in Rs.)
X_4 = Pesticides per acre (inRs.)
X_5 = Human Labour (inRs.)
X_6 = Machine Labour per acre (inRs.)
U = Random Term
$\alpha, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ & β_6 are the respective parameters estimated from the model

Separate regression results were estimated for both small and large farmers and for the overall farmers cultivating GloriosaSuperba in the study area. Table 1 shows the magnitude of variables which influenced the yield from GloriosaSuperba.

Table 1
Determinants of Yield from GloriosaSuperba - Small and Large Farmers

No	riable	rameter Estimates		
		all Farmers	rge Farmers	tal Farmers
	ercept	282* .689)	187* .465)	334* .295)
	izomes	7 79)	8** 839)	07 541)
	tilizer	4 060)	0 05)	1 63)

	nure	01 052)	11* .826)	43 .867)
	sticides	1* 334)	15 28)	5* 07)
	man Labour	2* 738)	23* .881)	9* 597)
	achine Labour	5* 308)	88 .740)	8* 154)
		2		
	atio	169*	350*	252*

Note - Figures in brackets indicate t-values
**** - Significant at 10 per cent level**
*** - Significant at 5 per cent level**

As far as the determinants of yield from GloriosaSuperba for the total farmers was concerned, out of six variables considered for the analysis, the variables like human labour and machine labour were having positive and significant influence on yield i.e., a unit increase in these two inputs will increase the output by 94 and 14 per cent respectively. The factors like planting material and manure had negative and insignificant influence on yield of GloriosaSuperba. The estimated R^2 implied that, 75 per cent of the variation in yield was due to changes in the explanatory variables taken in the analysis and the F ratio ensures the statistical significance of the model as good.

With reference to small farmers cultivating medicinal plants, the variables such as pesticides, man power and machine power were found to be positive and had significant impact on yield of the crop. 72 per cent of the variations in yield were accounted by the factors included in the model and overall fitness of the model was statistically significant at one per cent level.

As far as the determinants of yield of large farmers cultivating GloriosaSuperba were concerned, the variables viz., planting material, manure and man power were identified as important determinants of yield from the crop in the study area. It was also identified that rhizomes and labour input had positive relationship with yield, but manure, pesticides and machine power had shown a negative influence on yield which states that the productivity of all these factors was found to be negative. The crop is not cultivated under controlled environment. Hence, changing climatic conditions and improper irrigation conditions might also reduce the efficiency of such inputs used in the production. The estimated F ratio was statistically significant and the R^2 denotes nearly 80 per cent of the variations in yield were accounted by the explanatory variables.

Hence, regarding the determinants of yield, labour input had shown positive and significant influence on yield for both small and large farmers and for the overall group as well. Further, the inputs like pesticides, man power and machine power were found positive and to be significant determinants of yield for small farmers while planting material and man power were the major determinants of yield for large farmers. Though manure, fertilizer and pesticide is expected to improve the yield to a greater extent, in the study the influence of these variables were found to be negative but insignificant. The reason could be the yield from a crop is also based on the water soil dynamics apart from the said factors.

The estimated value of R^2 in the three regression equations highlighted the fact that the explanatory variables chosen for the analysis accounted more than 70 per cent of the variations in yield from GloriosaSuperba in the study area.

II. Test of Structural Difference between Small and Large Farmers in the determinants of yield Cultivating GloriosaSuperba.

Chow test was used to find out whether there exists structural difference between small and large farmers in cultivating medicinal plants in the study area.

Table 2
Test of Structural Difference between Small and Large Farmers Cultivating Medicinal Plant

^{2}	$_1^2$	$_2^2$	$+n_2-2k)$		172) at 1% el
05	04	76	4	24	0

The estimated F ratio was more than the table F value at one per cent level. Hence it can be inferred that the model is statistically significant at one per cent level and there existed structural difference between small and large farmers in the determinants of yield from GloriosaSuperba in the study area.

III. Resource Use Efficiency

Resource use efficiency can be analysed by comparing the Marginal Value Product (MVP) of each resource with corresponding factor cost/purchase price. If the ratio of MVP of particular resource/ factor input to its corresponding factor cost were found to be more, then the resource was said to be efficiently used in the production process.

Marginal Value Product (MVP) was calculated using the following formula:

$$MVP = b_i \times \frac{Y}{X}$$

Where, Y = Average gross returns (in Rs.)

X = Mean value of i^{th} input

b_i = Production elasticity of i^{th}input

The estimated regression coefficients of factors inputs, marginal value products and marginal factor cost to the corresponding factor inputs used in the cultivation of GloriosaSuperba in the study area is given in table 3.

Table 3
Value of Efficiency Parameters for GloriosaSuperba

No	puts Used	all Farmers			rge Farmers		
		VP	FC	VP/ FC	VP	FC	VP/ FC
	izomes	8	0	8	0	0	0
	tilizer	8	0	8	2	0	2
	nure	7	0	7	0	0	0
	sticides	14	0	14	9	0	9
	man Labour	7	0	7	0	0	0
	chine Labour	8	0	8	3	0	3

The Marginal Value Product (MVP) estimated and was compared with Marginal Factor Cost (MFC) in order to find out the efficiency of resources used in the cultivation by both small and large farmers in the study area. In case of small farmers MVP of all the factors except pesticides were positive which indicates that an additional investment of one rupee on these factors will bring additional returns to the farmers. The extra one rupee invested in fertilizer would bring returns worth Rs.4.78 paise followed by a rupee of additional investment in factors like human labour, machine labour, manure would bring returns of about Rs.9.97, Rs.4.68 and Rs.6.97 respectively. The MVP of planting material and pesticides were lower than the MFC which indicates that these two factors are underutilized.

In case of large farmers, all the factors had shown positive MVP values indicating that a unit cost increase in the factors like human labour, machine labour, manure, fertilizer, planting material and pesticides brings the returns of about Rs.6.40, Rs.5.53, Rs.5.10,Rs.1.32, Rs.0.90 and Rs.0.39 respectively. However, planting material was underutilized by the farmers.

Conclusion

The growing of medicinal plants serves as a way to both fulfil present and future demands from the pharmaceutical industry and the herbal medicine system, as well as a way to reduce the harvest strain on wild populations. The selection of what crops or cattle to raise is a crucial one for every farming enterprise. There are several elements that influence the development of medicinal plants. The production of medicinal plants is affected by various factors. The main predictors of yield were found to be human effort and mechanical power. The study also suggested that there was a structural difference in the factors affecting GloriosaSuperba productivity between small and large farmers. In terms of resource use efficiency, small farmers in the study region employed labour, machinery, fertiliser, and manure more effectively than big/large farmers, who were more resourceful in their use of manpower, machinery, and manure.

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