

Constraint Analysis of Cashew (*Anacardium occidentale*) Cultivation for Sustainable Development with Special Reference to Double Season

S. SHARMILA¹, A.M.T.P. ATHAUDA¹ and M.B. LOGANATHAN²

¹Department of Agribusiness Management, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gonawila, Sri Lanka

²Sri Lanka Cashew Corporation, Puttlam, Sri Lanka

ABSTRACT

There are two types of cultivation systems practised in Sri Lanka, single season and double season, which are based on rainfall pattern. Cashew cultivation needs fewer inputs when compared to other crops, leaving a broader gross profit margin for the cashew farmer. This study was carried out to identify the constraints in cashew cultivation for the sustainable development with special reference to double season cultivation in Puttlam district of Sri Lanka. The primary data were gathered from a sample survey of 50 farmers in the study area. Descriptive model was used to analyze the collected data during the period of survey. Linear programming model and Benefit Cost Ratio were constructed to identify the limiting constraints and profitability of the single and double season cultivation systems. The results showed that the land, labour, fertilizer and irrigation were the major constraints. Further, it was revealed that the land and labour act as the limiting factors of cashew cultivation, and increasing of one unit of these constraints result in increase of farmer's profit. Though both cultivation systems are profitable, double season cashew cultivation system generates more profit for the farmer. The results further indicated that the required number of labour was higher than the available number in the double season cashew cultivation. The major problems faced by the cashew farmers were, high cost of inputs (fertilizer, labour), pest attack (stem borer) and unavailability of farm inputs (irrigation).

KEYWORDS: Cashew, Constraints, Double season, Linear programming model, Profitability, Single season

INTRODUCTION

The cashew (*Anacardium occidentale*) is a seasonal crop known as a "poor man's crop" as it can grow with fewer inputs even in sandy soils. It is a fast growing evergreen tree which has an extensive root system and deep tap root and it is native to arid north-east coast of Brazil from Ceara to southern Bahia. The most important climatologic factor of the dry zone cashew farmer is sufficient and reliable annual rainfall cycle. Average rainfall of this zone of Sri Lanka usually varies from 889 mm to 1524 mm which mainly derived from the North-East and South-West monsoons (Surendra, 1998). Cashew crop usually unirrigated but responds to summer irrigation. It needs more attention in terms of improvement of its management in order to give higher yields.

Total area under cultivation of cashew in Sri Lanka in year 2004 was 35,646 ha (anon., 2005). During the latter part of the last decade, the area under cultivation as well as total bearing extent have gradually increased due to various efforts taken by the Sri Lanka Cashew Corporation (SLCC) to increase the production (Jeyasekera, 2003). Cashew is cultivated in almost all the districts in the country. However, the extents are substantial in the dry zone areas, especially in the districts of Puttlam, Mannar, Vavuniya, Jaffna, Trincomalee, Batticaloa, Polonnaruwa, Moneragala and Hambantota (Surendra, 1998). The development of the cashew industry in the country is the responsibility of the SLCC under the Ministry of Plantation Industries.

Total area under cultivation of cashew in Puttlam in year 2005 was 10,506 ha (Anon., 2005). There are two types of cultivation systems in this area, such as

double and single season cultivation based on rainfall pattern. One harvest per year is referred as single season cultivation where as two harvests per year is double season cultivation. Single season cultivation is the main system in Sri Lanka. It follows the annual rain fall pattern of Sri Lanka. Average yield from single season cashew is 4 to 5kg per tree (Jeyasekera, 2003). Double season cultivation is cultivated in Puttlam district, especially in Vannathuwillu. In areas where there are two dry seasons, the trees usually flower twice a year explained by Ogler (1979). This cultivation referred to as double season cultivation. Double season cashew gives the first harvest with single season cashew harvesting period of March to April and second harvest from period of September to November.

Some of the major constraints responsible for cashew cultivation are lack of knowledge on improved cultural and management practices, high cost of inputs, variations in weather patterns, poor farm-gate prices during harvesting season, poor market and physical infra-structure including storage, very less research support for the development of double season cashew and low income of cashew farmer (Surendra, 1998).

Farmers are unable to use recommended amount of inputs such as fertilizer, labour, weedicide, pesticide, planting material, land and water which are suggested by the SLCC, due to high cost. Cashew farmers have lack of knowledge on improved cultural and management practices which recommended by the SLCC. Though management practices are different in double and single season cultivation, they practice the same methods for both cultivation

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systems. When there are any changes in weather pattern, farmers get a low harvest of raw cashew nut. Wayamba University of Sri Lanka and the SLCC released three new single season cashew varieties named as WUCC-9, WUCC-19 and WUCC-21 which have shown wide adaptability and proved to be high yielding, although there is no research support for double season cashew cultivation. Cultivators sell their cashew as raw nuts immediately after harvesting due to lack of storage facilities and need of immediate cash for their consumption.

Cashew farmer's income is much less when compared to other crops. But double season farmers might be having higher income than single season farmers as single season cultivation gives income only once a year where double season farmers get an income twice a year. Even though there is an income variation between both cultivation systems in cashew sector, no research has been conducted so far in Puttlam district. So, objective of this study was identifying the factors affecting the cashew cultivation, finding the constraints and problems of this farming, identifying the profitability of different cashew cultivation systems and give recommendations for sustainable development and to increase the income level of cashew farmers with special reference to double season.

METHODOLOGY

The primary data used in this research were collected through questionnaire survey from random sample of 50 farmers in Puttlam district during the period of April to May of 2006. Puttlam district was selected because of higher proportion of cultivating double and single season cashew. Primary data included information on income of family, physical quantities of inputs, cost of production and total production of double and single season cultivation.

Data were analysed using descriptive statistical method described by Steve Simon (2006). Linear programming (LP) model (Weeranewa et al., 1990) was used to identify the constraints of cashew cultivation. It was constructed to maximize objective function with labour and land as constraints. Irrigation and fertilizer were not considered as constraints as these inputs were not significantly used by the farmers. The objective function was formulated as follows:

$$\text{Maximize } P_1S_1 + P_2S_2$$

Where,

P_1 = Average price per kg in season one

P_2 = Average price per kg in season two

S_1 = Total production of season one and

S_2 = Total production of season two.

Season one was considered as total single season and first part of the double season cashew and season two included rest of the double season cashew.

Benefit Cost Analysis (Portney, 2006) was carried out for different cultivation systems. Benefit Cost Ratio (BCR) was calculated as follows,

$$\text{BCR} = \frac{\text{Present value of benefits}}{\text{Present value of costs}}$$

Benefit component identified in cashew cultivation system was raw cashew nuts. Cost components were labour cost and fertilizer.

Problems faced by the cashew farmers in production and marketing of raw cashew nuts were identified during the survey and they were listed according to their relative importance.

RESULTS AND DISCUSSION

Cultivation Type of Cashew Based on Rainfall Pattern

Survey data revealed that the 32 percent of the farmers cultivated single season cashew where as 14 percent of the farmers involved in double season cultivation and 54 percent of the total farmers practiced both double and single season as mixed cultivation (Figure 1).

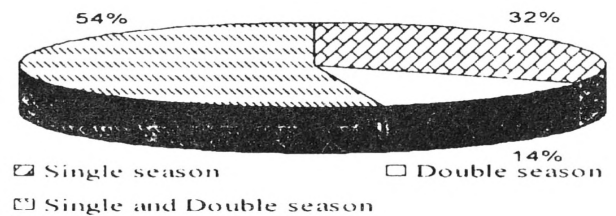


Figure 1 - Distribution pattern of farmers among the type of cultivation:

Cultivation Type of Cashew as Mono or Mix Crop

According to the survey, 74 percent of the farmers cultivated cashew as a mono crop and 26 percent of the farmers involved in mix cropping with other plants such as banana and mango. But farmers are unable to get yield from other crops as they did not practiced proper management recommended by the SLCC (Figure 2).

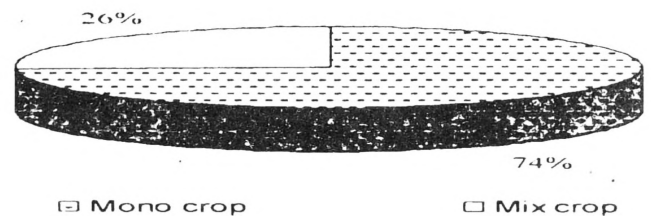


Figure 2 - Distribution pattern of farmers among mono and mix crop cashew cultivation:

Average Yield

The average yield per tree was high in double season cultivation (Table 1).

Table 1 - Average yield per tree in year 2005:

Cultivation system	Average yield(kg)
Double season	11
Single season	9

Land Extent

Survey revealed that the single season farmers have higher land extent than the double season farmers (Table 2).

Table 2 - Land extent of double and single season cultivation:

Variable	Single Season(Ac)	Double season(Ac)
Mean	7.47	4.60
Minimum	0.50	0.50
Maximum	75.00	25.00
StDev	12.34	5.37

Labour Requirement of Cashew Cultivation

The required number of labour was lower than available number in single season cultivation. But required number of labour was higher than available number in double season cultivation (Figure 3). Therefore it is observed that the double season farmers need more labour days than for single season cultivation. The cultivators were unable to maintain the required number of labour level in double season due to labourer scarcity. Labourers who are working in cashew sector are shifting to another job for getting higher salary in other sectors.

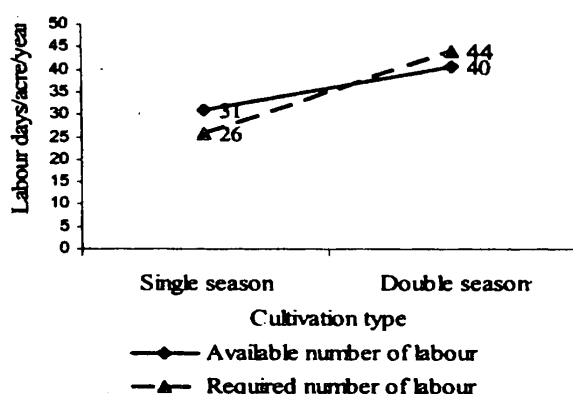


Figure 3 - Relationship between labour days and cultivation type:

Linear Programming Model to Identifying the Constraints of Cashew Cultivation

Land and labour days were identified as limiting factors in the cashew cultivation. These inputs were fully satisfied with no spare values which explained by slack or surplus (Table 3). The dual price of a limiting factor was provided valuable guidance because it was indicated to farmer that the increasing of one unit of these constraints result in increase of farmer's profit.

Table 3- Linear programming solution:

Constraints	Slack or Surplus	Dual Price
Labor day(Day)	0.00	358
Land(Acre)	0.00	14711

The objective value of linear programming was the profit maximization value which is Rs.341776. If season one produced 3437kg and season two is 1300kg the maximum profit of Rs.341776 can be achieved (Table 4).

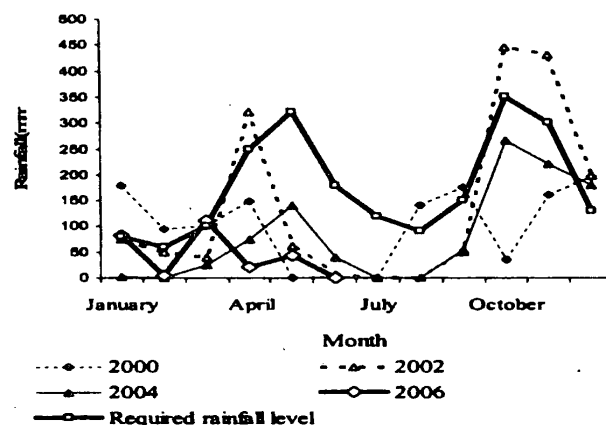
Table 4 - Linear programming outcome:

Variable	Value(kg)
Season 1	3437
Season 2	1300

Objective value: Rs.341776

Rainfall Requirement of Cashew Cultivation

The required rainfall level was higher than available rainfall level in Vannathuwillu from 2000 to 2006 except in year 2002 that was better rainfall pattern for cashew cultivation (Figure 4). Double season cashew is depending on the Yala season. Rainfall pattern of Yala season in year 2006 has highly deviated from required rainfall pattern. So, production might be reducing in future periods for both cultivation systems especially for double season cultivation system. Therefore irrigation is very



important for future cashew cultivation.

Figure 4 - Relationship between rainfall level and month in Vannathuwillu:

BCR Analysis for Identify the Profitability of Different Cashew Cultivation System

Both cultivation systems are profitable. Out of two cultivation systems, double season cultivation is more profitable as it records the higher profits (Table 5). High price of raw cashew nut in off period increases the profit of the cultivators.

Table 5 - Benefit Cost Ratio of different cashew cultivation systems per acre per year:

	Cultivation system	
	Double season	Single season
Present value benefits(Rs)	32858.00	20734.00
Present value costs(Rs)	17701.00	13442.00
BCR	1.86	1.54

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Problems of Cultivation and Marketing

High cost of inputs and Stem borer attack were the major problems for the farmers (Table 6). Unavailability of inputs and lack of subsidy scheme were also significant problems in cashew cultivation. Most of the farmers did not practice good management practices. Absence of proper marketing system was a major issue prevailing in Puttlam district. The middleman involvement was high in marketing channels. For double season cultivation, obtaining of good quality planting materials was difficult.

Table 6 - Problems hindering the performance of cashew cultivation:

Problems	Farmer reporting (%)
High cost of inputs (fertilizer, labour)	97%
Stem borer attack	91%
Unavailability of farm input(irrigation)	89%
Lack of subsidy scheme	83%
Low management	74%
Absence of proper market	67%
Helopeltis attack	54%

Suggestions stated by the cashew farmers to overcome the problems were improvement of subsidy programmes, market development, improve the research support and input facilities.

CONCLUSIONS AND SUGGESTIONS

The results of the study revealed that the average yield per tree in double season cashew cultivation is 2kg greater than of the single season cashew which is 9kg.

Further it highlighted that the inputs of cashew cultivation such as land, labour, irrigation and fertilizer are major constraints in both cultivation systems. But land and labour are limiting factors. Available Rainfall of Vannathuwillu is lower than the required rainfall level.

This study determined that the double season cashew cultivation is profitable than the single season cashew cultivation.

The major problems hindering the performance of cashew cultivation were high cost of inputs (fertilizer, labour), pest attack (stem borer) and unavailability of farm input (irrigation).

For overall development of cashew sector in Sri Lanka a planned approach and a strategy are needed. Following are some suggestions for the SLCC and the government to overcome the problems faced by the farmers.

Farmers should manage the cashew crop properly according to recommendations made by the SLCC. Sri Lanka Cashew Corporation must facilitate the farmers with;

- Generating of quality planting materials for double season cashew
 - Replanting programmes
 - Application of improved agronomic practices
 - Pest management
 - Strong research support for double season cultivation
 - Effective education programmes for farmers.
- Government must provide subsidies and financial facilities for the cashew sector in future.

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REFERENCES

- Anon. (2005). "Cashew, sericulture, sugar." Plantation sector statistical pocket book 7,167-173.
- Jeyasekera, S.J.B.A. (2003). "The cashew nut." In S.J.B.A.Jeyasekara and N.E.M.Jayasekara (eds.), Cashew cultivation principles and techniques (pp.1-33) CP printers, Gangodawilla, Nugegoda, Sri Lanka.
- Portney, P.R. (2006). "Benefit-Cost Analysis." Online. Available at <http://www.econlib.org/LIBRARY/Enc/BenefitCostAnalysis.html> - 21k [Retrieved July 29, 2006].
- Paulo Nicua Mole, (2000). "An economic analysis of smallholder cashew development. opportunities and linkages to food security in Mozambique's Northern province of Nampula." Online. Available at <http://www.aec.msu.edu/fs2/mozambique/moledisertation.pdf> [Retrieved January 30, 2006].
- Steve Simon, (2006). "Stats, Steps in a descriptive model." Online. Available at <http://www.childrens-mercy.org/stats/model/descriptive.asp> [Retrieved July 30, 2006].
- Surendra.G.B.B, (1998). "Integrated production practices of cashew in Sri Lanka." Online. Available at <http://www.fao.org/docrep/005/ac451e/ac451e08.htm> [Retrieved January 30, 2006].
- Weeranewa, J., and S.M.M.Zuhair. (1990). "An empirical test of multiple objective Vs single objective decision making in agricultural production." Journal of tropical agricultural research 2,209-217.