

An Analysis of Smallholder Rubber Farmers' Output Choice

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ABSTRACT

Rubber is a major exporting crop in Sri Lanka produced in many areas in the country. There are various kinds of rubber outputs as latex, bulk, and ribbed smoke sheets from grade number 5 to 1. But the farmers do not produce all these types because of many reasons. Rubber production depends on the farmers' human capital, physical capital, knowledge and market related reasons. Using a multinomial Logit model, the farmers' production choice was analysed for a sample of 491 smallholder rubber farmers. Results revealed that main reason for lack of production of high quality rubber outputs are lack of physical capital (i.e. smoke houses). Therefore, policy makers should consider granting facilities to improve such or promote group processing schemes.

KEY WORDS: Multinomial logit, Output choice, Rubber, Smallholders

INTRODUCTION

Rubber is a perennial plant of economic importance (economic crisis, 2008a), which has helped sustainability and the development of quality of life of rubber small holders. Almost 72 percent of Sri Lanka's rubber is produced by smallholders who account for just over half the cultivated extent (Sri Lanka Rubber producer, 2012). Rubber is used in producing many final products like tyres and tubes, hot water bottles, Auto parts, industrial components, gloves, condoms, balloons, boots, shoe soles, jar seals, carpets and mattresses etc. Before all of those final products, the farmers must produce rubber. Any farmer keen on producing, only if they can maintain their livelihood well by selling them to the market and getting an income. Farmers have the chance to sell rubber to the market in many forms.

Farmers, who produce rubber, sell them to the buyers as latex or sheets. In that case the farmers would like to sell rubber as the output which gives more benefits to them. That depends on the present market price of various outputs of rubber and how easy to produce them and transport.

In addition to latex, in Sri Lanka about 43 percent of the rubber output is sold as 'ribbed smoked sheets' (RSS) made from raw, processed latex. The visual-based grading of RSS, on a scale of one to five as RSS1, RSS2, RSS3, RSS4, and RSS5 creates problems as buyers dealing with smallholders who find it too costly to find out the quality of each and every sheet. In Sri Lanka, buyers offer prices in two bands, RSS1 and RSS2 for the top grades, and RSS3, RSS4 and RSS5 for the rest. Within those price bands prices don't vary a lot. So, farmers end up making only RSS5 as higher quality sheet is difficult to produce. Not

only that, the small farmers find it difficult to give the required quantities at stable prices for a given standard and do not have enough money to invest in technology to improve the quality of their final production.

Although, farmers produce high quality RSS1 or RSS2, there is no significant price difference in the market between top quality grades and low quality grades. Therefore the farmers' effort to produce top quality grades is useless according to their effort. When they are going to sell with top quality grades, buyers buy them for the low quality grades as there is no highly detectable difference in visual based between them. Farmers might think that it is not reasonable. This study was carried out to understand the characteristics of farmers who produce different types of rubber.

METHODOLOGY

Multinomial Logit

In statistics, a multinomial logistic regression model, also known as softmax regression or multinomial logit, is a regression model which generalizes logistic regression by allowing more than two discrete outcomes. It is a model that is used to predict the probabilities of the different possible outcomes of a categorically distributed dependent variable, given a set of independent variables (which may be real-valued, binary-valued, categorical-valued, etc.). However, it should be kept in mind that the actual goal of the multinomial logit model is to predict categorical data. The multinomial logit model assumes that data are case specific; that is, each independent variable has a single value for each case. The multinomial logit model also assumes that the dependent variable cannot be perfectly predicted from the independent variables for any case. As with other types of regression, there is no need for

the independent variables to be statistically independent from each other. Thus, the multinomial logit specified in this research can be stated as:

$$Y = f(X)$$

Where, Y, is a categorical outcome variable with 6 categories and X is a matrix of covariates these covariates are described below.

Human Capital

Human capital is the stock of competencies, knowledge, social and personality attributes, including creativity, embodied in the ability to perform labor so as to produce economic value (Human capital, 2008b). This is proxied by three key variables: age, education and gender.

Physical Capital

In economics, physical capital or just 'capital' refers to a factor of production (or input into the process of production), such as machinery, buildings, or computers. More relevant here are: smoke houses

Market Related Reasons

Assuming transaction costs reduce incentive to sell, it is represented by time spent to travel to buyer.

Knowledge

The knowledge is not measured directly but through the followings, training and Extension visits

Study Area

Kaluthara is a major Rubber growing area with 33,598 holdings with an extent of 19,058 ha (Rubber Research Institute, 2010). There are 14 divisional secretariat (DS) divisions in Kaluthara district.

Sample Selection

500 growers distributed throughout the Kaluthara district were taken as the total sample size. There are 14 divisional secretariat (DS) divisions within the district and they are divided into 762 Grama Niladhari (GN) Divisions. Targeted GN divisions are selected from the DS divisions using a multi stage cluster sampling technique. Number of growers who are selected into the sample from each DS division is determined based on the weighted proportion as;

$$\text{sample size per DS division} = \frac{\text{No of smallholders in DS division}}{\text{No of smallholders in district}} \times 500$$

Growers have been selected purposefully from each GN division according to the concentration of the smallholders. Estimation was carried out using STATA 11.

RESULTS AND DISCUSSION

Summary statistics of the sample are given in Tables 1 and 2.

Table 1. Summary of farmers output choice

Product type	Frequency	Percentage
Latex	33	6.71
Bulk	385	78.25
RSS5	58	11.79
RSS4	5	1.02
RSS3	9	1.83
RSS1	2	0.41
Total	492	100.00

Most of the farmers in the sample sell as bulk and RSS5. This shows evidence of lack of production of high quality rubber grades.

Table 2. Summary statistics of the variables in the model

		Frequency	Percentage
Gender	Female	99	20.12
	Male	393	79.88
	Total	492	100.00
Education	No Schooling	11	2.24
	Grade 1-5	87	17.68
	Grade 6-10	200	40.65
	Grade 11-12	179	36.38
	Degree	11	2.24
	Postgraduate	4	0.81
	Total	492	100.00
Smoke ho.	No	318	64.63
	Yes	174	35.37
Ttraining	Total	492	100.00
	No	370	75.20
	Yes	122	24.80
	Total	492	100.00
N.E.V.	0	407	82.72
	1	70	14.23
	2	14	2.85
	4	1	0.20
	Total	492	100.00
		Mean	
	Age	56.67	12.39
	time buyer	36.67	35.73

Number of extension visits-(N.E.V.)

Most of the rubber producers are male. In the educational level grade 6-10 and grade 11-12 farmers are appearing in higher percentage than the other levels. Many farmers in the sample have no smoke houses. Having a training and number of extension visits, give information about the farmers' knowledge. In this sample most of the farmers have no training to produce. Many farmers haven't had an extension visits. Only one farmer of the sample has extension visited for four times.

If the coefficient value is a minus, then an increase in an independent variable would result in the declined probability of the dependent. But if the sign of coefficient is

plus, when the independent variable is increased, the probability increased. These equations have been analyzed from STATA 11 (Table 3 and 4).

Results of the Analysis

Table 3. Results of multinomial logit analysis.

Sell type	Independent variable	coefficient	Std. Err.
Latex	age	-.0008*	.0143
	gender	-.7638*	.4399
	education	.4582**	.2288
	Smoke_House	-1.7502**	.7501
	time_buyer	-.1037***	.0390
	training	-.7240	.4587
	extension_~s	-.0713	.4767
RSS5	age	-.0183*	.0108
	gender	-.4491	.3626
	education	.0438	.1739
	Smoke_House	.9316***	.3046
	time_buyer	-.0135	.0097
	training	.2785	.3055
	extension_~s	-.0933	.2518
RSS4	age	.0015	.0412
	gender	-1.3353	.9157
	education	.6259	.6224
	Smoke_House	.3822	.8524
	time_buyer	-.0324*	.0166
	training	-.4395	1.0453
	extension_~s	.6724	.6428
RSS3	age	.0311	.0376
	gender	-1.0577	.6609
	education	.9009**	.3588
	Smoke_House	1.3745**	.6609
	time_buyer	-.0034	.0079
	training	-.1999	.9427
	extension_~s	.0429	.6737
RSS1	age	-.0301	.0384
	gender	13.8485***	.7455
	education	-.6219	1.3628
	Smoke_House	.8211	1.7424
	time_buyer	-.0335***	.0074
	training	1.1701	1.1728
	extension_~s	-13.5126***	.7504

*10%, **5%, ***1% significant level. Figures within parantheses are standard errors. Bulk is treated as the reference category.

In the latex equation, age, gender, smoke house and time to buyer show significance. Both age and gender show a negative impact on production of latex. Smoke house is negative as expected because farmers who own smoke houses would produce sheets rather than latex. Time to buyer, which represent transaction costs also reduce latex production as expected.

Coefficient Values of the Equations

Table 4. Sign of the coefficient values belongs to each equation relative to Bulk.

	Sign of coefficient values of				
	Latex	RSS5	RSS4	RSS3	RSS1
Age	-*	-*	+	+	-***
Gender	-*	-	-	-	+
Education	+**	+	+	+**	-
S. house	-**	+***	+	+**	+
Time to b	-***	-	-*	-	-***
Training	-	+	-	-	+
Extension	-	-	+	+	-***

Smoke house-(S. house), Time to buyer-(Time to b)

In the production of RSS5 & RSS3 availability of smoke house was significant and positive as expected. For other sheet types (RSS4 & RSS1) it failed to show significance although positive sign was obtained. This might be a data issue because the data set did not have a large number of farmers who produce these outputs. One important finding is high & negative significance of transaction costs (time to buyer). This tells us that reducing transaction costs are important.

CONCLUSIONS

The study reveals that non important factors to improve production of sheet rubbers are lack of physical capital & higher transaction costs. Therefore it is prudent to reduce transaction costs and improve physical capital. Therefore group processing & cooperative selling should be encouraged.

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