Performance Indicators-Component 2 (Status as on 31.08.2011)

Name of sub-project : A VALUE CHAIN ON CASHEW FOR DOMESTIC AND EXPORT MARKETS

Name of CPI : Dr. V.P.Potty

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
1	No. of production technologies released and/or adopted **(Please fill separate proforma#1 for each technology)**	**1. 1). Development of mechanical peeler** In cashew processing industries, peeling of cashew is done manually. In market the some of the peeling machine have been developed but it cost around 7-13 lakhs. So to reduce the cost, a simplest and cheaper peeler for cashew production has been manufactured using air blower and a brush. It will cost only below Rs.20,000/. But the technology is under progression and not installed in any of the cashew production industry. Stage of technology • New developed • Tested – Being tested • Validated – **No** **2). Polymerised compound from residol** Residol is obtained as a by-product during the cashewnut shell liquid process after separating the monohydroxyl phenol. The presence of the natural phenol in residol makes it a versatile raw material for various	

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
		industries. Residol finds it application in verities of areas in polymerized product. A novel and cheaper liquid crystalline polyester has been synthesised that can substitute for polymer fibres and films in specialty applications. Liquid crystalline (lc) polymers have attracted much attention in recent years because of their potential use as high performance materials. **Production technology** **1)** ***Polymerization*** Polymerization of residol was carried out in the presence of polymerizing agents like Urea and formaldehyde at various proportions and their characteristics were studied. It provides resistance to moisture and weathering, good green strength and surface finish to moulded articles. Different combinations were tried to select the best ones. Stage of technology • New developed • Tested - Yes • Validated – Yes • Released – Patent applied	

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
		Adopted – Waiting for patent result **3).Bioremediation technology** Cashew nut processing is becoming an environmental contamination by the waste water coming out of the processing units. In both steam roasting as well as drum roasting the waste water which sent out of the processing unit contains a good amount of cashew nut shell liquid .The cashew nut shell liquid is a skin irritant and can cause allergy to many people. The cashew nut shell contaminated waste water can be bioremadiated thereby reducing BOD and COD using microbes. The CNSL is converted to CO_2 in the absence of any cellulosic material. The COD, BOD reduced water can be used for agricultural or even can be reused for scrubber. In the presence of cellulosic material, methane gas can be produced which can be used for fuel by the industry. Methanogenesis studies being carried out with Cashew Nut Shell Liquid (CNSL) and Microbial flora cultured from there. Six different bacteria *Pseudomonas pseudoalcaligenes*, *Enterobacter sakazakii, Sphingomonas paucimobilis, Pseudomonas stutzeri, Enterobacter*	

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
		cloacae, Escherichia coli have been cultured and identified. Methanogenesis analysis of CNSL has been produced methane gas and it was analysed with GC-MS for the confirmation as methane gas. From BOD analysis this it was further proved these organisms were promising in degrading CNSL by lowering its BOD. Stage of technology • New developed • Tested - Yes • Validated – Yes • Released – Process of installing in twelve units • Adopted – Three units already installed. More than 60 units need the technology	
2	No. of processing technologies released and/or adopted **(Please fill separate proforma#2 for each technology)**	**1. Production of anacardic acid from cashew shell** Anacardic acid is a phenolic compound and it is a major component of cashew nut shell liquid. During thermal processing it gets converted into cardanol. The cashew nut shell liquid if obtained by low temperature treatment contains only anacardic acid and cardol with anacardic acid as the major component.	

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
		Anacardic acids do have many industrial and medicinal applications with established anticancer activity and the cost of which falls on a higher side. It is very much demand in the international market. New extraction process for anacardic acid was deloped without thermal application in salt form and can be stored as anacardate. The existing method for the extraction of anacardic acid was very costly and time consuming. But the newly developed method could over come that problem. Moreover by using cashew shell as a raw material, the utilization of cashew industry by product into a very good foreign exchange earner compound conversion is possible. Since cashew nut shell is used as fuel in cashew processing system. Stage of technology • New developed • Tested – Yes • Validated – Yes • Released – Patent applied • Adopted – Waiting for patent result. Two industries are ready to take	

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
		2. Developed water scrubber and bioremediation It is a newly developed technology for pollution preventing system for cashew nut processing unit. Atmospheric pollution is one of the major problems with drum roasting cashew processing units in India. The national pollution control board has stopped working of many such units in many states. The water scrubber is designed in such a way that all the polluting agents viz. sulphate, nitrate and carbonate from the drum roasting cashew processing units can be brought down and only steam is let out. The waste water can be recycled since sulphate and nitrate content (19.0 mg/L and 1.1 mg/L) is much below the accepted level. It reduces environmental pollutions and creates green atmosphere. Stage of technology • New developed • Tested – Yes • Validated – Yes • Released – Patent applied.Twelve units placed order • Adopted –Three units installed. Nearly more	

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
		than 60 units made enquiry **3. Production of cellulase from cashew shell** Cashew shell contains a good amount of cellulose which is difficult to separate. By applying microbes the cellulose is converted into cellulase. The cellulase is widely used in food industry and textile industry. The recycling of the waste is being effected. Stage of technology • New developed • Tested – Yes • Validated – Yes • Released – No industry has come **4. Adopted – No industry has come Production of tannase enzyme from cashew testa** The cashew shell is about 0.3 cm thick, having a soft feathery outer	

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
		skin and a thin hard inner skin. Between these skins is the honeycomb structure containing the phenolic material known as CNSL? Inside the shell is the kernel wrapped in a thin skin known as the testa. Testa is the good source of tannins. Tannins act as the sole source of carbon and to degrade the tannins, microbes have been introduced and the microbes produce tannase. Tannase is extensively used in the food, feed, beverage, brewing and pharmaceutical industries. The major applications of tannase are in the manufacturing of instant tea and the production of gallic acid. Gallic acid is the key intermediate required for the synthesis of the antibacterial drug trimethoprim used in the pharmaceutical industries. In food industries, tannase is utilized as a clarifying agent of various beverages like wine, fruit juice, and coffee flavoured drinks. Stage of technology • New developed • Tested – Yes • Validated – Yes • Released – No industry	

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
		has come • Adopted – No industry has come **4. Production of pectinase enzyme from cashew shell** It is estimated that about 8.5 lakh tone of cashew shell is being generated annually. A very small quantity is being used for extraction of cashew shell liquid. Another very insignificant quantity is used for hardboard making and similar applications. Remaining shell is totally used for fuel. The pectin content of the cashew shell is to the tune of 2.3-3.4% w/w By the fermentation of microbes using cashew shell as substrate, can produce the enzyme pectinase. They are one of the important functional food ingredients in jams, jellies, fruit juices, confectionery products, bakery fillings and are used for stabilization of acidified milk drinks and yoghurts. Thus the utilization and conversion of cashew industry waste to a highly useful enzyme production can be possible. Stage of technology • New developed	

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
		• Tested – Yes • Validated – Yes • Released – No industry has come • Adopted – No industry has come	
3	Number of technologies/products commercialized based on NAIP research **(Please fill separate proforma#3 for each technology)**	Two 1. Pollution Preventing System implemented in Cashew processing units	2. non-thermal Extraction of Anacardic Acid from Cashew nut shell was standardized and commercialized by Industry
4	No. of new rural industries/entreprises established/ upgraded **(Please fill separate proforma#4 for each rural industry)**		
5	No. of product groups for which quality grades developed and agreed **(Please fill separate**	NA	

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
	proforma#5 for each product group)		
6	Total no. of private sector organizations (including NGOs) participating in consortium **(Please provide list of private sector organizations)**		
7	No. of farmers involved in consortia activities	NA	
8	Total number of farmers' group for marketing and processing **(Please provide list of farmers' group)**	NA	
9	Number of patent/intellectual property protection applications filed based on NAIP research **(Please fill separate proforma#6 for each tchnology)**	1. Pollution controlling drum roasting cashew processing units 2. Low cost method for the extraction of anacardic acid from cashew nut shell 3. Development of bioremediation technology for CNSL polluted surface of the cashew processing unit. 4. Recycling of waste water from cashew processing industry through immobilized bioremediation techniques. 5. Development of polymerized products from the CNSL waste	

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
		RESIDOL. 6. Production technology of cellulase enzyme from cashew nut shell. 7.Production technology of pectinase enzyme from cashew nut shell 8. Production technology of tannase enzyme from cashew testa. 9.Non thermal processing technology for raw cashew nut cut open 10. Production of nano cellulose from cashew nut shell. 11. Hand operated peeling machine	
10	Number of patents/intellectual property protections granted/published based on NAIP research **(Please fill separate proforma#7 for each technology)**	Applied	
11	Number of scientists trained overseas in consortium-based subject areas **(Please fill separate proforma#8)**		ONE
12	Success stories **(Please give seperate write up for each success story)**		

Sl. No.	Indicator	Performance as on 31.03.2011		Performance as on 31.08.2011	
13	Incremental employment generated (person days/year/HH)	Baseline	March 31, 2011	Baseline	August 31, 2011
		NA			
14	Increase in income of participating households (Rs. per annum)	Baseline	March 31, 2011	Baseline	August 31, 2011
		NA			
15	**Publications** **(Please fill information as per guideline given in proforma#9)**	1. Sabna Prabha S., Sisu Pramod S., Kutti Raja M., Gentle Sebastian. Muneer A. M and Potty V. P (2010). **Extraction of anacardic acid from cashew nut shell.** 20th Swadeshi Science Congress (6-8 Nov), CMFRI, Kochi, Kerala. 2. Sisu Pramod S., Sabna Prabha S., Gentle Sebastian. Muneer A. M and Potty V.P (2010). **Microbial bioremediation of cashew nut shell liquid.** ***20th Swadeshi Science Congress*** (6-8 Nov), CMFRI, Kochi, Kerala. 3. Muneer A. M., Sabna Prabha S., Sisu Pramod S., Gentle Sebastian and Potty V. P (2010)**. Causes for formation of rejects in cashew processing.** ***20th Swadeshi Science Congress*** (6-8 Nov), CMFRI, Kochi, Kerala. 4. Prabha Kumary C., Potty V. P, Rekha Sivadasan and Anitha Jose (2010). **Management of *Tribolium castaneum* the serious pest of stored cashew kernels**. 20th ***Swadeshi Science Congress*** (6-8 Nov), CMFRI, Kochi, Kerala 5. Prabha Kumary C., Rekha Sivadasan (2010). **Biology of the red rust flour beetle (*Tribolium castaneum*). *Journal of applied Zoological Research***, 21(1), 63-66.		

Sl. No.	Indicator	Performance as on 31.03.2011	Performance as on 31.08.2011
		6. Sabna Prabha S., Sisu Pramod S., Muneer A. M and Potty V. P (2011). **Effect of storage temprature and humidity on moisture, carbohydrate, protein, fat, peroxide value and iodine value of raw cashew nuts**. ***African journal of pure and applied sciences.*** Communicated 7. Prabha Kumary C., Rekha Sivadasan (2011). **Management of *Tribolium castaneum* by using different temperatures in stored cashew kernels.** ***Journal of applied Zoological Research***. Communicated	

Proforma -4

Information on Rural Industries

1. Name of Sub-project:

2. Name of CPI:

3. Name of Rural Industry with Address: a.Aneesh Industries, Kollam
b. Achal Industries, Baikampady, New Mangalore, Karnataka
c. Asiatic export enterprises, kilikolloor, Kollam
d. Surya exports, Kollam

4. Contact: Phone and E-mail of rural industry

5. Investment (Rs.): NAIP funds
Industry/Entrepreneur

6. Product(s) produced and marketed:

7. Annual Production (kg or litre):

8. Raw Material(s) and Quantity Used/Year (kg or litre):

9. Cost of raw material (per kg or litre):

10. Price of Product: In Whole Sale
: In Retail

11. Type of Beneficiaries:

12. No. of Beneficiaries

13. How the Industry is beneficial to Primary Producers:

14. Estimate Employment Generation/Year (person days):

15. CPI to explain whether the industry is approved by FPO/BIS or any other statutory body and how the food safety and quality assurance of end product are being ensured?

Proforma -5

Information on product groups for which quality grades developed and agreed

Name of Product Group	Details of Product Group	Tangible/ Intangible Benefits

Proforma -6

Information on Technologies/ Innovations Filed for Patent

1. **Exact title of the technology and date of filing application**: "Pollution Controlling Drum Roasting Cashew Processing Units" dated 30th December 2010
2. **Where it was filed?** National Research Development Corporation
3. **Present status (if number is awarded, give No. and date)**: Waiting for Award

4. **Brief writes up of the technology (duly masking the IPR related issues) which can be printed**: The system consists of a water scrubber and the filtration unit. The smoke generated from the fire below the drum is taken up by the draught force to the 40 m top of the chimney and disperses in the atmosphere. The new system installed separately along with the Chimney of 40 m height at 25 m from the ground. The scrubber is 10 m length and two different types of nozzles of varying diameter (1mm and 0.1mm) are used inside the scrubber for spraying the water efficiently. The extended exhaust tube of the scrubber lets out the steam coming out of the chimney instead of carbon particles leaving the atmosphere clean. The water pumped into the scrubber is collected at the bottom of the scrubber along with the carbon particles that flows down through a pipe to a primary filter and falls to the first tank at the ground level. From the first tank it passes through a second filter and falls into the second tank. The water from the second tank is again used for pumping into the scrubbe

4. **Whether the technology is commercialised**? Yes

5. **Impact of the technology**: Highly recommended

Information on Technologies/ Innovations Filed for Patent

1. **Exact title of the technology and date of filing application**: "Low cost method for the extraction of Anacardic acid from cashew nut shell" dated 10th January 2011

2. **Where it was filed?** National Research Development Corporation

3. **Present status (if number is awarded, give No. and date):** Waiting for Award

4**. Brief writes up of the technology (duly masking the IPR related issues) which can be printed**: The newly invented method can reduce the cost and time as around 2 and1/2 hr than the existing method. More over this method can utilize the cashew industry by-product, such as cashew shell cake. Thus we can produce one of the important foreign exchange earner anacardic acid from waste raw material.

CNS was processed into small pieces (approx. 1 cm x 1cm) with blending machine. 50 g of processed shell was treated with 200 ml of medium polar solvent (methanol) and kept in a shaker for 1 hr. The extract was then precipitated as sodium anacardate using saturated solution of sodium carbonate and filtered through watman filter paper and dried at 45^0C -50^0C. The retendate was converted into anacardic acid by treating 5.5 g of sodium anacardate with 3 ml of 11N HCl and 20 ml of distilled water and kept in a shaker for 1 hr. The resultant solution was extracted with ethyl acetate (2 X 15 ml) and the combined organic layer was washed with distilled water (2 X 10 ml), and then dried over anhydrous sodium sulphate or it can be stored as sodium anacardate salt for long time. The identity of anacardic acid was later confirmed with HPTLC in comparison with standard.5.

5**. Whether the technology is commercialised**? Yes

6**. Impact of the technology:** Highly recommended

Proforma -8

Details of Scientists Deputed for International trainning in Consortium-based Subject Areas

Name of Scientist with Address	Area of Training	Name of Host Institute	Period of Trainning	
			From	To
Mr. Muneer A.M. Research Assistant, CEPCI, Kollam, Kerala	Food Analysis	Lund university, Sweden	20th September 2011	4th October 2011

Proforma -9

Bibliography of Publications from NAIP sub-projects

Guidelines

1. Book:

Turner P D. 1981. *Diseases and disorders of Oil Palm,* p 281 Incorporated Society of Planters, Kuala Lumpur, Malaysia.

2. Book Chapter:

Kochu Babu M. 1994. Diseases and disorders of oil palm. (*in*) *Advances in Horticulture,* Vol. 10, p 985-1000 *Plantation and Spice Crops* part 2, Chadha K L and Rethinam P. (*Eds*), Malhotra Publishing House, New Delhi.

3. Thesis:

Kochu Babu M. 1993. 'Investigations on spear rot complex of oil palm *(Elaeis guineensis* Jacq.*).*' Ph D thesis, Mangalore University, Mangalore, Karnataka.

4. Popular Article:

Kochu Babu M, Ramachandran Nair K and Nampoothiri K U K. 1998. Oil palm seed and nursery diseases. *Indian Oil Palm Journal* ***7***(42): 242-4.

5. Newspaper Article:

Author(s) Name, Title of the article, Name of the News Paper, Date.

6. Seminar/ Symposium/Conference/Workshop Proceedings

Kochu Babu M. 2007. Scope for Oil palm-A potential source of vegetable oil in India. (*in*) Proceedings of ISOR National Seminar 2007 held during date month year at place. Hegde D M (*Ed*), *Changing global vegetable oil scenario: Issues and challenges before India.* Indian Society of Oilseeds Research, Hyderabad, pp 392-418.

7. Research Journal:

Kochu Babu M, Ravindran P S and Ramachandran Nair K. 1991. Phytosanitary seed treatments in Oil Palm (*Elaeis guineensis* Jacq). *Journal of Plantation Crops* **18** (Suppl.): 244-7.

8. Technical Bulletin:

George V Thomas, Kochu Babu M and Chandramohanan R. 1999. Mushroom cultivation on palm wastes. *Tech. Bull. No. 36,* 14 p Central Plantation Crops Research Institute, Kasaragod.

9. Manual

Author(s) Name, Year, Title, Institute Name, Location, Total Pages

10. Seminar/ Symposium/Conference/Workshop Presentation

Mishra H S, Tiwari S K, Saini B C and Ashutosh Singh. 2008. Influence of secondary and micronutrients on the growth and yield of matured tea plants under salix based Agroforestry system in northern India. (*in*) *National Seminar on Improving Productivity and Quality of Tea through Traditional Agricultural Practices*, held during 15-16 November 2008 at University of North Bengal, Siliguri, Darjiling, India p. 26.

11. CDs/Videos:

Author(s) Name, Year of Production, Title, Institution, Location.

12. Popular article in other Language

Saurabh Tripathi, Dinesh Tiwari and Ashutosh Singh. 2008. *Lobia ki kheti: Ek Parichya* (Hindi) (An Introduction: Cultivation of Lobia). *Kisan Bharti*, September, 2008 p 28.

13. Folder/Leaflet/Handout:

Kochu Babu M. 1990. Spear rot and bud rot in Oil Palm. Extension folder No. 21, Central Plantation Crops Research Institute, Kasaragod.

14. Report:

Anupam Varma, Rethinam P, Solomon J J, Kochu Babu M, Srivastava K P, Radhey Shyam Reddy and Majutndar A. 1995, *Virus infection in oil palm seedlings.* Report of the team constituted by ICAR, New Delhi, 19 p.

Note:

Name of CPIs and CCPIs to be given in *italics*

Use of Arial font size 12

Journal name to be given in full, do not abbreviate