Prospects of High Value Fruit Crops Even on Degraded Gullied Lands

Foundation Stone 2008

Innovativeness

- ✓ State of art off campus faculty at door steps of tribal people Godhra
- ✓ Academic prog (Vocational courses, Diploma, B Tech, M Tech, Ph.D, distant education all under a single roof
- ✓ One of the Dream project of Gujarat Govt under Tribal Mission
- ✓ Developing 20 ha instructional farm located under farmer's fields
- ✓ Conceiving, execution, successful demonstration of bouquets of Agril Engg based Interventions (water, energy, mechanization, value additions at 1 place
- ✓ Innovative fruit crops-rainfed as well as most advanced irrigation setups
- ✓ Quality field labs for conducting UG & PG practicals in real scenarios
- ✓ Successful land reclamation, rainwater harvesting, recycling,
- ✓ Cashew nut, sweet orange & other high value fruit production
- ✓ Model prototype pilot processing plants for value additions , demonstratins

Full College 2011

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Horticultural interventions

- A valuable part of rural economy
- Emerging as dominating business
- Reasons increased regulations, climate , high prospects of value additions & market

What actually needed ?

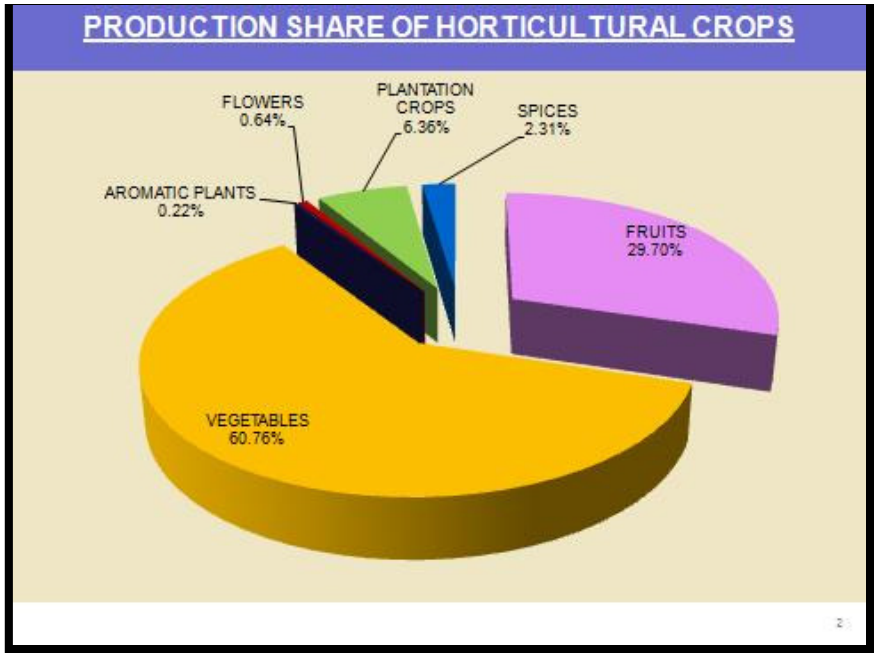
- Designated allocations of land, water, and Management (Man, machine, material, Market0
- Bouqet of technology (high quality plants, Advanced water applications/Fertigations, Orchard managerial inputs, processing & value addition
- Interlinking land, water, energy, financial institutions, market retailers, and technocrates with farmers

This presentation speaks on

- An operational R&D for innovative utilization of degraded gullied lands
- A real field model where plethora of relevant technologies are conceived , executed and widely demonstrated at single location
- Integrated demonstration of Research (Basic & operational), Academics (UG,PG, Vocational), Development (High value orchards, land, water, energy, products, market, entrepreneurship, livelihood)

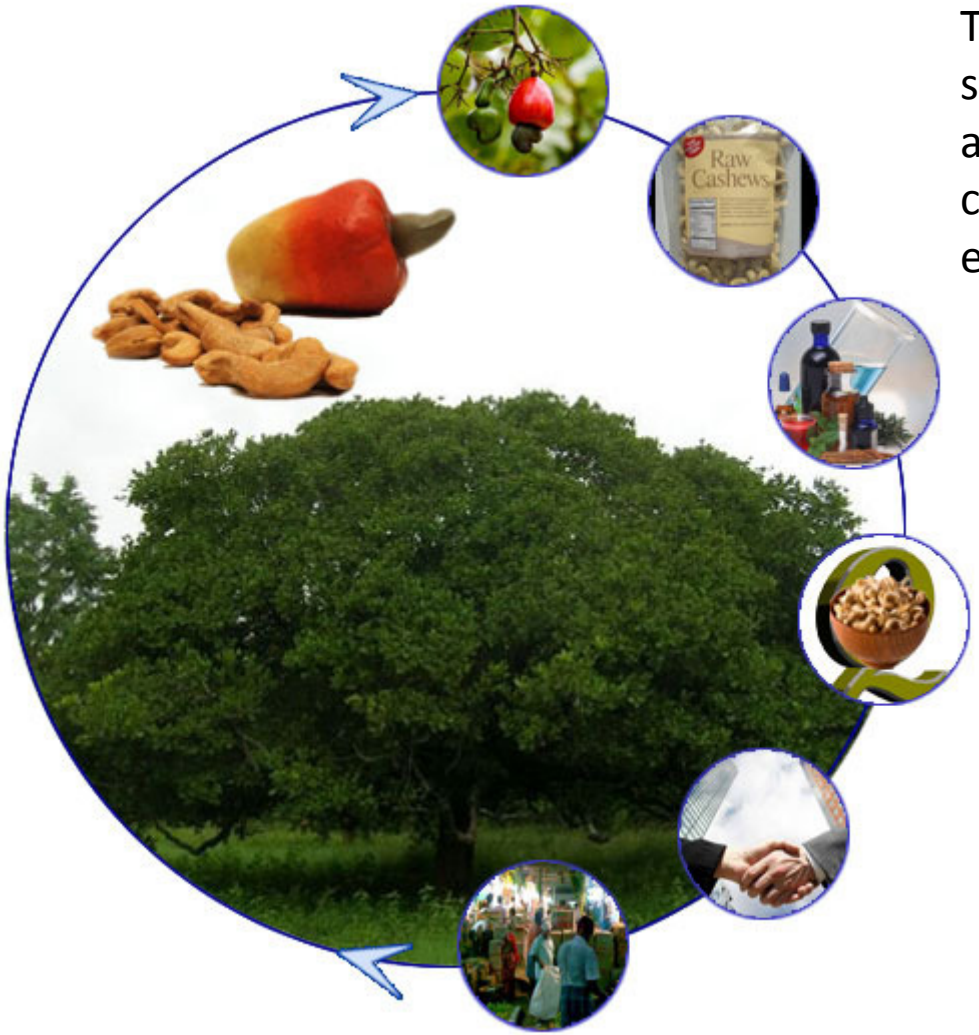
Constituents

- Scientific developments of land & water in 20 ha experimental farm in a tribal region
- Planning, implementing, managing and successful harvests of high value fruit crops even from degraded gullied lands
- Success indicators/ specific Achievements towards growing cashew nut, sweet orange, custard apple and some food for thoughts for their wider replications/reinforcements



Sr. No.	Districts	Crops
1	Gandhinagar	Mango Sapota,Aonla, Lime, Pomegranate, Guava, Papaya , Fennel, Medicinal & Aromatic Plant and flowers
2	Surendranagar	Mango, Papaya ,Aonla , Lime , Cashew nut Cumin, Fennel
3	Panchmahal (Godhra)	Mango, Lime , Sapota Aonla ,Papaya, Fennel
4	Narmada	Mango, Banana, Papaya , Cashew nut
5	Patan	Lime , Sapota , Aonla , Cumin , Fennel
6	Dang	Mango , Cashew nut , Custard Apple
7	Jamnagar	Mango , Sapota , Lime , Papaya, pomegranate
8	Rajkot	Mango Sapota , Lime , Aonla
9	Dahod	Mango , Lime , Aonla , Guava , Cashew nut
10	Porbandar	Sapota , Lime , Papaya

Cashew nuts



The trade pattern in cashew in the world suggests that **8 to 9 million cartons of cashews** are traded in the world in an year. The main countries that constitute the world cashew exporting list are

- ✓ India (4.5 million cartons)
- ✓ Vietnam (2.3 million cartons)
- ✓ Brazil (1.75 million cartons)
- ✓ Tanzania
- ✓ Ghana

India contributes to over half of the world cashew exports

Cashewnut

STATE	2005-06			2006-07			2007-08			2008-09		
	A	P	APY	A	P	APY	A	P	APY	A	P	APY
Kerala	80	67	900	80	72	900	84	78	900	70	75	900
Karnataka	100	45	700	102	52	700	103	56	710	107	60	720
Goa	55	27	690	55	29	690	55	31	700	55	30	700
Maharashtra	160	183	1300	164	197	1500	167	210	1500	170	225	1500
Tamil Nadu	121	56	640	123	60	670	123	65	700	131	68	710
Andhra Pradesh	170	92	880	171	99	890	171	107	900	182	112	920
Orissa	120	78	860	125	84	860	131	90	860	137	95	865
West Bengal	10	10	950	10	10	1000	10	10	1000	11	11	1000
Gujarat	4	4	900	4	4	900	4	4	1000	6	4	700
NE States	14	10	640	15	11	700	15	12	750	16	12	750
Others	3	1	400	5	2	500	5	2	500	8	3	460
TOTAL	837	573	815	854	620	820	868	665	860	893	695	900

A = Area in '000 ha ; P = production in '000 T ; APY = Av productivity Kg/ha

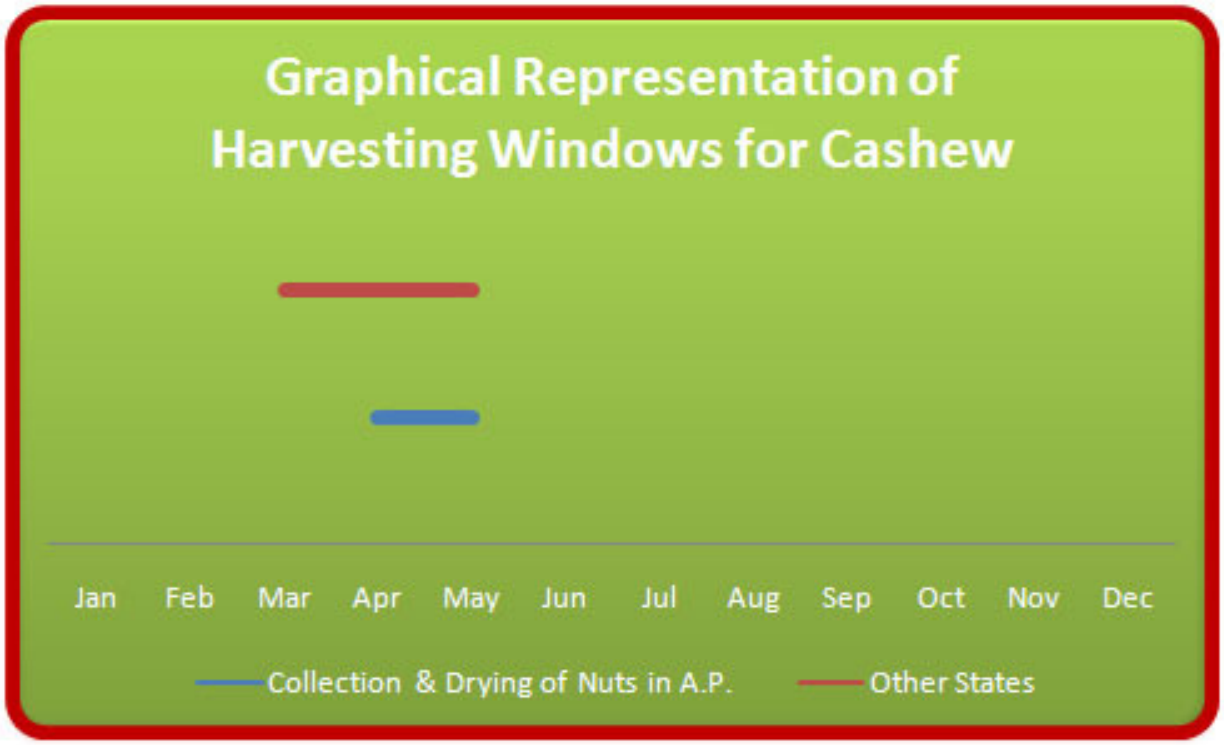
Food Value Per 100 g of Fresh Cashew Apple

Moisture	84.4-88.7 g
Protein	0.101-0.162 g
Fat	0.05-0.50 g
Carbohydrates	9.08-9.75 g
Fiber	0.4-1.0 g
Ash	0.19-0.34 g
Calcium	0.9-5.4 mg
Phosphorus	6.1-21.4 mg
Iron	0.19-0.71 mg
Carotene	0.03-0.742 mg
Thiamine	0.023-0.03 mg
Riboflavin	0.13-0.4 mg
Niacin	0.13-0.539 mg
Ascorbic Acid	146.6-372.0 mg

Cashews have 553 calories per 100g of their weight.

Nutrients	Amount	Nutrients	Amount
Basic Components			
Proteins	25 g	**Fats & Fatty Acids**	
Water	7.2 g	Total Fat	60 g
Ash	3.5 g	Saturated Fat	11 g
		Monounsaturated Fat	33 g
Calories		Polyunsaturated Fat	11 g
Total Calories	761	Omega-3 Fatty Acids	85 mg
Calories From Carbohydrates	169	Omega-6 Fatty Acids	11 g
Calories From Fats	505	**Vitamins**	
Calories From Proteins	87	Vitamin C	688 mcg
		Vitamin E	1.2 mg
Carbohydrates		Vitamin K	47 mcg
Total Carbohydrates	42 g	Thiamin	582 mcg
Dietary Fiber	4.5 g	Riboflavin	80 mcg
Starch	32 g	Niacin	1.5 mg
Sugar	8.1 g	Vitamin B6	574 mcg
		Folate	34 mcg
		Pantothenic Acid	1.2 mg
Minerals			
Calcium	51 mg	Potassium	908 mg
Iron	9.2 mg	Sodium	17 mg
Magnesium	402 mg	Zinc	8 mg
Phosphorus	816 mg	Copper	3 mg
		Manganese	2.3 mg

Name of Variety	Mean nut yield/tree
Madakkathara - 2 (NDR-2-1)	17.00 Kg
Priyanka (H-1591)	17.03 Kg
Ullal - 4	9.5 Kg
UN - 50	10.5 Kg
Vengurla - 4	**17.2 Kg**
Vengurla - 7	**18.5 Kg**
Vridhachalam - 3 (M 26/2)	11.68 Kg
Bapatla - BPP - 8 (H2/16)	14.5 Kg
Bapatla - BPP 6	10.50 Kg
Bapatla - BPP 4	10.50 Kg
Vridhachalam 2 (M 44/3)	07.40 Kg
Ullal 3	14.70 Kg
Ullal 1	16.00 Kg
Vengurla 1	19.00 Kg
Vengurla 6	13.80 Kg
Bhubaneshwar -1	10.50 Kg
Goa-1	07.00 Kg
Jhargram-1	08.50 Kg
NRCC 2	09.00 Kg
UN 50	10.50 Kg
Chintamani	07.20 Kg
Amrutha (H 1597)	18.35 Kg
Dhana (H 1608)	10.66 Kg



Cashew Nut Basics

CROP CULTIVATION

- ✓ Fast growing evergreen tropical tree (even upto 12 m height. Blossoms between Nov & Jan. Fruits ripen in two months. The cashew nuts hang at the bottom of the apple. The edible kernel has a shell outside.
- ✓ Cashew apple contains 5 times more vitamin –C than an orange and contains more calcium, iron and vitamin B1 than citrus, avocados and bananas.

Soils & Climate

- ✓ More suitable for sandy soils. Best in deep well drained sandy loams. Can't grow on ill drained soils.
- ✓ It is frost sensitive. Though 1000 mm annual rain is needed but its showing well in less rains too

Spacing

- ✓ **8 x 5 m** spacing is adequate. Trees are vigorous growing.

Fertilizers

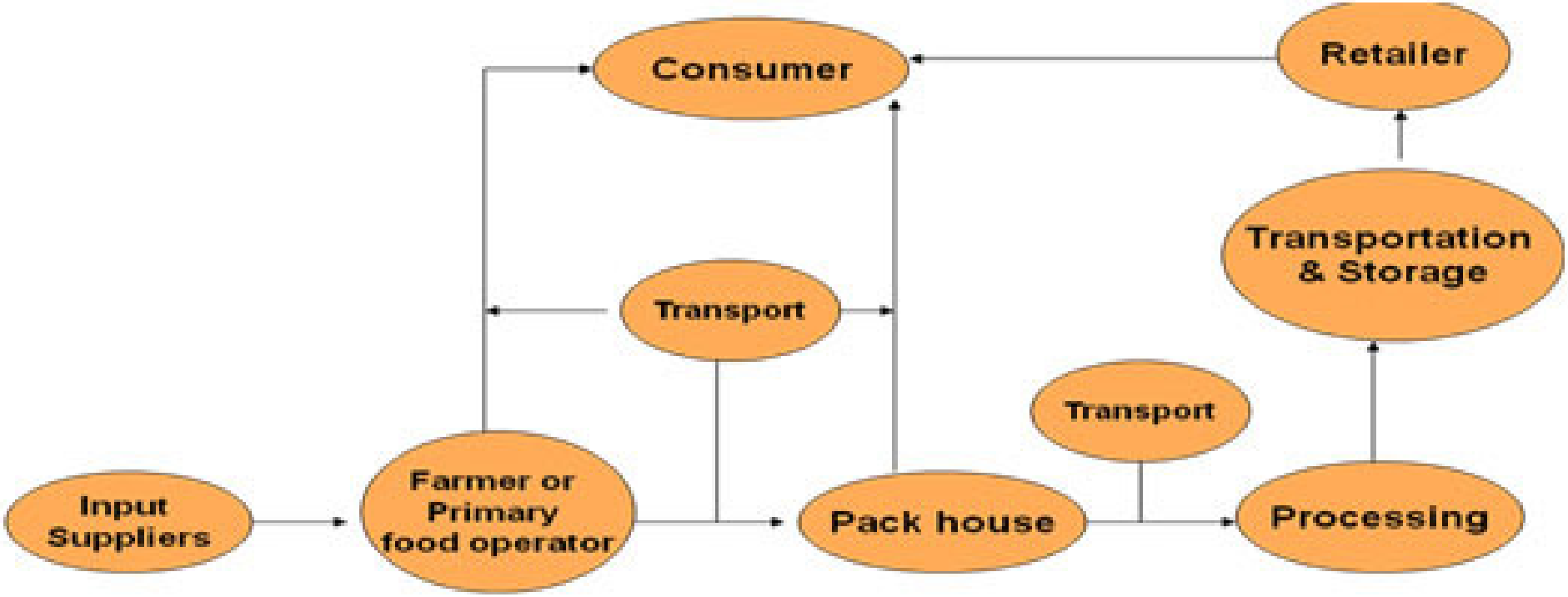
70gm of Urea + 200 gm SSP / per year of age . Can go up to 750 gm Urea and 2 kg SSP for tree. Zinc deficiency normally occurs. Use 200 gm Zinc Oxide in 100 liters of water for foliar spray.

Flowering

- ✓ Both male and bisexual flowers are born in the same cluster. Pollination is by insects. After pollination it takes 6 – 8 weeks for the fruit to develop. The nut develops first and the apple enlarges 2 weeks later. Nuts to be harvested and dried.

Irrigation

- ✓ Fruit bearing trees require 100 liters of water per day.



"FARM TO PLATE" Approach

- ✓ Development of Technologies for High Valued Fruit Crops for Tribal Areas
- ✓ Development of package of practices for high valued fruit crops like grapes, pomegranate, cashew nut, custard apple and sweet orange.
- ✓ Development of post harvest processing technology including value addition of high valued fruit crops like grapes, pomegranate, cashew nut, custard apple and sweet orange.
- ✓ Transfer of technologies to the farmers.

Expected Deliverables

- ✓ Middle Gujarat Agro - climatic Zone
- ✓ The people tribal area will gain the knowledge for advance agro techniques of growing high valued fruit crops.
- ✓ Grape, pomegranate, cashew nut, custard apple and sweet orange will give better income from unit area and employment generation and economical sound status.
- ✓ Value added products will provide higher return to them.

Experimental Research Farm of College (20 ha)

Not only Agricultural & Horticultural Development but also for

Operational Research & Students Hands On Training /regular Practical Classes

Experimental Research Farm of College (20 ha)

Highly Degraded Ravenous Lands Got Transformed into a Beautiful LandScap adopting Bouquets of Technological Interventions

Ravines Converted to Agril. Fields Before & After

Leveling and plotting of the farm during 2008-09

Growth of Maize GM-3 and Paddy crop during kharif season of 2009-10


NETA
NETA

- ✓ Recent Extreme Event (in Sept, 2014) Successfully handled by Multipurpose RWH Structure self designed & constructed in 2011
- ✓ Rainwater Harvesting - 7 Km water body upstream
- ✓ Cashew nut & Sweet Orange Orchards Located on Lands along Stream Banks
- ✓ Recycling of Harvested Rainwater plus Automated Sensor Based Drip Applications to Orhcrads

Rainwater Harvesting & Advanced Irrigation Applications for Developing Quality Orchards on Gulled lands Just in 5 yrs

Pomegranate orchard

Cashewnut orchard

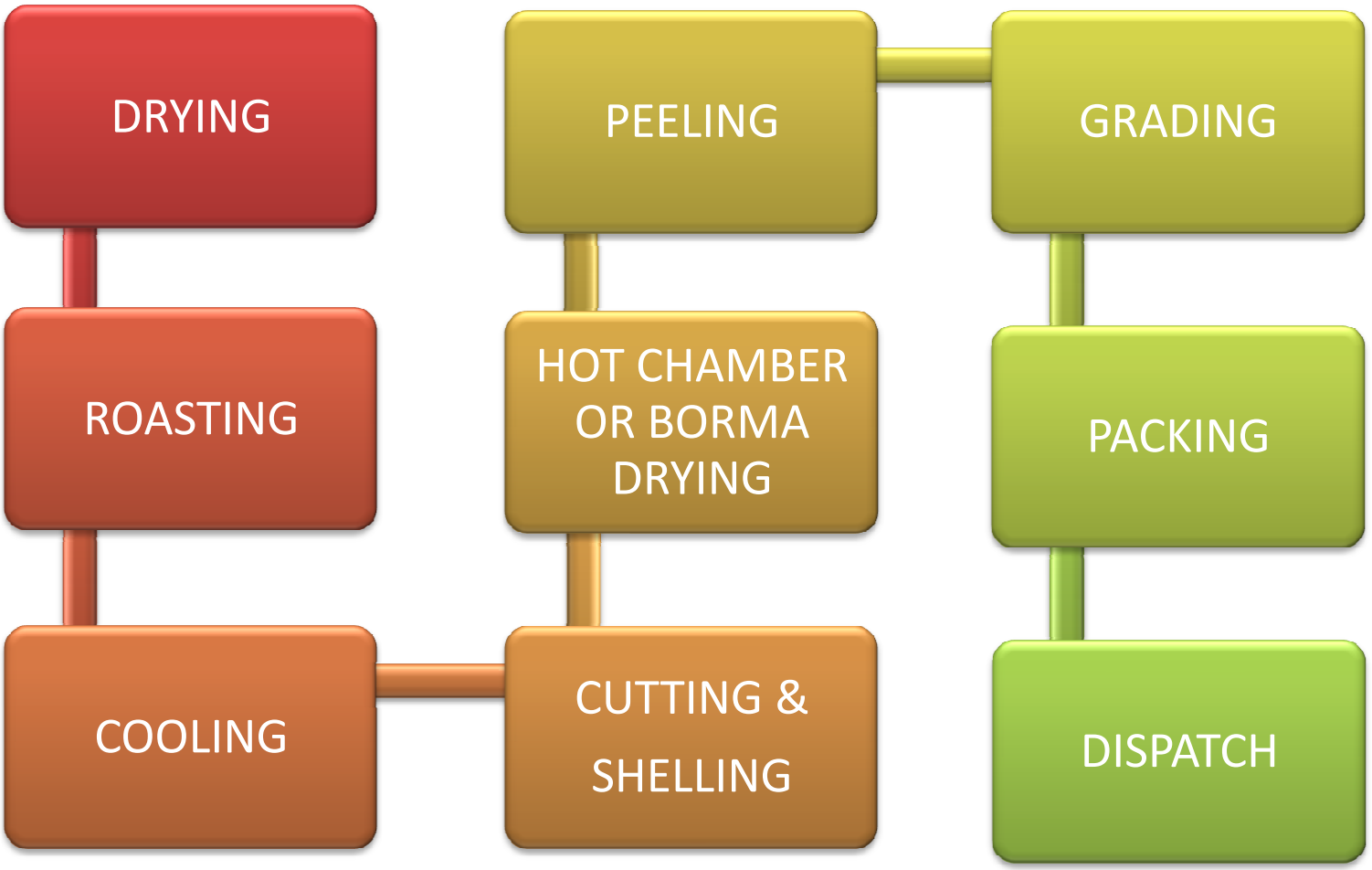
Harvested Cashnewnut

Sweet orange orchard

Custard apple orchard

Real Pictures
(October 2014)

Major Engineering Processes for Cashew nuts



Real Pictorial Views – Traditional v/s Updated Working Plants/Principles

DRYING PROCESS

✓For 2 Days nuts exposed to sun , dried nuts are stored in store room
✓Sun drying loss - 7 to 8%, value added , better colored , oil content reduced

ROASTING PROCESS

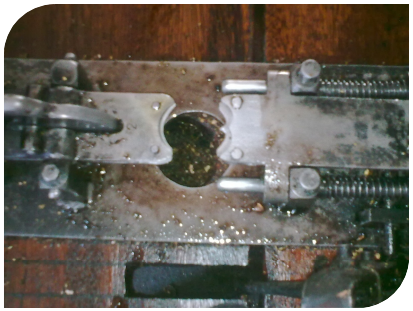
✓Roasting of raw Cashew Nut is done ; 4 case @75 Kg , 4 workers
✓Steaming- 20 minutes @ 90 deg C (firewood-steam)

COOLING PROCESS

✓Roasted nuts are taken to a separate room and spread on floor for 2-3 days
✓Cooled roasted nuts are transferred shelling process.

Kernal Seperation By Cutting

- ✓Shelling is done with machine , 2 women @ 8 – 10 Kg cashew nuts per day
- ✓Cutting is done to separate kernals (30 % yield, 2-3 % breakage)
- ✓Each shell is split open , cashew inside is immediately taken out by hand.
- ✓Strength is not required for breakage of shell, rather correct positioning of nut and ability to hit the nut in correct position is vital ensuring quality kernals
- ✓During shelling process workers use Castro oil to keep their hands safe
- ✓Next day Kernals are transferred to sorting department




BORMA DRYING PROCESS

- ✓ Cashew nuts which are cut, are taken to a hot chamber for Borma drying.
- ✓ Borma look like a rectangular box (8 stands with 60 aluminum treys(480)
- ✓ Loading 4 kg of cashew kernels /tray (1920 kg/box) and closing door
- ✓ Door is locked & heat is generated at 81 deg C , continuously released to Borma box for 8 hrs
- ✓ Afterward cashew kernels taken to separate room for cooling for a day, 2 workers easily handle whole process
- ✓ Shell cake of raw cashew nut is used for fuel purpose

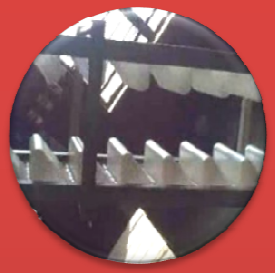
PEELING & GRADING PROCESS

- ✓ Major labours are needed in this process. Average peeling by one worker is 10 kg/day
- ✓ Workers remove husk from cashew nuts using small knife.
- ✓ Nuts are transferred to Grading section very next day.
- ✓ Cashew nuts are categorized , given different grades, depending upon grades rates are set

- Scorched wholes
- Scorched butts
- Scorched splits
- Desert splits
- Large white pieces
- Small white pieces
- Baby bits

- Wholes 12
- *Whole*s 140
- Wholes 180
- Wholes 240
- Wholes 300
- Wholes 350
- Wholes 440

Cleaning and metal detector



In this process the cashew nuts are being passed in a machine where the dust is removed out.

Once this is done the cleaned nuts are passed through the metal detector.

This is done to see that, there are no unwanted particles.

This is the final process before packing.

Flexi bags

Nuts are filled in the packets and the air in the packets is replaced wit carbon de oxide. this is done in order to keep the final product in good condition. this type of packing is done when the goods are meant for export**.**

Packing Machines

PACKING PROCESS

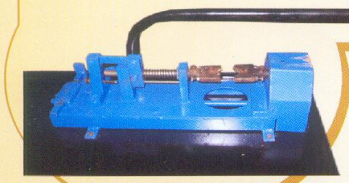
SHELLING, PACKING & GRADING MACHINERY

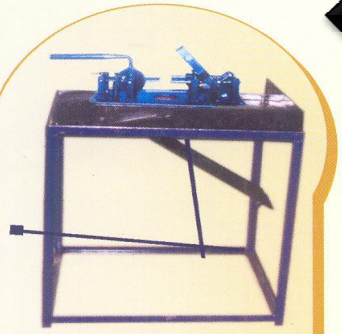
Capacty: 900 nuts per hour

Features:

New concept in Cashew nut Shelling machine
Easy to handle (Hand operated)
Gear attachment made shelling much easier

CASHEW HAND SHELLAR





HAND & PADDLE SHELLAR

Capacty: 900 nuts per hour

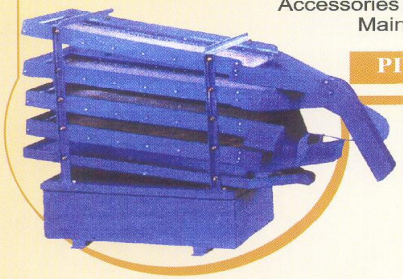
Features:

- Traditional Cashew nut Shelling machine
- Hand & Paddel operation, divided load on workers
- M. S. Body, Heavy Duty & Long life

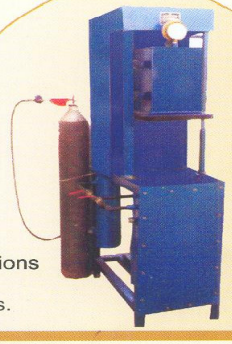
Seperators: LWP, SWP & BB Grades Capacty: 200kg Cashew piece/hour

Features:

Vibratory sieves with 1 H.P. 3 phase/single phase 1440 RPM motor.
Accessories includes Motor & Rotar Assembly
Maintenance free and easy to operate



PIECE SEPERATAR MACHINE



VITA PACKING MACHINE

Capacty: 15 tonner per hour

Features:

- Vacuum Tin Packing Machine with attachment of Co_2 filling.
- Specifically designed for the Vacuum Creations with 1 H.P. vacuum pump attached
- M.S. Angled framed with safety accessories.

At CAET Godhra

CASHEW PROCESSING MACHINERY

CASHEW STEAM PROCESSOR

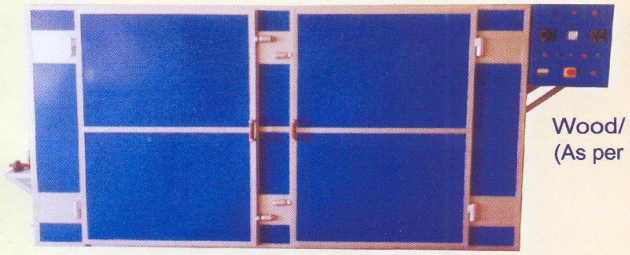
Cap/Batch:
40kg, 80kg, 160kg, 320kg

Fuel Type:
Wood/ Agro Waste/Oil Fired
(As per Customer's requirement)

Features :

- Indirect Steam Processing made up of M. S. Steel with Basic Safety measures
- Steam Vassel with 2 stages with Zero Electricity and Easy to handle.
- 45-55 minutes working time for each batch.

CASHEW BORMA DRYER



Cap/Batch:
200kg, 300kg, 500kg

Operation:
Wood/ Agro Waste/Oil Fired
(As per Customer's requirement)

Features :

Complete M. S. Structure/Bricks with Heat Exchanger Assembly
Capacity can be extended up to 1000 kg./batch
6 Hrs. working time & Easy to Handel trolly tray facility.

CASHEW ELECTRIC DRYER

Cap/Batch:
25kg, 60kg, 120kg, 150kg, 200kg.

Operation : Electric
single or 3 phase

Features :

- Complete M. S. Outside Structure with Industrial heaters used.
- 6 Hrs. working time for each batch,
- Basic safety & Easy to handle

Processing Equipments Procured for Value Addition

Pomegranate peeling machine

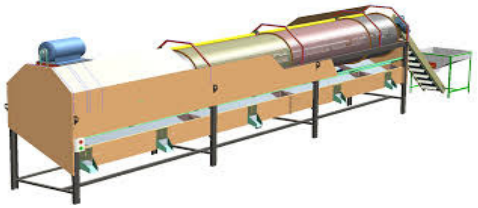
Pulp Homogenizer and storage mixing tank

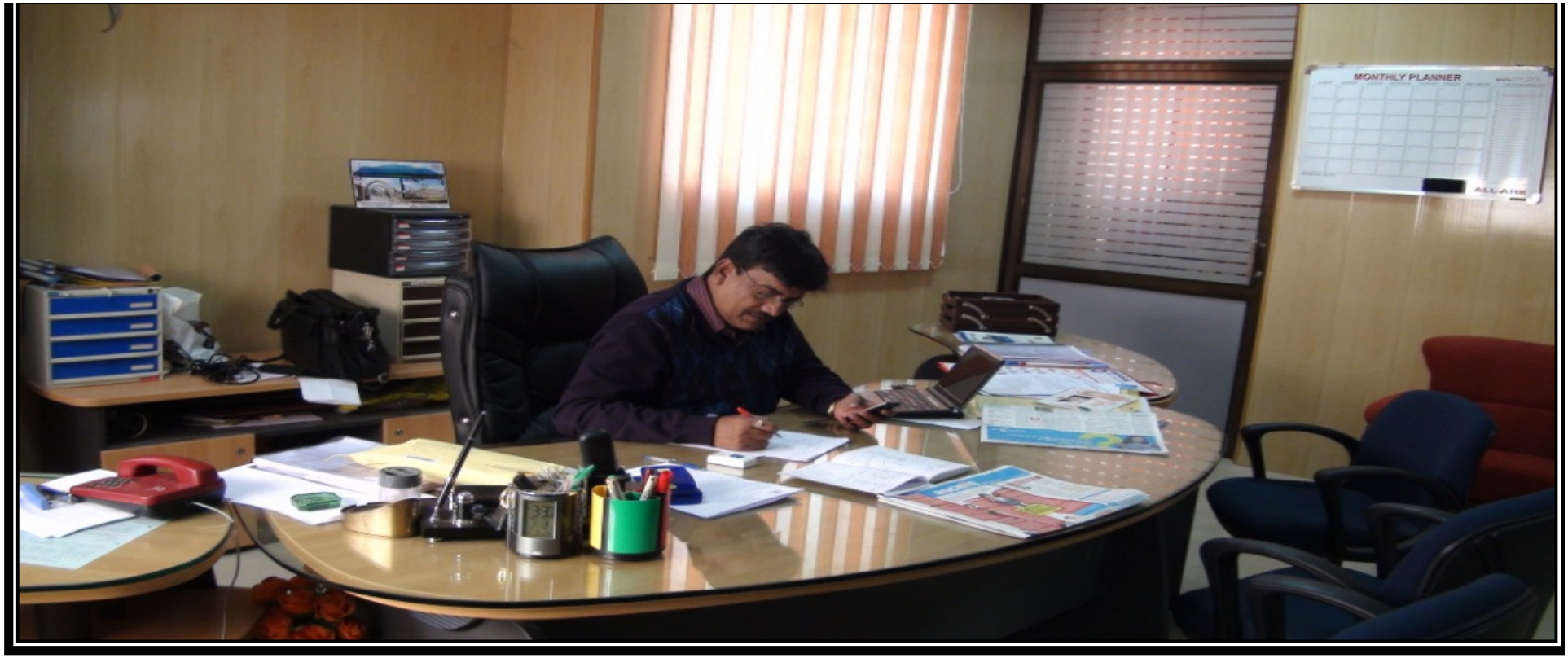
Cap sealing machine & vacuum filling machine

multipurpose helicodial screw exchanger

Retorter

Exhaust line





THANKS

To Whole of My Team without Whom it was Just Impossible