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Identification and prioritization of the constraints of rubber farming in Moneragala District

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Abstract

Identification and prioritization of the constraints of rubber farming perceived by rubber smallholders in Moneragala district were the objectives of this study as rubber farming is still being expanded. There were 44 constraints identified by the focus group discussion with 48 Rubber Smallholders (RSs), who were selected from eight rubber-growing DS divisions based on a stratified sampling technique, prior to the questionnaire survey. Identified constraints were listed on the questionnaire. A pre-tested questionnaire survey, a focus group discussion, semi-structured interviews and field observations were used to collect data from 597 rubber smallholders who were selected from eight rubber-growing DS based on stratified sampling technique. The respondents were asked to assign a rank for all constraints. The 44 constraints perceived by rubber smallholders were categorized into following rubber farming activities; 1. Immature up-keeping, 2. Rubber tapping, 3. Manuaring of rubber farming, 4. Rubber processing, 5. Rubber marketing, 6. Extension service related to rubber farming and 7. Thurusaviya rubber societies. Among them, low quality of planting material, lack of knowledge of tapping, lack of knowledge of applying mature fertilizer unavailability of quality acid, low prices for every grade of RSS, lack of training programmes on rubber processing aspects and unsatisfactory input distribution were the highest prioritised constraints address the sustainability of rubber farming in Moneragala by the Henry Garrett Ranking Method. Development of an extension strategic plan in order to transfer the knowledge of the recommended rubber farming practices introduced by the Rubber Research Institute of Sri Lanka to rubber smallholders in Moneragala with the aim of enhancing rubber productivity, restructuring the rubber farming subsidies focused on Intermediate Zone rubber farming, improving the rubber marketing system and strengthening the Thurusaviya rubber societies were identified as strategies to overcome the identified perceived constraints of rubber farming in Moneragala.

Key words: constraints, non-traditional rubber farming areas

Introduction

The IL1c, IL2 and IM2b agro-ecological regions in Moneragala District (Moneragala) are used for Rubber Farming (RF) which are distributed among eight Divisional

Secretariat (DS) divisions (Wijesuriya *et al*., 2011). At present, the total extent of rubber smallholdings in Moneragala is about 5,087ha (9,415 holdings) and Moneragala is the fifth in position to grow rubber according to the land extent under rubber cultivation in Sri Lanka (MPI, 2019). Rubber Smallholders (RSs) have identified a wide range of constraints they perceived to affect their RF activities which fall into the aspects of immature up-keeping, mature up-keeping, tapping, Ribbed Sheet Rubber (RSS) manufacturing, marketing, extension and *Thurusaviya* Rubber Societies (TRSs) (Wijesuriya, *et al*., 2007, 2008, 2011 and 2012). The identification and prioritization of constraints of RF in Moneragala was important with regard to sustainability of RF and also in improving rubber productivity in the country as the process of expansion of RF into Moneragala is still being carried out. So that, identification and prioritization of the constraints of RF perceived by RSs in Moneragala were the objective of this study. Wijesuriya, *et al*., (2011) has studied the constraints in sustainable smallholder RF in Moneragala with participatory studies and has focused only on the constraints of adoption on technology. Wijesuriya, *et al*., (2007) has studied the constraints related to sustainability in the three major rubber growing districts. In both studies, it was not focused on the major areas of RF separately, as of immature up-keeping, mature up-keeping, tapping, RSS manufacturing, marketing, extension and TRSs.

Hence, the findings of this study would be useful for policy makers, researchers and extension personnel to formulate guidelines and also to organize work programmes more effectively to improve rubber productivity and sustainability of RF, as Moneragala is a non-traditional rubber growing locality with higher extent of area with newly-planted cultivars. The present study will have an impact on the level of livelihoods of RSs as well as on the sustainability of RF in Moneragala, while having a footprint on the country's economic development.

Methodology

The study was conducted in Moneragala in Sri Lanka during 2019. The minimum total size of the sample was 597 RSs, representing 23% of the population at a 90% confidence interval using Raosoft web-based sampling calculator for which stratification was applied on the basis of geographical distribution of RSs in all rubber growing eight DS divisions in Moneragala (http:// www.raosoft.com/samplesize. html). Pre-tested questionnaire survey, semi structured interviews and field observations were used to collect data from the respondents. The questionnaire consists of questions from the three main domains and key general information of RSs, smallholdings, perceived constraints of smallholder RF and suggestions to solve the identified constraints. The perceived constraints of RF in Moneragala were evaluated at the ground level. There were 44 constraints identified by the focus group discussion with 48 RSs, who were selected from

eight rubber growing DS divisions based on stratified sampling technique, prior to the questionnaire survey and the list was then administrated to RSs for response.

Identified constraints were listed on the questionnaire. The constraints were broadly divided into; 1. Immature up-keeping (14), 2. Rubber tapping (5), 3. Manuaring of RF (5), 4. Rubber processing (9), 5. Rubber marketing (4), 6. Extension service related to RF (5) and 7. TRSs (2). The respondents were asked to assign a rank for all constraints and the outcomes of such ranking have been converted into a score with the help of the following Eq. 1;

Percent position of each rank = 100 (R_{ij} - 0.5)/N_j……Eq. 1

Where;

R_{ij} = Rank given for the i^{th} variable by j^{th} respondents

N_j = Number of variables ranked by j^{th} respondents

Based on the results of the calculation of ranks using the formula mentioned above, Garrett values were determined using Garrett Ranking Conversion table. The Garrett values were then multiplied by the frequencies of the constraints in every rank. The mean score was used as the basis of the final ranking of the constraints (Rakesh *et al*., 2020; Manaros, *et al*., 2020). Suggestions were obtained from the Rubber Development Officers, officials of TRSs and RSs through questionnaire survey in order to remove and find solutions for the constraints.

Results and Discussion

Key information of smallholders

Male RSs were dominated, with male: female ratio of nearly 4:1. The age of RSs varied from 20 to 79 years. The majority (55%) of RSs belonged to the age category of 36-40 years. Nearly 10% of the respondents were above 60 years, while only 35% were found below 35 years. However, the young age (<35 years) category was not prominent in this study area, and it differs from a previous study carried out in Moneragala by Wijesuriya *et al*., 2008. The attraction of the younger generation must be directed to the smallholder rubber sector to ensure the sustainability of RF. None of the RSs has obtained higher education (diploma and degree level), and 1% of RSs had not attended a school. Further, only 3% of RSs had attended tertiary education level (GCE A/L). The majority of RSs (53%) have achieved more than ten years of RF experience with an average of 11.5 years.

Key information of rubber smallholdings

The summary of the characteristics of rubber smallholdings is presented in Table 1. The majority of the rubber smallholdings fall into the size of 1-1.5 acres (0.4-0.6ha). The clone RRIC 121 occupies 82% of the rubber smallholdings selected for the study. The prominent current harvesting panels were B0-1 and B0-2. The average harvesting stand was 478 trees/ha. The average number of harvesting days was reported as 123 per year and the average yield was 997 kg/ha/year.

Table 1. *The summary of the characteristics of rubber smallholdings*

Characteristics of rubber smallholdings	**% (N=597)**
Size of the holding (acres)	
<1	6
1-1.5	68
1.5-2	2
2.1-3	21
3.1-4	12
>4.1	1
Type of the clone	
RRIC 100	18
RRIC 121	82
Harvesting stand per ha. (no. of trees)	
Average	346
Range	(316-499)
Current harvesting panel	
B0-1	37
B0-2	46
B1-1	15
B1-2	2
Harvesting days/year	
Average	104
Range	(65-175)
Yield (dry basis) kg/ha/year	
Average	997
Range	(348-1102)

Constraints for immature up-keeping of rubber farming

The Table 2 revealed RF constraints for immature up-keeping of RF. Among those poor quality of planting material was the prominent constraint reported by RSs. The second and third constraints were the unavailability of planting material in the correct time and unavailability of plants for vacancy filling. The Rubber Development Department can play an important role for minimizing those three constraints. Because they have the authority to issue quality planting materials. The quality control process in rubber nurseries could be strengthened as one of the remedies to poor quality planting material. The recommended number of rubber trees is 512 ha^{-1} in immature smallholdings, which was found to have reduced to an average of 436 ha^{-1} and it ranged from 316 to 499. Lack of knowledge of applying fertilizer for immature rubber plants, unavailability of fertilizer for immature rubber plants in the correct time, unable to apply due to long drought period during the immature period and cost of fertilizer for immature rubber plants and manuaring were highlighted as manuaring constraints in the immature

stage of RF. Immature plant death due to disease attack was mentioned as minor issue. Rubber plants per hectare when becoming tappable girth are positively related to low quality of planting material, unavailability of planting material in the correct time, un availability of plants for vacancy filling and immature plants death due to animal attack. Delay in the rubber subsidy and insufficient monetory value of rubber subsidy were also highlighted by RSs. The prominent reasons for the vacant areas in the fields are due to drought condition and *Wild boar/Porcupine* attacks. The most of RSs don't aware to identify the rubber diseases. RSs are needed to educate on the subsidy scheme to avoid any delays.

Constraints for rubber tapping

Table 3 shows the constraints for rubber tapping. Lack of knowledge and skill of tapping were major constraints, which are similar to traditional rubber growing areas as confirmed by Dissanayake *et al*., (2010). Comparatively, *Tapping Panel Dryness* (trees that do not produce latex) trees per acre were low (5/ac) with traditional rubber growing areas (traditional areas, *Tapping Panel Dryness* trees/ac= 12) (Dissanayake *et al*., 2010). The *Tapping Panel Dryness* trees were one of the reasons for the low number of trees tapping in a holding. Unavailability of modified tapping knives and marking plates were also highlighted by RSs. The unavailability of tappers was one of the lowest constraints in Moneragala, because the self-tapping system was more prominent (52%) in the area. Lack of knowledge and skill of tapping came up with possible causes such as lack of systematic training programmes accompanied with demonstrations and practical sessions. Farmers due to resource limitations (Mahaliyana-arachchi and Sivayoganathan, 1996) did not adopt management practices. Marking plates and modified tapping knifes should be distributed through TRSs.

Table 2. *Constraints for immature up-keeping of rubber farming*

Constraints	**Garrett mean score**	**Rank**
Low quality of planting material	73.18	1
Unavailability of planting material in correct time	72.75	2
Un availability of plants for vacancy filling	70.56	3
Plants death due to drought condition	69.88	4
Plants death due to animal attack (*Wild boar/Porcupine)*	68.53	5
Lack of knowledge of applying fertilizer for immature rubber plants	67.55	6

Constraints	Garrett mean score	Rank
Unavailability of fertilizer for immature rubber plants in correct time	65.22	7
Unable to apply due to long drought period during the immature period	63.25	8
Cost of immature fertilizer	62.24	9
Cost of manuaring for immature rubber plants	60.55	10
Long time period to reach the mature stage (>5 yrs)	59.88	11
Monitory value of rubber subsidy insufficient	58.24	12
Delay the rubber subsidy	50.33	13
Immature plants death due to disease attack	46.22	14

Table 3. *Constraints for rubber tapping*

Constraints	Garrett mean score	Rank
Lack of knowledge of tapping	72.75	1
Lack of skill of tapping	71.20	2
High number of *Tapping Panel Dryness* plants	69.18	3
Unavailability of marking plates and modified tapping knifes	60.56	4
Unavailability of tappers	58.53	5

Constraints for manuaring of mature stage of rubber

Table 4 revealed the constraints for manuaring of the mature stage of RF. Lack of knowledge of applying fertilizer for mature rubber trees and unavailability of fertilizer for mature rubber trees at the required time were the major constraints under the constraints of manuaring of mature stage RF. Commercial-level fertilizer suppliers mentioned (Semi–structured discussion with input suppliers) that demand for fertilizer for mature rubber trees was very low, therefore large quantities couldn't be ordered. Fertilizer should be applied when enough soil moister is available, therefore rainfall is very important (Samarappuli *et al.*, 2005). In some areas (*Bibila, Wellawaya* and *Buttala* DS divisions), it is unable to apply fertilizer for mature rubber trees due to long drought periods. The lowest prioritized issue was the cost of manuring, because of the subsidy of fertilizer for mature rubber trees given by the state.

Table 4. *Constraints for manuaring of mature stage of rubber farming*

Constraints	Garrett mean score	Rank
Lack of knowledge of applying fertilizer for mature rubber trees	73.75	1
Unavailability of fertilizer for mature rubber trees in the correct time	70.34	2
Cost of fertilizer for mature rubber trees	69.18	3
Unable to apply due to long drought periods during the mature period	60.56	4
Cost of manuring of fertilizer for mature rubber trees	54.67	5

Constraints for rubber ribbed smoke sheet manufacturing

Table 5 revealed that the constraints for rubber processing faced by RSs. RSs highlighted poor standards of acids in the absence of quality certification as the major issue. The cost of processing was high due to the high cost of acid. They also pointed out the scarcity of RSS manufacturing equipment and other inputs such as rollers, smokehouses and coagulation trays and the lack of credit and subsidy facilities to buy RSS manufacturing equipment. They requested to provide these through TRSs in a transparent way. Many (53%) of the RSs used group processing centres to produce RSS, where only a few RSs highlighted constraints in the group processing centres such as transparency and corruption. The average distance from processing centres (group and own) to the plantation is 4.8 km which affects the RSS manufacturing cost. The number of group processing centres in Moneragala was not sufficient to cater to the requirement of RSs. Increasing the group processing centres, supplying subsidy and loan facilities, increasing the loan and subsidy amount were proposed by officials of TRSs and Rubber Development Officers (RDOs), as solutions for the development of processing centres.

Table 5. *Constraints for RSS manufacturing*

Constraints	Garret mean score	Rank
Unavailability of quality acid	70.53	1
Cost of acid	68.53	2
Unavailability of smooth roll	67.21	3
Unavailability of diamond roll	63.44	4
Lack of subsidy/credit facilities to buy inputs/rollers	60.55	5
Lack of credit facilities to build smokehouse	60.34	6
Constraints in group processing centres	59.45	7
Unavailability of coagulating trays	58.46	8
Distance from plantation to processing place	58.35	9

Constraints in rubber marketing

Table 6 revealed that the constraints found in rubber marketing *in* Moneragala. Market constraints which exist are similar to that of traditional areas, like purchasing sheets in bulk and large margins kept by middlemen (Edirisinghe *et al*., 2005). However, low price for every grade of RSS was the major issue. Rubber prices between Colombo rubber auction and Moneragala have gaps comparing the traditional rubber growing areas. Most of rubber buying centres are situated in town areas and the average distance from farm gate to the market is 13.5km and significantly affects the COP of RSS. Rubber marketers mentioned that rubber sheets and field latex have to be transported to Colombo District, due to the unavailability of manufacturing centres in Moneragala. Therefore, their profit margins were also low. The most of *Thurusaviya* District coordinating officials indicated that rubber purchasing centres should be implemented through TRSs. Thus, the rubber product manufacturing sector should be developed as cottage level, medium and large industries to consume the rubber in the District itself. The cause for this high price of rubber, as mentioned by the *Thurusaviya* District co-ordinating officials, is due to the district level consumption.

Constraints related to the extension service of the rubber farming

Table 7 revealed the constraints related to the extension service of the RF. Lack of training programmes on RSS manufacturing and mature up-keeping were major constraints under the extension services. Although relevant authorities conducted the training programmes, it was not sufficient enough to fulfil the requirement and also RSs highlighted more extension needs in the RSS manufacturing aspects. The number of advisory visits to rubber smallholdings, processing centres/smoke houses and market places are comparatively low, due to the lesser number of RDOs (2,450 RSs/RDO) in *Moneragala* (Dissanayake, 2009; Wijesuriya *et al*., 2011). Poor knowledge on RF was identified as a result of poor extension and advisory services. One of the reasons for the non-adoption on RF technologies was that the technology generated by researchers and disseminated to RSs by extension workers was not accompanied by adequate and timely supply of farm inputs. Wijesuriya, *et al*., (2011) has highlighted that, low education level was a constraint in improving the awareness of rubber smallholders on recommended rubber farming technologies. Thus, low monthly income was also a bottleneck for adoption on recommended technologies. These constraints need to be considered thoroughly in drawing up appropriate action plans to make RF productive in Moneragala. Therefore, there is a great responsibility on the shoulders of all the institutions catering the smallholder rubber sector in devising appropriate management plans to help the RSs in these areas.

Constraints related to Thurusaviya rubber societies

The Table 8 shows the constraints related to TRSs which were highlighted by RSs. It was reported as unsatisfactory input distribution and trustworthiness of the officers of TRSs. Relevant officials (RDOs and *Thurusaviya*) should monitor the activities of societies to minimize the mal functions.

Table 6. *Constraints for rubber marketing*

Constraints	Garrett mean score	Rank
Low prices for every grade of RSS	73.18	1
Distance from farm gate to the market	72.21	2
Corruptions in latex weighing	70.75	3
Unavailability of a village level market places	65.56	4

Table 7. *Constraints of extension service related to the rubber farming*

Constraints	Garrett mean score	Rank
Lack of training programmes on rubber processing aspects	74.45	1
Lack of training programmes on mature stage rubber cultivation	72.21	2
Lack of advisory visits to mature stage rubber plantations	70.55	3
Lack of advisory visits to processing centers/smoke houses	68.66	4
Lack of advice in marketing	64.32	5

Table 8. *Constraints related with Thurusaviya rubber societies*

Constraints	Garrett mean score	Rank
Unsatisfactory input distribution	68.99	1
Trustworthiness of the society officers	67.55	2

Conclusion and recommendations

The 44 constraints perceived by rubber smallholders were identified into following rubber farming activities; 1. Immature up keeping (Low quality of planting material, unavailability of planting material at correct time, unavailability of plants for vacancy filling, plant death due to drought condition, plant death due to animal attack (wild boar/porcupine), lack of knowledge in applying fertilizer for immature rubber plants, unavailability of fertilizer for immature rubber plants in correct time, inability to apply due to long drought period during the immature period, cost of fertilizer for immature rubber plants, cost of manuaring for immature rubber plants, long time period to reach the mature

stage (>5 yrs), insufficient monetary value of rubber subsidy and delay in rubber subsidy and immature plants death due to disease attack), 2. Rubber tapping (Lack of knowledge in tapping, lack of skill in tapping, high number of *Tapping Panel Dryness* plants, unavailability of marking plates and modified tapping knifes and unavailability of tappers), 3. Manuaring of rubber farming (Lack of knowledge in applying fertilizer for mature rubber trees, unavailability of fertilizer for mature rubber trees at correct time, cost of fertilizer for mature rubber trees, inability to apply due to long drought period during the mature period and cost of manuaring of fertilizer for mature rubber trees), 4. Rubber processing (Unavailability of quality acid, cost of acid, unavailability of smooth roll, unavailability of diamond roll, lack of subsidy/credit facilities to buy inputs/rollers, lack of credit facilities to build smokehouse, constraints in group processing centres, unavailability of coagulating trays and distance from plantation to processing place), 5. Rubber marketing (Low prices for every grade of RSS, distance from farm gate to the market, corruptions in latex weighing and unavailability of market places at village level), 6. Extension service related to rubber farming (Lack of training programmes on rubber processing aspects, lack of training programmes on mature stage rubber cultivation, lack of advisory visits to mature stage rubber plantations, lack of advisory visits to processing centres/smoke houses and lack of advisory service regarding marketing) and 7. *Thurusaviya* rubber societies (Unsatisfactory input distribution and trustworthiness of the society officers).

Among them, low quality of planting material, lack of knowledge of tapping, lack of knowledge of applying fertilizer for mature rubber trees, unavailability of quality acid, low prices for every grade of RSS, lack of training programmes on rubber processing aspects and unsatisfactory input distribution were the highest prioritised constraints address the sustainability of rubber farming in Moneragala. The strategies and recommendations for practical implications for overcoming the present constraints of rubber farming in Moneragala can be summarized as follows;

Strategy 1: Development of an extension strategic plan in order to transfer the knowledge of the recommended rubber farming practices introduced by Rubber Research Institute of Sri Lanka to rubber smallholders in Moneragala with the aim of enhancing rubber productivity.

Recommendations for implementation of strategy 1

- All multi-stakeholders of rubber industry should be involved in the development of the strategic plan
- The strategic plan is needed to be focused on the following; a) development of appropriate technology, b) transfer of developed technology, c) promotion of avenues for diffusion of technology and adoption on transferred technology, d) creation

of a suitable environment for implementation and e) development of research extension dialogues between researchers, extension personnel and rubber smallholders.

- The nature of training and extension programmes should be changed with regard to use of information and communication technologies.
- Awareness and training programmes on soil and moisture conservation, manuring, tapping panel marking, Brown root disease controlling, prevention of fire damages and animal attacks, the impact of droughts and wild animal attacks, tapping and rubber sheet manufacturing should be continuously organized for the sustainability of rubber farming.
- New recruitment of rubber development officers should be made with the provision of necessary travelling facilities (Motor bicycles and/or transport allowances, *etc.)*

Strategy 2: Restructuring the rubber farming subsidies focused on Intermediate Zone rubber farming.

Recommendations for implementation of strategy 2

- The criteria/indicators for subsidy should be revised in order to achieve sustainable development of rubber farming, based on the condition of the Intermediate Zone.
- The constraints of land ownership which prevail with *Swarnabhoomi* and *Jayabhoomi* deeds should be solved through relevant authorities.
- Rigorous monitoring is needed on the provision of subsidy to rubber smallholders.
- Increase subsidy of rollers and smoke houses.
- Rubber smallholders should be educated on the subsidy scheme of rubber farming to avoid any delays and misunderstandings with relevant institutions.
- The number of rubber development officers should be increased in order to establish an efficient distribution of rubber farming subsidies.

Strategy 3: Improvement of the rubber marketing system.

Recommendations for implementation of strategy 3

- Establishment and strengthening of the village-level marketing channels.
- Marketing system based on *Thurusaviya* societies can be formed to buy high-quality sheet rubber at the village level.
- Development of rubber grading system.
- Establishment of rubber sealing price.
- The rubber manufacturing industries should be developed in Moneragala.

- Development of rubber-based cottage industries at smallholder level.

Strategy 4: Strengthening the *Thurusaviya* rubber societies

Recommendations for implementation of strategy 4

- The management unit of *Thurusaviya* rubber society should take appropriate action to identify the needs of their members.
- According to the need identification, the strategic plan should be established in each *Thurusaviya* rubber society in collaboration with the relevant organizations, with maintaining good rapport with them.
- *Thurusaviya* rubber societies should be restructured as mix model of cooperative systems and commercial systems with business entity.
- *Thurusaviya* rubber societies can be upgraded as small-scale industries which are capable of manufacturing value-added rubber products (rubber bands, automotive accessories, *etc.*).
- The *Thurusaviya* rubber societies should be classified as low, moderate and high based on the viability and strength, through measurement of the involvement in the extension activities, welfare activities and record keeping, *etc.* and develop a strategic plan for each society by the relevant authorities.

Strategy 5: Addressing the constraints for immature up-keeping

Recommendations for implementation of strategy 5

- The availability of quality plants should be assured and that should be distributed through proper quality rubber plant certification
- Make rubber smallholders aware of quality plants
- Form smallholder quality plant selection clusters which consist of smallholders who are going to plant rubber, so that, these clusters can reject low-quality plants
- Introduction of guidance, monitoring and record keeping book for each smallholding. Criteria for reserving subsidies and immature up-keeping practices should be included in this book
- Subsidies should be released only after monitoring the field observation.

Strategy 6: Promotion of self-tapping

Recommendations for implementation of strategy 6

- *In-situ* Tapping skill development programmes should be conducted covering all smallholders/tappers in Moneragala at field level with post evaluation
- Adoption of self-tapping (Smallholders tap their own holdings) should be promoted
- Necessary equipment for annual tapping marking should be

distributed through the *Thurusaviya* rubber societies.

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