Amity Business Journal
2012, Vol. 1, No. 1

Copyright 2012 by ABS,
Amity University Uttar Pradesh, Lucknow Campus (ISSN 2278-0904)

Technology Issues in Sri Lankan Coconut Industry with Special Emphasis on Marketing and Sales Promotion

Dr. S. W. S. B. Dasanayaka* **M. N. M. B. Mendis**** **Dr. G. D. Sardana*****

Coconut is one of the major plantation crops which play a pivotal role in the economy of Sri Lanka. It has been contributing on average 1.8% to country's Gross Domestic Production. Coconut industry faces a major setback due to non-utilization of up to date appropriate technological advances to improve product and process efficiency by focusing on market requirements. This study attempts to identify technological issues in the industry with special emphasis on marketing aspects to gain the competitive edge in the global market. The study utilizes Porter's value chain model to identify main industry sectors such as Plantation, Processing and Marketing. The conceptual model designed around this primary model, takes into consideration Technological Competency and Marketing Orientation as the main two inputs to derive the competitive edge. The findings stress the importance of overcoming application of primitive traditional technology and convert to modern effective state of arts industrial practices with the support of new technological applications. This paper concludes with recommendations on needs to improve technology to enhance productivity and cost efficiency.

Keywords: Technology management, Coconut plantation, Marketing, Sales promotion, Sri Lanka.

Introduction

Coconut tree is perhaps the only tree known to the mankind whose all parts are consumed. It is an essential component of daily food of millions over South and South East Asia. It finds a place in religious and traditional rituals. With loving regard, it is known as a "Tree of life" (Adkins et.al, 2005). The wonderful coconut tree has the ability to grow in the wet zone, intermediate zone and the dry zone. Though the tree has a long history in Sri Lanka, it is after the British occupation and commercial contribution that it has become an industrial sector in its own right. It gives direct impact to the country's economy and an indirect impact to the country's social, political and technological macro factors. The importance of the tree has significantly increased after it got connected with the social life of the community. As a nature of social life the tree has become a part of the countrymen's domestic life style. Technology has become one of the key factors and also plays a major role in every sector with regard to current development scenario. It is not purely due to the open economic polices but also because of many reasons which have led to negative impact to the industry (Ministry of Coconut Industries, 1984). Some of these are lack of concentration due to poor returns, lack of new technological applications, variation of the international market demand & stiff competition in the global market.

Othman Yeop Abdullah Graduate School of Business, University of Utara Malaysia, 06010 UUM Sintok, Kedah, Malaysia, E mail: sarathd@mot.mrt.ac.lk

Dept. of Management of Technology, Faculty of Engineering, University of Moratuwa, Moratuwa, Sri Lanka. E mail: maheshmend@yahoo.com

BIMTECH Institute of Management Technology, Greater Noida, India. E-mail: gdsardana@gmail.com

Research Objectives

The main focus of this study is to identify the real cause effects/issues with regard to technological applications (with special emphasis on marketing and sales) in the Sri Lankan coconut industry. The study encompasses capturing data from all three processes (plantation, harvesting and processing) to identify relevant issues of these processes & technological (process development) connectivity. The prime concern includes improving the productivity in all three processes to get the competitive edge. For the purpose of supporting the main focus in a more constructive manner is to identify the current coconut industry standard in Sri Lanka. Final objectives focus at determining right recommendation and policy strategies to drive industry to a profitable venture.

Objective 1: What are the major technology problems encountered by the Coconut sector with special emphasis on Marketing & Sales Promotions?

Objective 2: What is the current technology status of the Sri Lankan Coconut sector?

Objective 3: Recommend policies and strategies to promote the coconut sector as a viable sector in Sri Lankan economy by overcoming current technological issues.

Literature Review

In recent years the acreage of coconut has come down not only domestically but also in Asia and Pacific Coconut Community (APCC) countries (Table 1).

Appendix

Table 1: APCC Countries: Area of Coconut, 2003 -2007 (in 1000 Ha)

Country	2003	2004	2005	2006	2007
A. APCC Countries	**10,687**	**10,614**	**10,601**	**10,494**	**10,639**
F.S. Micronesia	17	17	17	17	17
Fiji	60	61	60	60	60
India	1,922	1,934	1,935	1,947	1,940
Indonesia	3,913	3,797	3,804	3,818	3,860
Kiribati	25	25	25	25	29
Malaysia	131	131	130	115	109
Marshall Island	8	8	8	8	8
Papua New guinea	260	260	260	260	260
Philippines	3,217	3,259	3,243	3,243	3,355
Samoa	93	96	93	93	93
Solomon Islands	59	59	59	59	59 Sri
Lanka	422	395	395	395	395
Thailand	328	343	344	226	225
Vanuatu	96	96	96	96	96
Vietnam	136	133	132	133	133

Source: *Coconut Statistical Year book: 2008, APCC*

Table 2 details the production of various coconut products in the country over period 2000-2009. There is a perceptible decline in 2008. A small recovery has taken place in 2009.

Table 2: Manufacture of Copra, Coconut Oil, Poonac & Desiccated Coconut (MT) in Sri Lanka, 2000-2009

Year	Copra	Coconut Oil	Poonac	Desiccated Coconut
2000	82,062	44,407	22,204	89,030
2001	112,996	64,320	32,160	50,955
2002	59,033	30,100	15,050	30,700
2003	49,466	21,000	10,500	46,149
2004	37.081	25,000	12,500	54,885
2005	37,419	20,000	10,000	36,991
2006	81,233	37,982	18,991	44,964
2007	117,490	75,945	37,973	42,982
2008	103,830	59,018	29,509	38,414
2009	122,999	75,495	37,748	38,125

Source: *Coconut Development Authority, 2009*

Coconut industry in Sri Lanka contributes 1.8% of the total GDP. Table 3 indicates export of various coconut products to satisfy international market requirements.

Table 3: Volume of Coconut Products Exports in Sri Lanka, 2001- 2010

Year	Kopra ('000kg)	Coconut Oil ('000kg)	Desiccated Coconut ('000kg)	Total Nuts (Million)
2001	15037	3437	49874	516
2002	13282	2585	28582	328
2003	17546	2473	42233	461
2004	15050	2095	54098	538
2005	16858	1425	33377	377
2006	18677	1759	41635	456
2007	16737	1381	37022	406
2008	13313	1521	36263	360
2009	4795	1935	42449	367
2010	510	2263	28874	247

Source: *Central Bank of Sri Lanka, 2010*

The coconut industry in Sri Lanka is beset with various problems (Purasinghe, 2009, Gunathilake, 2010, Dissanayaka, 2005 and Dadagasmuwa, 2008). These include falling acreage in plantation, low productivity, high costs, poor returns, lower exports, obsolete technology, and more. There is the scarcity of suitable land to cultivate coconut and high costs of lands are the major problems faced by the planters. This impacts other processes, processing & marketing. Without the nuts, kernel and non-kernel products cannot be made. Simultaneously, marketing suffers. Bandara (2004) and Aponsu (2008) reveal that low income owners sell their land to commercial entities for financial gains to bring down the plantation area. The second problem lies in high cost of production. The changes in the raining pattern impacts coconut plantation (Fernando et al., 2007). The processing sector is also faced with many problems. Old traditional but inefficient methods are used to process the coconut to its final products (Mandal, 2000). Social and cultural attitudes and barriers become bottlenecks to adopt new methods. High cost of new applications, lack of knowledge and poor confidence on return of investment stand in way. Desiccated Coconuts (DC) is one of the key products that Sri Lanka exports to the global market. The market volume has comedown drastically in recent years. Other issues facing this industry are

high energy cost, absence of financial support to upgrade the processing systems, waste water discharge arrangement and price fluctuation in the export market (Liyanage. et.al, 1986). There is a lack of market information and sales promotion activities and absence of a brand image. It is a necessity to identify technological issues in these areas. The product has to identify its correct position in the market and industry. It has to identify where the industry stands compared to the global situation. Since most of the coconut products are very competitive and also the price elasticity of demand is high, marketing issues can be set off by value addition and improvement in the supply chain. There is a strong need to implement a value based price mechanism to cater to top end markets and to convert it to a profitable industry (Ratnayake, 2005).

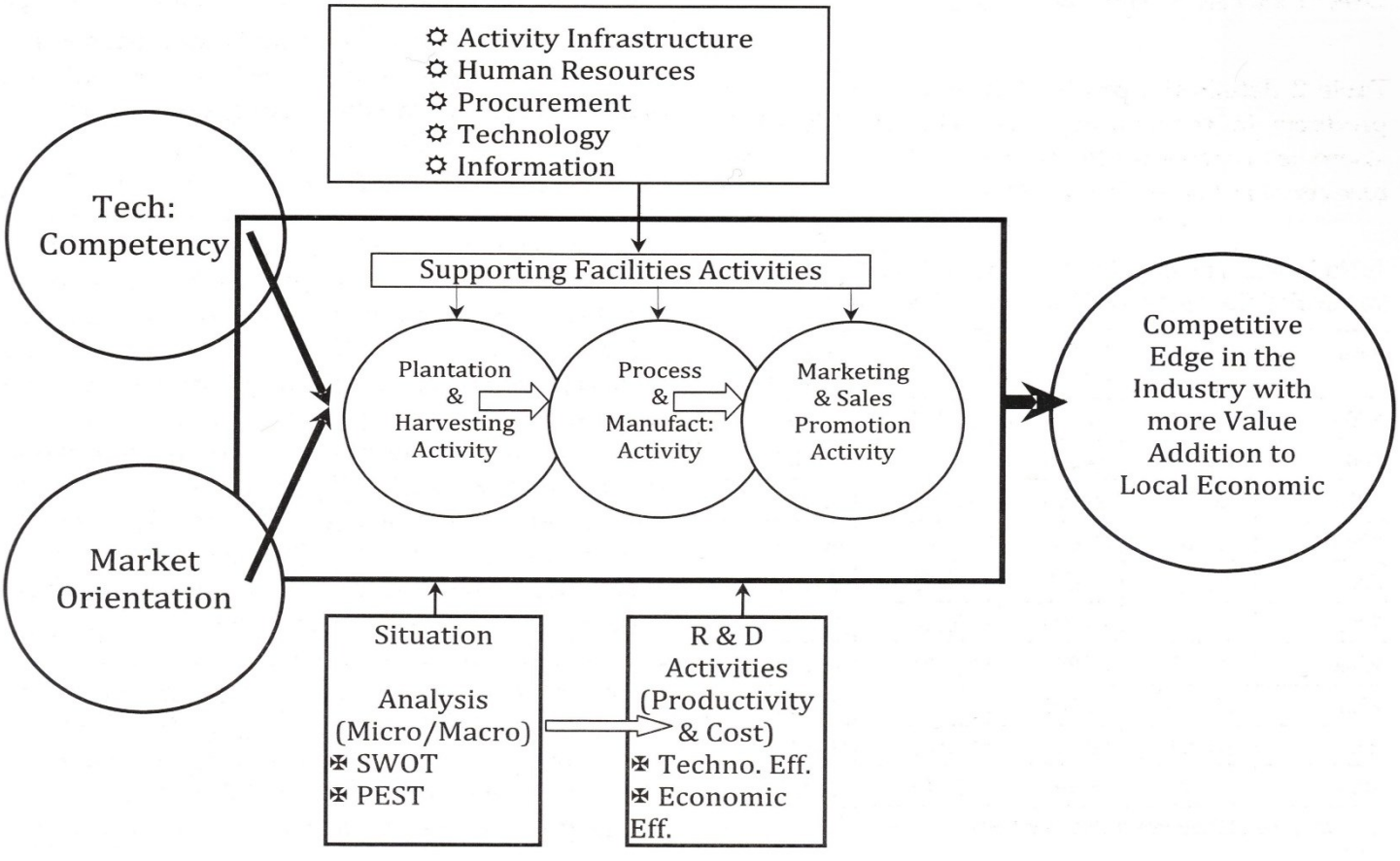
Research Methodology

The study comprises of various stages. A model is first conceptualized depicting relationship between various factors impacting the performance. Major factors are analyzed in the second stage through a focused survey. The model is further elaborated by emphasizing the importance of situation analysis to get the correct ground situation and thereafter implement continuous R&D activities to improve the effectiveness and efficiency of the industry's performances.

Conceptual Model

Concept of Michael Porter's (1985, 1998) Value Chain have been adopted to develop the conceptual model. Plantation & Cultivation, Processing & Manufacturing, and Export & Marketing are the three main processes in coconut industry that need to be focused and developed. These are supported by supporting facility activities, such as Activity Infrastructure, Human Resources, Procurement, and Technology & Information (Dasanayaka, 2010 and Hindle, 2008). The model is depicted under Fig.1.

Figure 1: Model



R&D activities provide two main contributions: in improving the operational effectiveness through technological efficiency, and improvement drive from the cost efficiency through economic efficiency. The overall objectives are to upgrade operational performances through product and process developments.

Operationalization of Variables and their parameters

Technology Competency

The model comprises of two main constructs: Technology Competency, and Marketing Orientation. These two constrains must be operational so as to enable to measure any relationship. This implies that the abstract notions of the constructs must be reduced to observable behavior or characteristics (Sekaran and Bougie, 2010). Operational definitions provide meaning to the constructs and a tangible way to measure them. The two constructs in this study consider multi item measures on a five point Likert type scale.

The constructs have been adapted from the subject literature. The two constructs are empirically measured from all required variables. Besides, external infrastructure facilities, marketing impact and political polices play a significant role as variables on technology competency (Gunawardena, 2007). There has to be a positive attitude and perception towards technology to get the required result from technological changes (Goedde, 2006). The constructs and dimensions as selected of Technology Competency are listed in Table 4.

Table 4: Operationalization – Technology Competency

Construct	Dimension / Variables	Indicators
Technological Competency	Knowledge and Experience successfully (K1)	1. Amount of knowledge to provide technical support to fulfill the basic operation
		2. Period of experience to carry out the duties and meet the targets (K2)
		3. Ability of acquiring technological knowledge and implement in a more practical manner to support organization strategies to achieve business objectives (K3)
		4. Ability of understanding any operational issues in a technical point of view & provide technological solution to improve operating effectiveness (K4)
		5. Ability to use technology as a tool to increase the productivity (K5)
		6. The extent of making use of experience to overcome any practical issues which are come across during the operations (K6)
		7. Ability of using technology to communicate with other divisions of sharing resources (K7)
		8. Capability of making use of not only limited resources internally but also to handle external factors in an appropriate manner to meet technical objectives (K8)
		9. Having adequate knowledge and experience to evaluate the technological performances (K9)
		10. Ability of training & developing the staff to build technology competency (K10)
	Innovative and creative ability	1. Ability of creativity thinking in an innovative manner (novel way) to propose technological solutions (C1)
		2. Degree of innovate solution helps to improve operational effectiveness (quality & productivity) & cost efficiency (reduce cost / time) - (C2)
		3. Ability of supporting business /.marketing objectives through innovative solutions (C3)
		4. The amount of resource/constraints effect for innovate solutions (ability of making use of current resources/working conditions in an effective manner) - (C4)
		5. Ability of providing the most social/ethical/environment friendly innovate solutions (reduce legislation & at the same time to gain competitive edge) (C5)
		6. Degree of motivating human resources aspect for the purpose of improving performances of production process (C6)

Construct	Dimension/ Variables	Indicators
Technological Competency	Exposure (within the Organization and outside organization)	1. Organization vision align with technological objectives (E1) 2. Internal management to support technological competency (E2) 3. Organization resources (equipment /materials) assistance to fulfill technological aspirations (E3) 4. Internal & external infrastructure impact to provide technological oriented solution (E4) 5. Support organization culture to improve Technological competency (E5) 6 Get the assistance from the latest technology developments & industry related new findings to improve the performances (E6) 7 Externally marketing push/pull impact to motivate technology competency (E7) 8 Political assistance to the industry (Political decisions which support technology related industry solutions) - (E8) 9 Impact of economical factors (if economic factors favors that leads to improve R&D activities) - (E9)
	Attitudes and Perception	1. Likeness and positive thinking towards technological solutions (A1) 2. Industrial & social influences for technology solutions (A2) 3. Overall management perception/attitudes towards technological oriented applications for the production /process system (A3) 4. Extend of motivation of technology for operational activity (believe it gives positive results) (A4) 5. The amount of technology literacy & also using non obsolete equipment (A5) 6. Complexity of technology & simple understandable proposing methods (A6) 7. Social living standard of the relevant, which leads to have different types of values and perception against technology (A7)

Table 5: Operationalization Market Orientation

Construct	Dimension / Variables	Indicators
Market Orientation	Customer Orientation	1. Monitor level of commitment in serving customers' needs (U1) 2. Business objective of customer satisfaction (U2) 3. Competitive advantage based on understanding customer needs (U3) 4. Business strategy driven by greater customer value (U4) 5. Measuring customer satisfaction (U5) 6. After-sales services (U6) 7. Corrective actions taken immediately (U7) 8. Modifying products/services based on customer ideas (U8) 9. Meet customer quality expectations (U9) 10. Pricing are appropriately designed according to customer expectations (U10) 11. Supplies on time without any shortage (U11) 12. Promotional campaigns meet customer awareness objectives (U12)
	Competitor Orientation	1. Rapidly responding competitive actions (P1) 2. Sharing information on competitors' activities (P2) 3. Discussing competitors' strengths & strategies (P3) 4. Differentiation from competitors (P4) 5. Targeting opportunities for competitive advantage (P5) 6. Analyzing evolution of substitutes (P6) 7. Precautions been taken for new entries (P7) 8. React with strategies for suppliers bargaining power (P8)

Construct	Dimension / Variables	Indicators
	Inter functional coordination	1. Integration to serve target customers' needs (T1)
		2. All activities are responsive to each other's needs & requests (T2)
		3. Activities (Plantation, Process and Marketing) heads try to identify total market requirements (T3)
		4. Communicating market experiences among the activities processes (T4)
		5. Everyone understands how to create customer value (T5)
		6. All three processes are working as a team (T6)
		7. Sharing resources with other sections (among processes when it is necessary) – (T7)
		8. All sections involving in product / service modifications (T8)
		9. Informal information exchange to fulfill industrial Expectations (T9)
		10. All three processes common perception is to achieve overall business objectives (T10)

Marketing Orientation:

Narver and Slater (1990); Matear and et al. (2002) and Dabholkar (1994) observe that marketing orientations consist of external factors and an internal factor. Externally there are two dimensions such as customer orientation and competitive orientation; internal dimension refers to inter functional co-ordination. Customer orientation is important because the customer is the most important factor in the market. Competitive orientation leads to an urge to excel against competition. Functional co-ordination is important as it provides a high impact to the market volumes. Constructs and dimensions as adopted for this study are listed in Table 5.

The indicators are linked to the relevant measures. Five point Likert scale is used to rank the response and analysis carried out through SPSS/Excel to identify the construct's impact.

Sample of the Study

Subsets from each unit have been used to collect data. Since Sri Lankan plantation sector is scattered, "Convenient Sampling" has been adopted. Convenient data collection has been carried out mainly from the coconut triangle, where the industry has the highest density and also from some Colombo entities where the industry carries out most of the commercial transactions. The major portion of the acreage is cultivated by small holdings (323,489Ha) and the balance from the estate sector (71,347 Ha). 60% of the same is cultivated in the Coconut Triangle. It was decided to identify 50 coconut plantations in three different layers: the larger ones on more than 100 acres, medium scale on 50 100 acres and thirdly small scale plantation growers, at less than 50 acres. Fifty questionnaires were distributed. There are around 100 coconut processing and manufacturing millers in Sri Lanka. However, there are only a few that are active at present. Here again, questionnaire was distributed in different capacities. Marketing and export sector entities are mainly scattered in Colombo and suburbs. There are around 400 export entities registered with the Coconut Development Authority. The questionnaire was distributed to only selected exporters that do regular international transactions. As the study has special emphasis to the marketing and sales promotion, sample size was comparatively larger.

Questionnaire Design

Two separate questionnaires were developed based on two main contributors, "Technology Competency" and "Marketing Orientation". Each construct compound with required necessary variables and the relevant variables were measured from different indicators or separate questions (for each indicator). A multiple-item scale to measure readiness to embrace new technologies as developed by Parasuraman (2000) was employed. A 55 item questionnaire was first developed. After analyzing the results of a pilot survey conducted using 10 industry experts from the two components (Technology and Marketing), the questions were suitably changed and reworded. The final questionnaire comprised of 60 questions in two different sections to identify the relationship of two different constructs. Technology Competency carried 30 questions under different variables to include 5 -10 questions to measure the variables. Section on marketing orientation 30 questions. Five point Likert type scale was used. Customers were provided a choice of English and Sinhalese, the local language. Besides, primary data was gathered from establishments that provided comprehensive knowledge of different aspect of the coconut industry. Secondary data was collected from

previous findings and from tabulated data, and from periodicals/ magazines and annual statistical reports published by Coconut Development Authority (CDA).

Technology Issues : Response on Variables

The analysis aims to provide an overview of the respondents and an insight into their perception with regard to industry technology competency and marketing orientation.

Technology Competency:

Composition of variables of Technology Competency was analyzed.

a: **Variable**: Knowledge and Experience.

Indicator: This indicates amount of knowledge to provide technical support to fulfill the basic operations. The results are shown in Table 6.

Table 6 : Composition of perception with regard to Knowledge and Experience

		Frequency	Percent. Th	Valid Percent	Cumulative Percent
Valid	2	2	3.6	3.6	3.6
	3	5	9.1	9.1	12.7
	4	20	36.4	36.4	49.1
	5	28	50.9	50.9	100.0
	Total	55	100.0	100.0	

Source: *Questionnaire Survey*

A majority (50.9%) of responses strongly agreed to the above indicator and there was no single response for not disagreeing strongly.

b: **Variable**: Attitudes & Perception

Indicator: Social Living Standards of the relevant, which lead to have different types of values and perception against technology. The results are depicted in Table 7.

Table 7: Composition of perception with regard to attitudes and perception

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	3.6	3.6	3.6
	2	10	18.2	18.2	21.8
	3	10	18.2	18.2	40.0
	4	20	36.4	36.4	76.4
	5	13	23.6	23.6	100.0
	Total	55	100.0	100.0	

Source: *Questionnaire Survey*

Majority of respondents agree that there is some positive relationship between social living standard and technological competency.

Table 8 details responder's perceptions of composition percent of each variable's impact with regard to the Technology Competency.

Table 8: Technology Competency Composition in percentages

Variable	Indicator	1	2	3	4	5
Knowledge &	K1	0	3.6	9.1	36.4	50.9
Experience	K2	0	0	7.3	47.3	45.5
	K3	0	5.5	5.5	43.6	45.5
	K4	0	9.1	23.6	32.7	34.5
	K5	0	7.3	16.4	30.9	45.5
	K6	0	0	5.5	56.4	38.2
	K7	0	5.5	25.5	49.1	20
	K8	0	9.1	12.7	34.5	43.6
	K9	1.8	7.3	18.2	36.4	36.4
	Ave:	**1.8**	**5.2**	**13.8**	**40.8**	**40**
Innovative &	C1	3.6	1.8	9.1	50.9	34.5
Creative ability	C2	1.8	5.5	12.7	32.7	47.3
	C3	0	7.3	20	38.3	34.5
	C4	0	5.5	16.4	38.2	40
	C5	0	9.1	20	43.6	27.3
	C6	1.8	12.7	16.4	32.7	30.4
	Ave:	**1.2**	**7**	**15.8**	**39.4**	**36**
Exposure (Internal	E1	5.5	14.5	23.6	29.1	27.3
& External)	E2	0	16.4	17.3	40	36.4
	E3	1.8	7.3	21.8	43.6	25.5
	E4	1.8	14.5	14.5	27.3	41.8
	E5	0	12.7	12.7	38.2	36.4
	E6	0	12.7	14.8	40	32.7
	E7	1.8	12.7	18.2	38.2	29.1
	E8	16.4	12.7	18.2	38.2	29.1
	Ave:	**3.4**	**12.9**	**17.6**	**36.8**	**32.3**
Attitude &	A1	0	7.3	9.1	27.3	56.4
Perception	A2	0	3.6	16.4	43.6	36.4
	A3	0	3.6	25.5	32.7	38.2
	A4	0	3.6	9.1	36.4	30.9
	A5	0	3.6	12.7	34.5	49.1
	A6	0	3.6	9.1	41.8	45.5
	A7	3.6	18.2	18.2	36.4	23.6
	Ave:	**0.5**	**6.2**	**14.3**	**36.1**	**40**

Source: *Questionnaire Survey*

Marketing Orientation: Response on variables

Some of the indicators, which have high impact on variables, are explained as under.

a: Variable: Customer Orientation

Indicator: Monitor level of commitment in serving customer's need. Table 9 depicts the results

Table 9: Composition of the perception with regard to Customer needs

Needs		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	4	7.3	7.3	7.3
	3	12	21.8	21.8	29.1
	4	20	36.4	36.4	65.5
	5	19	34.5	34.5	100.0
	Total	55	100.0	100.0	

Source: *Questionnaire Survey*

The above indicates that more than 70% agreed or believed that serving customer needs had a high impact to customer orientation.

b: Variable: Inter functional Coordination

Indicator: All sections involved in product/service modifications viewed that 60% of the sample believed that involvement did not have much impact on the relevant variable. Table 10 shows the results.

Table 10: Composition of perception with regard to inter functional coordination

coordination		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	1.8	1.8	1.8
	2	7	12.7	12.7	14.5
	3	25	45.5	45.5	60.0
	4	11	20.0	20.0	80.0
	5	11	20.0	20.0	100.0
	Total	55	100.0	100.0	

Source: *Questionnaire Survey*

The following Table 11 explains in detail the responder's perceptions composition in percentages of indicators impact on the relevant marketing variables.

Under customer orientation, more than 70% responded 'as agreed' for the indicators and shown a very much positive relationship. There are situations that have exceeded more than 80% situations where sample 'agreed' specially for the areas such as 'business objectives align with customer satisfaction (U2)', 'Business strategy is driven by greater customer value (K4)', and 'measuring customer values (U5)'. Internal factor of 'Inter functional Coordination' explains perception measurement as the majority of them responded as 'agreed (60%)'.

Table 12 depicts results of Technology Competency with reference to the minimum, maximum, mean and standard deviation as descriptive statistics.

Table 11: Marketing Orientation Composition

Variable	Indicator	1	2	3	4	5
Customer	U1	0	7.3	21.8	36.4	34.5
Orientation	U2	0	5.5	14.5	23.6	56.4
	U3	3.6	10.9	9.1	25.5	50.9
	U4	0	10.9	3.6	34.5	50.9
	U5	0	3.6	16.4	25.5	54.5
	U6	9.1	7.3	14.5	32.7	36.4
	U7	1.8	12.7	10.9	20	54.5
	U8	3.6	3.6	18.2	34.5	40
	U9	1.8	9.1	21.8	29.1	38.2
	U10	7.3	21.8	18.2	16.4	36.4
	U11	7.3	12.7	9.1	38.2	32.7
	U12	0	10.9	27.3	29.1	32.7
	Ave:	**2.9**	**9.7**	**1.5**	**28.8**	**43.2**
Competitor	P1	5.5	9.1	27.3	32.7	25.5
Orientation	P2	3.6	25.5	27.3	25.5	18.2
	P3	0	14.5	16.4	27.3	41.8
	P4	3.6	10.9	30.9	23.6	30.9
	P5	3.6	10.9	27.3	25.5	32.7
	P6	7.3	12.7	20	30.9	29.1
	P7	10.9	18.2	25.5	20	25.5
	P8	9.1	12.7	23.6	34.5	20
	Ave:	**5.5**	**1.6**	**24.8**	**27.6**	**28**
Inter	T1	3.6	14.5	20	29.1	32.7
functional	T2	0	14.5	20	29.1	32.7
Coordination	T3	0	18.2	16.4	38.2	27.3
	T4	0	7.3	18.2	25.5	32.7
	T5	0	14.5	18.2	25.5	41.8
	T6	14.5	12.7	14.5	20	38.2
	T7	3.6	12.7	21.8	40	21.8
	T8	1.8	12.7	45.5	20	20
	T9	0	12.7	21.8	43.6	21.8
	T10	5.5	16.4	12.7	32.7	32.7
	Ave:	**3**	**13.6**	**20.9**	**30.4**	**30.2**

Source: *Questionnaire Survey*

Table 12 : Descriptive Statistics of Technology Competency

	N	Minimum	Maximum	Mean	Std. Deviation
Mean of the knowledge – Technology	55	2.78	4.89	4.1515	.53431
Mean of Creativity – Technology	55	2.00	5.00	4.0333	.69714
Mean of Exposure – Technology	55	2.00	5.00	3.7977	.81454
Mean of Attitude – Technology	55	2.00	5.00	4.1455	.60951
Valid N (list wise)	55				

Source: *Questionnaire Survey*

Table 13: Descriptive statistics of Marketing Orientation

	N	Minimum	Maximum	Mean	Std. Deviation
Mean of Customer Orientation - Marketing	55	2.33	5.00	3.9970	.77612
Mean of Competitor Orientation - Marketing	55	2.12	5.00	3.5818	.82117
Mean of Inter-Functional – Marketing	55	1.90	5.00	3.6818	.83446
Valid N (list wise)	55				

Source: *Questionnaire Survey*

Table 14 : Correlations of Technology Competency Variables

		Mean of Creativity - Technology	Mean of Exposure - Technology	Mean of Attitude - Technology	Mean of the knowledge - Technology
Mean of Creativity – Technology	Pearson Correlation	1	.725**	.740**	.752**
	Sig. (2-tailed)		.000	.000	.000
	N	55	55	55	55
Mean of Exposure – Technology	Pearson Correlation	.725**	1	.723**	.674**
	Sig. (2-tailed)	.000		.000	.000
	N	55	55	55	55
Mean of Attitude – Technology	Pearson Correlation	.740**	.723**	1	.795**
	Sig. (2-tailed)	.000	.000		.000
	N	55	55	55	55
Mean of the knowledge – Technology	Pearson Correlation	.752**	.674**	.795**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	55	55	55	55

***. Correlation is significant at the 0.01 level (2-tailed).*

Source: *Questionnaire Survey*

Table 15 : Correlations of Marketing Orientation Variables

		Mean of Customer Orientation – Marketing	Mean of Competitor Orientation - Marketing	Mean of Inter-Functional - Marketing
Mean of Customer Orientation – Marketing	Pearson Correlation	1	.760**	.653**
	Sig. (2-tailed)		.000	.000
	N	55	55	55
Mean of Competitor Orientation – Marketing	Pearson Correlation	.760**	1	.727**
	Sig. (2-tailed)	.000		.000
	N	55	55	55
Mean of Inter-Functional – Marketing	Pearson Correlation	.653**	.727**	1
	Sig. (2-tailed)	.000	.000	
	N	55	55	55

***. Correlation is significant at the 0.01 level (2-tailed).*

Source: *Questionnaire Survey*

The "mean" at 4.15 of knowledge technology is above the agreed consent. Similarly, 4.0333 as "mean" of creativity technology depicts agreed position. Mean at 3.7977 being the lowest in the table explains perception or beliefs of this variable as beyond the undecided limit but well below the agreed position. Comparatively, this is in a lower position compared with other means. It means relationship of this variable is comparatively lower to the main contributor. Out of the 55 responses 'Attitudes' perception plays a medium role compared with other variables in the Technology Competency. "Mean" as 4.1455 explains the majority of sample agreed through the relevant questions. Standard Deviation of 0.60951 explains that deviation from the mean of the variable data has spread to a greater extent but significantly is better compared with the above variable.

Descriptive statistics of Marketing Orientation performed are summarized in Table 13.

Marketing Orientation variables have behaved in a similar manner. Customer orientation 'minimum' falls to 2.33 (close to not agreed) and 'maximum spread' up to 5 means maximum level. "Mean" at 3.9970 is very close to agreed position. Standard deviation of 0.77612 indicates that it has spread to a greater extent but compactly is lower compared with other marketing variables. Competitor orientation responses are well spread from minimum level 2.12 to maximum 5. "Mean" being 3.5818 indicates overall opinion is between undecided and agreed position. It shows that most of them do not agree for the competitor orientation perception but above the undecided situation and towards the agreed direction. Simultaneously, standard deviation at 0.82117 is greater from the majority opinion. Inter functional orientation (from all three plantations, processing and marketing) sectors depicts expansion from minimum level of 1.9 (below the not agreed) to maximum 5. This has spread wider and it has been proved by stranded deviation of 0.83446. The "mean" of the data set at 3.618, explains most of the responders of the sample are away from undecided but closer to agreed position. Correlation measures the strength of the liner relationship between two variables. The strength of the relationship is also known as the degree of relationship. According to the conceptual model, the studies have two main contributors, such as Technology Competency & Marketing Orientations. Each contributor has relevant variables accordingly. Pearson Correlation is used to analyze and measure strength of the relationship among the variables for each contributor.

An Analysis of Technology Competency Variables

Technology competency has four variables: Knowledge and Experience, Innovative and Creativity ability, Internal and External Exposure and Attitudes and Perception. These variables have different behaviour. By analyzing through Pearson Correlation tries to identify the relationship or behaviors among these variables. SPSS 16.0 analyzed and performed Technology Competency variables relationship and strengths are noted in Table 14.

The Correlation table explains that there is a significant positive relationship among all the variables. When it considers the relationship between knowledge and the creativity, there is a high positive correlated relationship (0.752) . Knowledge variable related to Attitudes and Perception is similar to other variables. The co-relationship observed is highly correlated (0.795). Creativity and Exposure under Technology Competency relate their responses among them significantly (0.725).

An analysis of Marketing Orientation Variables

Marketing Orientation has three variables which have been measured from relevant indicators: Customer Orientation, Competitor Orientation, and Inter Functional Coordination. The above, researcher identified there are similar types of relationship among these variables. The relationships have been analyzed from SPSS 16.0 and the outcome of the findings is detailed in Table 15 as follows.

There is a good positive relationship (close to strong relationship) among the variables. External factors such as customer orientation and competitor orientations have strong co relationship (0.760) with competitors orientation and inter- factor variables such as intra functional coordination. It is also positively correlated in some strong manner by indicating Pearson correlation as 0.727. The correlation between customer orientation and inter functional correlation has slightly more than moderate positive relationship compared with other correlations. (0.653). Marketing Orientation variables have strong correlation.

Factor Analysis

The factor analysis indicates up to what extent each variable is explained to the relevant contributor. It doesn't really show the effect or impact of the variable contribution towards the contributor (Technology or Marketing) but it statistically explains or explores the relevant variable contribution. It helps to reduce a vast number of variables to a meaningful, interpretable and manageable set of factors. A principal-component analysis transforms all the variables into and as a set of composite variables that are not correlated to one another.

Technology Competency

In this study, Technology Competency has been measured against four variables with different types of questions. Table 16 points out as to how much each variable explains and measures the concept correctly.

Table 16 : Factor analysis - Technology Competency

	Initial	Extraction
Mean of the knowledge - Technology	1.000	.811
Mean of Creativity - Technology	1.000	.808
Mean of Exposure - Technology	1.000	.756
Mean of Attitude - Technology	1.000	.830

Extraction Method: Principal Component Analysis.
Source: *Questionnaire Survey*

Marketing Orientation

Marketing Orientation variables were measured through 30 questions from 55 responders. The concept has three variables and factor analysis is explained in Table 17 as under:

Table 17:Factor analysis- Marketing Orientation

	Initial	Extraction
Mean of Customer Orientation - Marketing	1.000	.800
Mean of Competitor Orientation - Marketing	1.000	.854
Mean of Inter-Functional – Marketing	1.000	.774

Extraction Method: Principal Component Analysis.
Source: Questionnaire Survey

Compared with Technology Competency, the Marketing Orientation concept is explained by variables in a stronger manner.

Situational Analysis

Situation analysis is done in two parts: micro and macro level. Micro level situation analysis is done through SWOT (Strengths, Weaknesses, Opportunities and Threats). Macro point of view, analyzes environment factors PEST (Political, Economical, Social and Technological) as key issues. Currently, the plantation sector is at a minimum level due to the high cost of production and is also struggling to make a profit. There are a few planters' who manage to cultivate a crop in the average 7000-8000 per acre in a single pick (Romero, 2008). The processing sector faces major problems with nut shortage as also the need of technological application to improve the process. Marketing sector with high costs is struggling to gain competitiveness for their high quality coconut products. There are substantial direct and indirect variances. Both planting and growing the plant are tedious processes. The plant needs treatment and protecting it from many external factors. It is essential to take care of land, soil, fertilizer treatments and protection from pest and weed to gain a good yield (Shunji, 1992). However, cost of production of a nut is based not only on these expenses but also on quantity of nut cultivated per pick.

Table 18 provides the current status of coconut industry in Sri Lanka.

Table 18: Sri Lanka Coconut Industry In a nut shell: Year 2009

Sri Lanka Coconut Industry 2009	
Area under Coconut	
Total Area (Ha)	394,836
Estate Sector	71,347
Small Holdings	323,489
Cultivation Subsidies	
Area Benefited (Ha)	10,816
Amount (Rs. Mn.)	234
Total Nut Consumption (Mn .Nuts)	2,762.18
House hold fresh nut consumption	1,815.96
Used by industry	946.22
Consumed locally	453.10
Exported	493.12
Value of Kernel products	
Total Sri Lanka Exports	813,911.00
Coconut products (Rs: Mn)	29,081.00
As % of total exports	3.57
Contribution to GDP (Constant factor cost Price 1996) %	
Total Agriculture	12
(Agriculture, Live Stock, Forestry & Fishing)	3.5
Total Plantation (Tea, Rubber & Coconut)	
Coconut Products	1.3

Sources: *Central Bank of Sri Lanka, Coconut Cultivation Board & Coconut Development Authority, 2009*

Table 19 presents a comparison of cost of production in some of the leading countries engaged in coconut production. Sri Lanka tops with highest cost and lowest pick. This fact further evident from the Report of COGENT (2002). Competitiveness of Sri Lanka has gone down in coconut exports which was a one of major source of revenue for the country.

Table 20 details the key indicators of Sri Lanka coconut industry over last five years. Production has come down drastically in the year 2009. There is hardly any growth in production of nuts. Production in 2009 stands where it was in 2006 and come down from levels of 2007 and 2008. On the other hand cost of production per nut has exactly doubled in 2009 from figures of 2006

Conclusions

The issues pertaining to all three sectors and most of the problems around one key issue. That is a nut shortage as an issue gives a huge impact to the total industry. Simultaneously the product and process development with the support of modern technological applications is equally important to increase the volumes in the international, market under competitive environment. The study revealed that there is positive thinking and good hopes with regard to the industry's growth correlation of the perception. The quantitative survey revealed that the whole industry is in a positive perception and believe technological application and marketing strategies are very much

Table 19: Comparative Position of Cost of Production

	Philippines	Indonesia	Malaysia	India	Sri Lanka*
Cost of Prod: /	7-8	8-9	10-12	9-10	12-15
Nut (in SL Rs :)	per nut	per nut	per nut	per nut	per nut
Per nut No of trees Per areca (ave :)	75-80	70-75	65-70	65-70	64-75
Nut cultivation Per Pick/acer	8,500	7,000	4,500	6,000	2,850

** By considering total coconut cultivation & nut production in Sri Lanka in year 2010*

Source: *Coconut Statistical year book – APCC: 2010*

Table 20 : Key Indicators Coconut Industry (year 2005 2009)

Item	unit	2005	2006	2007	2008	2009
1. Production	Mn: .nuts	2,515	2,785	2,869	2,909	2,762
a. Desiccated Coconut	Mn: kgs	37	45	43	38	38
b. Coconut Oil	Mn: kgs	20	38	76	59	75
c. Copra	Mn: kgs	37	51	117	104	123
d. Poonac	Mn: kgs	10	18	42	30	38
2. Domestic nut consumption	Mn: .nuts	2,047	2,222	2,451	2,437	2,269
3. Total Extent	'000 hec	395	395	395	395	395
4. Average Export Price (F.O.B.)	Rs/nut	16.29	24.26	27.56	28.96	22.92
5. Fertilizer issues	'000 MT.	33	47	25	29	25
6. Cost of production	Rs/nut		5	6	8.80	10.6
7. Replanting	Ha	-	3,865	2,528	2,468	3,069
8. New planting	Ha	-	4,101	2,955	3,683	4,356
9. Export earnings	Rs: mn	17,237	19,661	24,096	28,093	29,081
	US$ mn	-	188	218	259	253
10. Kernel products	Rs. Mn	7,719	9,142	11,270	13,667	11,974
	US$ mn	-	87	102	126	104
11. Other products	Rs. Mn	9,518	10,519	12,826	14,426	17,10
	US$ mn	-	101	116	133	149

Source: *Coconut Development Authority, 2009*

important to the industry. Correlations of the variables are significant. It indicates that there is some common understanding of the issues which are interrelated amongst in each sector. With regard to qualitative analysis secondary data findings revealed, most of the product lines (Desiccated Coconut and Coconut Oil) of the industry are declining drastically compared with other exporting countries. In the plantation sector one major issue is that most of the trees are very old (more than 100 years). These need to be replanted with the assistance from bio-technology and makes bud or good breed coconut which could provide a yield with in one or two years. At present only 2000-3000 nuts per pick is obtained, but it can be increased up to 7000-8000 nuts if the required treatments come to the plant appropriately. In the processing sector most of the traditional applications and practices lead to deterioration of the quality, increase of the costs and reduction of the effectiveness of the production process. This has to be changed by using new up to date technology. Desiccated Coconut manufacturing, making activated carbon, charcoal, eco bricks, coconut sugar and coconut oil are some of the product lines that could be applied with new technology to make value added coconut based products. By using technology to suit niche markets is a marketing issue faced by the industry. This is indeed a necessity if the industry wants to align with the export market under competitive environment. Since the majority of planters are small holders (more than 80%) it is essential to have subsidiary schemes (e.g. fertilizer subsidiary) and other necessary supports (arrange systems to collect planters nut cultivation to a regional hub at a good price) to take the daily operation smoothly.

References

Adkins, S., Foale, M. and Samosir, Y. (2005) Coconut Revival: New possibilities for the 'Tree of Life' Proceedings of the International Coconut Forum Held in Cairns, Australia, 2224 November 2005. Retrieve on January 24 of 2010 from aciar.gov.au/system/files/node/748/PR125%20full%20text.pdf.

Asia Pacific Coconut Community: APCC (2008) Coconut Statistical Year book 2008, APCC.

Asia Pacific Coconut Community: APCC (2009) Coconut Statistical Year book 2009, APCC.

Asia Pacific Coconut Community: APCC (2010) Coconut Statistical Year book 2010, APCC.

Aponso, D. (2008) The present plight of the coconut industry and remedial measures for Sri Lanka, November 25, Page 12, Daily News, National News Paper in Sri Lanka, Lake House Publishers.

Bandara, H.R.U.D. (2004) Will there be a future for coconut plantation in Sri Lanka, December 28, Page 28, Sunday Lakbima, National News Paper in Sri Lanka, Sumathi Publishers, Colombo.

Coconut Development Authority (2009) Sri Lanka Coconut Statistics 2009, Colombo.

Central Bank of Sri Lanka (2010) Annual Report 2010, Colombo.

COGENT: Coconut Genetic Resources Network (2002) Draft concept paper for coconut research and development in the South Pacific. Bangkok, Thailand.

Dadagasmuwa, T. (2008) Liberalize Edible Oil imports, Sri Lanka Business standard, April 03, Page 08, Daily News, National News Paper in Sri Lanka, Lake House Publishers.

Dabholkar, P.A. (1994) "Technology-based service delivery" in Schwartz,T.A., Bowen,D.E. and Brown,S.W. (Eds.), Advances in Service Marketing and Management Research and Practice, JAI Press, Greenwich, pp. 241-77.

Dasanayaka, S. (2010) Technology Problems in the Sri Lankan Tea Industry, A case study based on Twenty Regional Plantation Management Companies. IME Journal Vol. 4, No. 2, pp. 1-7.

Dissanayaka, A.M.U.(2005) Progress of Coconut Cultivation, 1962 2002, Dept.of Census and Statistics, Colombo, ISBN: 955577501X.

Fernando, M.T.N, Zubair, L., Pieris, T.S.G., Ranasinghe, C.S. and Rathnasiri, J. (2007) Economic Value of Climate Variability Impacts on Coconut Production in Sri Lanka, AIACC Working Paper No.45, March 2007, www.aiaccproject.org.

Gunathilaka, J. (2010) Formula to halt coconut wilt disease in Sri Lanka, July 04, Page.12, Sunday Observer, National News Paper in Sri Lanka, Lake House Publishers.

Gunawardena, A. (2007) Trade & Environmental Dimensions in the Food & Food processing Industry: Country case study of Sri Lanka. Retrieved 20 Feb 2010 from www.un-trade-environment.org/.../study%20paper/Case%20study%20Sri%20Lanka.

Goedde, A.M. (2006) Factors predicating preserves teacher technology competency. Retrieved 2010 August 10 from www: etd.ohiolonk.edu/send.pdf.

Hindle, T. (2008) Value Chain; One of the most discussed and most misunderstood ideas in the whole of the management arena. Retrieved 2010 March 5 from http:www// books.google.lk/books? isbn=1846681081...

Liyanage, M. De. S., Tejwani, K.G. and Nair, P.K.R. (1986) Inter Cropping under Coconut in Sri Lanka, Agro Forestry Systems Vol.2, No.2, pp. 215-228.

Mandal, R.C. (2000) Coconut: Production and Protection Technology, Agobios, India, ISBN: 8177540661.

Ministry of Coconut Industries (1984) Coconut Development Strategies, Short & Long Term Strategies. Ministry of Coconut Industries, Colombo.

Matear, S., Osborne, P., Garrett, T. and Gray, B.J. (2002) How does market orientation contribute to service firm performance, An examination of alternative mechanism, European Journal of Marketing, Vol.36, No.9/19, pp. 1058-1075.

Narver, J.C. and Slater, S.F. (1990) The effect of market orientation on business profitability, Journal of Marketing, Vol. 54, No.4, pp. 20-35.

Porter, M. (1985) Competitive Advantage: Creating and Sustaining Superior Performance, Free Press, New York.

Porter, M. (1998) The Competitive Advantage of Nations, Macmillan Business.

Parasuraman, A. (2000) Technology Readiness Index (TRI): a multiple-item scale to measure readiness to embrace new technologies, Journal of Service Research, Vol.2, No.4, PP. 307-320.

Purasinghe, D.J.U. (2009) Productivity Improvement Program for Coconut Land in Sri Lanka. Dec. 28, Page. 10, Daily News, National news paper in Sri Lanka, Lake House Publishers.

Ratnayake, S.B. (2005) Technical & Economical Interphases of the Coconut Industry, Stanmford Lake Publishers, ISBN: 9558733946.

Romero, J.V. (2008) Transforming the Coconut Industry: Institutional and Policy Reforms towards Shared Development, Central Book Supplier Publishers, ISBN: 9716917635.

Sekeran, U and Bougie.R. (2010) Research Methods for Business, A Skill Building Approach J. Wiley Publishers.

Shunji,O. (1992) Philippines Coconut Industry and International Trade. Retrieved 2010 June 05 from www.purl.umn.edu/10977.