

Contemporary Drowning Cashew Trade of India

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ABSTRACT:

India is one of the competitive trader of raw cashew nuts and the 2nd consumer of cashew kernels in the globe. India import raw cashew from Africa, process it and negotiate the demand supply gap of 21st century. Present declination of the trade of India has been overtaken by some competitive countries like Brazil, Vietnam and many others. The present work is predicting through statistical and computer based models about cashew produce and future cashew trade of India. The outcome is the declination in future production and export due to low domestic production and export to fall of trade in India. Considering the limitations, India needs immediate augmentation in its productivity modern agricultural practices in addition to enhancing the outlook of farmers, processors and export under government initiations and concessions for the drowning trade.

Keywords: Cashew plantation, Kernels; cashew trade; soft computing, Export & Import

1. INTRODUCTION:

The Cashew plants are tropical and subtropical that yields palatable raw cashew kernels processed from its nuts. The cashew plantations are in hilly/coastal unused land with minimum investment for plant growth when matched with other viable crops. The tasty, juicy and enriched food contain simultaneously fat, Protein, Carbohydrates, minerals, fibres and Vitamins (US Department of Agriculture (USDA) National Nutrient Database). As a mangrove plant, it conserves soil erosion, moderate flooding and used as poor man's fibrewoods. In past cashew was grown in coastal track of Kerala, Goa, Maharashtra, Andhra Pradesh and Odisha states. But the plantation has been commercialised and propagated to Jharkhand, and Assam and Manipur and many other states. The competitors of cashew trade to India are Indonesia, Tanzania, Brazil, Mozambique, and few African countries.

Cashew Production Players:

The cashew crops are falling in production due to old farms, climate anomalies, processing methods, on-farm storagesets, type of transportation, storing, RH control, amalgamation mixing of old and new plant varieties, port amenities, pre and post-harvest risks, and tax pattern and so many factors. Our cashew variety is not matching world standards.

Objective of Research

The annual average inland production of raw cashew is about 800Th MT to 1000 Th Mt. India imports about 700 to 800Th Mt of cashew nuts (raw)/annum to satisfy domestic and export loads. Africa exports raw cashew nuts to Vietnam and Brazil in addition to India with commercial farming and advanced processing who are challengers to India. Thus India is trailing market among the traditional markets like USA, Japan, France and UK (Israrullah et al., 2018). Present study investigates the fall in present cashew production and export sector in India.

2. Methodology:

The domestic production and exports of India based on data collected from secondary sources (Elakkiya et al., 2017; Nayak et al., 2018). The collected time series data has been used for prediction of Cashew trade in future. The time series data uses the SPSS package (Statistical package) and Artificial neural network (SVM-PSO algorithm) to predict futuristic trend of Cashew production and export of India.

2.1. Linear Regression Model:

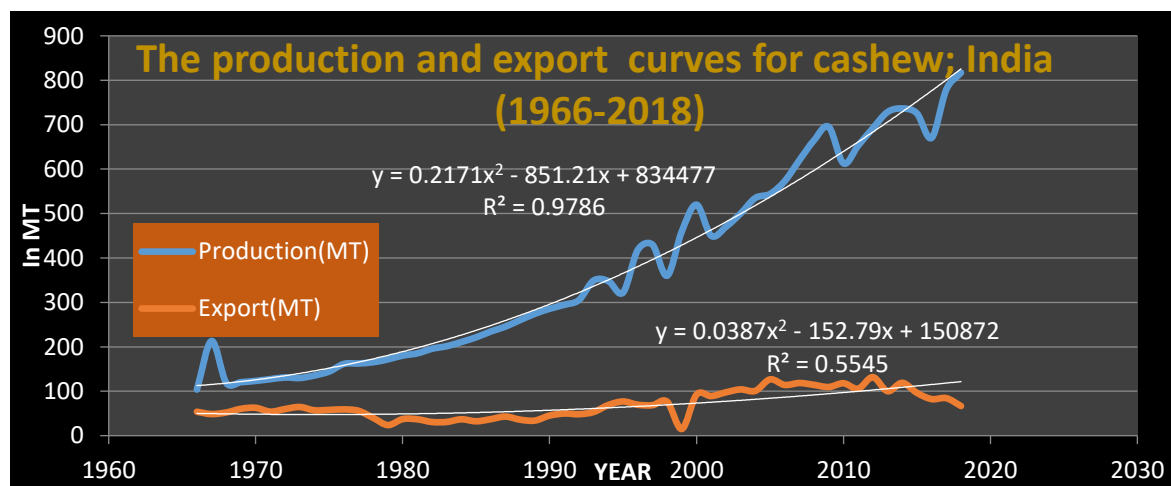


Fig 1: The production and export of cashew nuts in India FY's (1966-2018)

On drawing the best fit curves like linear, exponential, power and logarithmic it is found that the most suitable trend 2nd order power function is the best fit curve for both production and export of cashew nuts of India. The R² value (the goodness of fit in linear regression model) is very good for the curve indicating a rising production of Cashew nuts whereas the export curve having not so good R² value is fluctuating and the trend shows declining export.

2.2. Auto Regressive Integrated Moving average (ARIMA) Model:

The Auto Regressive Integrated Moving Average (ARIMA) model was used to predict the production and export of cashew nuts of India using IBM SPSS statistics software. The model results are as average production of 373.1677 MT, the average quantity exported is only 68.86MT. The standard deviations for production and export are 218.99 and 30.57. The model gave a declining trend prediction when the production is taken against export considering the import and the curve is in Fig 2.

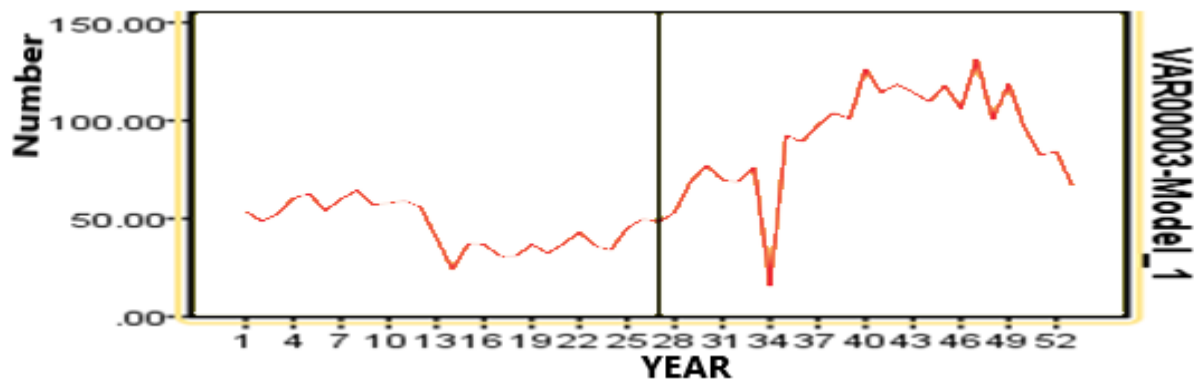


Fig 2: ARIMA model results of prediction of production vs export considering the import

2.3. SVR-PSO Hybrid Model:

Particle Swarm Optimization (PSO) optimised Support Vector Machine (SVM), a hybrid model is considered as one of the best predictive model option for predicting economic and social sector time series data (Nile, 2012); Sudhir et al., 2014; Onuma et al., 2016). The SVMPSO hybrids the two models SVM and PSO, uses an extension of Support Vector nonlinear regression (Vapnik, 1996). The procedure is created basing upon optimization of mathematical problems by improving real function on supply of values from the data set and later computed to frame the suitable function. The PSO model concocts a hyper plane in the old input space so that it clusters the given training set. It optimizes the closest distance at the both faces of the hyperplane (Scholkopf et al., 1996; Kecman, 2001). SVM with RBF has outstanding forecasting performance for non-linear and fewer independent parameters.

Support Vector Regression (SVR), the mathematical optimization was optimized with particle swarm algorithm enhances its resilient global search capabilities and is one of the better predictive models. The entire dataset is compartmentalized at a proportion of 85% and 10%, used for training and testing purposes. The C (learning factors) and γ (optimized values and selection parameter of the radial basis function) are attained by using PSO and the termination principles. At the end the efficiency is calculated with the assigned SVR-PSO hybrid model, the result function is negotiated with the testing dataset to find the appropriateness of the model. The limiting range of C 'regularization parameter' is taken between 0.005 - 20000 and the range of γ is 0.00001 to 10. The ϵ value is insensitive loss and is taken as 0.001.

Table 1: Support Vector Regression Algorithmic Parameters

Parameters of SVR	Parameter value
Type(SVM)	Epsilon SVR
Type(Kernel)	Radial Basis Function
C	0.005 to 20000
Γ	0.00001 to 10
ϵ	0.001

Weighing Error Based Matrices:

The error based metrics like RMSE, MAE, MAPE, delivers the spot-on portrait of the prediction quality. An appropriate threshold value for these metrics is not taken like high values of MAE, RMSE can show on presence of one or two outliers. Prediction curves are in Fig 3 (A to D)

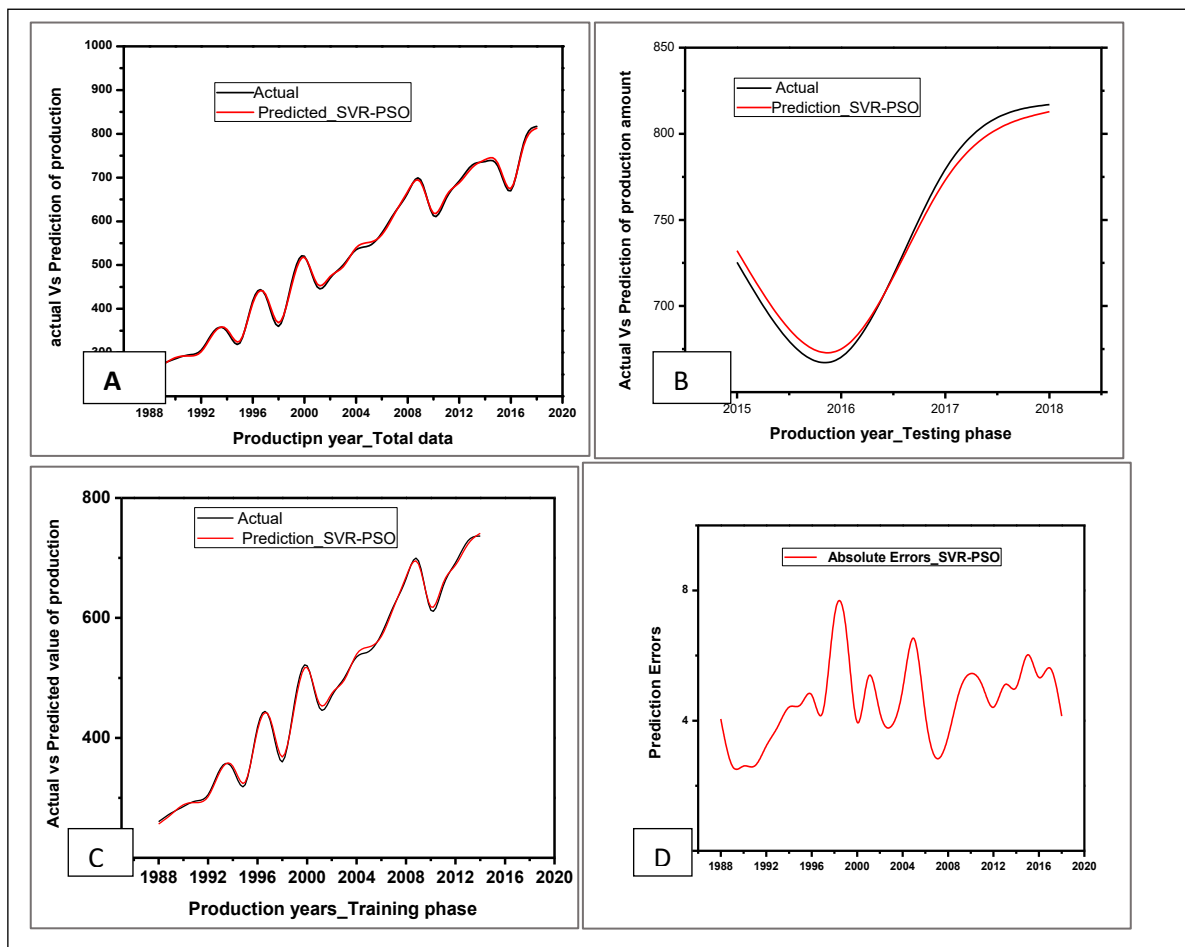


Figure 3: (A to D): Prediction curves for training/ testing phase for production of Cashew.

They MAE, RMSE and MAPE are the mean absolute error, root mean square error and mean absolute percentage error respectively. The expressions details are given in Table-2. The purpose of the statistical metrics are to minimize the prediction error to achieve better accuracy in the hybrid model.

Table 2: Principles of measuring the performance of the SVM/PSO model

SI	Metric	Definition
1	MAE	$\frac{1}{l} \sum_{i=1}^l y_i - d_i $ (i= 1,2,3,...n)
2	RMSE	$\sqrt{\frac{1}{l} \sum_{i=1}^l (y_i - d_i)^2}$ / (i= 1,2,3,...n)
3	MAPE	$\frac{1}{l} \left(\sum_{i=1}^l \left \frac{y_i - d_i}{d_i} \right \right) 100$ / (i= 1,2,3,...n)
Here, l is the total observations, d_i is recorded value, and y_i is the projected value of prediction model considered.		

The errors calculated on operation of the model (MAE, RMSE, and MAPE) in training phase are 4.437401, 4.716169 and ≈ 0.9809 % respectively and the testing phase errors are 5.45625, 5.55581 and ≈ 0.7337 % respectively.

Table 3: Performance evaluation by SVR-PSO models on Training and Testing

	Errors	Models
		SVR/PSO
Training	MAE	4.437401
	RMSE	4.716169
	MAPE	0.9809 %
Testing	MAE	5.45625
	RMSE	5.55581
	MAPE	0.7337 %

The Figures- 3(A) to 3(D) shows the prediction of production of Cashew using SVR/PSO including the absolute error. The errors evaluated with MAE, RMSE, and MAPE in training phase are 3.2456, 3.7292 and 5.19 % (approx) respectively and the errors in testing phase are 4.56, 4.67 and ≈ 5.31 % respectively during prediction of export strategies of cashew kernels India.

Table 1 indicate the Support Vector Regression Algorithmic parameters, 2 gives the performance equations of the SVM/PSO model and 3 narrates the results performance evaluation by SVR-PSO models on Training and Testing

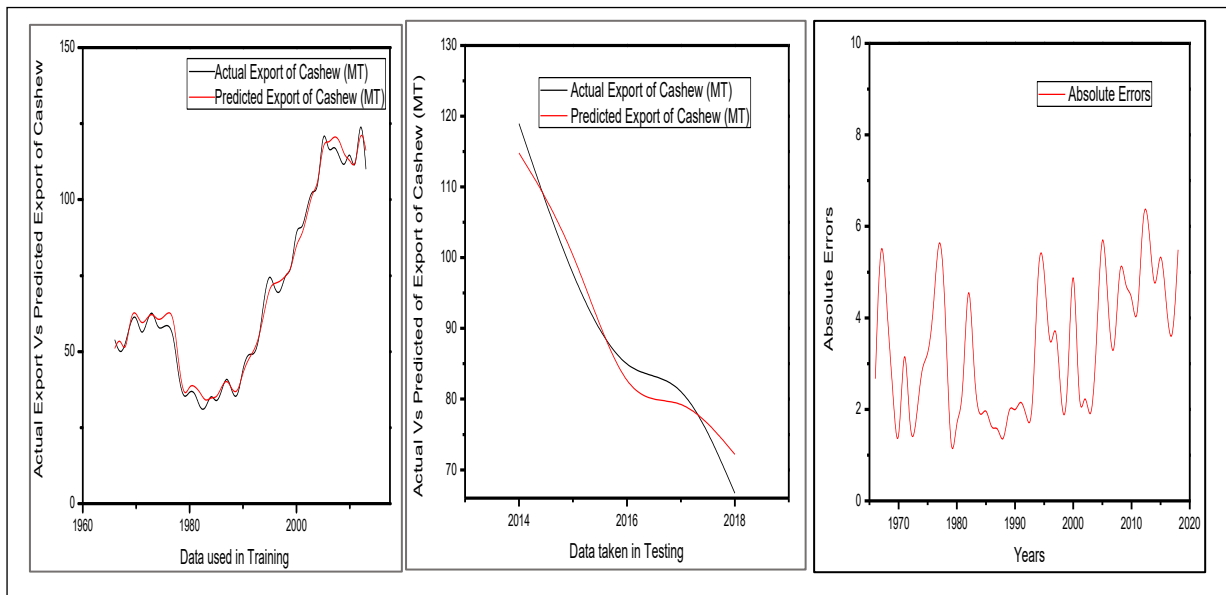


Fig 4 (A to C): The training curve and the testing curve for predicting export of cashew

Fig4 (A to C): The predicted of training and testing curves for Cashew export India (SVR-PSO, incl. Abs. error) (data: 1965-66 to 2017-18). Table 5 indicate the SVM/PSO model and 4(c) narrates the results performance evaluation by SVR-PSO models on Training and testing of the export data.

Table 5: Evaluation of Performance of SVR-PSO Models on Training and Testing Datasets during prediction of export of cashewkernels from India

		SVR-PSO Model
Training	MAE	3.2456
	RMSE	3.7292
	MAPE	5.19 %
Testing	MAE	4.56
	RMSE	4.67
	MAPE	5.31 %

The results of the SVM PSO indicate that the export of Cashew nuts from India shall decline in future. The importers, the exporters and government should analyse and impose actions and inactions for export of the dwindling cashew trade of India. Some of the analysis has been done below for depletion trend of processed cashew export from India and request pertinent action.

Export of Cashew Nuts in India:

There was growth in kernel export from India was not alluring @ 6 %. India’s cashew kernel export was highest (118.54TMT) in the FY 2006-07 at a cost of 24552million INR. But gradually the trend has waned to @ 2.13% in the year 2016-17. During 2011-12, India reached its apex export of cashew kernel of 132 TMT to the export markets of USA, UAE, the Netherlands, Japan, UK, Saudi Arabia, France, etc. (Desai et al., 2015). Value added cashew kernels (Roasted and Salted) exports have increased. The USA import of cashew kernels from India has declined as the countries like Vietnam.

Issues Related to Cashew Sector:

During the study it was observed that is huge marketing potential for cashew kernels both in domestic and overseas markets though both markets have different and reasons for consumption. In domestic market broken and cashew pieces are demanded for food use, but, overseas markets like USA, and Japan the demand for snack and health food. Most effective estimation of the inland consumption of cashew is the quantum of kernels harvested that comprises of amounts involved in domestic plus import and subtraction of export India depends on cashew imports from African countries to bridge the gap between domestic production and processes. The African origins, especially, Tanzania, Mozambique supply raw cashew nuts with better quality than the Indonesia and Brazilian origin. There is less transparency of price fixing by the African traders and traders and intermediaries play significant role in the supply chain by exploiting the arbitrage position. These quality parameters incorporated in the contracts between the overseas suppliers and domestic buyers lead to quality rebates such as out turn (yield), nut count, defects, moisture and foreign matter. The respondent's cited higher raw material, labour cost, unethical and unprofessional business practices affects their bottom line of operation.

Higher labour and processing costs and lack of parity or viability in processing operation has led to closure of many processing units in Kerala, Orissa, Andhra Pradesh and Goa. But all these traditional cashew growing states have devised a strategy to keep their industry afloat mainly due to catering to domestic market rather than heavily depending on exports, which is shrinking gradually. All the respondents underlined the crucial importance of cashew sector in providing employment to women workforce. Many of the processors and packers expressed their keen desire to lay emphasise on export and trading of value added cashew kernels (Roasted and Salted) to revive the cashew sector Kulkarni et al, 2012. As per the International Nuts and Dried Fruit Council the international demand for the cashew kernel has increased by 53% since 2010. India is facing competition from countries like Vietnam, Indonesia and Brazil and some African nations like Tanzania, Guinea Bissau and Cameroon, Mozambique etc in the global market primarily due to cheaper processing cost in these above mentioned nations. The cashew processing in India is highly labour dominated and the general problems associated with labour issues also affect the production process. The cost of processing of one bag raw cashew in Kerala is in the range of US\$ 48-50 whereas the cost of processing one bag in other producing states in India like Maharashtra, Goa and Andhra Pradesh is about US\$ 20-25 per bag. Comparatively the country like Vietnam the processing cost is in the range of US\$ 12-15/bag. The major importing countries like South Korea, Australia and China impose higher import duty for Indian origin cashew and other cashew exporting countries like Vietnam and African nations enjoy tariff advantage.

Government has taken various steps to augment supply such as reduction of basic Custom Duty on import of raw cashew (from 5% to 2.5%) and Goods and Service Tax (from 12% to 5%). Vide DGFT notification dated 12.06.2019 import policy for cashew kernel and broken has been revised from "free" to "prohibited" with certain conditions. Merchandise Export from India Scheme (MEIS) for cashew there is increase from 3% to 5% for cashew kernel and for salted/roasted cashew kernel is increased to 7% from 5%. The Standard Inputs and Outputs Norms (SION) for raw cashew for export of cashew kernel from imported raw cashew nuts have been revised to facilitate exports. Enhanced and liberal financial assistance

to cashew processing sector through Cashew Export Promotion Council of India (CEPCI) has been approved to modernize and mechanize

3. STRATEGIES FOR PRODUCTION/EXPORT PROMOTION:

Based on the study the Authors suggest certain measures to boost domestic production and India's export share in global markets and the foremost suggestions is to achieve production and productivity. The present rate of yield is 753 kg/ha covering 1042 THa area. The improved high yielding varieties can have productivity @2000 kg/ ha. Indian cashew growers should replace the new dense cashew farms with dwarf/ cloned types. Researchers are to be made to decide plants spacing with different density. The tried spacing from high tree density planting (384 trees/ha, 6.5 x 4m) is to be employed for the first 10 years compared to orthodox average density of 156 trees/ha. For rejuvenation of cashew plants methods like pruning and top working with upgraded planting tools, suitable disease/ pest control, etc. are required for better management of yield (Guruprasad et al., 2008).

The yield can be boosted through a phase-wise replanting curriculum as Cashew Farmers are reluctant to adopt replantation apprehending the anticipated crop loss with negative returns during early years. Inter cropping (like groundnut, cowpea, tapioca, casuarinas, turmeric, black gram, etc.) can be an option for cashew growers to retain returns from cashew during initial years supplemented by extension programmes with liberal credit assistance. The development of eco-friendly cultural practices like IPM, grafts plantation of high yield varieties in first-hand areas or in old planted areas to improve cashew cultivation. Recently SE Asian countries like Indonesia and Vietnam have encouraged cashew farming on commercial scale with emphasis on mechanization of farming and processing sector. India should promote commercial farming of cashew both in traditional cashew growing states and non-traditional States like Chhattisgarh, Jharkhand and North Eastern states to increase production of raw cashew nuts.

As India's cashew plantations are organic category with minimum / no fertilizers which should be replaced with total organic farming, intensive efforts should be made towards promoting Indian cashew as organic cashew Kurjan B., 2008. Only the states like Kerala, Karnataka and Goa utilise cashew apples and other states like Odisha, AP, and Tamil Nadu etc. treat cashew apples as waste. Cashew apple can be promoted with value addition in food industry in the form of soft drinks and food products like jam, jelly, chutney, juice, syrup, etc. The self-help groups (SHG) can increase employability and earning in this sector by imparting training and knowledge sharing (Mukherjee et al., 2018 and Paikra et al, 2018). Emphasis to be laid on exporting and promoting added kernels like salted, roasted, sweetened and flavoured cashew especially in West Asian markets. Indian exporters should be trained and educated to adopt modernised processing technology in order to meet the quality, health and fumigation and pesticide standards of importing nations.

The role of middlemen in the cashew supply chain to be minimised to ensure actual price for the farmers. Infrastructural amenities like sun-drying yard, stockyards, and ware houses are to be constructed so that the processing units will need less storage space and discourage

present buying procedure of nuts. The nurseries and allied services shall encourage the farmers to admit cashew plantation as a viable crop (Karunakaran et al. 2013). There is immediate need of infusing liquidity like easy, cheap and subsidized fund in the cashew sector so that the cashew processing sector becomes resilient to face competition. Strategy should be in place by branding “Indian Origin Cashew” to recapture the market share in traditional importing nations like Japan, USA, Australia, Netherland and European countries. The emerging markets like South Korea, Russia, Iran, Singapore and Hong Kong to be cultivated by organizing seminar, exhibitions and buyer-seller meet on regular basis to boost our market share. Each state should frame separate cashew boards enhance the farm procedures, production enhancement and export Velmurugan et al., 2019.

India importers can undertake barter transactions of jute bags export with cashew import with African nations so that bags exported can be utilised for packing imported raw cashew nuts. This system would save precious foreign exchange in addition it would eliminate confusion of origin of import to certain extent at discharge ports.

4. CONCLUSION:

The cashew crop is gradually gaining acceptance among planters in both traditional and non-traditional cashew growing region in India. Introduction of scientific and modern farming practices on commercial scale indicates positive signal towards achieving higher production and productivity. Lower input costs and minimization of labour cost component would improve the bottom line of the cashew sector as whole. India is presently facing stiff competition from Vietnam, Indonesia, Brazil and some of the African nations in the export markets especially in USA, Netherland and other European nations. Concerted, integrated and coordinated approach is the need of the hour to recapture the traditional markets and establish footprint in lucrative west Asian markets through, penetrative pricing, brand positioning, advertising, buyer-seller meets and visits of delegations. Complying with the critical parameters in export value chain like quality, health and phytosanitary standards, packing requirements, delivery timelines etc would restore the confidence of overseas buyers in Indian cashew.

Indian cashew sector is practically at cross roads at present and players in Indian cashew sectors are taking a tightrope walk to retain both domestic market share and struggling to recapture the lost export markets. The study is optimistic of emergence of ethical and professional business practices and emergence of processors taking a lead role instead of the unscrupulous traders at the end of the walk.

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