Type of article : Original research article

Performance of Cashew processing units in Tamil Nadu; A case study in Kanyakumari

ABSTRACT

Aims: This study aimed to analyse the growth rate of export and import of raw cashew nuts and Cashew Kernels in terms of quantity and value in India and to carry out the economic analysis and evaluate investment efficiency of Mechanised and partially mechanised processing units in the Kanyakumari District.

Study design: Purposive random sampling is used.

Place and Duration of Study: The study was carried out in the Kanyakumari District of Tamil Nadu in February 2022. Data were also collected from the official website of DCCD(Directorate of Cashew and Cocoa Development) and the UNCTAD(United Nations Conference on Trade and Development) special issue on cashew nuts.

Methodology: The growth rate of exports of cashew kernels and import of raw cashew nuts in terms of quantity and value is calculated using CAGR (Compound Annual Growth Rate) and the instability index has also been calculated using Cuddy Della Valle Index(CDVI). Economic analysis of cashew processing units was calculated by categorizing processing units into mechanized and partially mechanized units. 10 samples in each category were selected randomly and analyses like gross returns, net returns, payback period, and break-even point were carried out.

Results: The study lead to many important findings as follows. The CAGR of export of cashew kernels in terms of quantity and value is found to be -2.27% and 5.19% respectively. Also, the CAGR of import of raw cashews in terms of quantity and value was found to be 4.91% and 13.27% respectively. The net returns from processed cashew products gave a mechanised business an edge over a partially mechanised firm (a mechanised firm earned a net return of Rs.31126/tonne, whereas a partially mechanised firm received a net return of Rs.18032/tonne).

Conclusion: Also, this study shows that even though mechanization involves a large initial expenditure, mechanisation is a beneficial alternative in the long term.

As a recommendation, it could be suggested from the study that mechanization is a feasible option wherever there is labour shortage as it can help the processors to maintain the quantity of cashew processed to obtain the benefits.

Keywords: (Cashew processing, mechanization, cashew kernel export, Marketing, Profits)

1. INTRODUCTION

The Portuguese came sailing along the Indian shores four centuries ago, bringing with them the magnificent tree nut "Cashew," the world's wonder nut. Cashew then established itself throughout India's coastline area and found Indian soil to be more welcoming than its land. It later became a major crop in other regions of India. Global Cashew Council states that the production of cashew at the global level is around 7,20,000-7,90,000 metric tonnes per year(2019-2020). The Indian cashew harvest was down by roughly 50,000 tonnes in 2020-21, according to the International Dried Fruit and Nut Council (INC), due to a variety of factors, including the Covid-19 epidemic. The export value of Indian Cashew kernels in 2021 is Rs.2840.39 Crores. The import value of Indian raw kernels is Rs.7331.28 Crores. After Ivory Coast, India is the world's second-largest producer of raw cashews. India is also the largest consumer of cashew kernels all over the world.

According to the Cashew Export Promotion Council Of India (CEPCI), India was the first country to introduce cashew kernels to the world market, and it was also the first to commercialise cashew processing. The conversion of raw cashew nuts in the shell to blanched graded kernel form is known as cashew nut processing. Several steps are necessary to process raw cashew nuts to grade cashew kernels such as roasting, shelling, drying, Peeling, grading etc. Kerala, Tamil Nadu, Karnataka, Goa, Andhra Pradesh, Maharashtra, and Orissa are the states with the most processing units. The procedure is extremely labour demanding, and the majority of the workers are women. The total installed capacity of 3940 cashew processing units is 1643 thousand MT and the average installed capacity of the same is 0.4 thousand MT per day.

Table 1: Processing units across India and their capacities

States	Processing units(Nos.)	Share of processing units(%)	Capacity('000 MT)	Share of installed capacity	Average installed capacity	Utilization('000 MT)		
						Indigenous	Import	Total
Tamil Nadu	417	10.6	400	24.3	1	294	225	519
Kerala	432	11	600	36.5	1.4	67	320	387
Andhra Pradesh	175	4.4	100	6.1	0.6	92	0	92
Karnataka	266	6.8	300	18.3	1.1	45	20	65
Goa	45	1.1	50	3	1.1	21	0	21
Maharashtra	2200	55.8	50	3	0	20	0	20
North Eastern States	22	0.6	10	0.6	0.5	15	0	15

Orissa	350	8.9	120	7.3	0.3	11	0	11
West Bengal	30	0.8	8	0.5	0.3	8	0	8
Chattisgarh	3	0.1	5	0.3	1.7	0	0	0
Total	3940	100	1643	100	0.4	573	565	1138

Source: (Reema Jenifer D'Silva, et al,2021).

It is shown from the table(1) that Maharashtra has the most share of processing units, at 55.8%. Kerala, on the other hand, has the highest installed capacity (36.5%)(Reema Jenifer D'Silva, et al,2021). The production of cashew nuts in India is lesser than the capacities of the processing units. Thus, most of the processing units import raw cashew nuts majorly from African countries namely Ivory Coast, Ghana, Tanzania etc. The processed cashew kernels are exported to countries like the USA, Singapore, the Middle East and Japan. It's a potential commodity earning considerable foreign exchange for India. Cashew processing units use a large amount of manual workforce and are thus considered a labour-intensive industry. But now due to the shortage of labour force, cashew processing units are being mechanised.

Tamil Nadu has 417 cashew processing units as per the UNCTAD special report on cashew nuts 2021. Kanyakumari is an industrially backward district and cashew processing units were established in this district by industrialists from Kollam. The number of cashew processing industries in the district has been reducing with time due to the shortage of labour and import duties.

Table 2 : Geophraphical distribution of exports from India to the countries of the world during 2016-2021

	2017-18		2018-19		2019-20		2020-21	
Countries to which cashews are exported	**Qty**	**Rs. Crore**	**Qty**	**Rs. Crore**	**Qty**	**Rs. Crore**	**Qty**	**Rs. Crore**
United Arab Emirates	17571	1252.43	13718	877.46	14771	838.22	12785	726.83
Japan	8509	596.85	7883	570.6	7733	460.86	6093	370.1
Netherlands	8650	584.05	8298	546	10890	613.99	6095	334.72
Saudi Arabia	7827	552.36	7438	485.14	6859	398.81	6372	374.6
Socialist Republic of	5225	76.59	11674	158.54	17708	205.36	20185	210.12

Vietnam								
USA	13179	906.14	5178	333.78	4569	245.9	2450	138.89
Spain	2534	182.16	2846	216.31	3023	206.64	2668	184.65
Germany	3278	229.44	1547	108.68	2623	152.68	2228	137.74
Kuwait	2067	150.58	1645	108.55	1614	95.8	1137	66.59
Qatar	1153	82.82	1344	88.07	1406	82.71	1126	65.72

source: WITS

Table 3 : geophraphical distribution of imports to india from the countries of the world during 2016-2021

	2016-17		2017-18		2018-19		2019-20		2020-21	
countries from which raw cashew are imported	**qty**	**rs. crore**	**qty**	**rs. crore**	**qty**	**rs. crore**	**qty**	**rs. crore**	**qty**	**rs. crore**
Benin	78182	831.6	62432	778.37	140171	1976.61	164084	1525.17	163676	1321.7
Ghana	41429	450.24	49762	665.17	101332	1317.36	96966	874.61	134350	1257.05
Guinea-Bissau	120548	1405.91	107113	1646.24	66056	882.69	89810	882.07	99090	934.25
Cote d Ivoire	210108	2175.22	151050	1894.27	191338	2408.87	113379	1037.84	99607	839.75
United Republic of Tanzani	136657	1954.52	116079	1742.82	12080	156.74	129120	1520.89	70789	778.89

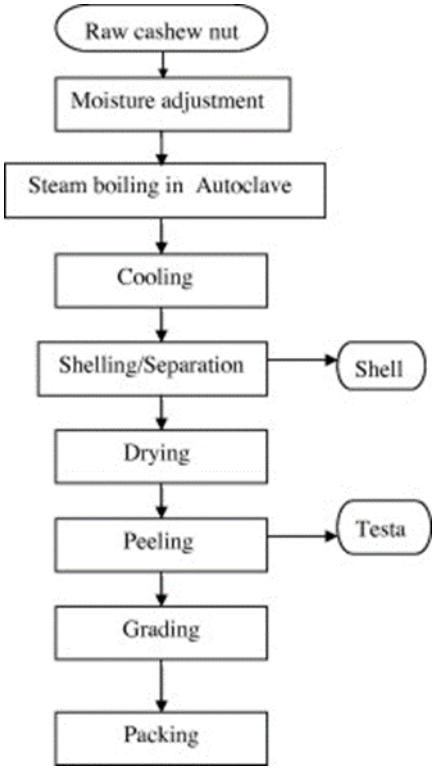
a										
United Arab Emirates	0	0	0	0.05	46669	599.09	53426	467.5	39660	320.64
Guinea	16174	169.39	15855	200.8	26841	290.78	41408	307.34	40852	292.81
Nigeria	36577	351.31	35178	417.47	64310	839.31	37036	316.15	35810	289.82
Gambia	22235	266.24	21817	328.47	18157	249.59	25270	229.28	23331	215.4
Togo	5551	58.06	11269	142.09	24449	349.1	32364	288.4	24004	186.49

Source: WITS

1.1 Processing of Raw cashew nuts

Study problem

There are six essential phases in the processing of raw cashews (according to the data collected from the primary survey). Roasting, shelling, drying, peeling, grading, and packaging are among them. Raw cashew nuts are imported and sun-dried before being roasted at a temperature of 80 degrees Celsius. The CNSL is released during roasting and collected as a by-product. The most popular roasting method is drum roasting. Boiling has mostly replaced roasting in recent years because it prevents raw cashews from becoming over-roasted and yields a higher proportion of CNSL. Shelling and peeling are usually done by hand, however, they may now be done by machines. Grading allows you to distinguish between different types of processed nuts, such as White Wholes, Scorched Whites, Baby Bits, Butts, Splits, and so on. White Wholes (WW) gives the highest market price and is favoured in exports. The processed nuts are packed according to the markets in which they will be sold once they have been graded. Nuts that are shipped to other countries are vacuum-packed in pouches or tins. The main processes carried out in amodern processing unit is given in the following figure.



Source: Babatunde Sunday, Ogunsinaa and Adeleke Isaac Bamgboye (2014).

Objective of the study

The cashew processing industry has untapped potential and mechanisation has been advantageous to the cashew processing industry in filling the void created by the labour shortage. In this regard, this study has the following objectives,

i. Analysing the growth rate of export and import in terms of quantity and value of raw cashew nuts and Cashew Kernels in India.

ii. To carry out the economic analysis and evaluate investment efficiency of Mechanised and partially mechanised processing units in the Kanyakumari District

2. MATERIAL AND METHODS

2.1 Data sources

Both primary and secondary sources of data have been used for the study. The secondary data was collected from the website of DCCD(Directorate of Cashew and Cocoa development) and the UNCTAD (United Nations Conference on Trade and Development) special issue on cashew nuts. The data regarding the economic and materialistic aspects of the processing units were collected from the cashew processing units spread across Kanyakumari District.

2.2 Sampling design and method of data collection

For the study, a visit was made to cashew processing units in Kanyakumari and a primary survey was conducted based on the prepared questionnaire. A sample size of 10 processing units in the mechanized and partially mechanized categories was selected randomly and visited to collect information on the performance analysis of cashew processing units.

2.3 Method of Data Analysis

The data collected is analysed using the following methods

2.3.1Compound Annual Growth Rate(CAGR)(Haritha Paul and Ushadevi K.N, 2021)

The Compound Annual Growth Rate (CAGR) is the most often used growth rate indicator for analysing growth and, by extension, export success.

$$CAGR = (Vf_{inal} / V_{begin})^{1/t} - 1$$

Where:

• V_{begin} – beginning value

• V_{final} – final value

• t- Time in years

2.3.2 Cuddy Della Valle Index(Haritha Paul and Ushadevi K.N, 2021)

The instability index is a statistical technique for detecting inconsistencies or variations in time series data. The Cuddy Della Valle index is a tool for determining data instabilities. When the coefficient of variation is overestimated, this measure de-trends it, indicating the direction of instability. Here's how to calculate CDVI:

$$CDVI = CV \sqrt{1- R^2}$$

Where,

CDVI is the coefficient of variation (in per cent), CV is the standard deviation to mean ratio, and R^2 is the corrected coefficient of determination. Low volatility is indicated by a low-value index.

The ranges of CDVI are given as follows:

- Low instability = between 0 and 15
- Medium instability = greater than 15 and lower than 30
- High instability = greater than 30

2.3.3 Break-even point(K. Harish Kumar and B. Chinnappa, 2009)

A break-even analysis is carried out to determine the minimal production required to recoup the fixed capital invested in cashew nut processing. Here, sales price per unit minus variable cost per unit will give the contribution margin.The following formula is used to compute the break-even point.

$$\text{Break even output} = \frac{\text{Fixed costs}}{\text{Price / unit} - \text{variable cost/ unit}}$$

2.3.4 Payback Period(K. Harish Kumar and B. Chinnappa, 2009)

It's the amount of time it takes to recover the cost of an investment. The initial investment was divided by yearly net returns to arrive at this figure.

$$\text{PBP} = \frac{\text{Initial investment}}{\text{Annual net returns}}$$

To find exactly when the payback occurs, the following formula can be used

$$\text{Payback period} = \frac{\text{Initial investment- Opening cumulative cash flow}}{\text{Closing cumulative cash flow-Opening cumulative cash flow}}$$

2.3.5 Gross Returns

A gross rate of return is the return on an investment before any expenditures or deductions.

2.3.6 Net Returns

The return on an investment after charges such as taxes, inflation, and other fees is known as the net rate of return.

Net returns =Gross returns-total cost

3. RESULTS AND DISCUSSION

3.1 Imports and exports

Table 4: cashew kernel export and raw cashew nut import in india during the study period (2000-2020)

YEAR	CASHEW KERNEL EXPORT FROM INDIA		RCN IMPORT INTO INDIA	
	QUANTITY (MT)	VALUE (RS. CR.)	QUANTITY (MT)	VALUE (RS. CR.)
2000-2001	89,155	2049.00	2,49,318	961.00
2001-2002	98,203	1789.00	3,55,556	950.00
2002-2003	1,04,137	1933.00	4,00,659	1237.00
2003-2004	1,00,828	1804.00	4,52,399	1401.00
2004-2005	1,26,667	2709.00	5,78,884	2191.00
2005-2006	1,14,143	2515.00	5,65,400	2163.00
2006-2007	1,18,540	2455.15	5,92,604	1811.62
2007-2008	1,14,340	2289.02	6,05,970	1746.80
2008-2009	1,09,522	2988.40	6,05,850	2632.41
2009-2010	1,17,991	2801.60	7,52,806	3037.09
2010-2011	1,05,755	2819.39	5,29,730	2649.56
2011-2012	1,31,760	4390.68	8,09,825	5338.64
2012-2013	1,00,105	4067.21	8,92,365	5331.74
2013-2014	1,14,791	5058.73	7,71,356	4563.99
2014-2015	1,18,952	5432.85	9,39,912	6570.93
2015-2016	96,346	4952.12	9,58,339	8561.01
2016-2017	82,302	5168.78	7,70,446	8839.42
2017-2018	84,353	5870.97	6,49,050	8850.03
2018-2019	66,693	4433.99	8,35,463	10929.00
2019-2020	67,647	3867.165	9,38,038	8861.58
CAGR(%)	**-2.27**	**5.19**	**4.91**	**13.27**
CDVI	**16.04**	**19.45**	**16.17**	**25.89**

Source: Indiastat

Table 4 shows that the CAGR for cashew kernel exports in terms of quantity and value from India has been dropping over time during the study period(2000-2020). The number of processed cashew kernels exported value from India has been steadily decreasing during 2015- 2016. In 2014-15, India's export quantity was 118952 MT of cashew kernels, whereas, in 2015-16, it shipped 96346 MT. It can be observed that it has decreased significantly since then with a CAGR of -2.27%. This might be attributable to a rise in domestic demand for processed nuts (Mahanthesh Nayak and Manjunath Paled, 2018). The value of cashew exports, on the other hand, has grown at a CAGR of 5.19 per cent. Raw cashew nut imports have been expanding at a CAGR of 4.91%, while the value of cashew imports has been increasing at a CAGR of 13.27%, during the study period(2000-2020)

Cuddy Della Valle Index was used to compute the instability index in cashew kernel exports in terms of quantity and value, as well as raw cashew nut imports in terms of quantity and value (CDVI). In terms of quantity and value, the CDVI of cashew kernel exports is 16.04 and 19.45, respectively, indicating mild instability. The CDVI of raw cashew kernel imports in terms of quantity and value is 16.17 and 25.89, respectively, indicating medium instability.

Table 5: Establishment (investment) costs

PARTICULARS	MECHANISED (AMOUNT IN LAKHS)	PARTIALLY MECHANISED (AMOUNT IN LAKHS)
Land	4.077(3.5)	3.78
Land development	0.5(0.4)	0.5
Buildings&civil structures	50(44.06)	30
Plant&machinery	56.4(49.70)	5.2
Preliminary&preparative expenses	2.5(2.20)	2.5
Total cost	113.477	41.98

Source: Primary data

3.2: Establishment (investment) costs

From the table 5, it can be note dthat, plant and machinery machinery cost make up the major percentage of establishment in the case of mechanized units and in partially mechanized units, the cost of land makes up the major percentage of establishment costs. This is because mechanized units require well-structured buildings and modern machinery for its working. Land development costs the least in establishment of a cashew processing industry

From the primary survey, it was found that the cashew processing units were established in Kanyakumari a few decades ago by the industrialists from Kollam(Quilon, Kerala). The district of Kanyakumari is close to Kerala, which is known for its cashew cultivation, processing, and export. As a result of growing government intervention in Kerala as a result of several factors, the processing activity was gradually shifted to the Kanyakumari district due to the great availability of cheap labour and the low rates offered to the workers.

Table 6: Types of Machinery installed in Mechanised units

PARTICULARS	NUMBER	RATE(AMOUNT IN LAKHS)	TOTAL AMOUNT IN LAKHS
Steam boiler	1	7.2	7.2
Cashew cutting machine	1	10	10
Borma	1	9	9
Automatic peeling machine	1	7.5	7.5
Grading machine	1	12.7	12.7
Vacuum packing machine	1	7	7
Diesel generator set	1	3	3
	TOTAL	56.4	56.4

Source: Primary Data

TABLE 7: Types of machinery installed in partially mechanised units

S.NO	PARTICULARS	NUMBER	RATE(IN LAKHS)	AMOUNT IN LAKHS
1	Roasting machine	1	0.35	0.35
2	Hand-operated shelling machine	40	0.08	3.2
3	Peeling machine	1	0.95	0.95
4	Drying machine	1	1.05	1.05
		Total	2.43	5.235

Source: Primary Data

3.3 TYPES OF MACHINESRY INSTALLED IN MECHANIZED AND PARTIALLY MECHANIZES UNITS

The machines installed in mechanized and partially mechanized processing units have been listed in tables 6 and 7. As we see, the expenditure for installing machines is higher in mechanized units when compared to that of partially mechanized units.

Table 8: Comparison of variable costs incurred in mechanized and partially mechanized processing units

Variable costs	Mechanised(Amount in Rs)	Percentage of total variable costs	Partially mechanised(Amount in Rs)	Percentage of total variable costs
Raw material	1,00,000	55	1,00,000	52.11
Labour	2450	1.35	13600	7.089
Packing material	660	0.36	105	0.054
Transportation cost	26120	14.49	26620	13.87
Sales tax(5%)	7500	4.16	7500	3.91
Import tax(2.5%)	25000	13.87	25000	13.029

Electricity	1110	0.61	833	0.434
Utilities	6341	3.51	4387	2.286
Interest on working capital(8%)	11006	6.1	13826	7.205
Total Variable Costs(A)	1,80,187		1,91,871	

Source: Primary Data

3.4 Comparison of variable costs and fixed costs incurred in mechanized and partially mechanized processing units

The raw materials used for processing are imported from countries like Ivory Coast, Senegal, Tanzania, Gambia and other African countries since the production level of raw cashews in India is lesser than the processing capacities of the units. The cost of raw materials ranges from Rs.90-120 based on the quality of the raw cashew nuts. Here, the raw material cost is taken as Rs.100. It contributes to the largest share of variable costs of processing in both mechanized and partially mechanized processing units(55% and 52.11% respectively). The imported raw cashews are transported from the Tuticorin Port to the processing units by lorries. Sales tax and import tax of 5% and 2.5% respectively are also a significant part of the variable costs. Mechanised and partially mechanized units differ much in labour. Partially mechanized labour employs around 60-200 women labourers for shelling and grading whereas mechanized units consist of 10-20 labourers. In this study, the number of labourers in partially mechanized units is taken as 60 and the number of labourers in mechanized units is taken as 10. The processing unit operates around 250 days a year. Mechanised units process 1.5 tonnes of raw cashew nuts in a day, whereas, partially mechanized units process 1 tonne a day.

Table 9 Comparison of fixed costs and total costs incurred in the processing units

Fixed costs	**Mechanised(cost in Rs)**	**Percentage of total Fixed costs**	**Partially mechanized (Cost in Rs)**	**Percentage of total Fixed costs**
Depreciation	2558	25.89	1634	20.84
Service and maintenance cost	533	5.39	300	3.83
Permanent Labour	1990	20.14	4200	53.57
Interest on fixed capital(12%)	4800	48.58	1706	21.76
Total fixed	9881		7840	

costs(B)				
Total costs(A+B)	1,90,068		1,99,711	

Source: Primary Data

In table 9, the depreciation is calculated using the straight-line method. The depreciation in mechanized units is higher than that of the partially mechanized units. (Rs.2558 and Rs.1634 respectively). The service and maintenance costs of mechanized units are higher than that of the partially mechanized units.This might be due to the use of more number of machines in the mechanized units. As mentioned in the table, the interest in fixed capital is the most contributing factor to fixed costs.(Rs.4800 and Rs.1706 respectively.)

Table 10: Gross returns obtained from various products

Products	**Gross Returns from mechanized units(Rs/tonne)**	**Percentage to Gross returns**	**Gross Returns from partially mechanized units(Rs/tonne)**	**Percentage to Gross returns**
Cashew kernels	201600	95.403	200000	95.254
Cashew shells	6250	2.957	6250	2.976
Cashew husk	900	0.425	900	0.428
Cashew rejections	688	0.325	938	0.446
CNSL	1875	0.887	1875	0.893
Gross returns	211313		209963	

Source: Primary Data

3.5 Gross returns obtained from various products

Table 10 shows the gross returns obtained from the products and by-products we obtain from cashew processing. From the table, it can be seen that, cashew kernels are the main by-products contributing to the gross returns and the reections contribute the least to the gross returns. In general, we get about 200-250 kilogrammes of cashew kernels, 625 kilogrammes of cashew shells, 90 kilogrammes of husk, 37.5 kilogrammes of rejects, and 75 litres of CNSL for every tonne of raw cashew processed. The graded cashew kernels are exported to countries like Japan, Korea, USA and Singapore. The cashew kernels can be sold at a rate of Rs.800-Rs.1200 based on the quality and the markets in which they are sold. CNSL is also exported or sold in the domestic market. The cashew shells are mostly used by the

processing industry as a fuel for roasting or even sold in the markets to be used as a fuel. The cashew rejections and cashew husk are sold to bakeries. As the shelling and peeling are done by labourers in partially automated units, the rate of rejection is higher. Because they use a boiling and cutting process rather than roasting and shelling, the cashew kernels obtained are greater in automated units. Here in the case of partially mechanized units, we have obtained 200 kg of cashew kernels which are priced at Rs.1000/kg. Cashew shells and cashew husk are priced at Rs.10/kg. Rejections are priced at Rs.18.35/kg. CNSL is priced at Rs.25/litre.

Table 11:Results of different analyses performed

Particulars	**Mechanised**	**Partially Mechanised**
BEP(Tonnes)	140.5	118
Payback period(years)	2.14	1.48
Gross returns/tonne(Rs)	211313	209963
Net returns/tonne(Rs)	31126	18032

Source: Primary data

3.6 Economic evaluations

The economic viability of mechanised and partially mechanised processing units is analysed using the break-even point and Payback period. From the table, the break-even point for mechanised and partially mechanised processing units is 140.5 and 118 tonnes. At the break-even point, the revenues of the business are equal to its total costs and its contribution margin equals its total fixed costs. From table 9, the payback period for mechanised and partially mechanised processing units is 2.14 and 1.48 years respectively. The partially mechanised units have a lesser payback period. But, in places where there is a labour shortage mechanised units are profitable.

4. CONCLUSION

Cashew processing is traditionally a labour-intensive industry. The labour force consisted mainly of women. nowadays cashew processing industries are being mechanised due to labour shortage. The owners of the industry state that, after the introduction of the MNREGA programme by the government of India, the labour force available has been drastically reduced since the drudgery in cashew processing industries is more. Installation of improved machinery can also increase the cashew kernel recovery percentage. We can see the advantage of a mechanised firm over that of a partially mechanised firm from the net returns obtained from the processed cashew products(a mechanised firm received a net return of Rs.31126/ tonne whereas a partially mechanised firm received a net return of Rs.18032). So, mechanisation is a profitable option in the long run even if it requires high investment initially.

COMPETING INTERESTS

"Authors have declared that no competing interests exist.".

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ABBREVIATIONS

DCCD- Directorate of Cashew & Cocoa Development
UNCTAD- United Nations Conference on Trade and Development
CAGR-Compound Annual Growth Rate
CDVI- Cuddy Della Valle Index
INC- International Dried Fruit & Nut Council of India