

Slide 1



Slide 2



Slide 3



Slide 4

Objectives

- To understand the current utilization pattern of cassava in different sectors in India.
- To work out the demand for cassava in different sectors of its use
 - a. Human consumption sector.
 - b. Industry
 - c. Animal feed sector.

Slide 5

Methodology

- Secondary data on consumption expenditure from National Sample Survey Organisation (NSSO) in different years were collected.
- Estimated expenditure elasticities of demand for cassava in human consumption sector.
- Primary data on use of cassava in different industries of its use (Textile, Adhesive, Paper etc.) were collected.

Slide 6

Methodology

- Estimated the demand for cassava in industrial sector.
- Opinion survey of animal feed nutrition experts in TANUVAS, traders and animal feed manufacturers was made to assess the potential of cassava in animal feed industry.

Slide 7

Utilisation of cassava in India in 1999-2000						
Sector	cassava is Utilised as	Kerala	Tamil Nadu	Andhra Pradesh	Other states	All India
	Actual produced (t)	25,63,500	34,25,500	1,66,100	80,600	62,35,700
	Wastage (15%)	3,84,525	5,13,825	24,915	12,090	9,35,355
	Actual available	21,78,975	29,11,675	1,41,185	68,510	53,00,345
Human consumption	As Fresh tubers	5,44,744 (25%)	2,91,168 (10%)	706 (0.5%)	34,255 (25%)	8,70,873 (16.43%)
	As parboiled chips	1,08,949 (5%)	---	---	---	1,08,949 (2.05%)
	As fried chips	2,17,898 (10%)	2,91,168 (10%)	---	---	5,09,066 (9.6%)

Slide 8

Utilisation of cassava in India in 1999-2000						
Sector	Cassava is Utilised as	Kerala	Tamil Nadu	Andhra Pradesh	Other states	All India
Industry	Sago	2,17,898 (10%)	9,75,000 (33.5%)	60,000 (42.5%)	34,255 (50%)	12,87,153 (24.28)
	Starch	2,17,898 (10%)	9,64,000 (33.11%)	25,000 (17.71%)	---	12,06,898 (22.77)
	Dry chips	21,789 (10%)	3,90,340 (13.41%)	55,479 (39.3%)	---	6,63,717 (12.5%)
Animal feed	As fresh tubers	6,53,693 (30%)	---	---	---	6,53,693 (12.33%)

Slide 9

Qty. (kg) of cereal substitutes consumed/person for a period of 30 days in different years reported by NSSO										
Year/State	Kerala		Meghalaya		Mizoram		Arunachal Pradesh		All India	
	R	U	R	U	R	U	R	U	R	U
1973-74	6.99	3.64	--	--	--	--	--	--	0.56	0.18
1977-78	5.55	2.59	--	--	--	--	--	--	--	--
1993-94	1.62	0.68	0.42	0.06	0.11	0.02	--	--	0.06	0.04
1994-95	1.10	0.82	--	--	--	--	--	--	0.05	0.04

Slide 10

Qty. (kg) of cereal substitutes consumed/person for a period of 30 days in different years reported by NSSO										
Year/ State	Kerala		Meghalaya		Mizoram		Arunachal Pradesh		All India	
	R	U	R	U	R	U	R	U	R	U
1995-96	1.05	0.43	--	--	--	--	--	--	0.04	0.03
1996-97	0.87	0.40	--	--	--	--	--	--	0.03	0.03
1998	1.09	0.54	--	--	--	--	--	--	0.05	0.03
1999-2000	0.96	0.45	0.40	0.12	0.05	--	0.22	0.14	0.05	0.03

Slide 11

Expd. elasticities for different expenditure groups on cereal substitutes in Kerala						
Expd. Group	1977-78		1983		1999-2000	
	R	U	R	U	R	U
1	2.304	5.725	2.347	3.249	0.003	-0.025
2	1.058	2.787	1.601	2.156	-1.796	0.966
3	0.770	1.789	1.210	1.477	0.834	0.761
4	0.522	0.956	0.953	1.074	1.076	0.104
5	0.402	0.511	0.789	0.786	0.411	1.649
6	0.342	0.327	0.629	0.536	-0.360	0.739
7	0.279	0.119	0.498	0.310	0.257	0.499
8	0.220	-0.076	0.377	0.115	0.275	0.704
9	0.177	-0.219	0.269	-0.064	0.450	0.601
10	0.149	-0.318	0.175	-0.216	0.467	0.357
11	0.118	-0.423	0.092	-0.358	0.166	0.665
12	0.075	-0.568	0.036	-0.447	0.519	0.491
All	0.145	-0.457	0.253	-0.086	0.357	0.356

Slide 12

Expd. elasticities for different expenditure groups on Cereal substitutes in India		
Expd. Group	1999-2000	
	Rural	Urban
1	0.124	0.567
2	0.405	0.560
3	0.539	0.557
4	0.355	0.324
5	0.684	0.738
6	0.423	0.642
7	0.553	0.659
8	0.367	0.470
9	0.674	0.458
10	0.616	0.395
11	0.452	0.499
12	0.431	0.582
All	0.472	0.417

Slide 13

Projected demand for cassava in Kerala in human consumption sector. (1999-2000 as base period)

Projected Year	Projected Demand (Lakh tonnes)
2005-06	2.93
2010-11	3.27
2015-16	3.76

Slide 14

- HISTORICAL PERSPECTIVE**
- First Indian starch industry: 1938 Bharat Starch & Chemicals Ltd. Jamnanagar, Punjab
 - First Indian Tapioca Starch Industry: 1943 in Tamil Nadu; Late 1960s in Andhra Pradesh.
 - Presently there are 3 large scale cassava starch plants and 800 small scale industries producing more than three lakh tonnes of cassava starch.

Slide 15

- Uses of cassava starch**
- **Food industry:** Sago pearls, Sago wafers, Stabilisers and Thickeners.
 - **Textile industry:** In warp sizing, improve weaving efficiency, thickeners in printing inks for textiles.
 - **Adhesives:** Paper conversion industry, Corrugating adhesives, stationery gums.
 - **Paper industry:** Improves paper's tensile, bursting and directional strengths, smoothness, resistance to oil and water.
 - **Other industries:** Pharmaceuticals, Plywood etc.

Slide 16

CURRENT INDUSTRIAL UTILISATION OF CASSAVA IN INDIA

- No industrial utilisation of tubers in Kerala.
- 20% of production from Kerala supplied to starch and sago industry in Tamil Nadu.
- 80% of cassava produced in Tamil Nadu is used industrially.
- Major quantity (66.6%) of total production goes to starch and sago industry in Tamil Nadu.
- In Andhra Pradesh 99% of total production is being utilised industrially.

Slide 17

Scenario of Textile industry

- Textile industry currently is static.
- Ratio of cotton and synthetic is 70:30 in 2000-01.
- Shift in the consumer expenditure from cloth to other consumer durables.
- During the last two decades trend of production of cotton yarn has shown an increase by 4 per cent.

Slide 18

Scenario of Textile industry

- Yarn requires sizing before weaving.
- Cassava starch is preferred for sizing coarse yarn while maize starch is preferred for sizing fine yarn.
- Ratio of coarse to fine yarn during the last decade was 86:14
- Average count of cotton spun yarn production points towards high production of coarse yarn.
- Cotton Yarn sizing industry is currently consuming nearly 50,000 tonnes of cassava starch.

Slide 19

Cassava starch demand in Textile (sizing) industry			
Year	Projected Population (Crores)	Projected per capita availability of cotton cloth	Projected Cassava starch demand (tonnes)
2000-01	101.24	16.01	49,412
2005-06	109.41	16.89	60,877
2010-11	117.89	17.82	69,208
2015-16	126.35	18.80	78,253

Slide 20

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Slide 21

ADHESIVE SECTOR

An important raw material used in

- Corrugation box industry
- Paper conversion industry and
- Stationery adhesives

Slide 22

Scenario of Corrugation box industry

- Cassava starch and kraft paper are the important raw materials in making corrugation boxes.
- Currently eight lakh tonnes of kraft paper is being used in making 6,050 million sq. mt corrugation boxes.
- Cassava starch is able to replace successfully maize starch due to its good adhesive properties and currently cheaper over maize starch in making corrugation adhesives.

Slide 23

Scenario of Corrugation box industry

- Corrugation box industry is consuming 46,000 tonnes of cassava starch currently.
- Industry is growing at 10 per cent per annum.
- Cassava starch demand in corrugation box industry is a derived demand from industrial growth as a whole in the country.

Slide 24

Cassava starch demand in Corrugation box industry

Year	Projected Cassava Starch Demand (tonnes)
2010	1,19,000
2015	1,92,000
2020	3,09,000

Slide 25

Scenario of Paper conversion industry

- Kraft paper and cassava starch or maize starch or Yellow dextrins are the important raw material in making paper conversion products.
- Paper cones and Paper tubes are the important paper conversion products.
- There are 600 paper cone making units and 400 paper tube making units in India using starch based adhesives.
- Starch is used in making paper cones and yellow dextrins are used in making paper tubes.

Slide 26

Scenario of Paper conversion industry

- Currently the industry is stagnant due to unremunerative prices and stiff competition.
- South based units are consuming tapioca starch and its based yellow dextrins, while north based units are using maize starch.
- Currently this industry is consuming 34,500 tonnes of cassava starch.
- At a nominal growth of one per cent, projected requirement of cassava starch for 2020 will be nearly 42,000 tonnes.

Slide 27



Slide 28

Cassava starch for making stationery adhesives.

- Cassava starch is the most used raw material in making stationery adhesives.
- Currently this industry is consuming a meager 250 tonnes cassava starch per annum.

Slide 29

Starch in paper industry is added to improve

➤ Paper's tensile strength, bursting strength and directional strength as well as surface properties such as smoothness, resistance to oil and water.

Starch in paper making is added

- At the wet end where cellulose fibre is beaten to a suitable pulp.
- At the size press when the paper sheet or board is formed and partially dried.
- When pigment coatings are applied to the paper.

Slide 30

Types of paper produced

<u>Name of the Paper</u>	<u>% of Total consumption</u>	<u>Main Varieties</u>
Cultural paper	46	Creamwove, Maplitho, Bond, Chromo paper
Industrial paper	48	Kraft paper, Paper boards, Chromo board, art board
Speciality paper	6	Security paper, Grease proof paper and Electrical grade paper
News print		Glazed and Non-Glazed

Slide 31

Demand for paper depends on	
>	GDP growth
>	Increase in per capita income
>	Literacy rate
>	Growth of service sector
>	Advancement of printing technology in the country
>	Development of packaging industry
>	Development of paperless transaction

Slide 32

Projected Demand for starch in paper industry in India						
Year	Projected Population (Crores)	Projected per capita consumption of paper & paperboard in Kg @ 6% growth	Projected demand for paper & paperboard (million mt)	Starch requirement for different types of paper at different use levels (lakh tonnes)		
				2%	2.5%	3.0%
2000-01	101.24	4.55	4.61	0.92	1.15	1.38
2005-06	109.41	6.09	6.66	1.33	1.67	1.99
2010-11	117.09	8.15	9.54	1.91	2.39	2.86
2015-16	126.35	10.90	13.78	2.75	3.44	4.13

Slide 33

Industry wise projections of starch requirement					
Industry		1999-2000 (t)	2005-06 (t)	2010-11 (t)	2015-16 (t)
Textile		50,000	60,877	69,208	78,253
Corrugation adhesives		46,000	1,19,000	1,92,000	3,09,000
Paper conversion		34,500	36,800	38,700	40,600
Stationery adhesives		200	220	240	260
Paper at	2%	46,000	66,000	95,000	1,37,000
	2.5%	57,000	83,000	1,20,000	1,72,000
	3%	69,000	99,000	1,43,000	2,06,000
Others		25,000	30,000	35,000	40,000
Total demand	2%	2,01,700	3,12,897	4,30,148	6,05,113
	2.5%	2,12,700	3,29,897	4,55,148	6,40,113
	3%	2,24,700	3,45,897	4,78,148	6,74,113

Slide 34

Demand-Supply projections for cassava starch in India			
Projected Period	Demand (t)	Supply (t)	Gap (t)
2005-06	3,12,897 (15,64,485)	2,65,387 (13,26,936)	47,510 (2,37,549)
2010-11	4,30,148 (21,50,740)	3,09,791 (15,48,957)	1,20,357 (6,01,783)
2015-16	6,05,113 (30,25,565)	3,54,196 (17,70,978)	2,50,917 (12,54,587)

Note: Figures in parentheses indicate the tuber equivalent of starch.

Slide 35

Demand-Supply projections for sago in India			
Projected Period	Demand (t)	Supply (t)	Gap (t)
2005-06	2,64,793 (16,25,245)	2,09,441 (12,56,644)	55,352 (3,68,601)
2010-11	2,85,341 (17,51,372)	2,41,724 (14,50,342)	43,617 (3,01,030)
2015-16	3,05,819 (18,77,054)	2,74,007 (16,44,040)	31,812 (2,33,014)

Note: Figures in parentheses indicate the tuber equivalent of sago.

Slide 36

Prospects of Cassava starch Industry

- Growing demand for cassava starch in adhesive sector and paper industry.

Slide 37

Current Livestock Population	
Cross bred cows	3.0 million
Milk cows of non-descript Breeds	52.0 million
Buffaloes	25.0 million
Poultry birds	80.0 million
Layers	50.0 million
Broilers	30.0 million

Slide 38

Demand for Total feeds		
Feed	Demand in million tonnes	
	Current	2010
Cattle Feed	28.75	30.00
Poultry feed	13.25	38.00
Total Feed	42.00	68.00

Slide 39

Composition of Cattle Feed in a Private Feed Mix Plant in A.P			
Ingredient	Content as per cent in		
	Formulation 1	Formulation 2	Formulation 3
Maize	10	10	8
G. nut cake	--	--	3
Cotton seed cake	5	5	5
Sunflower cake	10	10	7
Rice bran	5	--	10
Wheat bran	5	10	--

Slide 40

Composition of Cattle Feed in a Private Feed Mix Plant in A.P			
Ingredient	Content as per cent in		
	Formulation 1	Formulation 2	Formulation 3
G.Nut hul bran	5	5	3
Cassava waste	4	5	8
DORB	37.5	36.5	37.5
Molasses	13	13	13
Urea	1.5	1.5	1.5
Calcite	2.0	2.0	2.0
Salt	2.0	2.0	2.0

Slide 41

Compound Feed Manufactured by CLFMA – Zone wise (Lakh tonnes)					
Zone	Member Number	Cattle	Poultry	Total	% of Total
East	20	0.68	1.32	2.00	6.8
North	14	0.55	1.31	1.87	6.4
West	38	7.80	3.30	11.11	<u>37.8</u>
South	48	6.00	8.18	14.38	<u>49.0</u>
Total	102	15.03	14.11	29.36	100.0

Slide 42

Projected cassava demand in animal feed in organized sector (million tonnes)				
Year	Projected CF by CLFMA in		CF with cassava waste at	
	India	South	5%	10%
2005-06	3.0	1.52	0.07	0.15
2010-11	4.0	2.03	0.10	0.20
2015-16	5.4	2.70	0.13	0.27

Slide 43

Conclusions

- Demand for cassava in human consumption sector is declining at rapid rate.
- Cassava starch demand is more in adhesive industry than in textile industry.
- Demand for cassava starch is increasing in paper industry.
- Demand for cassava fresh tuber as animal feed is present only in Kerala.

Slide 44

Conclusions

- Demand for cassava waste for making compound feed was observed mostly in South India.
- Projected cassava demand in animal feed sector for 2010-11 and 2015-16 was 0.1 and 0.13 million tonnes respectively.
- Demand supply gap in cassava starch and sago require an additional area of 0.75 lakh ha to be brought under cassava cultivation especially in non-traditional areas.

Slide 45

