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ECONOMIC ANALYSIS OF COST AND RETURN OF LEMONGRASS FARMING IN NAKHON NAYOK PROVINCE OF THAILAND: AN EMPIRICAL STUDY

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Received on: 09/01/16 Revised on: 20/02/16 Accepted on: 09/03/16

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DOI: 10.7897/2277-4343.07261

ABSTRACT

Rural farming systems of Thailand, especially in nursery farming, is one of the most interesting field to economists, sociologists, social anthropologists. Many studies have been attempted to identify the factors that influence the growth Ayurvedic and nursery farming from ecological, social, and economic perspective. This study was aimed to examine economic analysis of cost and return of lemongrass farming in Nakhon Nayok province of Thailand. It also attempts to explore the economic characteristics of lemongrass production and its profitability across varied farm size in the study area in which socioeconomic factors with respect to sustenance of livelihood of the farmers is also taken into account. The present study indicates that land size and productivity is slightly inversely related. The per rai (1 Rai= 0.395 Acre) production is highest for large cultivators which is 9.2 tons. Whereas it is 8.9 tons and 9 tons for small and medium farmers respectively. Consequently, per rai profit is also highest for large farmers. However, the overall benefit to cost ratio (BCR) is 1.30 which indicates that lemongrass production is a profitable cultivation in the study area. It is also found that overall return on investment (ROI) of lemongrass (*Cymbopogon flexuosus*) production in the study area is 30 percent per cycle of production. Based on the study, suggestions and recommendations has been furnished to support the development and sustainability of local lemongrass farming community. The study will help to fulfil the lacunas in research and development to improve the sustenance of lemongrass farming.

Keywords: Lemongrass, Ayurvedic Nursery Farms, Cost Benefit Analysis, Socio-economic and Sustainability.

INTRODUCTION

The scientific name of a Lemongrass is *Cymbopogon flexuosus*. Lemongrass (*Cymbopogon flexuosus*) is a tall, perennial and aromatic grass. The leaves of lemongrass are prolific, soft, long, chocolate and violet in color. The average economic life of lemongrass five years. Lemongrass is found across the globe, mostly in Thailand, China, Cameroon, Sri Lanka, Islands Brazil, Indonesia and India. In many countries lemongrass is popularly used as antibacterial and mosquito repellent to control mosquitos and to prevent headache, toothache, stomachache. It is also used as a flavoring agent in wide variety of food products and in herbal tea. Widely used in manufacturing variety of perfume industry as a perfumery¹. In Africa and Asia, lemongrass particularly oil is utilized to treat spinal pain, to treat rheumatic, antiseptic and it is additionally considered to use as sudorific stomachic antitussive-sprain hemoptysis separately^{1,2}. In Cuba and Caribbean areas lemongrass is broadly utilized as a part of conventional solution to cure assortment of infections such as pain relieving and aggravation^{1,3}.

In Thai-dialect lemongrass (*Cymbopogon flexuosus*) is famously known as *Ta-krai* and utilized as a part of the vast majority of the day to day devouring nourishments like *tom yum*. In all continents over the globe crisp and dry leaves of lemongrass broadly utilized as a part of tea and infusion. This fragrant plant comprises an assortment of spectral properties of substances. Whereas in Asian nations like India, lemongrass oil is used to cure gastrointestinal ailments². In China this aromatic plant is utilized as ansio-litic⁴. Lemongrass tea is generally utilized against influenza, fever, pneumonia, and to cure gastritis and sudorific issues in a few sections of Mauricio islands and in the

Malay Peninsula⁵. African nations like Nigeria uses lemongrass as antipyretic and also for antispasmodic properties⁶. In Indonesia lemongrass fragrant plant is utilized to improve absorption, advance diuresis, taster in desserts and as medicine separately^{1,7}. In Trinidad and Tobago lemongrass is used to cure diabetes^{1,6,7}. In traditional medicine, lemongrass is used to cure bladder disorders, asthma, coughing, diaphoretic and also it is used as an insect repellent^{1,8,9}.

Nursery farming is the system of practices of rearing of plants and growing under controlled conditions within the managed landscape. The main products of nurseries include all most all plants like natural aromatic fragrance oil plants, flowering plants, Ayurvedic plants, medicinal and many others. Efforts have been made by the many socioeconomic researchers across the globe to heighten the nursery farming systems and techniques to elevate the sustainability extension of farming of the globe.

Thailand's Ayurvedic and other nursery farmers are dynamic in evolutionary in nurseries, compositions and its uses. Diversity have been influenced by the changes in their socioeconomic circumstances and the Buddhist cultural values for nursery farming and. Furthermore, the nursery farmers are using their land for their innovative simple experimentation, domestication of Ayurvedic plants, bonsai and floricultural plants.

Nursery farming crops and greenhouse crops represent the second most important sector in U.S. agriculture. In terms of total farm income in 1998, the nursery farming industry ranked seventh nationally. US nurseries employ about 40,000 full time workers and approximately 105,000 seasonal workers. The

nursery and landscape services industries employ over 600,000 workers during peak seasons^{10, 11}.

In the field of nursery farming the main dependent variables are proportion of sales going to mass merchandisers, garden centres, re-wholesalers, landscapers, and other retailers. The proportion of sales going to each of the above said five market channels were hypothesized to be a function of raise, expenditure, age, contract sales, in-person sales, in-state sales, repeat customer sales, telephone sales, use of four or more channels^{11, 12, 13}.

In the Myanmar section of Himalaya, a nursery for 100,000 plants has been established. A 10,000-acre plantation owned by indigenous people was established in 2012. (Country Status Report on Medicinal and Aromatic Plants in Myanmar: Zin-Zin New Food Control, Department of Food and Drug Administration Ministry of Health, Myanmar). Ranjit Puranik, Executive Director, Shree Dhootpapeshwar Ltd. Mumbai, India made a fascinating and fundamentally examined presentation on the status of usage and promoting of therapeutic plants in Asia and expressed that it is exceptionally hard to get sole information on therapeutic plants while some high volume botanicals have 4-digit HS codes and can be distinguished for exchange purposes. Which reflects exchange information for 2010-11. The world exchange botanicals are worth US \$ 32.702 billion and Asian natural exchange is US \$ 14.505 billion with 6.634 million tons and records for 44.35 for each penny and 53.13 for every penny of world exchange terms of quality and volume, individually. Among the main 15 nations which represents 72 for each penny of the world exchange botanicals in Asia, China (11.48%) and the India (8.75%) are at the first and second position in world positioning as far as worthwhile as far as volume, their positioning is second (9.92%) and third (8.75%), individually. The Chinese exchange covers 107 plant numbers, 51 restorative plants product checks and the estimation of exchange is US \$ 3,651.79 million. The Indian exchange represents US \$ 3,050.04 million with 304 natural ware tallies and 174 restorative plant product numbers expressed his views on Expert Consultation on Promotion of Medicinal and Aromatic Plants in the Asia-Pacific Region Bangkok, Thailand 2-3 December, 2013^{13, 14, and 15}. Lemongrass and satavari is used as galactogogue¹⁶

According to the theoretical framework, growth of nursery farm or any kind of firm is expected to be a function of buyer concentration ratio, entry and exit barriers, planned expenditures in equipment, and concessions to buyers, size of the firm, risk propensity/aversion, and education level of the farmers. The objective of the study is to conduct a survey on cost benefit analysis of the lemongrass farming and discussed about how farmers can overcome the problems and the drawbacks based on the cost benefit analysis.

RESEARCH METHODOLOGY

In study area, Nurseries having less than 0.04 rai of field production is not considered. A very important aspect of this study is the development of a survey instrument to collect producer level information on the demographic characters, farm size, lemongrass nursery farms, expenses, revenues, workforce, marketing and technology.

Sampling Method

The present study employs simple random sampling method. Out of 416 farmers, 128 farmers are found producing lemongrass. Among those 128 lemongrass cultivators 61 were small, 46 were medium and 21 were large farmers. Farmers with having 0.05 rai to 10 rai is considered as small, 10.1-20 rai is considered as medium and more than 20 rai is considered as large farms (1 Rai= 0.395 Acre)

Data Collection

Primary data was collected from the study area by the author with the help of Thai- native speaker through personal interviews with the respondents. To get accuracy and reliability of data, precautionary measures were taken, apart from that care and caution were taken in data collection. The author took all possible effort to establish a congenial relationship with the respondents so that the cultivators do not feel hesitation to provide correct data. Prior to interview, the author explained the main objectives of the study to each and every lemongrass cultivator. As a result, they were convinced that the study was purely a research one and was not likely to have any damage or adverse effect on their daily business activities.

Data Analysis

The Statistical Package for Social Sciences version 22 (SPSS-22) and Microsoft office Excel 2010 techniques have been used for analysing the collected data from the study area. Tabular and statistical analysis were performed for analysing demographic condition of the concerned area including socio- economic characteristics of Nursery farmers, classification of nursery size, production practices, inputs used and returns of nursery farming community. Statistical analysis was also used to show the effect of inputs used and other related influencing factors of lemongrass farming practices in Nakhon Nayok district of Thailand.

ANALYTICAL TECHNIQUES

- To satisfy the objectives of the study, the following analytical tools were used:
- Descriptive analysis such as frequency, percentage, mean, standard deviation was used to describe socio-demographic characteristics of Nursery farmers.
- Cost and returns analysis were used to examine the cost and returns of lemongrass production.

Profitability ratios such as Benefit-Cost Ratio, return on investment was used to analyse the profitability of lemongrass farming.

BCR = TR/TC Where;
BCR = Benefit Cost Ratio
TR = Total Revenue
TC = Total Cost

Return on Investment (ROI) = Profit/Total Cost

- Correlation of Lemongrass farming output to inputs i.e. land preparation cost, seed and planting cost, fertilizer cost, labour cost, black soil cost, land value and Other miscellaneous expenses has been employed. The significance test of the correlation is done to validate the findings.

Table 1: Distribution of lemon grass farmers according to their age

		Frequency	Percent	Mean	Std. Deviation
Valid	32-38	15	11.7	4.5625	.69588
	39-45	26	20.3		
	46 and above	87	68.0		
	Total	128	100.0		

*Source: Field survey

Table 2: distribution of the lemon grass growers according to their Education

		Frequency	Percent	Mean	Std. Deviation
Valid	Uneducated	32	25.0	2.1797	.95103
	Primary	57	44.5		
	Secondary	23	18.0		
	Higher Secondary	16	12.5		
	Total	128	100.0		

*Source: Field survey

Table 3: Distribution of Lemon grass cultivators according to their family size

		Frequency	Percent	Mean	Std. Deviation
Valid	1-3	22	17.2	2.1562	.69234
	4-6	64	50.0		
	7-9	42	32.8		
	Total	128	100.0		

*Source: Field survey

Table 4: Distribution of farmers according to their farm size

		Frequency	Percent	Mean	Std. Deviation
Valid	.5 – 10 rai (Small)	61	47.6	2.1562	.69234
	10.1- 20 rai (Medium)	46	36.0		
	20.1 and above (Large)	21	16.4		
	Total	128	100.0		

*Source: Field survey

Table 5: Distribution of lemongrass farmers depending on the farming experience

		Frequency	Percent	Mean	Std. Deviation
Valid	less than 5	12	9.4	2.1562	.69234
	16-20	71	55.5		
	21 and above	45	35.2		
	Total	128	100.0		

*Source: Field survey

Table 6: Distribution of the lemongrass farmers according to the place of sale

		Frequency	Percent	Mean	Std. Deviation
Valid	Market	56	43.8	2.1562	.69234
	Nursery	72	56.3		
	Total	128	100.0		

*Source: Field survey

Table: 7 Cost of lemongrass cultivation in the study area.

Cost (THB)	Small farmer	Medium farmer	Large farmer	Total
land preparation cost	1647360.0	1235520.0	549120.0	3432000.0
seed and planting cost	2059200.0	1544400.0	686400.0	4290000.0
fertilizer cost	3157440.0	2368080.0	1052480.0	6578000.0
labour cost	1510080.0	1132560.0	503360.0	3146000.0
black soil cost	1098240.0	823680.0	366080.0	2288000.0
Other expenses	1372800.0	1029600.0	457600.0	2860000.0
total variable cost	10845120.0	8133840.0	3615040.0	22594000.0
land value	3432000.0	2574000.0	1144000.0	7150000.0
total fixed cost	3432000.0	2574000.0	1144000.0	7150000.0
total cost (total fixed cost + total variable cost)	14277120.0	10707840.0	4759040.0	29744000.0

* All the values are calculated in Thai-Baht (1 \$ = 34.50 THB).

*Source: Field survey

Table 8: Profitability and benefit cost ratio analysis of lemongrass production

Item	Small farmer	Medium farmer	Large farmer	Total
Total land used (Rai)	1372.8	1029.6	457.6	2860
Lemongrass output (ton)	12217.92	9266.4	4209.92	25694.24
Lemongrass revenue (TBH) / 100 kg	1500	1510	1520	4530
Total revenue	18326880.0	13992264.0	6399078.4	38718222.4
Total Costs	14277120.0	10707840.0	4759040.0	29744000.0
Net Profit	4049760.0	3284424.0	1640038.4	8974222.4
Profit per Rai	2950.0	3190.0	3584.0	
Benefit Cost Ratio (BCR) = Total Revenue / Total Cost = 1.301				
Return on Investment (ROI) = Net Profit / Total Cost = 0.301				

*Source: Field survey

Table 9: Correlations among the different influencing factors

	Land value	Seed and plantation	Fertilizer	Black soil	Labor cost	Total cost	Total revenue
Land value	1						
Seed and plantation	.785(**)	1					
Fertilizer	.796(**)	.869(**)	1				
Black soil	.916(**)	.964(**)	.764(**)	1			
Labor cost	.972(**)	.826(**)	.569(**)	.618(**)	1		
Total cost	.949(**)	.852(**)	.827(**)	.849(**)	.983(**)	1	
Total revenue	.944(**)	.861(**)	.769(**)	.864(**)	.967(**)	.994(**)	1

*Source: Field survey

Correlations of the Table 9 is significant at the 0.01** level (2-tailed) and at 0.05* (2-tailed)

RESULTS AND DISCUSSION

Demographic Characteristics of Lemongrass Cultivators

Demographic characteristics play a vital role in production of agricultural products. Before analyzing the profitability and factors affecting the profitability of the lemongrass cultivation, explanation of socioeconomic characteristics of the concern study area is very important. Age of the cultivators and their family size, educational standard, farm size, experience in farming and place of sale are included in the analysis of socioeconomic study of the concerned area.

In the present study based on the primary data nursery farmers were categorized into three different age groups. From the Table 1 the age of the nursery farmers in between 32 to above 46 years, with the mean of 4.56 years and with the standard deviation 0.69. The table indicates the majority of the Ayurvedic nursery cultivator's age is above 46 years which is 68% of the sample population.

Based on the Table 2 it is observed that 25% of the farmers of the study area are illiterates. 44.5%, 18% and 12.5 % cultivators were having primary, secondary and higher secondary educational qualifications respectively, with the mean 2.18 and standard deviation 0.95.

Table 3 shows that 50% of the nursery plant cultivators were having family members 4-6, whereas 7-9 family size was 32% and 17.2 % of the plant owners were having family members 1-3

Table 4 describes that the lemon grass farmers were categorized into three types based on their farm size. In the study area most of the farmers are belongs to small size farm holders that is 0.5 – 10 rai (47.6%) with standard deviation 0.69 and mean 2.15 respectively.

Table 5 demonstrates that the experience of the farmer was characterized by the number of years involved in the farming activities. The study indicates that mean experience of the nursery farmers was 2.156 with standard deviation 0.692.

Majority of the farmers have nursery farming experience of 16-20 years (55.5%).

Table 6 shows that 56.3 % of the lemongrass farmers sold lemongrass from nursery plant itself and 43.8% they sold directly through market.

Cost benefit analysis of Lemongrass production at Study area

The cost benefit analysis and factors influencing profitability of lemongrass farming were calculated as per the primary data of study area at current price and have been tabulated as presented in respective Tables (7 to 10). The Benefit Cost Ratio (BCR) value is calculated as total revenue divided by total cost and Return on Investment (ROI) is calculated by net profit divided by total cost.

Total cost of lemongrass plantation of small, medium and large farmers is explained in the Table 7. Total cost has two components namely total variable cost and total fixed cost. Total variable cost consists of land preparation cost, seed and planting cost, fertilizer cost, labour cost, black soil cost and other expenses. From the above table it is observed that the highest total cost was incurred by small farmers (THB 14277120.0), followed by medium (THB 10707840.0) and large farmers (THB 4759040.0) respectively.

Table 8 indicates that the total production is highest for the small farmers (12217.92 tons) though per rai productivity is least. The per rai production was highest for large cultivators which is 9.2 tons. Whereas it was 8.9 tons and 9 tons for small and medium farmers respectively. Consequently, per rai profit is also highest for large farmers. Per rai profit of large farmers was THB 3584 which was THB 3190 and THB 2950 for medium and small farmers respectively. However, the overall benefit to cost ratio (BCR) is 1.30 which indicates that lemongrass production is a profitable cultivation. It is also observed from the table that per Rai production of lemongrass is highest for large farmers. It is BHT 3584 for large farmer, BHT 3190 for medium sized farms and BHT 2950 for small cultivators. It is

also found that overall return on investment of lemongrass production at study area is 30 percent per cycle of production.

The Table 9, indicates that there is a significant correlation between total cost and labor cost which means when farmer uses more labor for higher output total cost increases. Fertilizer cost is significantly positively related to total cost. As more usage of fertilizers for better return involves more cost of production. A significant positive correlation between fertilizer and seed and plantation cost is also found in the above table. As the cultivators use more seed and better plantation process to obtain more output, more fertilizer is also required which thereby increases cost of production. The above table also indicates that black soil is also positively related with the total cost. To get more output when cultivators use more black soil, total cost also increase. There is also high positive correlation between seed and plantation cost and land value. When land value in terms of rent increases cultivators want to get better return in terms of output by using better quality of seeds, as a consequence seed cost also increases.

SUMMARY

In the study area the lemongrass (*Cymbopogon flexuosus*) growers were using lemongrass slips as planting materials. Time of plantation is June-July and some are following February-March. Those who planted in February and March got high yield in lemongrass production at study area Nakhonnayok province, Thailand.

Although some concessions have to be made in a negotiation, it is hypothesized that there is an inverse relationship between concessions and growth, because ultimately, the concessions the grower makes to the buyer can be thought of as having a cost. This cost is not directly measurable, but it takes away resources from other activities to reallocate them to comply with the buyer. A variable was constructed for the purposes of measuring exit barriers for nursery firms. Growers were asked to state the selling price of their business under two different scenarios; if they were selling their assets for nursery production, or if they were selling the company for purposes other than nursery production. The difference between selling the firm for nursery operations and for alternative uses should capture the level of investment that is associated with assets and facilities that can only be used for nursery production. In short, a firm would lose if it decided to switch from nursery production to alternative uses and difference is expected to be positive, but there were instances in which this difference yielded.

It is hypothesized that this variable is positively related to growth because higher expenditures in equipment would define reinvestment in the firm, as well as, to some extent, would reflect the replacement of old technology with newer technology, improving productivity and efficiency of the operations.

Socio economic characteristics of Ayurvedic nursery farmer of the study area demographic, socio economic background characteristics of the nursery farmers highly influences the productivity of the farms. Hence, in this study it is very important to study the socio economic characteristics of the farmers which including age, family size, farm size, farming experience, training, usage of technology, and place of selling the plants in the study area.

IDENTIFIED PROBLEMS

The study has identified apprehensive constraints being faced by the lemongrass cultivators mainly in production and channel of marketing.

Most importantly amongst problems facing are as follows: Lacking of training to the cultivators by the agricultural department, there are no crop insurance facilities, high cost of fertilizers and plant material, lacking of skilled labor and need to pay high labor cost for untrained labor, increased production cost, lack of awareness on government schemes and about incentives, lacking of credit loans from the banks, higher inflation and fluctuations in price, un-organized marketing system and poor in needy quality of inputs are predominant at the study area, which was disseminated by the lemongrass (*Cymbopogon flexuosus*) growers. The most of respondents expressed their concern about scarcity of water during peak season of production. The farmers are also concerned about persistent increase in pesticides and fertilizer prices.

RECOMMENDATIONS

Based on the identified problems a few things can be suggested. Firstly, government should ensure water supply through-out the year, especially in the summer. Secondly, the agricultural bank of Thailand, 'Bank of Agriculture and Agricultural Cooperatives' should open more branches across the country at the district level to provide more loan facilities. Thirdly Awareness campaign among farmers should be initiated by government of Thailand to cultivate the best practices of Lemongrass (*Cymbopogon flexuosus*) production. Fourthly, the concern of high fertilizer and pesticide cost is detrimental to the growth of lemongrass (*Cymbopogon flexuosus*) production in Thailand. Hence government of Thailand should subsidize the above cost to encourage the marginalized farmers.

Results of the present study has suggested that the diligence should be paid to address and overcome the above said constraints. So that the growers would be able to get a higher price for their produced lemongrass. Needy support should be initiated on good practices for lemongrass cultivation and in this direction research institutions should play a major leading role.

Eventually, the study has revealed that the stakeholders should take some immense endeavors to strengthen the agricultural practices, understand the market information system and to inculcate management of price risks will go far in building up the positive economy of lemongrass cultivation and as well as sustainability of agricultural economy. Need to undertake correlative research studies on net incomes from herbage and oil generation, so that farming community will be able get benefits and it helps in sustainability of the lemongrass (*Cymbopogon flexuosus*) cultivars.

CONCLUSION

The per rai cost of cultivation of lemongrass (*Cymbopogon flexuosus*) has been found maximum during the initial year, but declined substantially in subsequent harvestings due to the absence of cost of planting material. The present study has ensconced that returns are much higher from the production of lemongrass in the study area. The economic analysis of the production of lemongrass has revealed that investment on an aromatic plant is financially feasible. Hence it is indicated that the investment in farming of lemongrass aromatic plant has been found profitable.

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Cite this article as:

Sourabh Singha Roy. Economic analysis of cost and return of lemongrass farming in Nakhon Nayok province of Thailand: An empirical study. *Int. J. Res. Ayurveda Pharm.* Mar - Apr 2016;7(2):75-80 <http://dx.doi.org/10.7897/2277-4343.07261>

Source of support: Nil, Conflict of interest: None Declared

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