The Journal of Agricultural Sciences
Vol. 13, No. 2, May 2018. Pp 100-109
http://dx.doi.org/10.4038/jas.v13i2.8335

Open Access Article

A Study on Market Window and Economic Efficiency in Assessing Profitability of Selected Upcountry Vegetables in Sri Lanka

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Received: 23rd November 2017 / Accepted: 07th March 2018

ABSTRACT

Purpose : *Vegetable subsector being a foremost source of income and employments, plays an outstanding role in Sri Lankan economy. However, profits from vegetable farming have become low due to low prices and frequent price fluctuations. Thus, this study identifies the existence of profitable markets, profitability, economic efficiency and price fluctuations of selected upcountry vegetables; bean, tomato, potato, cabbage and knol-khol in Bandarawela Divisional Secretariat Division, Badulla district. The aim of the study is to address the key issues in Sri Lankan upcountry vegetable sector.*

Research Method : *Stratified random sampling was applied to draw a sample of 150 vegetable growers to collect primary data. Market window analysis was done to identify profitable markets for each crop. Profit function, economic efficiencies, seasonal price indexes, coefficients of variation of prices and Garret's ranking technique were employed to examine profitability, price fluctuations and factors that have contributed to above situations from farmers' point of view.*

Findings : *The results indicated that, market windows were existed during the year 2016 for all crops considered. When compared profits, tomato and bean have produced high profits in Yala; the shorter rainy season (4910.35 US$ ac^{-1}) and Maha; the longer rainy season (2301.35 US$ ac^{-1}) respectively. Moreover, the production of cabbage (Yala2.75) and bean (Maha 1.14) was economically more efficient compared to the other crops considered. The seasonal price index disclosed that, prices of vegetables tend upward during the festival seasons, especially during the months of March and April. The coefficient of variation of price fluctuations over the years and seasonal variation and variability of prices observed were mainly due to seasonality in production, oversupply of production and low level of shelf life of vegetables. As per the constraint analysis, the price fluctuations were the highest perceived obstacles followed by unreasonable price for the fresh produce.*

Limitations : *Limited availability of historical data was a constraint during the study and that was avoided using data for a base year.*

Value : *It is better to conduct a study on market window analysis and profitability evaluation for upcountry vegetables in order to find out profitable market existence for each vegetable because, these evidences are useful to the farmer, trader and planners.*

Keywords: *Upcountry vegetables, market window, economic efficiency, profitability, prices of vegetables*

INTRODUCTION

Agriculture plays a leading role in Sri Lanka's economy. Out of different subsectors of agriculture (food crops), vegetable sub-sector is the second most important one (Sandika, 2011). Upcountry vegetables and low country vegetables are major categories of vegetables

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grown in Sri Lanka. Due to favorable weather conditions commercial vegetable (exotic) production in Sri Lanka is concentrated into upcountry. People of Bandarawela also cultivate vegetables as their main livelihood activity.

Vegetable marketing is more complex than the marketing of other agricultural commodities because of high perishability, bulkiness and seasonality in production (Sandika, 2011). This phenomenon has caused low prices and frequent price fluctuations making vegetable farming a financially less attractive venture. Under such circumstances, farmers need to decide the most appropriate crops to be cultivated in different seasons. However, farmers are unable to identify the market behavior and are not well aware of the market information. Though planned harvesting is a way to capture high prices, finding alternative markets are beneficial. At the other end, such empirical evidences are scarce and out of the reach of the farmer. Therefore, it is vital to study the prevalence of market windows, price fluctuations and production efficiencies to bridge the prevailing gap in empirical evidences and to identify profitable crops for different seasons. Thus, this study attempted to identify the existence of market windows for bean, tomato, potato, cabbage and knol-khol in Bandarawela area, to ascertain economically efficient crops and the most profitable crops, to analyze the seasonality and variability of selected upcountry vegetable prices and to examine the major market constraints faced by the vegetable farmers in Bandarawela area, because such empirical evidence are useful to the farmer, trader and planners.

MATERIALS AND METHODS

The Divisional Secretariat Division of Bandarawela was purposely selected as it is one of the leading vegetable producing areas in Badulla district. A sample of eight Grama Niladhari (GN) divisions Watagamuwa, Aththalapitiya, Kirioruwa, Kinigama, Bindunuwewa, Kabillewela, Ambegoda and Makul Ella in Bandarawela were selected during the study.

Lists of farmers maintained by the farmer organizations were used as the sample frame. A random sample of 150 farmers was drawn from the lists. These were stratified into five strata based on extent cultivated during Yala 2016 and Maha 2016/2017. A total of 30 farmers per crop were selected from each strata. Both primary and secondary data were used and primary data were collected through a field survey while secondary data were extracted from authenticated sources. Descriptive statistics and simple analytical tools were employed in data analysis. Market windows, profit function, economic efficiency function, seasonal price index, coefficient of variation and Garret's Ranking Technique were used as the analytical tools.

The market window technique

If the price received for a crop is greater than its cost of production during a period, there exists a market window for the crop (Adrian *et al*., 1989; Henneberry and Kang, 1992), and is a technique used to evaluate the feasibility of production of fresh fruits and vegetables for the market. With a market window, price received for one unit of produce should be greater than the sum of production, transport and marketing costs of a unit and vice-versa. Therefore, a profitable market window means the prevalence of a positive difference between revenues and costs. The market window was created by collecting and plotting historical prices and subtracting pre-harvest, harvest, fixed, and transportation costs. Market window graphics for each vegetable were created by using historical prices and average cost estimation budgets. The prices were also used directly in cost/profit graphing and analyzed by averaging each year over the entire time span to get one average for each year from 2006 to 2016 (Thennakoon and Silva, 2012). Cost estimation was used to compare with farm gate prices and base year prices of cost of production. Production year 2016 was considered as the base year for cost estimation due to constraints of data limitation in previous years.

The profit function

Primary data were used to estimate net revenue and economic efficiency for each type of vegetable as explained below.

$$NR = TR - TC \ldots\ldots\ldots\ldots (1)$$

Where;

TR = Total Revenue (P* Qo)
TC = Total Cost (Vi* Xi)

Inserting the values of TR and TC, in equation 1, the following equation was obtained.

$$NR = f(P, C, Q) = PQo - Vi\ Xi \ldots\ldots\ldots..(2)$$

Where;

NR = Net Revenue (Profit RS/acre)

P= Output price at wholesale level (Rs/kg)

C = Cost per unit produced (Rs/Kg)

Q= Total production (kg/acre)

TC= Total cost of production (Rs/acre)

Vi = Input prices; i = 1.2.3 …n

Xi= Quantity of inputs (No. of units/acre)

Economic efficiency

$AGM_i = ATRi - AVCi$

$ANFI_i = AGMi - AFCi$

Where,

AGM_i = Average gross margin of i^{th} crop

ATR_i = Average total revenue of i^{th} crop

AVC_i = Average variable cost of i^{th} crop production

$ANFI_i$ = Average net farm income of cultivation of i^{th} crop

AFC_i = Average fixed cost for i^{th} crop

ATC_i = Average total cost for i^{th} crop

The economic efficiency (ei) for the particular crop is mathematically expressed as,

$$e_i = ANFI_i / ATC_i \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

When ei > 0, the production of the crop is economically efficient

When ei < 0, the production of the crop is economically inefficient

But when ei = 0, the production of the crop is said to be at the breakeven point.

(Thennakoon and Silva, 2012)

Seasonal Price Index (SPI)

Seasonal price index and coefficient of variation for each type of vegetable were computed using secondary data. To examine the seasonality of vegetable prices, seasonal price index for the year 2016 was calculated and it was graphed against time.

$$\textit{Seasonal Price Index (SPI)} = \frac{\textit{Monthly price}}{\textit{Average price of the year}} \quad (4)$$

Coefficient of variation of price (CV)

Variability of selected vegetable prices was examined by using coefficient of variation (CV) of prices. Prices at wholesale level in Bandarawela area in year 2012 to 2016 were used to calculate CV for each year. CV values against years were graphed for each vegetable.

$$\textit{Coefficient of variation} = \frac{\textit{Standarad deviation of prices}}{\textit{Mean of prices}} \times 100 \quad (5)$$

Garret's Ranking Technique

Constraints faced by the farmers at vegetable marketing were ranked according to the farmers' response in questionnaire survey. The order of the merits given by the respondents was changed into ranks by using the following formula.

$$\textit{Percent position} = \frac{100(Rij-0.5)}{Nj} \quad (6)$$

Where;

R_{ij} = rank given for i^{th} constraint by j^{th} individual
N_j = number of constraints ranked by j^{th} individual

According to Zalkuwi *et al*, (2015) per cent position of each rank was converted into scores referring to the table given by Garrett and Woodworth. Mean score was calculated for each factor by adding scores of individual respondents together and dividing by total number of the respondents for whom scores were added. The mean scores for all constraints were arranged in descending order and constraints were ranked accordingly.

RESULTS AND DISCUSSION

General descriptive statistics of the respondents

Of the respondents, 95% were male and 95% were between 30 and 60 of age. This reveals that, vegetable cultivation has become a less popular activity among the youths. In addition, 39% of farmers had received only primary education, while the majority had received different levels of secondary education. The level of education farmers have received is in a satisfactory level, on average. The observed high literacy rate of the respondents is a result of the free education policy of the government. Majority of the farmers in the study area have engaged in vegetable cultivation throughout their life. (50% with experience of 20-30 years, 3% < 10 years and 13%- 10 to 20 years) Thus, the respondents are with satisfactory levels of farming experience and the fact is a favorable condition.

The cultivated extent of vegetables is not more than 3 acres because it is practically impossible to have larger plots in an area with steep slopes. The majority (77%) of the land is between 0.5 and 2 acres. So, the average farm size is relatively small.

Market windows for upcountry vegetables

Market window for bean was existed in 2015 and 2016, for tomato in 2014, 2015 and 2016 (Figures 01 and 02). From 2011 to 2016, there was a market window for potato (Figure 03). Cabbage had a market window for the entire period considered; 2006 to 2016 (Figure 04). The existence of market window for knol-khol was reported only in 2015 and 2016 (Figure 05). All the vegetables considered had market windows in previous years of 2015 and 2016. Therefore, all crops have market windows in the study area and thus, growing vegetables is a profitable venture. Thennakoon and Silva (2012) have obtained similar findings in a study conducted on paddy, tobacco and big onion in Galewela area.

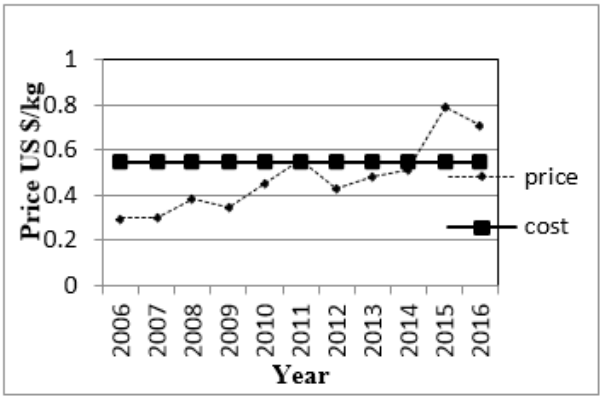

Figure 01: Market window for bean
Note: Exchange rate 1 USD = 155.22 LKR

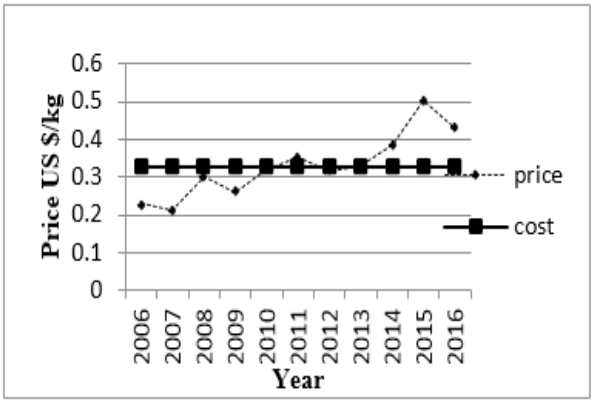

Figure 02: Market window for tomato
Note: Exchange rate 1 USD = 155.22 LKR

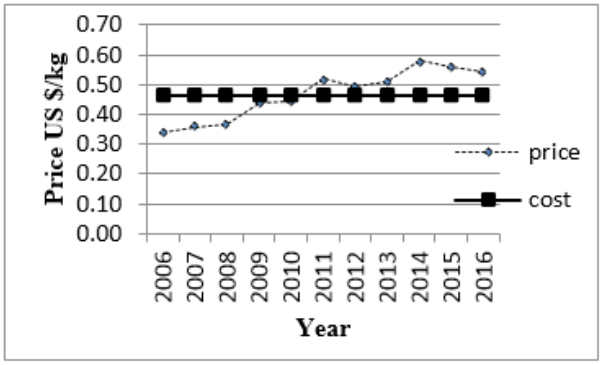

Figure 03: Market window for potato

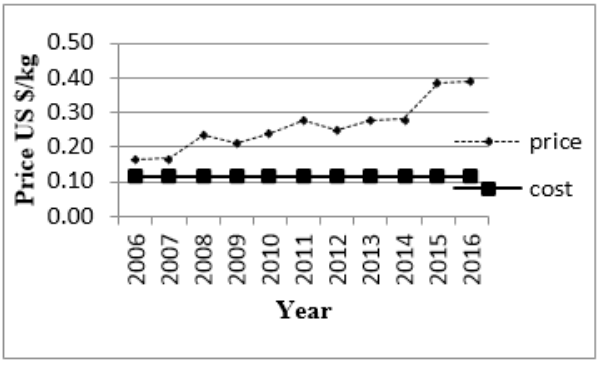

Figure 04: Market window for cabbage

Profitability and Economic efficiency of selected upcountry vegetables

The highest net revenue (4910.35 US$ ac^{-1}) was produced by tomato during Yala 2016 and the lowest (466.76 US$ ac-^{1}) was produced by knol-khol. Cabbage recorded the second highest net revenue (3323.69 US$ ac-^{1}) and potato produced the third highest net revenue (3302.52 US$ ac^{-1}). The fourth highest net revenue was associated with bean cultivation (1506.96 US$ ac^{-1}) in *Yala* 2016. The highest net revenue (2301.35 US$ ac^{-1}) in *Maha* season was recorded from bean cultivation and the lowest net return was from cabbage production (394.39 US$ ac^{-1}). The second highest net revenue was 2125.01 US$ ac^{-1}from potato cultivation (Figure 06). According to the survey data, the average selling prices of potato and bean were higher in *Maha* season than *Yala*. This may be the reason to record the highest net revenue from above mentioned crops. The third highest net revenue, (1876 .71 US$ ac^{-1}) was recorded from knol-khol cultivation in *Maha* season. The fourth largest net revenue was 748.61 US$ ac^{-1} from tomato cultivation. Tomato cultivation in *Yala* season is the most profitable venture and for bean, it is *Maha* season. Potato and cabbage cultivation in *Yala* season is also relatively profitable than bean and knol-khol cultivations in Bandarawela (Figure 07).

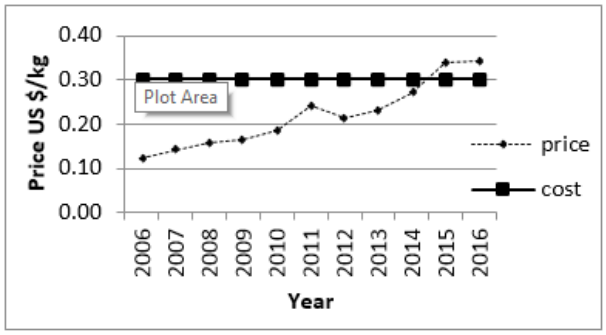

Figure 05: Market window for knol-khol

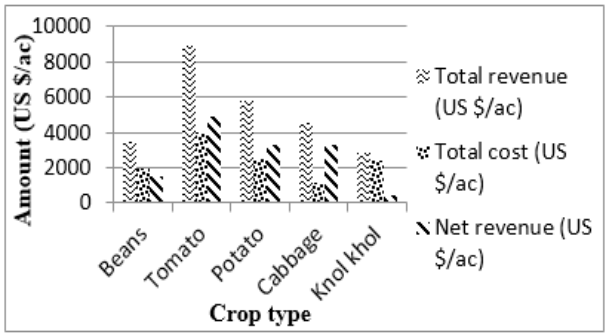

Figure 06: Profitability of vegetables (yala 2016)

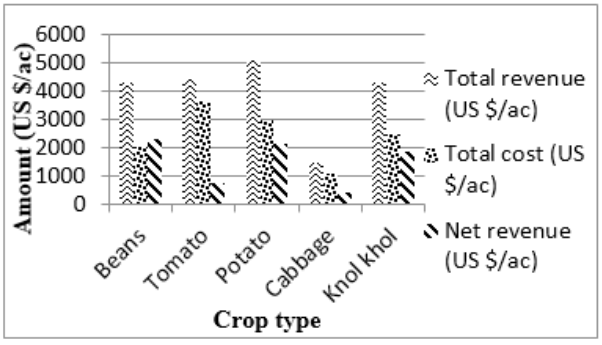

Figure 07: Profitability of vegetables (maha 2016/17)

Note: Exchange rate 1 USD = 155.22 LKR

It was found that, the importance of vegetables based on their per acre net revenue has changed between seasons. Tomato is a vegetable that has produced the highest net revenue in *Yala* and it has produced lower returns in *Maha*. Though cabbage is an important vegetable in *Yala*, it is a less important crop in *Maha*. However, potato is an important crop in both seasons (Table 01). The reason for this situation is, potato is the most suitable and profitable crop for both seasons in the study area. It is because of climatic and weather conditions which are more favorable for potato cultivation in the study area. At the same time, the producer price for potato is not much fluctuating as in other considered vegetables. But, cabbage and tomato are highly sensitive to price fluctuations through seasons.

The highest economic efficiency value (2.75) was associated with cabbage production while the lowest value (0.19) was recorded from knol-khol cultivation in Yala season. Economic efficiencies of potato, tomato and bean were 1.29, 1.2 and 0.76 respectively. All the crops selected were economically efficient in *Yala* 2016. Both economic efficiency and net revenue of knol-khol are the lowest values hence, knol-khol is not a crop suitable to cultivate in *Yala* season.

The highest economic efficiency, 1.14 was recorded from bean cultivation while the lowest value (0.19) was recorded from tomato in *Maha* season. Economic efficiencies of potato, cabbage and knol-khol were 0.7, 0.32 and 0.76 respectively in Maha season. Thus, all of the crops selected are economically efficient in maha 2016/17 season. Bean is most suitable cultivation for *Maha* since both economic efficiency and net revenue values are the highest (Figure 08 and table 01).

Even though all the selected crops have profitable market windows in 2016, economic efficiency of each crop has changed between *Yala* and *Maha* seasons. Cabbage recorded the highest economic efficiency in *Yala* 2016 and profitable market window also in 2016 but, the lowest profitability and low economic efficiency were recorded in *Maha* 2016/17. The reason for this deviation is the average farm gate price for the year is taken for market window analysis while the average price for a particular season is taken into account to calculate the economic efficiency and profitability in the respective season.

Table 01: Ranking order of net revenue per acre

Rank order of crops	Yala 2016	Maha 2016/17
1	Tomato	Bean
2	Cabbage	Potato
3	Potato	Knol-khol
4	Bean	Tomato
5	Knol-khol	Cabbage

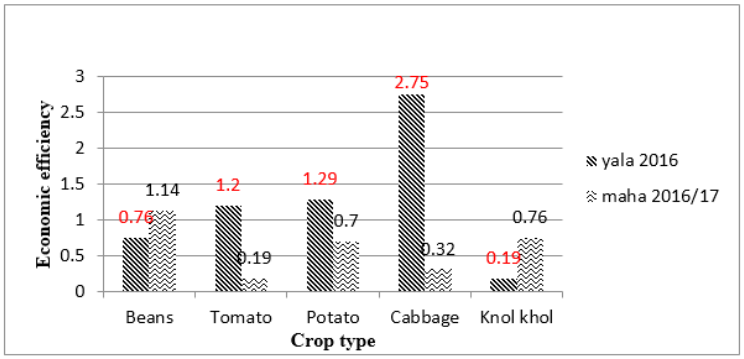

Figure 08: Economic efficiency of vegetable cultivation

Seasonality of selected upcountry vegetable prices

Seasonality of selected vegetable prices in the year 2016 was examined using the seasonal price index (SPI). The results indicated a great seasonal variation in the price indexes of all selected vegetables (Figure 09). From January to March, vegetable prices have been declined. Peak arrivals of vegetables to the market lead to the declining of the prices during this period. Prices have been trended up seasonally from March and reaching a peak at June. Therefore, *Yala* season showed peak prices in vegetables.

Lack of rainfall and low production are causative factors for high prices of vegetables in *Yala* season. Simply, the law of demand applied in, where prices fall during the harvest season and rises during the lean period. Prices tend to trend up from March to April because of the high demand prevailed during the New Year festival season. Again, starting from June, prices tend to decline up to August hence lower SPI values are recorded in August.

Next, starting from September, prices start to rise during *Maha* season except cabbage. Cabbage prices have declined from June until the end of 2016. Price of knol-khol tends to increase until the end of the year. But, prices of bean, potato and tomato have increased up to November and then begin to decline until December. Seasonality of vegetables may lead to this kind of price variations throughout the year. Makama *et al*, (2016) in studying the seasonality of price in rice also highlights that, seasonality of rice is one of the major causes of variation in prices as revealed through similar results from this study. Pest and disease incidence could contribute to the price fluctuation. And the inelastic supply and the effect of the global market are some other factors that could contribute to observed fluctuations in vegetable prices. The year round availability of processed vegetables (frozen, canned) may reduce demand for the fresh product, particularly when prices are inflated.

Variability of upcountry vegetable prices

Variability in prices of selected vegetables over five years (from 2012 to 2016) was examined computing the coefficient of variation of prices. Coefficient of variation of prices represents the linear variation between time and vegetable price. The highest CV values indicate price instability and lower values indicate price stability. Figure 10 shows the variation of prices in previous five years. According to the results, bean showed the highest price variation (CV value is 40.39) in 2015. Similar variations of bean prices are shown in the other years. The highest variation of knol-khol prices was recorded in year 2016. The CV was 42.93. Cabbage and potato showed high price variation in 2014 and tomato price variability was high in 2015. In case of tomato, a gradual increment of price variation was observed from 2013 to 2015. However, in 2016, most of the price variations of vegetables have declined except that of potato and knol-khol. In 2016, the lowest variability of price was recorded from potato. Lack of bargaining power of farmers, peak market arrival of vegetables, highly perishable nature of vegetables are possible causes to price variation of upcountry vegetables. Similar findings that have been found in a study on market arrival and turmeric prices in India, has revealed that the above factors could be the reasons for price variations over the years (Kanungo, 2015).

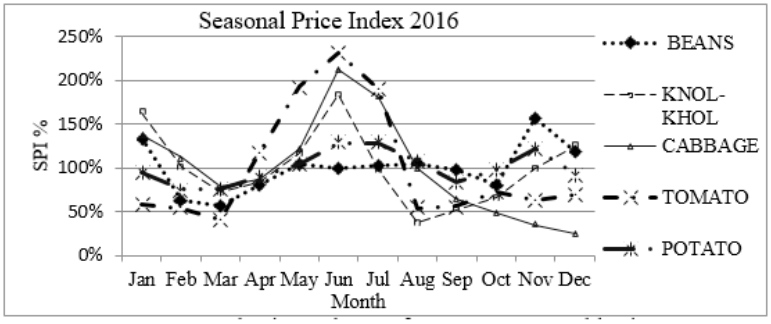

Figure 09: Seasonal Price Indexes of upcountry vegetables in 2016

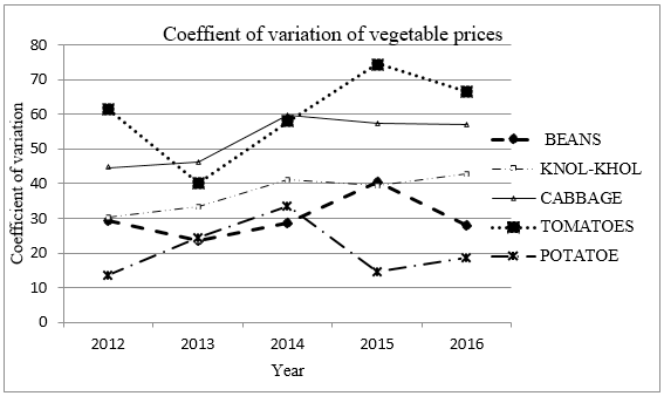

Figure 10: Coefficient of variation of selected upcountry vegetable prices

Coefficients of variation of prices were calculated for 5 years only from 2012 to 2016 due to data limitations. To examine the seasonality of prices, SPI was calculated in the year 2016. It showed the average relationship of prices in a particular month to the average for the year. Moreover, it offers an indication of the seasonal price patterns for that particular time series. But, variability shows the price variation throughout a long period of time. Therefore, seasonality and variability indicate two kinds of price variations. All of the selected upcountry vegetables for this study have showed a great seasonal variation and variability throughout the years. Furthermore, it is vital to suggest that, the government should initiate measures of market stabilization policies like allowing the availability of correct market information to both producers and consumers in order to reduce the seasonal price fluctuations of vegetables.

Constraints faced by farmers in marketing of fresh vegetables

Constraint analysis was done by using Garret's Ranking Technique. Constraints with their respective total score and Garret's mean score are presented in table 2. The information presented in the table indicates various constraints faced by upcountry vegetable farmers. Price fluctuation, unfair price, oversupply of produce, quality problems, high marketing cost, lack of bargaining power of farmers, middlemen's influence and imperfect timing of selling are the top ranked constraints faced by upcountry vegetable farmers.

The study revealed that, the most significant constraint is price fluctuation since it recorded the highest mean score (69.53). Therefore, it was ranked as number one constraint. Price fluctuation issue is not only a serious issue in vegetable cultivation, but also for other agricultural commodities. The major causative factor for this issue may be the highly perishable nature and seasonality of vegetables. Similar findings have been reported in India on sorghum production. The major constraint reported by this study is also the low price for sorghum (Zalkuwi *et al*, 2015). A study conducted on constraints in milk production in Pondicherry, Union Territory has also revealed that low price for milk is the main concerning issue (Manoharan *et al*, 2003). According to the results, the second most serious issue is the unfair price for vegetables. The mean score value of this constraint is 53.47. Lack of bargaining power of farmers may lead to dominate this constraint in vegetable market. In order to address this issue, it is possible to strengthen the marketing power of farmers with the support of government intervention. Oversupply of produce during the same period of time is ranked as the third constraint (52.36). Peak harvesting seasons are the factors for this issue and farmers should be aware of the crop to be cultivated according to their experience and market information. Low quality of the fresh produce is the fourth constraint. A high price can be obtained for the produce from first harvest but, the produce after first harvest receives very low prices due to the low quality. Therefore, it is difficult to earn high profits from the fresh produce after first harvest.

Table 02: Constraints of upcountry vegetable farmers ranked by Garret's Ranking Technique

Constraint	Total score	Total mean	Rank
Price fluctuation	10429	69.5266667	1
Lack of bargaining power of farmers	6777	45.18	6
Middleman impact	6251	41.6733333	7
Unfair price	8020	53.4666667	2
High marketing cost	7367	49.1133333	5
Imperfect timing of selling	6064	40.4266667	8
Quality problems	7838	52.2533333	4
Over supply	7854	52.36	3

High marketing cost related to vegetables has been ranked as the fifth constraint. Transport and other market related costs are sometimes very high. Most of the times, farmers have to accept the prices offered by the traders as the bargaining power of the farmers is low. Therefore, lack of bargaining power has been ranked as the sixth serious issue. Lack of market information may cause to this issue because farmers are not much aware of the market information. Establishing a market information system to vegetable farmers will be a solution to this constraint while extending the intervention of the government. Middlemen impact and the imperfect time of selling are the seventh and eighth constraints respectively. These are not much serious affecting issues since farmers have ranked them as less affecting constraints. Middlemen impact is also prevailing at the vegetable market because farmers do not sell vegetables directly to the traders at dedicated economic centers. They sell their produce through wholesalers hence a commission is deducted from their profit. But, this is not a much serious affecting issue. The imperfect time can also be managed by farmers, because it actually occurs at uncertain times. Arrival of harvest at peak price levels is advantageous to the farmer to obtain high profits. Imperfect timing at the market leads to low prices for the produce. Constraints mentioned above are the top ranked constraints by the vegetable farmers in Bandarawela. Establishing a powerful marketing channel to the Sri Lankan vegetable sub sector will be a great impact for the convenience of both farmers and consumers.

CONCLUSIONS

Market window analysis showed that all the selected upcountry vegetables had profitable market windows during the previous years of 2015 and 2016. It can be concluded that, at present, all of the crops are becoming profitable ventures in the study area.

According to the profit function, the highest net revenue was recorded from tomato cultivation and the lowest net revenue was from knol-khol production during the *Yala* 2016. The highest net revenue is from bean cultivation and the lowest net return is from cabbage production in *Maha* 2016/17. Tomato cultivation in *Yala* season is the most profitable venture and in *Maha* it is bean. All of the selected crops are economically efficient while cabbage cultivation is the most economically efficient in *Yala* season and bean cultivation is the most economically efficient in *Maha* season.

Prices of vegetables fluctuate seasonally and tend to trend up during the festival seasons especially during the months of March and April. According to the coefficients of variation of prices, price stability also fluctuates throughout the years. Seasonality, oversupply and highly perishable nature of vegetables lead to the seasonal variation and variability of upcountry vegetable prices. The major constraint faced by the upcountry farmers in vegetable marketing is price fluctuation followed by unfair price for the fresh produce. Based on the conclusions, the following policy implications can be recommended. Both the

private and the government sectors should be intervened to promote and develop the current vegetable marketing channels and to open novel marketing channels in Sri Lanka. Introduction of either staggered planting of vegetables to the farmers or establish a planting calendar in order to minimize the peak arrivals to the market at the same time is essential. Encouraging both private and public sector key stakeholders to store and release vegetables in lean periods to minimize the wastage of vegetables will be effective. Studying the export potential and creating a mechanism to direct the excess production of vegetables to the export markets and encouraging vegetable processing including value addition in order to minimize oversupply is required.

REFERENCES

Adrian, J., Upshaw, C., and Mook, R. (1989). Evaluation of feasibility of fruit and vegetable crops using market window analysis, Journal of Food Distribution Research. 1-891987. DOI: http://dx.doi.org/10.1038/nbt1289-1233

Henneberry, S.R., Kang, T. , (1992). Potential markets for Oklahoma produce: A market window analysis, Journal of food distribution research. 23(3). DOI: http://dx.doi.org/10.1108/00070709210018960

Kanungo, S., (2015). Influence of Market Arrival on Price Formation of Turmeric in Kandhamal District of Odisha, IOSR Journal of Business and Management.. 17(1): 01-05. DOI: http://dx.doi.org/10.9790/487x-16734245

Makama, S.A., Amrutha, T.J., Lokesha H.and Koppalkar, B.G. (2016). Analysis of Seasonal price Variation of Rice in India, Research Journal of Agriculture and Forestry Sciences. 4 (6): 1-6. DOI: http://dx.doi.org/10.5958/0976-4666.2016.00091.7

Manoharan, R., Selvakumar, K.N. and Pandian, A.S.S. (2003). Constraints in milk production faced by the farmers in Pondicherry Union Territory, Indian J. Anim.Res. 37(1): 68-70. DOI: http://dx.doi.org/10.5958/0976-4623.2017.00014.7

Sandika, A.L., (2011). Impact of middlemen on vegetable marketing channels in Sri Lanka, Tropical Agricultural Research & Extension. 14(3): 59-62. DOI: http://dx.doi.org/10.4038/tare.v14i3.4843

Thennakoon, M.T.C.P., Silva, D.A.M. (2012). Market window analysis: A case of tobacco, paddy and big oinon farmers in Galewela, Sri Lanka. Sabaragamuwa University Journal. 11(1): 95-128. DOI: http://dx.doi.org/10.4038/suslj.v11i1.5890

Zalkuwi, J., Singh, R., Bhattarai, M. and Rao, O.S. (2015). Analysis Of Constraints Influencing Sorghum Farmers Using Garrett's Ranking Technique; A Comparative Study Of India And Nigeria. International Journal of scientific research and management (IJSRM). 3(3): 2435-2440. DOI: http://dx.doi.org/10.11648/j.eco.20150402.11