An empirical study on the impact of declining coconut production in Sri Lanka on kernel-based export products and coconut oil production for the domestic market

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1. Introduction

More than nine varieties of coconut (*Cocos nucifera*) are grown in the island. Domestic coconut consumption, however, is a priority and accounts for 65 to 70 percent of the overall annual production of nuts. The remaining 30 to 35 percent of production is used to produce a variety of coconut-based value-added products as desiccated coconut, copra, coconut oil, cream, and milk powder, etc. both for the domestic and export market (Samarajeewa, 2002). Currently, a shortage of coconut nuts exists in the country. As a solution, coconuts based on value addition while allowing to import raw materials for other industries can be recognized. Nevertheless, the Sri Lankan government has allowed short-term importation as a temporary solution only during a shortage. As other countries make good decisions to unravel the impact of the decline in nut production, it needs to develop a timely important proper plan in Sri Lanka too by coming up with important and acceptable decisions that can be implemented during a shortage in the production of nuts. This plan will help to overcome the shortage and increase exports whilst minimizing the price fluctuation of coconut and continuing the proper supply and demand process in the coconut industry. Accordingly, the study was conducted to identify the impact of declining production of coconut in Sri Lanka on kernel-based export products and coconut oil (excluding export). In addition, the researchers aimed to forecast of coconut production in Sri Lanka, while identifying the impact of palm oil and dehydrated chips imports to the coconut industry, and the export behavior of selected kernel-based products.

2. Materials and Methods

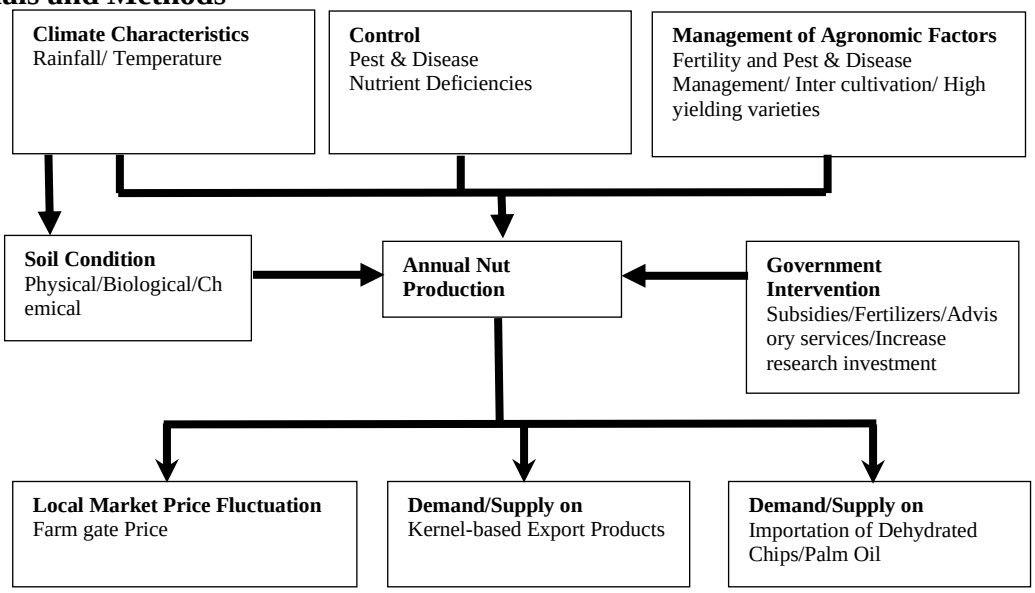

Figure 1. The conceptual framework of the study

The conceptual framework and methodology for this study were developed according to the information gathered in the literature survey and preliminary focus group discussions held with key experts attached to the coconut industry (Figure 1). Primary data were collected by interviewing coconut-based (Kernel) exporters, palm oil importers, and dehydrated chips importing millers who were registered under the Coconut Development Authority of Sri Lanka. In this study, six products with a total of 172 companies/mills formed the population that was undertaken for the investigation. The sample size was determined using a formula developed by Mugenda (2008). Accordingly, 120 respondents were selected for this study using a stratified purposive sampling technique. Three questionnaires five point-Likert scale questions were employed for three categories of above mentioned foreign traders. Moreover, the respondents were encouraged to share their knowledge of the industry at the beginning with any relevant comments in an open-ended format at the end of each questionnaire.

The production data of 20 years of coconut production of Sri Lanka were collected from the Marketing Development & Research Division of the Coconut Development Authority of Sri Lanka. In addition, time series Met data (Rainfall) for the period of 20 years from 2000 were obtained. The data on production of coconut in Sri Lanka for last 20 years were used for forecasting coconut production with ARIMA (Auto Regressive Integrated Moving Average) model. The ARIMA model is a method of analysis that uses only past observations of the variable of interest to explain the behavior of a time series data set and predict future values.

3. Results and Discussion

To fit an ARIMA model, it requires a sufficiently large data set. In this study, six tentative ARIMA models were used obtaining the production data of coconut in Sri Lanka for the period of 2000 to 2020. The general notation ARIMA (p, d, q) refers to the model with p-order of autoregressive (AR) terms, d is the order of non-seasonal differences and q, the order of moving average terms (MA). From that ARIMA (2,1,1) model was selected which has the minimum P value and MS Value (Table 1).

Table 01. Models and component order (p, d, q)

Model	AR	I	MA	P value	MS
Model1	1	0	0	0.029	56425
Model2	1	1	0	0.013	98134
Model3	1	1	1	0.031	59690
Model4	2	1	1	0.023	38312
Model5	2	1	2	0.111	29919
Model6	2	1	0	0.123	55955

The ARIMA (2,1,1) model was used to see if nut production in Sri Lanka would fluctuate between 2500-3000 in the next 5 years. Final estimates of forecasting parameters were reported as 2626.47, 2832.58, 2978.02, 2849.67, and 2760.92 million of nuts for the years 2021, 2022, 2023, 2024, and 2025 respectively.

A normality test was done to identify whether data were normally distributed. Consequently, non-parametric tests were applied to analyze the primary data. Thereafter, to find out the significant difference among tested statements, the Friedman test was performed.

Table 02. Results of Friedman test

Question	Chi-square Value
Kernel-based products (Exports)	
1	410.504**
2	47.276**
Impact of Dehydrated chips Importation	
1	142.376**
3	193.402**
Impact of Palm oil Importation	
1	2.667
2	13.780**
3	5.182

**significant at 0.05

Multiple comparisons of the selected questions were done by the Wilcoxon sign rank test (Probability adjusted by Bonferroni method) test. Accordingly, significant differences could be found among the pair of questions. However, there are no significant differences among questions in the Sri Lankan palm industry and among questions in the sustainability of final product supply. Therefore, multiple comparisons were not conducted for those question sets. There is a significant difference among the opinions on the export market of kernel-based products. Most of the respondents are (80.65%) strongly agreed with getting quality raw materials. Statistical analysis has reviled that; a significant difference ($P<0.05$) is found among statements that are related to the final product supply of kernel-based. Significantly highest number of respondents are strongly agreed with ensuring the quality of the final product (98.39%) and supply of the final product in the required demand (96.77%).

A significant difference could be found among statements on the impact of dehydrated chips/kernel importation. The effect of the decline in annual nut production on raw material supply from Sri Lanka is significant. All the respondents strongly agreed with the statement of consideration about the quality. Accordingly, a significantly higher number of persons (65.9%) are strongly agreed that the oil requirement would be complete by importing the raw materials. Samarajeewa and Gunathilake (2002) argue that local market demand for coconut oil is very likely to be affected by the presence of these replacement vegetable oils. Agreeing with the fact, in relation to the impact of palm oil importation, approximately 60% of the respondents have approved the import of crude oil while 40% have approved the import of refined palm oil. Most of the respondents are of the opinion that if crude oil is imported, it can be rejected and sent back to the same countries. The response rate for the questionnaire sent to Palm oil importers was 38.46%. According to 38.46% of the respondents, when importing palm oil, they are concerned about the local market demand and the quality of the palm oil.

4. Conclusions

According to the ARIMA model, the production volume of nuts for the next five years is also between 2,500 and 3,000 million nuts. Based on the current demand for nuts in the country, the coconut industry in Sri Lanka needs about 3,600 million nuts to work smoothly. Hence, a decline in nut production would be seen in Sri Lanka over the next 5 years. As most of the current annual coconut production goes to the export company without systematic distribution, it is difficult for the coconut oil millers to obtain the coconut required to produce coconut oil.

Therefore, the tendency to import dehydrated chips has increased. In addition, there are problems regarding the import of palm oil in Sri Lanka due to the recent concern raised on Aflatoxin. However, importing quality palm oil and dehydrated chips will help to meet the local oil demand as well as boost the industry. Further studies must be carried out to investigate whether there is an impact of the decline in the production of coconut in Sri Lanka on farm gate prices and taxes and impact of changes of tax and prices on coconuts in Sri Lanka.

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