

RAJASTHAN AGRICULTURAL COMPETITIVENESS PROJECT



Value Chain Analysis

Groundnut



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Executive Summary: Groundnut

Historically, ground nut originated in South America, and was introduced by Portuguese from Brazil to west Africa and then to South-western India in the 16th Century. It is one of the most important food and cash crop of India, accounting for more than 40% of area under oilseeds and 60% of oil seed production. In fact, ground nut seed mainly constitutes edible oil (45%) and protein (26%). It is also rich source of thiamine, riboflavin etc. Global groundnut production stood at about 400 million tonnes by 2012-13. China leads production followed by India, Nigeria, and the USA. Indonesia is a leading exporter. India is the second largest producer of groundnut after China. Groundnut is the major oilseed of India. Notably, India exported Ground Nut over Rs 4046.05 crore in 2015-16. Major groundnut producing states in India are Gujrat, Andhra Pradesh, Tamil Nadu, Karnataka, Maharashtra, Rajasthan, M.P., Orissa and U.P. In most developing countries, kernels are used for oil extraction, food and as ingredient in confectionary products. The important producing districts in Rajasthan include Bikaner, Jaipur, Jaisalmer, Nagaur and to a lesser degree Chittor, Tonk and Sawai - Madhopur. Some of the varieties cultivated in the Kharif season in Rajasthan include RS-1, RSB 103-87, Groundnut GG-7. Much of the production is in the Kharif season as rain fed agriculture. Typically, the commodity is harvested in Oct-Nov. The ground nut producing clusters in RACP project are Phoolasar and Kheruwala.

The groundnut crop is normally sown in (Kharif season) June-July and harvested in Oct-Nov. Groundnut oil, peanut butter and Chikki are some value added products. The cake residue after processing ground nut to oil has also a great demand in animal feed industry. A range of support institutions exist in the region. Swami Keshwanand Rajasthan Agricultural University, Bikaner is the leading agency supporting in research and development in Ground Nut in Rajasthan.

Some of the key strengths in ground nut value chain are: India is no 2 in ground nut production worldwide and Rajasthan is no 4 in production. Has a wide variety of applications from use of de hulled nuts as snacks as raw, processed, semi processed and also use as oil. The oil cake is a good fertilizer cum animal feed and the shells have a good caloric value. Hence Ground nut is a high value crop.

Some of the key weaknesses in the ground nut value chain are: The crop is vulnerable to lots of soil borne disease, there is lack of local level infrastructure, low share of farmers in consumer rupee in value added products and large chain of middle men.

Some of the key opportunities in the value chain are: Scope of intervention of RACP in the Ground nut production area in the cluster helping increase in production, productivity and increase in farmers share in consumer rupee through setting up of FPC and FCSC.

Some of the key threats are again pest attack, un-favourable conditions and competition with other oil crops like mustard, soyabean, castor and coconut oil.

Presently, the gross yield per acre is 30 qtls per ha. The market rate of sale is about Rs.4000 per quintal or Rs.120000 per ha. The cost of cultivation is about Rs 59200 per ha. Net profit per ha is Rs 69800 including fodder realization of Rs 9000 per ha. The investment of crop is Rs 1973 per quintal and gives a net profit of Rs 2027 per quintal in irrigated conditions.

The share of farmer over consumer rupee in case of ground nut oil is 25%. APMC has 1%, Trader has 2%, De-sheller has 16%, oil processor has 43%, Wholesaler has 4% and retailer has 9% share over the consumer rupee. On the first hand, it seems that the share of both primary and secondary processors is very high. However, there is significant volume loss up to 30% in case of de-shelling (Primary processor) and around 50% oil recovery in case of secondary processor. The retailer is actually the largest gainer with around 9% share over consumer rupee.

- **Pre Intervention Value Chain: Groundnut**

The present pre-intervention or value chain for groundnut may be viewed as one with two critical production-distribution or activity-marketing channels. The product is largely marketed by farmers through the APMC. Channel 1 may be viewed in terms of one for table variety and other for edible oil and DOC. The producers market their produce in both value chains through APMC Commission agents largely.

- **Post Intervention Value Chain: Groundnut**

The post intervention value chain map for groundnut may be visualised as one with three production-distribution or activity-marketing channels: table variety, edible oil and DOC, value added products like peanut butter. It is also envisaged that PCs of producers with FCSCs is evolved. Such FCSCs only undertake storage, grading and sorting and packaging of produce activity. These FCSCs may offer other related services in terms of input facilitation, custom hiring, facilitating B2B connectivity etc.

Chapter1. Introduction

Origin

Groundnut is believed to have been originated in South America, from where cultivation of groundnut spread to Brazil, southern Bolivia and North-western Argentina. It is reported to have been introduced by the Portuguese from Brazil to West Africa and then to South-western India in the 16th century.

Groundnut is an oilseed derived from the fruit of the groundnut plant. It is referred to as a nut in general terms but it is not a nut exactly in actual terms, it is a seed rather and is also known by the name of peanut. The groundnut plant is an annual plant herb that comes from the pea family of Fabaceae. The plant has feather type leaves; yellow flowers and grows a legume shaped fruit that has 2 to 3 seeds which develops inside the earth. Also, oil is obtained from the groundnut seeds that is an excellent source of vitamin E, various fatty acids and carbohydrates and is largely used as a cooking medium, lighting fuel and food constituent.

Importance

Groundnut is considered to be the one of the most important oilseed crops in the world. It is grown in over 100 countries of the world and plays a crucial role in the world economy. The seeds are a good source of edible oil and proteins present in the groundnut oil cake. The percentage of oil and protein are extracted from the seed are approximately 55% and 28% respectively. The oil cake meal left after the extraction of the oil is used as an animal fodder and fertilizer. The peanut oil is primarily needed as a cooking agent but it also has some industrial uses like in paint, varnish, lubricating oil, soap, furniture polish etc. the peanut seeds are also consumed directly in roasted form, as butter, in brittle and candies etc.. India is second largest producer of groundnut in the world and it occupies an important position in the Indian agricultural economy. It is one of the most important food and cash crops of the country accounting for more than 40 % of area under oilseeds and 60 % of oilseed production. The Groundnut seed mainly constitutes of edible oil (45%) and protein (26%).It is also a rich source of thiamine, riboflavin, nicotinic acid, vitamin E and all B vitamins except B12. It also contains minerals, phosphorus, calcium and iron. Biological value of groundnut protein is highest among vegetable proteins and it is a very rich food (one gram supplies 5.8 food calories).

1.1. Global Scenario: Production, Export and Import¹

Groundnut production remained at around 35 million tons until mid 2000 and thereafter steadily rose to reach nearly 40 million tons in the 2012. World trade also rose steadily but slowly from about 2 million tons to nearly 3 million tons during the past decade. Nevertheless, groundnut stocks appear to be at a comfortable level despite a marginal reduction in output in 2012-13. The groundnut oil production hovers around 8 million tons annually. India and China are also responsible for the highest consumption of groundnut. Other major ground nut consuming countries are Nigeria, United States and the European Union. Except European Union, all the countries lie in the list of major groundnut producing countries as well. European Union countries are the largest consumer of groundnuts where the crop is not produced. The major demand i.e. around 75% comes from the food sector and the rest from other sectors. The trade done in the world in the context of groundnuts is estimated to about 1 lakh tons per year. The leading groundnut exporting countries are; Argentina, Senegal, Nigeria, India, United States, China, Vietnam, South Africa and Gambia. The countries mentioned above contribute to about 90% of the world exports. Argentina makes the largest groundnut exporter to the world. The major countries that satisfy their domestic consumption demand by importing groundnuts are; Belgium, France, Germany, Ireland, Italy, Netherlands, United States, United Kingdom, Sweden, Indonesia, Canada, Malaysia, Singapore, Philippines, Japan

With respect to share of major producing countries in the production of groundnut, China stands first with production percentage of 42.4%, followed by India with 14.5%, Nigeria ranks third with 7.8% and United states stands fourth with the production of 4.4% in the year 2011-12.

Figure 1 Share of Major Producing Countries as in year 2011-12²

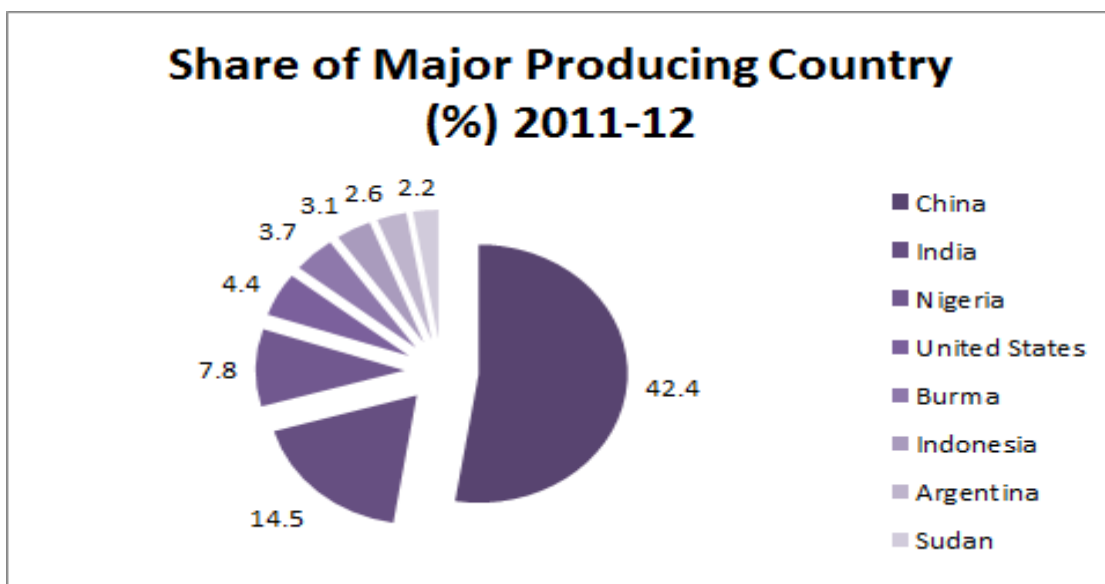


Table 1 Top 5 Groundnut producers, Consumers and Traders

Producer	Exporters	Importers	Consumers
China	Argentina	European Union	China

¹ <http://www.commoditiescontrol.com/eaqrtrader/staticpages/index.php?id=47>

² <http://www.commoditiescontrol.com/eaqrtrader/staticpages/index.php?id=47>

India	India	Vietnam	India
Nigeria	China	Indonesia	Nigeria
United States	United States	Mexico	United States
Burma	Nicaragua	Russia	Indonesia

Table 2 Trends in global demand and supply of groundnut (million tons)

	Production	Imports	Exports	Consumption	End stocks
2008-09	36.9	1.9	2.4	35.8	1.7
2009-10	35.9	2.0	2.4	35.7	1.5
2010-11	39.5	2.3	2.9	38.3	2.1
2011-12	37.9	2.4	3.0	38.1	1.3
2012-13	39.9	2.3	2.7	38.9	2.0
2013-14	39.5	2.3	2.8	39.1	1.9

Groundnut is cultivated in more than 60 countries in the world and occupied an area of about 246 million ha with the production of 400 million tonnes in the world during 2011. In Asia; China is the largest producer, accounting for 40 % of total world production followed by India (17.40 %). During 2011, China and India, Nigeria (7.4 %), United States of America (4.14 %), Myanmar (3.49 %), and Sudan (2.96 %) were the other major groundnut producing countries. India ranks number one in the world with regard to area under this crop. However in case of production, it ranks second because of lower productivity. Productivity of groundnut in India is only 1.32 tonnes per hectare as against productivity of 3.50 tonnes per hectare in neighbouring China. This calls for extensive and effective extension work to boost the productivity of groundnut.

Table 3 Country-wise area and production of groundnut in 2011 Country

Country	Area (million ha)	Production (million tonnes)
China, mainland	4.58	16.05
India	5.31	7.00
Nigeria	2.34	3.00
United States of America	0.44	1.67
Myanmar	0.89	1.40
Sudan (former)	1.70	1.19
Argentina	0.31	0.70
Indonesia	0.54	0.69
United Republic of Tanzania	0.68	0.65
Cameroon	0.40	0.56
Senegal	0.87	0.53
Others	6.57	6.58
Total	24.63	40.02

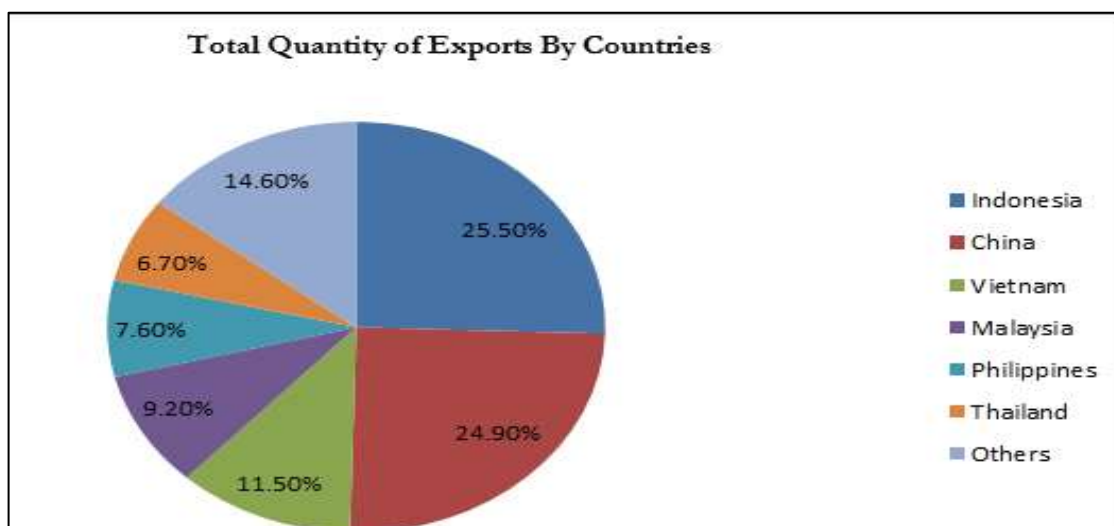
Figure 2 Benchmarking of Productivity Levels across Countries and States in India 2015-16³



Global Export

As per statistics from January 2014 to November 2016, the total value of global groundnut imports has been calculated to be 1705568361 (in USD). The following figure shows the total values of exports (in USD) of global groundnut in percentage share.

Figure 3 Total Value of Exports By Countries⁴

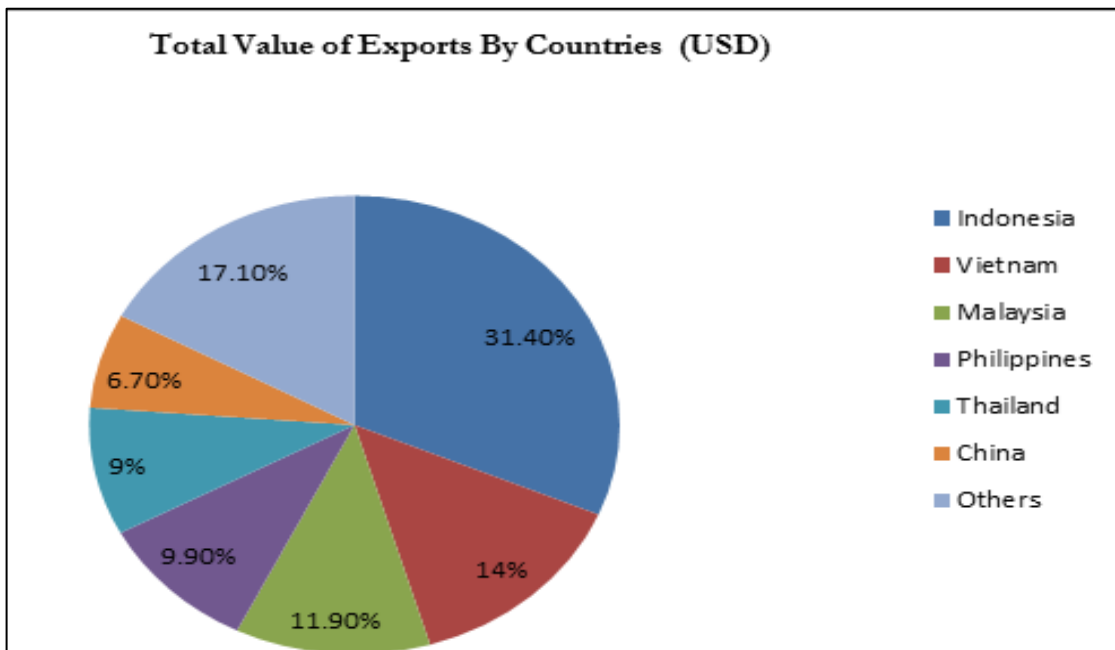


Indonesia, being the leader, accounts for 25.50% of the total value of global groundnut exports for the period January 2014 to November 2016. Indonesia is followed by China, Vietnam, and Malaysia and so on. The figure given below represents the share of the top countries which lead in total value of global groundnut exports:

³ <http://cacp.dacnet.nic.in/ViewReports.aspx?Input=2&PagelId=39&KeyId=547>

⁴ <https://www.zauba.com/exportanalysis-groundnut-report.html>

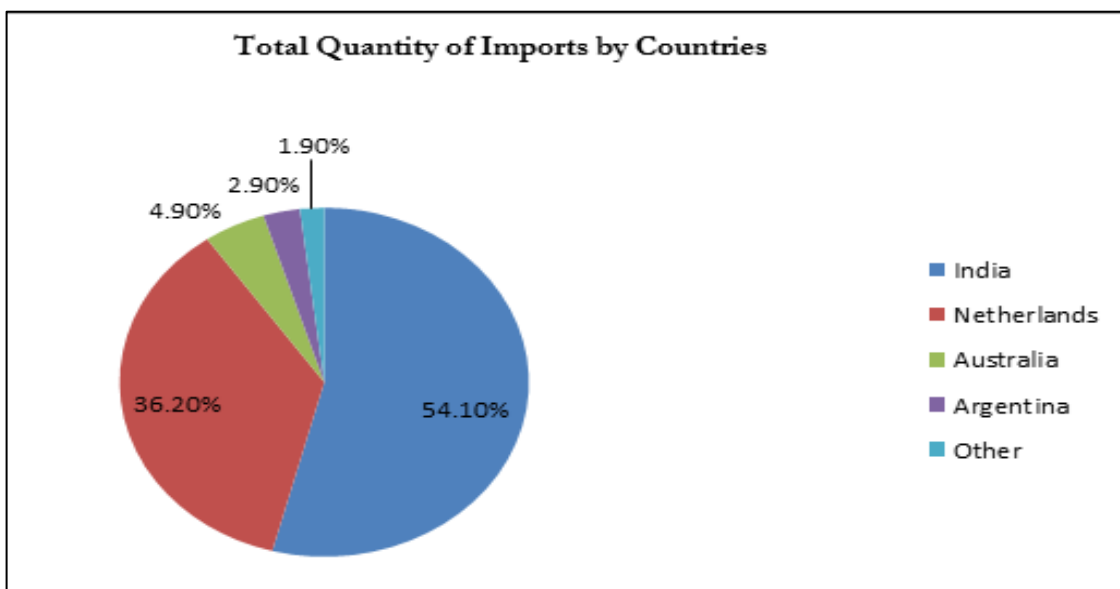
Figure 4 Total value of export by Countries (USD)⁵



Global Import

The total quantity of global groundnut imports for the period January 2014 to November 2016 amounts to 4969279 k. The details of global imports of groundnut in terms of quantity for the period January 2014 to November 2016 have been given in the figure below:

Figure 5 Total Quantity of Exports by countries⁶



⁵ <https://www.zauba.com/exportanalysis-groundnut-report.html>

⁶ <https://www.zauba.com/exportanalysis-groundnut-report.html>

1.2. Indian Scenario: Production, Export and Import

India has been producing groundnut since it has been introduced in Asia in the 16th century. The weather in the Indian subcontinent suited well to the crop and India transformed into an important contributor to the world production. The country ranks 2nd in the world groundnut production scenario with an annual groundnut seed production of 5.9 million tons and annual groundnut oil production of 1.5 million tons in 2005. Also, India has the maximum area covered under groundnut cultivation. The major states in India that are indulged in the production of this crop are Gujarat, Tamil Nadu, Andhra Pradesh, Karnataka, Maharashtra, Madhya Pradesh, Orissa and Rajasthan. The Indian production and area covered is largely concentrated in the above-mentioned states. Today, groundnut has a share of approximately 25% in the total Indian oilseed production. But this share is constantly reducing since India got independent, as it was around 70% in 1950s.

India is the second largest producer of groundnut after China. Groundnut is the major oil-seed of India. It accounts for around 25% of the total oilseed production of the country. Annual production of groundnuts in India is around 9690 thousand tonnes. As it is grown in rain-fed regions of the country, its production is highly vulnerable to rainfall deviations and display huge fluctuation between years. In India, groundnuts are produced in both Rabi (25%) and Kharif (75%) Seasons.

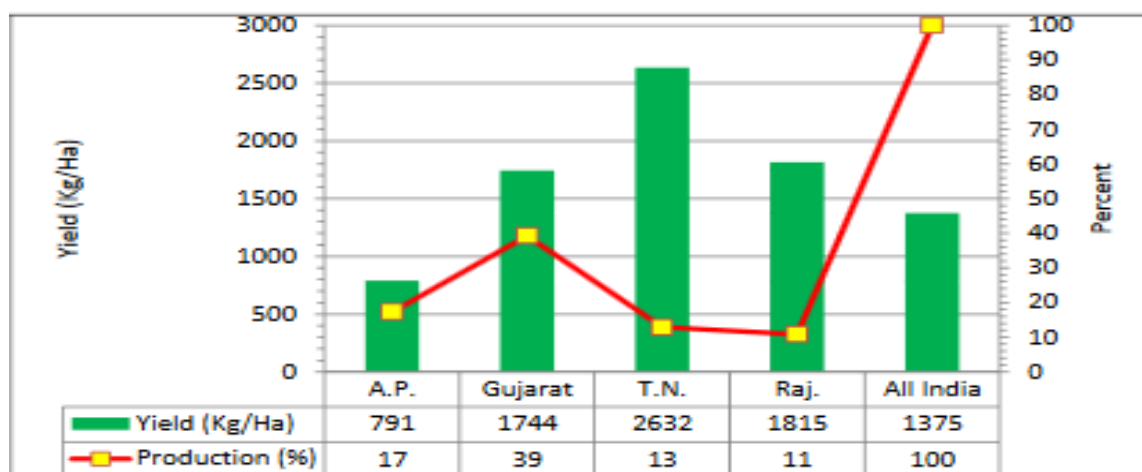
The country has exported groundnuts of the worth of Rs. 3187.69 crore during the year 2013 – 14. The major importing countries from India are Indonesia, Malaysia, Philippines, Vietnam, and Thailand.

Table 4 Groundnut producing States in India : 2013-14

Rank	States	Production (Thousand Tonnes)	Share %
1	Gujrat	4920	50.77
2	Andhra Pradesh	1230	12.69
3	Tamil Nadu	960	9.91
4	Rajasthan	910	9.39
5	Karnataka	660	6.81

Andhra Pradesh, Gujarat, Rajasthan and Tamil Nadu account for 80 percent of the production of groundnut with about 73 percent of the total area in TE 2013-14⁷

Figure 6 State wise Production of India 2013-14

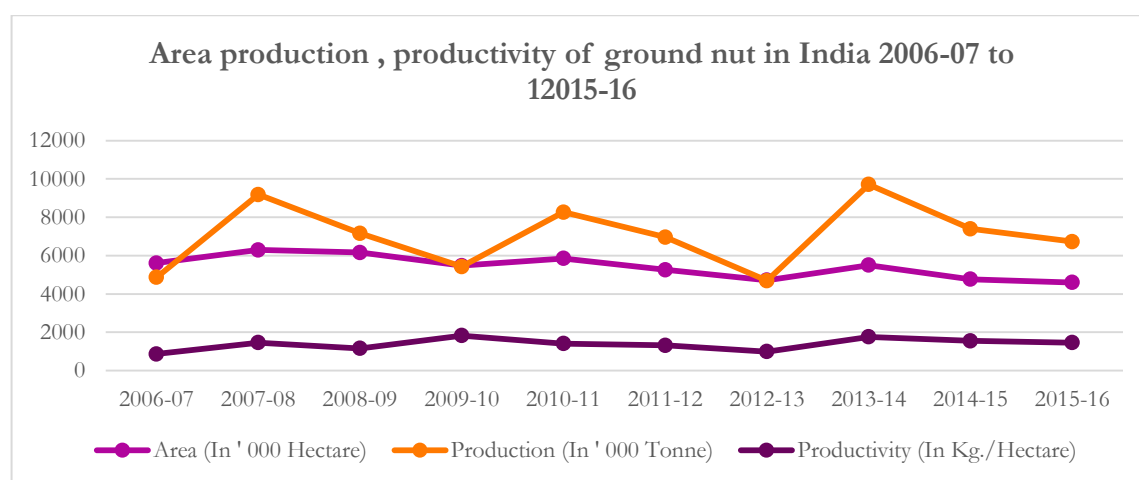


The top three districts in terms of the highest productivity are Nellore, Guntur and Warangal in Andhra Pradesh; Surendranagar, Porbandar and Junagadh in Gujarat; Hanumangarh, Bikaner and Churu in Rajasthan and Thiruvapur, Thiruvallur and Kancheepuram in Tamil Nadu. The efficiency gaps in terms of productivity levels within states vary in the range from 19 percent in Gujarat to 77 percent in Andhra Pradesh.⁸

Table 5 Season-wise Area, Production and Productivity of Groundnut in India (ten year data)

Year	Area (In ' 000 Hectare)			Production (In ' 000 Tonne)			Productivity (In Kg./Hectare)		
	Kharif	Rabi	Total	Kharif	Rabi	Total	Kharif	Rabi	Total
2006-07	4780	835	5615	3294	1569	4864	689	1880	866
2007-08	5312	980	6292	7362	1820	9183	1386	1857	1459
2008-09	5286	879	6165	5617	1551	7168	1063	1764	1163
2009-10	4616	862	5478	3852	1576	5429	835	991	1830
2010-11	4977	879	5856	6644	1622	8266	1335	1846	1411
2011-12	4316	948	5264	5127	1837	6964	1188	1938	1323
2012-13	3931	790	4721	3187	1507	4694	811	1908	994
2013-14	4645	860	5505	8058	1656	9714	1735	1927	1765
2014-15	4014	755	4769	5931	1471	7402	1478	1948	1552
2015-16	3878	759	4597	5368	1366	6733	1399	1801	1465

The analysis of ground nut area, production and productivity suggests that, there is a slight decrease over area of production. However, production has increased from 4869 thousand MT to 6733 thousand MT due to increase in productivity from 866 kg/ha to 1465 kg/ha. However, the productivity figures have also been stagnant. Ground nut is both a kharif and Rabi crop in India



Indian Exports:

Major Export Destinations (2015-16) are Indonesia, Malaysia, Thailand, Philippines and Pakistan. The total quantity of Indian groundnut exports for the period January 2014 to November 2016 amounts to 1903319682 MT and the total value is \$ 1705568361. The year 2014 was initially stable in terms of quantity of Indian groundnut export but drastically increased during the period of January 2016. The details of Indian exports of groundnut in terms of quantity and value for the period January 2014 to November 2016 have been given in the figure below: ⁹

⁸ <http://cacp.dacnet.nic.in/ViewReports.aspx?Input=2&Pageld=39&Keyld=547>

⁹ <https://www.zauba.com/exportanalysis-groundnut-report.html>

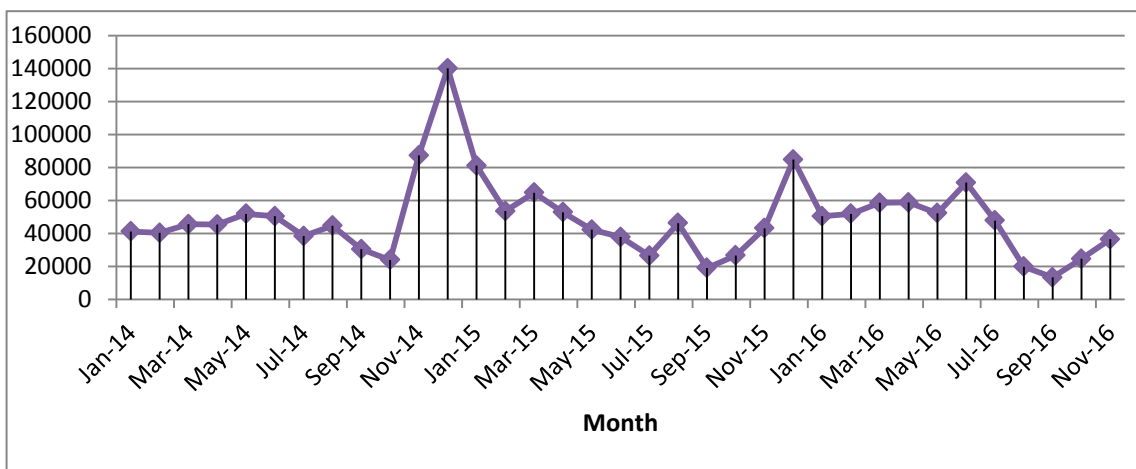
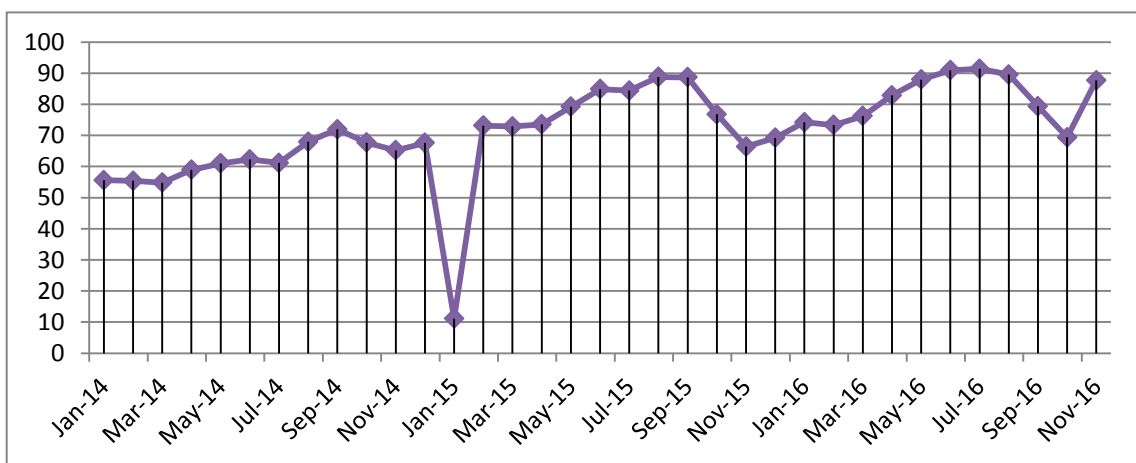


Figure 7 Total Volume Qty ('000 MT)

Groundnut Average Export Price:

The average price of groundnut throughout the period of January 2014 to November 2016 was \$0.9. In the year 2014 the average price was stable considering minor ups and downs. In the month of January 2015 there was an extreme fall in the average price and again from May 2015 the average price was followed by minor ups and downs. The details of Groundnut Average Prices for the period January 2014 to November 2016 have been given in the figure below:

Table 6 Average Price per kg in rupees¹⁰



The price in Jan 2015 dipped due to bumper production.

Indian Imports:

The imports in the country are negligible as the production level is quite sufficient for the domestic demand level in the country.

¹⁰ <https://www.zauba.com/exportanalysis-groundnut-report.html>

Market Influencing Factors

- Weather conditions in major groundnut producing regions.
- Monsoon status in the country.
- Price fluctuations of the other competitive edible oils.
- International price movements.
- High consumption in festive seasons and celebrations.

Major trading centers of groundnut

The major trading centers of groundnut and derivatives in India are

- Rajkot (Gujarat)
- Ahmedabad (Gujarat)
- Gondal (Gujarat)
- Junagarh (Gujarat)
- Mumbai (Maharashtra)
- Indore (Madhya Pradesh)
- Delhi
- Adoni (Andhra Pradesh)
- Bikaner
- Jaipur

Also, groundnut is traded in Indian commodity exchanges namely, National Commodity & Derivatives Exchange Ltd, National Multi Commodity Exchange of India Ltd, Multi Commodity Exchange of India Ltd, The Rajkot Seeds oil & Bullion Merchants' Association Ltd and The Bombay Commodity Exchange Ltd.

1.3. State, District and Cluster Scenario: Production

Table 7 District and Cluster Scenario

Total Production in Rajasthan (2015-16)	551611 MT
Total Production in the catchment Area (2015-16)	1000
Percentage share in the State Production	10%
Top Producing Districts in the catchment zone	Bikaner, Jaipur Jaisalmer

Figure 8 Groundnut Production in Catchment area of Rajasthan

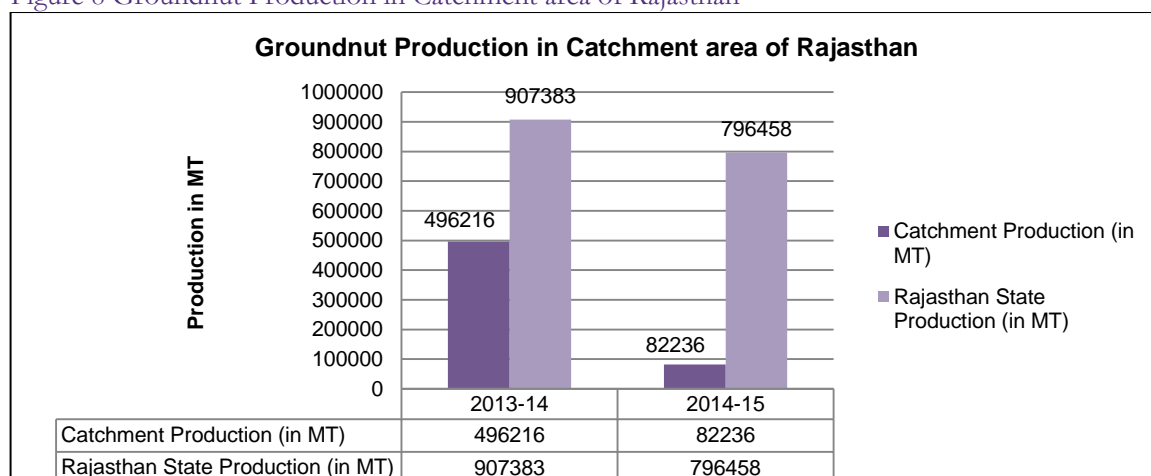


Table 8 District wise Groundnut Production 2015-16

Sr. No.	District in the Catchment Area	Production in MT	Rank of District in The catchment
1	Bikaner	402451	1
2	Jaipur	57762	2
3	Jaisalmer	31233	3
4	Nagaur	21081	4
5	Chittore	11016	5
6	Tonk	9855	6
7	S.Madhapur	3926	7
8	Ajmer	3440	8
9	Ganganagar	3011	9
10	Jhalawar	2236	10
11	Alwar	1826	11
12	Baran	1185	12
13	Bundi	1045	13
14	Pratapgarh	749	14
15	Kota	367	15
16	Banswara	341	16
17	Dholpur	87	17
	Total Production in Catchment Area	551611	

Ground nut has been selected as a value chain crop in Kheruwala and Phoolasar clusters in Rajasthan.

Table 9 Area (in ha %) of Ground nut in 2006-07 & 2015-16, increase / decrease over 10 years in State, Cluster districts and value chain clusters

Crops	State						Description
	2006-07	2015-16	Increase (+)/Decrease (-) over 10 Years		Average of 10 Years	% area of State average	
	Area (ha)	Area (ha)	Area (ha)	% Growth			
State	306037	516850	210813	69	387853		
Jaisalmer	6085	17286	11201	184	11622	3	% area to State Average
Kheruwala	2200	3000	800	36	2500	22	% area to district average
Bik	46251	165547	119296	258	100668	26	% area to State Average
Phoolasar	2710	4875	2165	80	3090	3	% area to district average

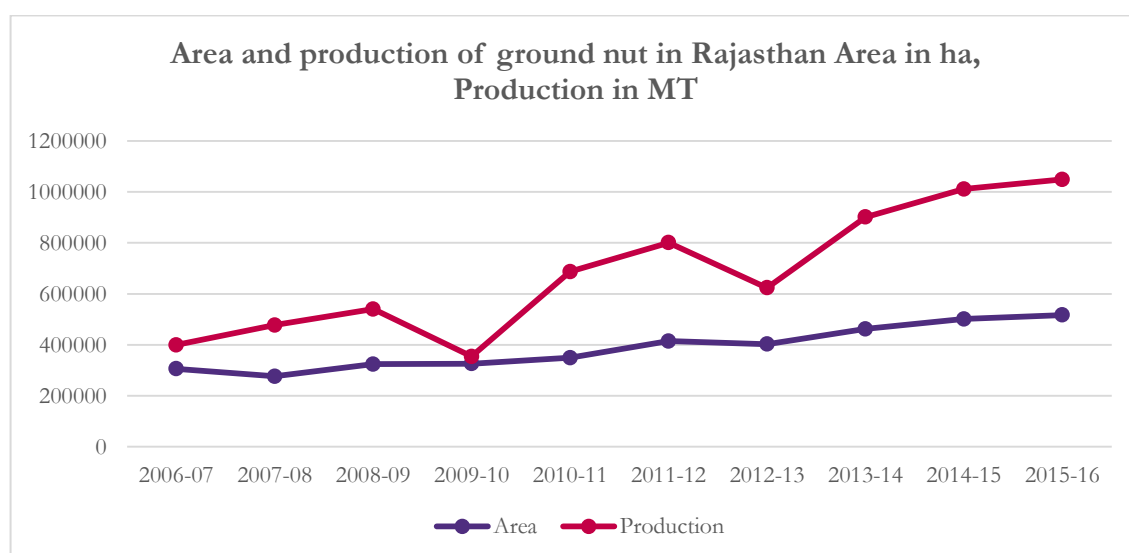
The SRR in Kheruwala is 32.6% and that of Phoolasar is at 4%. Major varieties grown in the cluster are RGC 936, Rgc1055, Hg-2 34, Hg 563 HG-365. At this rate, the total seed requirement of the clusters would be 7875 qtls at a seed rate of 100 kg/ha. As per the SRR in both cluster, total requirement of certified seeds in the clusters would be 1115 quintals. However, the seed demand may rise further with increased water availability in Phoolasar prompting farmers to sow improved variety of seeds under irrigated conditions.

Table 10 Area, production and productivity of Ground nut in Rajasthan over 2006-07 to 2015-16

Details	2006-07	2015-16	Average of 10 Years	% increase decrease
Area	306037	516850	387853	69
Production	399509	1048718	684356.8	163
Productivity	1305	2029	1723.21	55

There has been an increase in 69% of are over 2006-07 in 2015-16. The production has grown by 163% over the corresponding period and productivity has grown by 55%.

Area and production trend of ground nut over ten years (2006-07 to 2015-16)



Productivity trend in Rajasthan for ground nut over 2006-07 to 2015-16

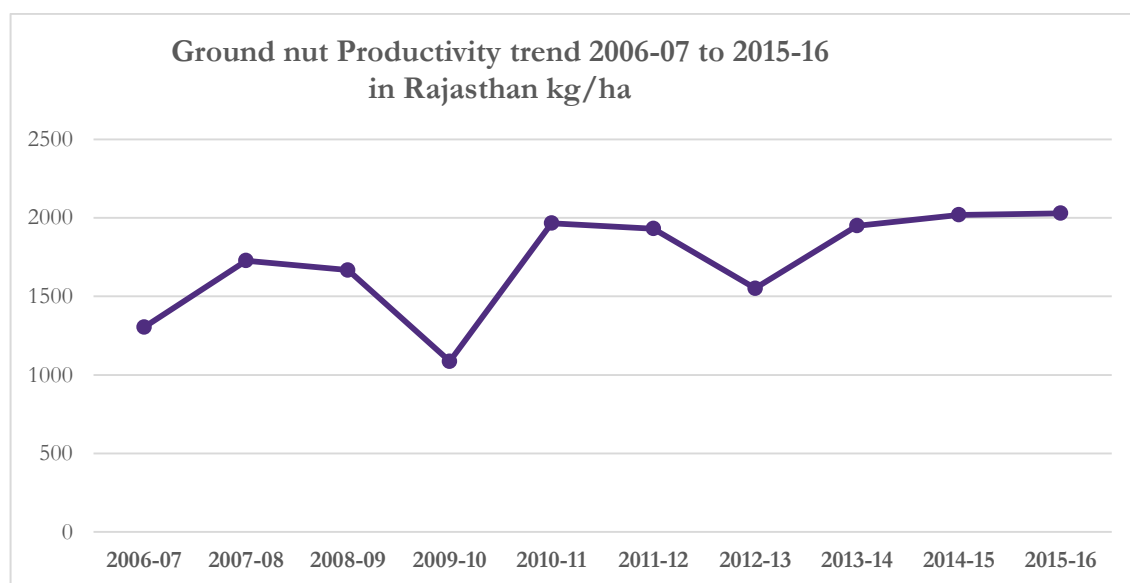


Table-10.1: Area, Production and marketable surplus in cluster area in 2016-17

Cluster	Area (Ha)	Production (MT)	Marketable surplus (MT) @ 90%	Value of surplus Rs in lacs
Phoolasar	4,875	13,162	11,846	4738
Kheruwala	2,760	5,390	4,851	1940
Total	7,635	18,552	16,697	6678

The area under Ground nut in Value chain clusters is 7635 Ha with total production of 18552 MT of Ground nut out of which 90% is considered as marketable surplus. The value of marketable surplus is being calculated at 6678 lacs

Resource mapping – Ground nut clusters

Cluster	Major mandi/s around cluster	Distance from major cities nearby	Warehouses/ Cold store with Capacity	No of FPCs targeted	Nearby processing facilities
Phoolasar	Bajju, Bikaner, Khajuwala, Nokha, Lunkaransar, Sridungargarh	150 kms from Bikaner, 160 kms from Nokha, 160 kms from Khajuwala, 95 kms from Phalodi	SWC – 31,850 MT, CWC – 30,400 MT	1	Bikaner, Jaipur
Kheruwala	Bajju, Bikaner, Khajuwala, Nokha, Lunkaransar, Sridungargarh, Jaisalmer	175 kms from Bikaner, 120 kms from Phalodi, 180 kms from Jaisalmer	CWC – 35,494 MT	1	Bikaner, Jaipur

1.4. Approach to Value Chain Analysis

In order to evaluate the value chain, consultations were held with major stakeholders in the chain including farmers, consumers, processors, traders and other support institutions in various parts of Rajasthan (RACP area), which are major producing clusters of the commodity.

Table 11: Surveyed Major markets for Value chain Analysis of Green gram

Consultations of stakeholders for the Value Chain Analysis			
	RACP clusters visited	Stakeholders consulted	Processor/Potential buyer
Within Rajasthan	Phoolasar (Bikaner) Kheruwala (Jaisalmer)	Producers (25), Traders (6), Processors (7), Other stakeholders (11)	Bikaner, Chittor, Jaipur

Chapter 2 Pre Harvest Management

A pre-harvest system may be defined as a system of existing technologies for agricultural raw material production. Thus, the term describes the fundamental technical and economic relations within agriculture.

2.1. Major commercial varieties Grown in Rajasthan

The varieties under cultivation fall into three groups with respect to the habit of growth, namely bunch (Spanish), semi-spreading (Virginia bunch) and spreading (Virginia runner). In the bunch group, the plants grow erect, possess light-green foliage, produce pods in clusters at the base of the plant and have round, plump non-dormant seeds, with light-rose testa. In the case of the semi-spreading and spreading varieties, the branches trail either partially or completely on the surface of the soil, produce pods all along them, possess dark-green foliage and have oblong, dormant brownish seeds. The semi-spreading and spreading types are usually heavier yielding and later-maturing than the bunch varieties.¹¹

These varieties are cultivated in the Kharif season in Rajasthan¹²

RS-1: It is a spreading variety and it matures in 135-140 days. It is tolerant to tikka disease and is suitable for growing on sandy soils of Rajasthan. It yields about 15-20 quintals per hectare. It has 77 percent shelling out turn. Seeds are of medium size and contain 48 percent oil.



RSB-103-87: It is a semi spreading variety recommended for cultivation in Kota districts and other areas of heavy soils in Rajasthan. It has a shelling out turn of 66 percent. Yield potential is 18-20 quintals per hectare. Seeds are deep red in colour and contain 50 percent oil.

Groundnut: GG-7¹³ - It is bold seeded with higher yielder variety



Groundnut: GG –It has a higher pod yield In addition, this variety has bold kernel size and attractive tan colour.

¹¹ <http://agropedia.iitk.ac.in/content/groundnut-varieties>

¹² <http://agropedia.iitk.ac.in/content/state-wise-varieties-groundnut-rajasthan>

¹³ <http://www.jau.in/attachments%5Cproceedings%5CVarieties-last-11-years.pdf>

2.2. New Initiatives & Practices

Many farmers in Gujarat have adopted mulching technology which has the capacity to yield up to three times more output than the existing conventional techniques in India.¹⁷

Initially, the planting was done on pilot basis in 50 acres just to experience the benefit of this technology. The initial growth in roots, stems and leaves was satisfactory. Hence, farmers believe the plants under mulching sheets will yield higher as compared to the plants under open air.

When properly executed, mulching can significantly improve the well-being of plants and reduce maintenance as compared to bare soil culture. Mulched plants have better vigor and, consequently have improved resistance to pests and diseases.

“This technology has the capacity to yield 2-3 times higher output than the conventional techniques of groundnut farming. This means, the technology can revolutionise entire groundnut farming in India,” said Nilesh Vira, Chairman of Indian Oilseeds and Produce Export Promotion Council (IOPEPC).

Grown mainly through age-old farming techniques, groundnut yield in India currently at 700-900 kg per hectares (ha) is less than one-third of the world’s average of 2,200 kg per ha. Comparatively, average groundnut yield in China today stands at 2,300-2,400 kg per ha while the same in the US and Argentina is 3,000 kg per ha and 2,800 kg per ha respectively.

“We have adopted this technology on trial basis in Gujarat. If it works out well this kharif season, the new technology in groundnut planting will be extended to other parts of the country as well,” said Vira.

The biggest advantage of this technology is that the crop does not have to dependent on monsoon. The irrigation is done through mechanical means. Hence, the crop can be grown in off-monsoon season as well.

2.3. Seasonal Availability Pattern

The crop can be grown in all seasons but Kharif season production accounts for about 80 % of the total production. More than 90 % of groundnut is grown under rainfed condition. Groundnut crop sown in rainfed areas in Kharif season is normally sown in June -July and harvested in Oct-Nov. However, wherever irrigation is available some farmers are taking summer crop. Groundnut is also cultivated during January-May as a summer crop under assured irrigation.

Figure 9 Seasonal Availability¹⁴

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Kharif						Planting	Planting		Harvesting	Harvesting		
Rabi			Harvesting	Harvesting						Planting	Planting	
Summer	Planting	Planting			Harvesting	Harvesting						

Planting
 Harvesting

¹⁴ <http://www.commoditiescontrol.com/eaqrtrader/staticpages/index.php?id=47>

¹⁷ http://www.business-standard.com/article/markets/farmers-adopt-new-technology-for-high-groundnut-output-111042100071_1.html

2.4. Land Preparation

Well-drained sandy and sandy loam soils with pH of 6.0-6.5 are best for groundnut. Land preparation includes one ploughing with soil turning plough followed by two harrowing to achieve a good surface tilth up to 12-18 centimetre depth. Deep ploughing should be avoided as deep ploughing encourages development of pods in deeper layers of soil which makes harvesting difficult and one ploughing is sufficient.

Sowing

Row to row distance of 30-40 cm for bunch type and in spreading types 45-60 cm and plant to plant distance should be 15 and 20 cm with seed rate of 80-100 kg for bunch types and 60-80 kg for spreading types is recommended. Sowing should not be more than 5 cm deep.

2.5. Sowing/Planting/Cultivation¹⁵

Seed Propagation

Seed treatment with 5 g of Thiram or Captan or Ceresan per kg of Kernels is done to check various seed and soil borne diseases is recommended. Seed should also be treated with a proper strain of Rhizobium specially in where groundnut is to be grown for the first time. The Groundnut seeds are sown at a depth of 5-8 cm at a seed rate of 40-50kg per ha.

Groundnut is an early season crop. It should be planted when the soil is not soggy as the crop does not do well in waterlogged soils. To prevent blights caused by soil bacteria and fungi, certified disease free seeds have to be used. If seeds from the last season are being used, ensure that the seeds for sowing are stored in their pods and only shelled a few days before planting. g.

The land should be ploughed and harrowed to a fine tilth. The small seeded types (bunch) should be spaced at 30cm between rows and about 15 cm between plants. This would have a plant population of 167,000 per hectare. The large seeded types (runner) can be spaced at 45cm between rows and 20cm between plants, giving an optimum plant population of 89,000 per hectare. The seeds can be planted in two rows on top of the ridge. Select clean and well-formed seeds for planting.

Crop Rotation

Groundnut is grown in rotation with wheat, gram, pea, barley, etc. It is grown as a mixed crop with bajra, maize, jowar, castor and cotton.

2.6. Climatic and Soil Requirement

Groundnut requires a long and warm growing season with a well distributed rainfall of at least 50 centimetres during growing season, abundance of sunshine and relatively warm temperatures. It requires 14 to 16°C for germination, a long and warm growing season lengthens flowering. A relatively warm climate at mean temperatures of 23°C with a well-distributed 37 to 60 cm of rainfall ensures best yields. The rainfed crop should be sown with the advent of monsoon in the last week of June or in the first week of July.

¹⁵ <http://www.theorganicfarmer.org/Articles/how-grow-groundnuts>

2.7. Nutrient Management

Farmyard manure or compost may be added, i.e. 10-15 tonnes per hectare about 15-20 days before sowing. It would be advisable to apply about 50-60 kg P₂O₅ and about 30-40 kg K₂O per hectare. In soils with low fertility, an application of 20-40 kg nitrogen per hectare as a starter dose is advisable to meet the nitrogen requirement of the crop in the initial stage. But before applying fertilisers a soil test is recommended.

The fertilisers should be placed at the time of sowing about 4-5 centimetres in the side of the seed and 4-5 centimetres below the seed level. For Iron chlorosis spraying 1% ferrous sulphate plus 0.1% ammonium citrate is recommended.

2.8. Water Management

Groundnut, being a rainy season crop, normally does not require irrigation; however, one irrigation should be given at pod development stage. Irrigation before harvesting facilitates the full recovery of pods from the soil.

2.9. Weed Management

Crop requires one or two hand hoeings and weedings as per soil type and extent of infestation. First hoeing is to be carried out three weeks after sowing and the second, three weeks after first hoeing, before commencement of flowering. Application of TOK-E-25 at the rate of 4 litres dissolved in 600 litres of water as pre-emergence spray is recommended. And Basalin at the rate of 1kg a.i. per hectare dissolved in 800-1000 litres of water is also advisable as pre-planting spray. To allow easy penetration of pegs in soil and to provide more area to spread; earthing up should be carried out simultaneously with inter-cultural operations.

2.10. Inspect Pest & Disease

1. Groundnut leaf miner (*Stomopteryx subsecivella*)

Symptoms/identification

Figure 10 Larvae of Leaf Minor



It is brownish gray moth, 6 mm long with 10 mm wing span. It creates blotches on the leaf and webs the leaf together. Attacked field looks "burnt" from a distance. Full grown larvae are green with dark head and thorax. At severe infestation entire leaflet becomes brown, shrivelled and dried up.

Control

Stray planting of cowpea or soybean as trap crop. Crop rotation with non-leguminous crop is advised in case of severe recurring problem. Use resistant/tolerant varieties. Install pheromone trap @ 5/ha for mass trapping and spray neem based formulation @ 5%. Release *Trichogramma Chilonis* @ 50000/ha twice (7-10 days interval) Mulching with rice straw causes reduction in leaf miner incidence and increase in percentage parasitism. Intercropping groundnut with *Pennisetum*

glacum enhanced the parasitoid *Goniozus* spp. on leaf miner. Carbaryl 50WP 0.2 per cent spray was found to be most economical for controlling this pest; or Spray Quinalphos 25 EC 2ml or Methyl demeton 25 EC 1.6ml or Dimethoate 30 EC 2ml /lit of water.

2. Groundnut bud borer (*Anarsia phippi*)

Symptoms/identification

Figure 11 Groundnut Bud Borer



Larvae are chocolate brown in color and 10-15 mm long. The larva bores into the terminal buds and shoots and tip of the stem. The tender leaflets emerging from central spindle will show shot-hole symptoms initially. In severe infestation emerging leaflets will have only the midribs or several oblong feeding holes.

Control

Neem oil 3 per cent and leaf extract of *Vitexnegundo* (notchi) 5 per cent are effective against this pest. Spraying of monocrotophos 36 WSC 0.5 per cent (1.5 ml/lit) was found to be more effective in controlling bud borer. The hymenopteran parasitoids, *Bracongelechiiae* and *Brachymeria* sp cause parasitism up to 24 per cent on larvae.

3. Tobacco caterpillar (*Spodoptera litura*)

Symptoms/identification

Figure 12 Tobacco Caterpillar



The adults are light brown moths with a wing span of about 30 mm and mottled forewings. The egg masses about 4 X 7 mm appear golden brown on the upper surface of leaves. Young larvae are light green in color. Full grown larvae are stout, cylindrical and pale greenish brown with dark markings. The pupae are reddish brown and are in the soil close to the plant.

Control

Planting castor or sunflower plants as trap crop for egg laying and destroying eggs help in reducing the incidence. Use pheromone traps (5/ha) to monitor moth population. Release of *Telenomusremus* @ 50000/ha. 4 times (7-10 days interval) based on pheromone trap catching. Use SNPV @ 250 LE (6X 10⁹/LE)/ha or B.t. @1 kg/ha, when large number of egg masses and early instars larvae are noticed. Release *Trichogramma chilonis* @ 50000/ha. 2 times (7-10 days interval) based on pheromone trap observation. Release of *Braconhebetor* @ 5000/ha. two times at 7-10 days interval. Spray insect pathogenic fungus *Nomuraearileyi* @10¹³ spores/ha for controlling early instars. Release larval parasitoid *apanteles africanus* @ 5000/ha. Use 5% neem seed kernel extract on need basis. Apply Methyl parathion 2% dust @ 20 kg/ha or spraying of monocrotophos

36 SL or Quinolphos 25 EC @ 1500 ml or Endosulfan 35 EC @1250 ml or Trizophos 40EC @ 800 ml in 700-800 lit of water. Poison bait with monocrotophos 36 SL or carbaryl, rice bran, jaggery and water can be used to control the grown up larvae.

4. Red Hairy caterpillars (*Amsactaalbistriga*)

Symptoms/identification

Figure 13 Defoliation due to red hairy caterpillar



They are brownish-white moths with a 40-50 mm wing span. The larvae are light brown colour and turn reddish as they grow and are haired and are up to 5 cm long. Caterpillars cause defoliation of the crop.

Control

Set up 3 to 4 light traps and bonfires immediately after receipt of rains, after sowing in the rainfed season to attract and kill the moths. Avoid migration of larvae by digging a trench 30 cm deep and 25 cm wide with perpendicular sides around the infested fields. Apply any one of the following insecticides at 25 kg/ha (for young caterpillars) : Phosalone 35 EC 750 ml/ha in 375 l of water. Dichlorvos 76 EC 627 ml/ha. Dusting of Methyl parathion 2% @ 25 to 30 kg/ha or Fenvalerate. 0.4% @15-20 Kg/ha. Spray Endosulfan 35 EC or Quinalphos 25 EC @ 1250 ml/ha or 500 ml of Nuvan (76%) 4 ml/ha to control full grown insect pests. Spray A-NPV (2X 10⁵ PIB/I) and *Bacillus thuringiensis* (Bt).

5. Gram pod borer (*Helicoverpa armigera*)

Symptoms/identification

Larvae feed on the foliage, prefers flowers and buds. When tender leaf buds are eaten symmetrical holes or cuttings can be seen upon unfolding of leaflets. The moths have a wing span of 40 mm and dull brown forewings. Eggs are spherical in shape and creamy white in colour, present singly on young leaves and flower buds. Larva shows color variation from greenish to brown. It has dark brown grey lines on the body with lateral white lines and also has dark and pale bands. Pupa is brown in colour, occurs in soil, leaf, pod and crop debris.

Figure 14 Gram pod borer



Control

Install pheromone trap @ 5/ha. Use *Trichogramma chilonis* @ 1 lakh/ha or *Chrysoperla carnea* @ 50000/ha at 40 and 50 days after sowing of groundnut can effectively check the pest. Apply HaNPV @ 250 LE/ha or Bt (*Bacillus thuringiensis*) 1 kg/ha or 5% NSKE for monitoring eggs and early

instar larvae. Spray any one of the following insecticide : quinolphos 2ml or chloropyriphos 3ml or Imidacloprid 2ml /lit of water.

6. Aphids (*Aphis craccivora*)

Identification/Monitoring

Figure 15 Aphids on leaves



Wilting of tender shoots during hot weather. Stunting and distortion of the foliage and stems. They excrete honeydew on which sooty molds flow forming a black coating. They are small-sized insects (2 mm long), pear-shaped, green, greenish brown or greenish black in colour. The nymphs are dark brown and turns to shiny dark adults. Adults are mostly wingless

Control

Growing of varieties which are densely hairy and with stiff leaves interfere like Girnar 1. Young crop may be applied with Monochrotophos 36SL 600ml/ha or Dimethate 30 EC @650ml/ha in 600 liter water. Dusting of Endosulphan 4% dust at 1 kg a.i./ha would be effective in controlling aphids. Seed treatment with *Trichoderma viride* @ 4 gm/kg seed. Apply NSKE 5% (neem seed kernel extract) to control sucking pests.

7. Jassids (*Empoasca Kerri Bachlucha* spp)

Identification/Symptoms

Figure 16 Jassid Adults



Nymphs and adults inject toxins resulting in whitening of veins and chlorotic patches especially at the tips of leaflets, in a typical 'V' shape. Heavily attacked crop looks yellow and gives a scorched appearance known as 'hopper burn'. At severe infestation the entire leaflet becomes brown, shriveled and dried up.

Control

Inter cropping with pearl millet. Avoid groundnut-castor inter crop, it increases the infestation. Spray dimethoate 30EC @ 650ml/ha or monochrotophos 36WSC @ 600/ha in 600 litre water.

8. Thrips (*Scirtothrips dorsalis*, *Thrips palmi*)

Identification/Symptoms

Figure 17 Symptoms of Thrips damage



They live on flowers and folded leaflets. These are about 10 mm long, pale cream in color and are hidden. Severe infestations cause stunted plants

Control

Grow tolerant varieties like ALR 3, Robut 33-1, Kadir3 and ICGS 86031. Spray Monochrotophos 36SL 600 ml/ha or Dimethoate 30 EC 650ml/ha or Methyl demeton 25 EC 600 ml in 600 lit of water. Spray per acre Monocrotophos 320ml mixed with neem oil 1lit and 1kg soap powder mixed in 200lit of water twice at 10days interval.

9. Termites (*Odontotermes spp*)

Identification & Symptoms

Figure 18 Termites



The wilting of plants in patches. Termites penetrate and hollow out the tap root and stem thus killing the plant. Bore holes into pod and damage the seed. It removes the soft corky tissue from between the veins of pods causing scarification, weaken the shells, makes them liable to entry and growth of *Aspergillus flavus* that produces aflatoxins.

Control

- Digging the termataria and destruction of the queen is most important in termite management.
- Use well rotten organic manure.
- Harvest the groundnut as soon as they are matured, early removal of the produce from the field reduces the chances of termite damage to pods.
- Apply chlorpyrifos 20 EC or lindane 1.3% to control termites.
- Dust chlorpyrifos @ 30-40 kg/ha in soil before sowing in endemic areas
- Seed treatment with chlorpyrifos @ 6.5ml /kg of seed may reduce termite damage.

2.11. Harvesting

Groundnut is harvested when plant foliage show yellowness and the pods are matured, become hard and tough, and when there is dark tan discoloration inside the shell and the kernels become unwrinkled. Usually, a fully mature pod is difficult to split easily with finger pressure. The bunch varieties mature in about 100-105 days, while semi-spreading and spreading ones in 125-135 days. This stage is achieved when vine begins to turn yellow and leaves start shedding. Harvesting should be done when good percentage of nuts is fully developed and fairly intact.

Various activities that constitute harvesting operation are digging, lifting, windrowing, stocking and threshing. In case of bunch type of groundnut, the plants are harvested by pulling. Harvesting of spreading type of groundnut is done by spade, local plough or with the help of blade harrow or groundnut digger.

2.12. Recommended Good Agriculture Practices

Critical areas	Recommendations
Land Selection and Rotation	Well-drained, sandy to sandy loam soils are best for quality peanut production. In most locations peanuts should be grown on the same land no more often than one year out of three. On this schedule, peanuts should be rotated with crops that are not viable hosts for <i>Cylindrocladium black rot</i> (CBR), nematodes, white mold or stem rot, <i>Sclerotinia blight</i> and other diseases affecting peanuts. Recommended rotational crops include corn, sorghum, grass sods, small grains, and cotton. Avoid rotating with legumes including soybean and certain vegetables since those crops may build up nematodes and soil borne diseases.
Land Preparation	In recent years reduced tillage production of peanut has become more popular. Raised bed planting is also another good option now a days. Mulching can also be a good option for checking soil pathogens.
Soil Fertility	Maintain a soil pH of 5.8-6.5. Increasing soil pH reduces the plant's ability to absorb manganese and iron. Deficiencies can lead to leaf chlorosis, yellowing and slow vegetative growth. If soil pH is too low zinc levels can become toxic and cause retarded plant growth, stem splitting and in some cases plant death. The use of raw manures is not recommended for peanut production. Properly decomposed organic manure should be used.
Seed Selection and Planting	Use high quality seed of a recommended variety. Plant at the recommended plant population based on a given row spacing and seed count. Plant peanuts as soon as soil conditions are favorable for rapid germination and development. Late planting dates generally reduce yield and quality and increase the risk of freeze damage and late season drought to peanuts. Prepare seed beds carefully to assure uniform seed germination and emergence
Crop Protection – Quality Enhancement	<p>Integrated Pest Management (IPM) is an effective approach to pest control. Following measures have to be taken under IPM.</p> <p>Prevention: tactics as using pathogen-free seeds, preventing weeds from reproducing, irrigation scheduling.</p> <p>Avoidance: Tactics include crop rotation, choosing varieties with genetic resistance to pests, choosing early maturing varieties, fertilization programs to promote rapid crop development, and simply not planting certain areas of fields where pest populations exist.</p> <p>Monitoring: Proper identification of pests through scouting. This will help in estimation of economic threshold limit and application of pesticides.</p> <p>Suppression: Physical suppression tactics may include cultivation or mowing for weed control. Chemical pesticides should be applied using the</p>

	<p>following sound management approach: 1) cost: benefit of the pesticide should be confirmed using economic thresholds and weather-based advisories where available); 2) pesticides selection should include understanding of products with the least negative effects on environment and human health in addition to efficacy and economics; 3) precision agriculture or other appropriate new technology should be utilized to limit pesticide use to areas where pests actually exist or are reasonably expected; 4) sprayers or other application devices should be calibrated prior to use and occasionally during the use season; 5) chemicals with the same mode of action should not be used continuously on the same field in order to avoid resistance development</p>
Irrigation	<p>Irrigated fields should have a good weed and disease control program to prevent excessive losses in yield and quality. Irrigation should be done seeing different stress stages in crop lifecycle.</p>
Determining When to Harvest	<p>Delay harvest until the greatest amount of nuts reach maturity but before excessive sprouting or over-maturity occurs. Digging when 75- 80% of pods have turned dark inside the shell will usually give the best grade and yield. Immature peanuts have poor flavor, are more difficult to cure, often deteriorate faster in storage and are more likely to be affected by undesirable mold growth.</p>

2.13. Pre Harvest Constraints

Cultivation of groundnut including harvest and post-harvest operations is highly labour intensive. Hence, timely availability of labour is very crucial and it is a major cost component. Majority of the farmers cited labour shortage and high cost of labour as the two biggest constraints being faced by them.

Chapter 3. Post-Harvest Management

In agriculture, postharvest handling is the stage of crop production immediately following harvest, including cooling, cleaning, sorting and packing. The instant a crop is removed from the ground, or separated from its parent plant, it begins to deteriorate.

3.1. Post- Harvest Losses, Harvesting Care and Post- Harvest Equipment¹⁶

Harvested crop is left in small heaps for two to three days for curing after which the pods are detached by hand for separating the pods. During the curing process, groundnuts are dried to an average moisture content of 10-15 %.

Post-Harvest losses in Groundnut consist of losses at two levels:

1. Pod losses during harvesting: Significant losses occur during harvesting operation. These can be upto 20-30% depending upon:

- a. Variety of Groundnut – Higher for Virginia type
- b. Soil Moisture at the time of digging - High soil moisture at the time of harvest affects the crop quality while low soil moisture leads to Pod losses
- c. Method of digging – Pod losses for manual harvesting are estimated at 10-20%

2. Post-harvest losses - Occur at different stages at harvesting, threshing, cleaning, winnowing, packaging, transportation, storages, processing and marketing. The losses during harvesting are due to left out pods in the soil. Groundnuts are stored both as pods and kernels and are vulnerable to insect pest after harvest. Post-harvest losses in groundnuts range between 10 to 25% of the production during processing and storage is due to level of maturity, moisture content in the product and the form in which it is stores and sanitation of storage area/space.

However in transportation, the losses occur on account of pilferage, leakage of gunny bags and rough handling. The losses during storage are mainly due to drying and through damage by rodents and pests.

To minimize post-harvest losses, the following measures should be followed;

- Timely harvest when soil contains sufficient moisture.
- Use of proper method of harvesting.
- Collection of the left out pods from the soil.
- Striping pods properly by adopting better mechanical methods.

¹⁶ http://aqmarket.nic.in/groundnut_profile.pdf

- Drying the wet pods immediately after harvest.
- Avoiding dampness of stored pods to avoid mould formation.
- Avoiding the losses in threshing and cleaning, to minimize damaged pods.
- Adopting grading practices to get more profit.
- Using good packaging in storage and transportation.
- Using a proper scientific technique in storage for maintaining optimum moisture content of pods.
- Using pest and rodent control measures before and after the storage.
- Storing the groundnut in the form of pods rather than in kernel form.
- Providing aeration to stored pods and stir bulk pods occasionally to avoid dampness and pest infestation.
- Staking of the gunny bags on wooden planks to avoid dampness.
- Properly handling at loading and unloading of Groundnut with efficient and hygienic transportation facilities to reduce the losses at farm and market level.

3. Harvesting Care

Harvesting of groundnut comprises of digging, lifting, windrowing and stacking of pods. Groundnut is harvested when plant foliage show yellowness. The pod is matured when it becomes hard and tough, and when there is dark tan discolouration inside the shell and the kernel become unwrinkled. Usually, the bunch varieties mature in about 100-105 days and the semi spreading and spreading varieties in about 125-135 days.

- Harvesting before maturity increases the free fatty-acid content in oil and with lesser shelling percentage, oil and protein content.
- Immature groundnuts should not be harvested, as they are more susceptible to fungal attack.
- Delay in harvesting results in retention of more pods in soil and less yield.
- Premature and delay in harvesting reduces viability of the seed kernel.
- Harvest groundnut on bright sunny day and avoid during humid/wet weather conditions.
- Harvest groundnut, when there is adequate moisture in the soil.
- Protect the harvested groundnut, from rain and excessive dew by covering.
- Avoid heaping of harvested groundnut to avoid mould formation, which leads in Aflatoxin contamination.
- Stripped the pods from the plants after the harvest. If the stripping is delayed, spread the harvested plant for few days, which facilitates the drying of pods and air circulation.
- Keep the harvested groundnut separately for each variety, to get true to type variety i.e. kernel.
- Dry the pods for 7-10 days, up to a safe moisture percent.
- Usually the spreading and semi spreading varieties may be up rooted by harrowing, while bunch varieties may be up rooted by hand operation i.e. manually.
- Harvesting should be done by adopting proper method harvesting.
- Keep the proper moisture in the field of groundnut during expected harvesting time.

3. Post-Harvesting Equipment :


There are various post harvest equipments available for ground nut as described below.

a. Harvesters

Tractor operated machine, which mechanically digs out the left over pods from the soil. It consists of elaborate system of crankshafts, flywheel, connecting linkages and rotating vanes on a shaft. A sieve is provided with a vibrating mechanism to filter the groundnut from the soil. As the tractor moves forward, the vanes rotate and dig into the ground, scoop and drop the soil-groundnut mixture into a vibrating storage unit with a sieve base. The system of linkages and drives vigorously vibrate the entire unit to shake the soil loose and the groundnuts stay trapped at the top in the central storage unit as the soil gets sifted out onto the ground. A window hatch is provided at the back that can be lifted and the groundnut taken out by a person into a basket.¹⁷

Table 12 Groundnut Digger

Udaipur Animal Drawn Groundnut Digger	
Specification and Performance results	
Dimensions (l x w x h),m	1.75x0.30x0.57
Weight, kg	10
Power source	A pair of bullocks
Width of cut, mm	300
Operating speed, km/h	2.74
Field capacity, ha/h	0.16
Field efficiency, per cent	61
Total pod losses, percent	5.7
Digging efficiency percent	80-90
Labour requt., man-h/ha	6.70



b. Groundnut Thresher :-

The harvested crop has to be fed into the feeding chute and machine separates the groundnuts from the harvested crop whether it is green or dried. This machine is operated with Tractor PTO and also with electric motor. This machine is portable and can be taken to any other places since, it has been attached with 2 tyres.¹⁸

¹⁷ <http://nif.org.in/innovation/groundnut-digger/745>

¹⁸ <http://www.kovaiclassicindustries.net/agricultural-threshers.html#groundnut-thresher>

Table 13 Groundnut Thresher

1. PAU Axial Flow Groundnut Thresher	
Specification and Performance results	
Dimensions (l x w x h),m	1.96x1.78x1.64
Weight, kg	550
Cylinder size, mm	530 dia x 1500
Beater size	12.5 dia x 75, (60 Nos.)
Type, of blower	Aspirator type, One No.
size of blower	400 mm dia x 1150 mm width
Power source	Tractor of 25 hp / above
Cylinder speed, rev./min	225-250
Output capacity, Kg/h	170 – 220
Broken grain, per cent	Less than 0.5
Total grain losses, per cent	1.0-2.25
Threshing efficiency, percent	99 – 99.5
Cleaning efficiency, per cent	92 – 98
Fuel consumption, l/h	2.8
Labour requt., man-h/q	1.5





Table 14 Tnau Groundnut Thresher


2. TNAU Groundnut Thresher	
Specification and Performance results	
Dimensions (l x w x h),m	2.05x1.65x1.57
Weight, kg	380
Cylinder tip dia, mm	410
Beater type	Curved edged pegs
Sieve	Oscillating type, 2 nos (top one With 50x17 mm, bottom one with 45x9 mm)
Type, of blower	Centrifugal, One no.
Power source	5 hp motor
Cylinder speed, m/s	7-10
Output capacity, Kg/h	146-168
Broken grain, per cent	1.5-2.1
Total grain losses, per cent	3.5-3.8
Threshing efficiency, percent	96 – 99.8
Cleaning efficiency, per cent	93 – 96
Labour requt., man-h/q	2



c. Stripper :

Table 15 Groundnut Stripper Drum Type

Groundnut Stripper (Drum Type)	
Specification and Performance results	
Dimensions (l x w x h),m	1.83x0.71x0.50
Weight, kg	28
Drum size, mm	280 dia x 610
Power source	One person
Output capacity, Kg/h	18
Stripping efficiency, per cent	100
Broken pod losses, percent	1
Total pod losses, percent	1
Labour requ., man-h/q	6




Pod Stripper :-

Stripping is done by holding the pod portion of a bunch manually over spiked cylinder. It is suitable for stripping of groundnut pod from the harvested crop. It saves 60 percent labour and pod separation time which ultimately reduces the cost of cultivation. The vines are not fed into the machine, so that the fodder value of the crops can be maintained and used in lean season also.¹⁹

Table 16 Groundnut Pod Stripper

Groundnut Pod Stripper	
Specification and Performance results	
Dimensions (l x w x h),m	1.4x1.0x0.6
Weight, kg	115
Cylinder size, mm	270 dia x 1250
Beater size	60 mm height, 120 Nos.
Type, of blower	Throwing type, One No.
Power source	2 hp electric motor
Cylinder speed, rev./min	330
Output capacity, Kg/h	120
Stripping efficiency, per cent	100
Cleaning efficiency, per cent	98 (total grain losses nil)
Power consumption, kW	1.2
Labour requ., man-h/q	3



d. Decorticator :-

The act of stripping the hulls of the seeds is known as decorticating. Decorticators are also known as shell removers or separators. Groundnut Decorticators are an integral part of the oil mill plant and they are specially made to crack the outer shell of the groundnuts (peanuts). Shelling a large

¹⁹ <http://myrada.org/groundnut-pod-stripper/>

number of these nuts is a laborious task and consumes a lot of time. In order to make the shelling process of groundnuts easier, Groundnut Decorticators are duly used.²⁰

Table 17 Groundnut Decorticator

TNAU Groundnut Decorticator	
Specification and Performance results	
Dimensions (l x w x h),m	1.27x0.87x0.52
Size of oscillator	520 mm arc length, 270 mm
Weight, kg	13
Power source	1 person
Shelling efficiency, percent	98
Shelling capacity, Kg/h	100 (graded
Broken kernels, percent	1-2
Total kernels losses, percent	1-2
Labour requt., man-h/q	1



Table 18 Groundnut Cum Castor Decorticator

CIAE Groundnut cum Castor Decorticator	
Specification and Performance results	
Dimensions (l x w x h),m	0.51x0.25x1.11
Radius of oscillating beaters, mm	225
Weight, kg	15
Concave clearance, mm	10-25
Shoe size	210x50 mm, 3 Nos.
Concave openings, mm	45x9 for Groundnut
Power source	1 person
Shelling efficiency, percent	98
Shelling capacity, Kg/h	68 (graded pods)
Broken kernels, percent	2.30
Total decortication losses, percent	2.30
Labour requt., man-h/q	1,6



²⁰ <http://www.oil-mill.com/groundnut-decorticator.html>

3.2. Grade Specification & Grading at producer level

3.2.1. Under AGMARK :

Under the Agricultural Produce (Grading and Marking) Act 1937, the grade specifications for groundnut have been notified. Agmark standards for groundnut are given below.

Grade specification of Hand Picked selected (HPS) Groundnut pods commercially known as peanuts

A. General characteristics :

The Hand-picked Selected Groundnut Pods shall:

- (a) be the pods obtained from the plant *Arachis hypogaea*;
- (b) have characteristics shape, size, appearance and configuration of the Peanuts variety;
- (c) be free from fungus and insect attack, live and/or dead insects, obnoxious smell, rodent contamination and excreta, larvae and pupae.

B. Special characteristics:

Table 19 Peanuts

Grade designation	Definition of quality					
	Special characteristics					
	Extraneous matter percent weight (maximum)	Immature and shriveled pods percent by weight (maximum)	Damaged & discolored pod percent by weight (maximum)	Pods of other varieties percent weight (maximum)	Shelling percent by weight (minimum)	Moisture percent weight (maximum)
Special	0.5	2.0	0.5	1.0	72	8.0
Standard	1.0	3.0	1.0	2.0	69	8.0
General	2.0	4.0	2.0	4.0	66	8.0

3.2.2. NAFED Grade specifications of groundnut – in – shell for price support operations during 2004 – 2005 marketing season

NAFED is the nodal agency of the Government of India for procuring Groundnut in different states under the Price Support Scheme (PSS). The concerned State Co-operative Marketing Federations are the procuring agents for NAFED. All the purchases under the PSS by NAFED are made in accordance with these specifications.

Table 20 NAFED Grade specification

Sl. No.	Special characteristics	Maximum limits of tolerance (Percent by weight per qtl.) for	
		Bold	Ginny
		FAQ	FAQ
1.	Foreign matter	2	2
2.	Damaged pods	2	2
3.	Shrivelled & immature pods	4	4
4.	Pods of other varieties	4	4
5.	Shelling (kernels / pods)	65 & above	70 &
6.	Moisture contents	8	8

3.2.3. Specification under Prevention of Food Adulteration Rules, 1955.

Groundnut Kernel (deshelled) for direct human consumption commonly known as Moongphali are obtained from the plant *Arachis hypogaea*. The kernels shall be free from non-edible seeds such as mahua, castor, neem or argemone, etc. It shall be free from colouring matter and preservatives. It shall be practically free from extraneous matter such as stones, dirt, clay etc. The kernels shall conform to the following standards, namely:-

a. Moisture	Not more than 7.0 per cent
b. Damaged kernel including slightly cent by weight damaged kernel	Not more than 5.0 per
c. Aflatoxin content billion	Not more than 30 parts per

3.2.4. CODEX Standards:-

Codex Standard for Peanuts Codex Stan 200-1995

The Annex to this standard contains provisions which are not intended to be applied within the meaning of the acceptance provisions of Section 4.A (I)(b) of the General Principles of the Codex Alimentarius.

Table 21 Codex Standard for Peanuts

Scope:	This standard applies to peanuts intended for processing for direct human consumption.
Description:	Peanuts, either in the pod or in the form of kernels, are obtained from varieties of the species <i>Arachis hypogaea</i> L
Essential Composition And Quality Factors:	Quality Factors – General : Peanuts shall be safe and suitable for processing for human consumption. Peanuts shall be free from abnormal flavours, odours, living insects and mites.

	<p>Quality Factors – Specific :</p> <table border="1" data-bbox="603 333 1477 553"> <thead> <tr> <th data-bbox="603 333 1051 407">Moisture Content</th> <th data-bbox="1051 333 1477 407">Maximum Level</th> </tr> </thead> <tbody> <tr> <td data-bbox="603 407 1051 479">Peanuts in-pod</td> <td data-bbox="1051 407 1477 479">10%</td> </tr> <tr> <td data-bbox="603 479 1051 553">Peanuts Kernels</td> <td data-bbox="1051 479 1477 553">9.0%</td> </tr> </tbody> </table> <p>Lower moisture limits should be required for certain destinations in relation to the climate, duration of transport and storage. Governments accepting the Standard are requested to indicate and justify the requirements in force in their country.</p> <p>Mouldy, rancid or decayed kernels 0.2% m/m max. Mouldy kernels are defined as kernels with mould filaments visible to the naked eye.</p> <p>Decayed kernels are defined as those showing visibly significant decomposition. Rancid kernels are defined as those which have undergone oxidation of lipids (should not exceed 5 meq active oxygen/kg) or the production of free fatty acids (should not exceed 1.0%) resulting in the production of disagreeable flavours. Organic and inorganic extraneous matter: is defined as organic or inorganic components other than peanuts and includes stones, dust, seeds, stems, etc.</p> <ol style="list-style-type: none"> 1. <i>Filth: Impurities of animal origin (including dead insects)</i> 0.1% m/m max. 2. <i>Other organic and inorganic extraneous matter: Peanuts in pod</i> 0.5% m/m max. <i>Peanut kernels</i> 0.5% m/m max. 	Moisture Content	Maximum Level	Peanuts in-pod	10%	Peanuts Kernels	9.0%
Moisture Content	Maximum Level						
Peanuts in-pod	10%						
Peanuts Kernels	9.0%						
<p>Contaminants*</p>	<p>Heavy Metals Metals in amounts which may represent a hazard to human health.</p> <p>Pesticide Residues Peanuts shall comply with those maximum residue limits established by the Codex Alimentarius Commission for this commodity.</p>						
<p>Hygiene:</p>	<p>The products covered by the provisions of this standard shall be free from heavy</p> <ul style="list-style-type: none"> ➤ It is recommended that the product covered by the provisions of this standard should be prepared in accordance with the appropriate sections of the Recommended International Code of Practice – General Principles of Food Hygiene" (CAC/RCP 1-1969, Rev. 2-1985), and other Codes of Practice recommended by the Codex Alimentarius Commission which are relevant to this product. ➤ To the extent possible in good manufacturing practice, the product shall be free from objectionable matter. ➤ When tested by appropriate methods of sampling and examination, the product: ➤ shall be free from microorganisms in amounts which may represent a hazard to health. ➤ shall be free from parasites which may represent a hazard to health; and ➤ shall not contain any substance originating from microorganisms, including fungi, in amounts which may represent a hazard to health. 						

Packaging:	<ul style="list-style-type: none"> ➤ Peanuts shall be packaged in such manner which will safeguard the hygienic, nutritional, technological, and organoleptic qualities of the product. Packaging will be sound, clean, dry, and free from insect infestation or fungal contamination. ➤ Packing material shall be made of substances which are safe and suitable for their intended use, including new clean jute bags, tinsplate containers, plastic or paper boxes or bags. They should not impart any toxic substance or undesirable odour or flavour to the product. ➤ When the product is packaged in sacks, these must be clean, sturdy, and strongly sewn or sealed
Labelling:	<p>In addition to the requirements of the Codex General Standard for the Labelling of Prepackaged Foods (CODEX STAN 1-1985, Rev. 1-1991, Codex Alimentarius Volume 1A), the following specific provisions apply:</p> <ul style="list-style-type: none"> ➤ <i>The Name of the Product</i> The name of the product to be shown on the label shall be "peanuts" or "peanuts in- pod" and type of peanuts. ➤ <i>Labelling of Non-Retail Containers</i> Information for non-retail containers shall either be given either on the container or in accompanying documents, except that the name of the product, lot identification and the name and address of the manufacturer or packer shall appear on the container. However, lot identification and the name and address of the manufacturer or packer may be replaced by an identification mark, provided that such a mark is clearly identifiable with the accompanying documents.

Methods of Analysis and Sampling:

In those instances where more than one factor limit and/or method of analysis is given it is strongly recommended that users specify the appropriate limit and method of analysis.

Table 22 Methods of Analysis and Sampling

Factor/Description	Limit	Method Of Analysis
1. In-Pod Defects		
1.1 Empty pods: pods containing no kernels.	3% m/m	To be determined
1.2 Damaged Pods: include:	10% m/m	To be determined
a) shrivelled pods (pods which are imperfectly developed and shrunken); or		
b) pods having cracks or broken areas which cause conspicuous openings or which seriously weaken a large portion of the pod, especially if the kernel inside the pod is easily visible without any pressure forced upon the edges of the crack.		To be determined
1.3 Discoloured Pods: pods having dark discolouration caused by mildew, staining, or other means affecting 50% or more of the pod surface.	2% m/m	To be determined
2. Kernel Defects		
2.1 Damaged Kernels include:		
a) those affected by freezing injury causing hard, translucent or discoloured flesh;	1% m/m	
b) shrivelled kernels which are imperfectly developed and shrunken; and/or	5% m/m	
c) those damaged by insects, worm cuts;	2% m/m	To be determined
d) mechanical damage;	2% m/m	
e) germinated kernels.	2% m/m	
2.2 Discoloured Kernels: kernels are not damaged but are affected by one or more of the following:	3% m/m	
a) flesh (cotyledon) discolouration which is darker than a light yellow colour or consists of more than a slight yellow pitting of the flesh; and/or		To be determined
b) skin discolouration which is dark brown, dark grey, dark blue, or black, and covers more than 25% of the kernel.	3% m/m	To be determined
2.3 Broken and Split Kernels: broken kernels are those from which more than a quarter has been broken off. Split kernels have been split into halves.	5% m/m	
3. Peanuts other than the designated type.		

3.3. Major Storage Diseases and Pest & their control measures

Table 23 Major Storage Diseases and Pest & their control measures

#	Pests	Damage	Control Measures
1	Groundnut borer/bruchid <i>Caryedon serratus</i> (oliver)	Larvae bore the pod wall and feed on the kernels and continue eating during transportation and storage.	1. Maintenance of optimum moisture content (not >5%) is always critical in preventing the development of storage pests.
2	Red rust/Confused flour beetle (<i>Tribolium castaneum</i>)	Beetle and larvae both do not cause damage to whole pod but feed on broken and damaged pod/kernel produced by milling and handling or attacks on infested/damaged pods of other insects.	2. For protection against storage pests, except for the groundnut bruchid, groundnuts should be stored unshelled. 3. Fumigation with celphons - 3g tablet per sack of groundnut (40 kg) - and covering the sacks with a polythene sheet for 5 days can effectively control bruchids without affecting seed viability.
3	Rice moth (<i>Corcyra cephalonica</i>)	Larvae feed on broken and damaged pods and kernels. Larvae produce dense webbings. Whole kernels are bound into lumps.	4. If groundnuts are stored accessed care should be taken to avoid breakage. 5. Broken seeds should not be stored for long periods.
4	Pod-sucking bug (<i>Elasmolomus sordidus</i>)	Nymphs perforate the pod and feed on the kernels. Kernels shrivel it increases the free fatty acid content of the oil.	6. Dusting with an inert substance such as attapulgate-based clay dust (ABCD) can help to minimize storage insect problems. 7. Rat cage:- Different types of rat cages are available in the market. Caught rats can be killed by dipping into water.
5	Rodents	Rodents eat whole pods and kernels. They spill more pods and kernels than they consume. Rodents also contaminate Groundnut by hair, urine and feces, which cause diseases like cholera, food poisoning, ring worm, rabies etc.	Poison baits:- Anti-coagulant pesticide like Zinc Phosphide is mixed with bread or any other food stuff used as bait. Keep baits for a week. Rat burrow fumigation:- Put tablets of Aluminum Phosphide in each hole and burrow and block that hole by mud mixture to make it airtight.

Chapter 4. Cost of Production and Net Value Accruals to Producers

Producer case illustration

A typical farmer has about 2 ha land holding. About 1 ha is deployed to Groundnut production as single harvest. The variety opted is Gajraj. The gross yield is 30 quintals per ha. The market rate of the sale is about Rs. 4000 per quintal Rs. 120000 per ha. The cost of cultivation is about Rs. 58000 per ha. Net realization per acre is about Rs. 60800/ha. Out of this about Rs.8000 is cost of land preparation, seed cost is about Rs. 20000, fertilizer and pesticide cost is about Rs. 10000 per ha, weeding related (labour cost) is about Rs. 3000, watering cost Rs 2000, Harvesting cost Rs 10000 and Thrashing cost Rs 5000. Apart from these, the farmers spends Rs 1200 in packaging the produce in 50 kg gunny bags and transporting it to the mandi The fluctuation in prices of Groundnut is between Rs. 3300 to Rs. 4800 in a year. The crop gives a net profit of around Rs 2027 per quintal.

Some constraints are; White grub attack is a major threat to the crop and can damage 50-60% to the entire crop if infested. At the time of sowing, a sudden increase in seed price is observed often which hamper the margins of the farmer at the later stage. As there are many seed suppliers in the market, sometimes farmer gets confused what to buy and sometimes there is very little germination which leads to re-plough the field.

Table 24 Cost of Production, Ground nut, Irrigated

Sr. No.	Particular	Amount (in Rs. Per ha)
A.	Income (30 qtl./ha @ Rs 4000/ctl)	120000
B.	Cost of Production	
1	Land Preparation Cost (Deep ploughing @ , 2-ploughing, 2 cultic, sowing)	8000
2	Seed Cost (200kg/ha@ Rs 100/kg)	20000
4	Input Cost	10000
5	Weeding Cost (Manual if needed) and weedicide cost	3000
	Watering	2000
6	Harvesting Cost (labour cost- Cutting, storing, thrashing)	10000
7	Thrashing (3 hrs) @ Rs 800/ hr plus labour	5000
	Packing and transportation to mandi for production of 1 ha	1200
C.	Total Cost of Production	59200
D.	Net Profit per ha	60800
E.	Yield of fodder (30 qtls/ha @ Rs 300/ctl)	9000
F.	Net profit per ha including fodder	69800
G.	Cost per ctl	1973
H.	Profit per quintal of Guar grain	2027

Chapter 5. Supply Chain of Commodity

5.1. Seasonal Availability and Price Pattern

Although the crop can be grown in all the seasons, *kharif* season production accounts for about 80 % of the total production. More than 90 % of the groundnut area is grown under rainfed condition. *Kharif* crop is grown during June-September period in majority of Gujarat and Maharashtra. In southern region it is grown as *kharif* as well as *Rabi* crop and in southeastern states it is even cultivated in rice fallows during October-March. Groundnut is also cultivated during January-May as a summer crop under assured irrigation.²¹

5.1.1. Seasonal Availability ²²

Table 25 Seasonal Availability

State	Period	Groundnut		
		Kharif	Rabi	Summer/ Spring
Rajasthan	Sowing	Jun(B)- July(E)		
	Harvesting	Oct(B)- Nov(E)		

Source : Indian Council of Agricultural Research (Crop Science Division)

5.1.2. Market Arrivals & Prices in Major markets of Rajasthan

Table 26 Market Arrivals

Sr no.	District	APMC Name	Arrival quantity (in MT)
1	Bikaner	Bikaner (Grain), Lunkaransar, Nokha, Sridungargarh	193470.25
2	Jaipur	Bagru, Chaksu, Chomu, Jaipur(Grain) (Chandpole), Kishangarh, Renwal	63649.76
3	Hanumangarh	Goluwala, Hanumangarh, Hanumangarh Town, Nohar, Pilli Banga, Rawatsar	12104.00
4	Chittorgarh	Badrisadri, Fatehnagar, Nimbahera	7215.30
5	Jodhpur	Jodhpur (Grain)(Mandor), Jodhpur (Grain) (Phalodi), Mathania	4060.49
6	Tonk	Deoli, Malpura, Niwai, Tonk	2799.70
7	Dausa	Dausa, Lalsot	2314.90
8	Churu	Sardar, Shahaar, Sujangarh (Churu)	1553.50
9	Ganganagar	Gharsana, Sri Vijayanagar, Sriganganagar	874.80
10	Jalore	Bheenmal (Ranlwada)	663.52
11	Nagaur	Deedwana	451.30

²¹ <http://www.cmindia.com/commodity/groundnut.html>

²² https://www.google.co.in/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0ahUKewiO-2Gz4fTAhUTSo8KHcaqB1kQFgqIMAE&url=http%3A%2F%2Fecds.dacnet.nic.in%2FAt_A_Glance-2011%2FAppendix-IV.xls&usq=AFQjCNE0kk9-n8bOOH0saRk9RQYrQIBfjw

12	Sikar	Sikar	424.10
13	Bhilwara	Bhilwara and Mandalgarh	313.43
14	Swai Madhopur	Gangapur City,Gangapurcity(Old Lal mandi), Sawai Madhopur	43.70
15	Baran	Atru,Atru(Kawai Salpura) ,Chhabra	18.50
16	Jhunjunu	Nawalgarh	18.10
17	Jhalawar	Jhalarapatan	5.30
Grand Total			289980.65

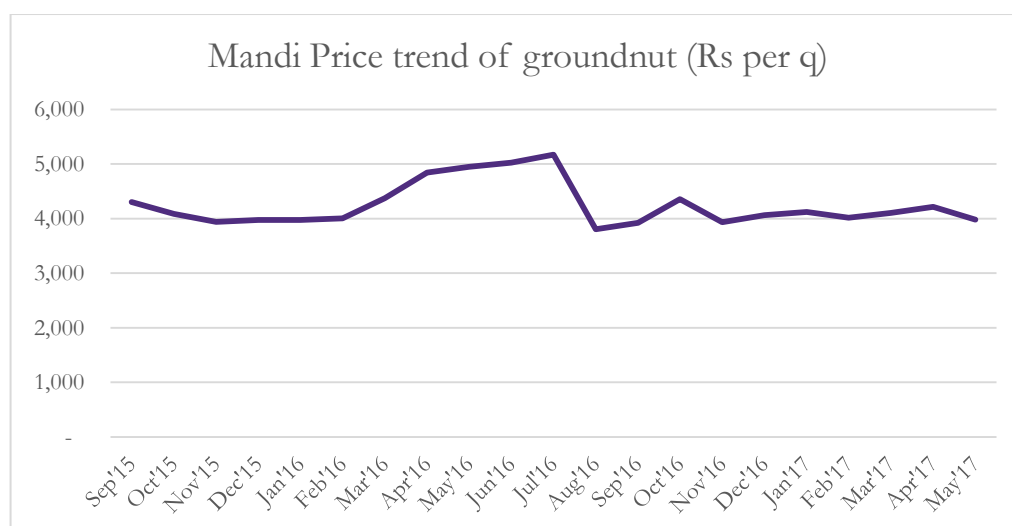
Groundnut

Table 27: Price trend of Groundnut in mandi for past 3 season Bajju mandi

Month	Price (Rs.)	Month	Price (Rs.)
Sep-15	4,268	Jul-16	4,448
Oct-15	4,771	Aug-16	4,419
Nov-15	4,736	Sep-16	4,378
Dec-15	4,603	Oct-16	4,250
Jan-16	4,063	Nov-16	4,231
Feb-16	3,849	Dec-16	4,105
Mar-16	3,648	Jan-17	3,835
Apr-16	3,978	Feb-17	3,583
May-16	4,005	Mar-17	3,366
Jun-16	4,171		

Groundnut crop has variation from Rs. 3,300 to Rs. 5,000.

Figure 19: Price trend of Groundnut in mandi for last 3 season



Ground nut oil prices in selected markets in India: (Rs. per Kg./Litre) (January, 2017)

States/UTs	Centres	January
Assam	Dibrugarh	165.00
	Dispur	165.00
	Guwahati	165.00
	Silchar	165.00
Gujarat	Gandhi Nagar	135.00
Jharkhand	Ranchi	165.00
Karnataka	Bangalore	90.00
Kerala	Ernakulam	187.00
	Trivandrum	190.00
Madhya Pradesh	Bhopal	140.00
Maharashtra	Mumbai	148.00
Mizoram	Aizwal	90.00
NCT of Delhi	Delhi	138.00
Rajasthan	Dausa	105.00
	Jaipur	128.00
	Jodhpur	115.00
	Swaimadhampur	120.00
	Udaipur	113.00
Tamil Nadu	Chennai	145.00
Telangana	Hyderabad	110.00
	Gorakhpur	150.00
	Lucknow	160.00
	Saharanpur	160.00
West Bengal	Howrah	180.00
	Kolkata	180.00

5.2. Existing Market Channels

Marketing channels are routes through which agricultural products move from producers to consumers. The length of the channel varies from commodity to commodity, depending on the quantity to be moved, the form of consumer demand and degree of regional specialization in production. The marketing/production-distribution/activity-marketing channel are presented as value-chain mapping.

Marketing channels for oilseeds are different from those for food grains, mainly because the extraction of oil from oilseeds is an important marketing function of oilseeds.

The present value chain for groundnut is highly complex in nature because of multiple levels of value addition and multiple stake holders present in the value chain. The value chain has essentially four channels out of which Channel 1 & 2 are for human consumption and end users are Households and institutions. Channel 3 is the by product from secondary processing (oil industry) and end users are farmers/ animal breeders as animal feed. The 4th channel is the by product chain of the Primary processing (De-shelling) industry whose end users are brick kilns, husk power plants and steam generators.

For an illustrative case of Ground nut oil, The farmers' share in consumer rupee is 25%. Village trader generally works on a collection charges of Rs 20-30 per quintal. APMC trader has a gross margin of 1% over consumer rupee in case of oil. Primary processor enjoys 16%, Secondary processor 43%, Distributor-4% and Retailer -9% over consumer rupee.

Generally Post harvest losses are 7-14% upto primary processing level. During primary processing (De-shelling) losses are 30% after de-shelling. The husk from de-shelling is sold @ Rs 300 per quintal to various brick clins or steam power plants in the vicinity of the processor. Similarly, oil harvest during secondary processing of de-shelled ground nut is around 35-48% depending upon the kind of oil extraction units. The other by-products of ground nut oil is Sludge and De-oiled cake. In 1000 kg Ground nut, around 42% oil harvest is optimum using metal machine and filter press, around 420 kg of ground nut cake and 40 kg of sludge. The De-oiled cake is also having marketable value and sells @ Rs 2000 per quintal.

The export channel consists of end users who are either households or institutional processors. The holding time is generally 3-5 months for farmers from farming to selling and self storage. Holding time for village trader is maximum 2-3 days, for APMC trader, primary processor and secondary processor, the holding time is 1-30 days whereas it is around 1-90 days for the distributors and retailers before they sell it to consumers.

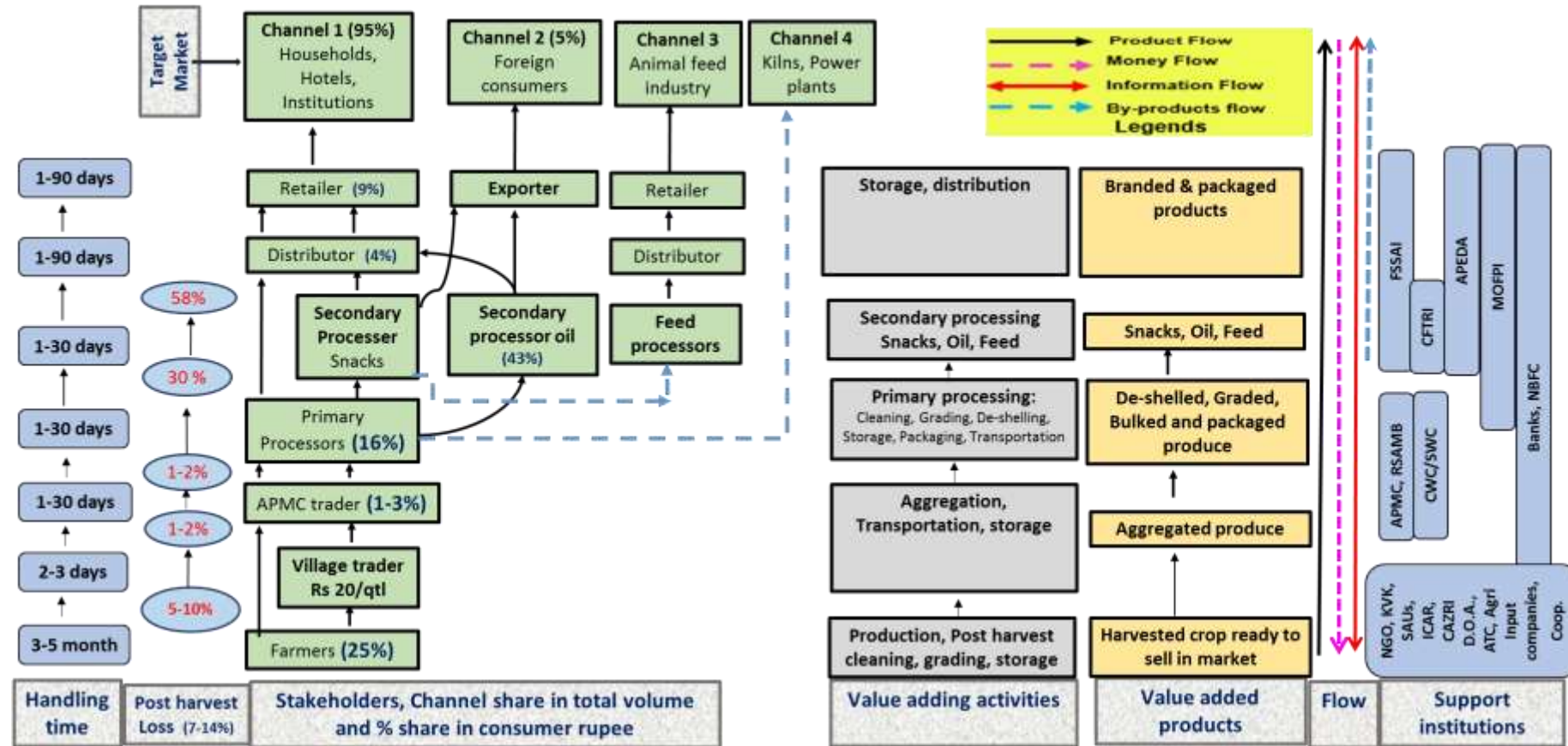
The support agencies in the value chain are NGOs, KVKs, CZARI, ATC, DoA, Input companies and cooperatives who provide support services during cultivation stage. During the processing stage, role of FSSAI and APEDA is important in terms of quality control and exports. Financial institutions contribute in the value chain from farmer upto distributors with various credit line products.

Farmers role in the value chain is Production, post harvest handling, doing sorting, grading and doing storage if needed. Village traders aggregate the produce from few farmers and sell them in nearby APMC. Their main role is bulking. The role of APMC traders is to facilitate auction of the produce at the mandi premises and he charges a commission of around 2-3% as aadat/ loading and weighing charges from the farmer. The role of primary processor in ground nut industry is to de-shell the product. Generally, long distance transport is done for de-shelled ground nut to reduce cost of transportation. Secondary processing is most widespread in case of ground nut value chain. The secondary processed products of ground nut are: Roasted and salted nuts, nuts used in namkeens, nut chikki, nut laddu, nuts used in sweets/ice-creams, ground nut oil and de-oiled cake. All these products find their way into the consumers' house through a long channel of state level agencies, distributors, wholesalers and retailers.

The role of various warehouses is very important in case of ground nut as the crop is mostly a kharif crop and has to be stored throughout the year for continuous production. However, most of the use of locally value added products of ground nut i.e. nut chikki, roasted nuts etc are liked most during winters.

Pre Intervention Value Chain: Groundnut

Pre-intervention value chain map: Ground nut



5.3. Alternative Systems of Marketing²³

5.3.1. Direct Marketing²⁴

There is currently no system of direct marketing because of absence of any community institution infrastructure. But eventually, there is scope for direct marketing through FPC/ FCSC.

5.3.2. Contract Farming

Contract farming in case of Ground nut has very little potential as there is abundant arrival of the crop during harvesting season and most of the mandi arrivals. Hence most processors prefer procurement from APMC. Procurement of Ground nut by government through NAFED at MSP is an example of indirect contract farming where the government assures a minimum support price. It procures Ground nut directly from farmers at MSP for government. Gujarat has the largest share in MSP procurement of Ground nut and NAFED has a target of procuring around 210000 MT of ground nut. The MSP for ground nut with shell for 2017 is at Rs 4450/qtl including a bonus of Rs 200 per quintal. RAJFED in Rajasthan also undertakes procurement of ground nut at MSP. The MSP for 2015-16 was Rs 4030 and that of 2014-15 was Rs 4000 per quintal. The state government has planned to open 29 centres for procurement of ground nut in the Kharif season 2017. For easy procurements, applications can be submitted online at E-Mitra centres. Payment will be made directly into the accounts of farmers by linking them with their Bhamashah cards. The arrangements for the storage will be done by Rajasthan State Warehousing Corporation and Central Warehousing Corporation.

5.3.2. Private market yard

Ground nut in shell is listed in NCDEX for trading two major companies from Rajasthan like Star Agri Warehousing Ltd. and CGR Collateral Management Ltd. have taken licenses to operate their warehouses as Private Market Yard. CGR is also a signatory of MoU with State Government of Rajasthan during GRAM, Kota and is keen to work with project farmers for offering their warehouses as Private market yard near to production centres from where farmers can store and sell their produce without going to Mandi. They are also offering 75% loan against warehouse receipt of ground nut to farmers.

²³ <http://eagri.tnau.ac.in/eagri50/AECO242/pdf/lec03.pdf>

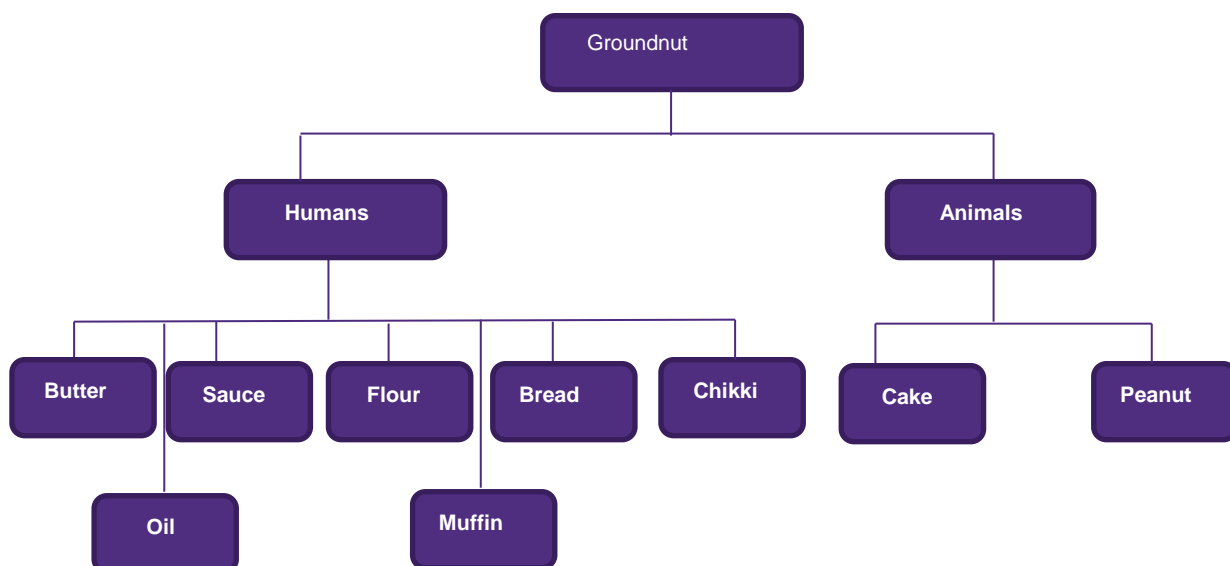
²⁴ <http://shodhganga.inflibnet.ac.in/bitstream/10603/25033/20/8.4.%20agro%20marketing%20strategies%20for%20western%20rajasthan.pdf>

Chapter 6. Processing Infrastructure Availability and Utilization

6.1. Processing

Groundnuts especially those produced in the developing countries have been used traditionally since the origin of humanity. It is rich in oil and protein and has a high-energy value. In most of the developing countries kernels are used for oil extraction, food and as an ingredient in confectionery products. Following extraction, the residual cake is processed largely for animal feed, but is also used for human consumption.²⁵ Following is the process of production of various processed products from ground nut.

Figure 20 Groundnut for Human & Animal



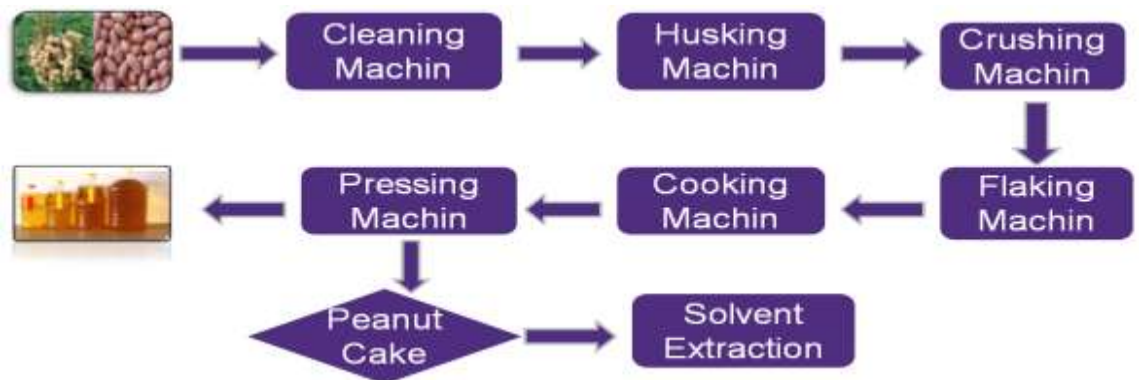
a. Groundnut Oil

- Cleaning device: Remove the various impurities in peanut/groundnut, such as: iron, stones, clump, such as the plant leaf, clean up till impurity content does not exceed 0.2%.
- Crushing machine: In order to meet the requirements of crushing, peanut should be broken into small pieces.

²⁵ <http://www.fao.org/3/a-av005e.pdf>

- c. Softening machine: The purpose of softening is to adjust the moisture and temperature of oil, and make it soft.
- d. Flaking process: Rolling raw material into flakes, and the purpose is to increase surface area, destroy the peanut cell tissue, shorten the way of oil out from cake.
- e. Cooking machine: Use steam cooking, inject direct steam and cook the flakes to meet the requirement of oil press.
- f. Pre-press: Press the flakes to leave about 16%-18% in the cake. The cake will go to solvent extraction workshop. - See more at: ²⁶

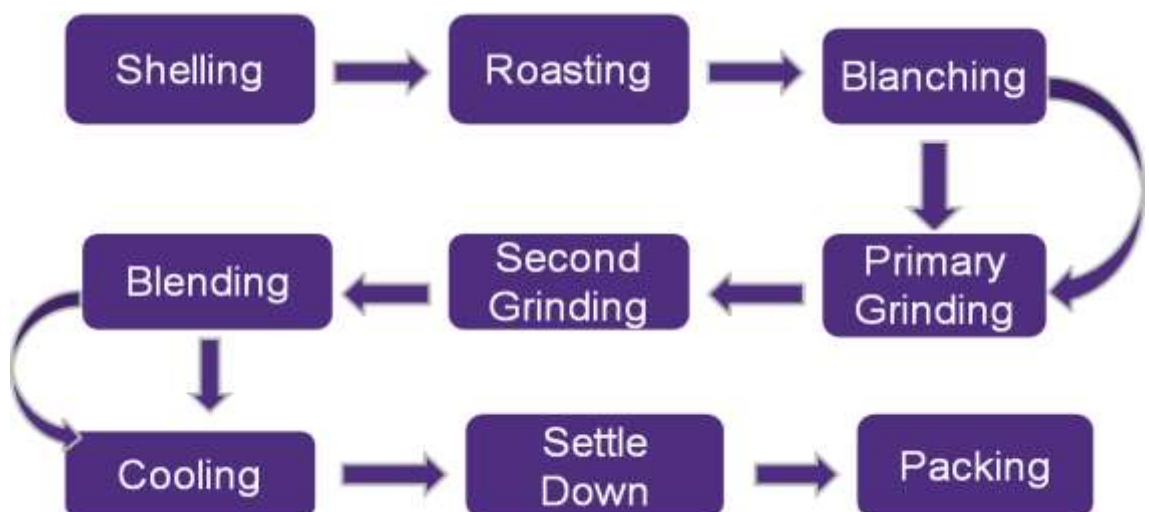
Figure 21 Groundnut Oil Processing



b. Peanut Butter

Peanut butter is not only rich in vitamin A, vitamin E, protein and trace elements, but also contains a large number of single unsaturated fatty acids, which can reduce body's cholesterol levels and the risk of heart disease. In addition, a Harvard University study proved that women who regularly eat peanut butter and nuts, less likely to develop diabetes. Furthermore, since the peanut butter is nutritious, good taste, convenient consumption for different gender and age groups, its products favored by customers, the market prospect is broad.

Figure 22 Peanut Butter Processing



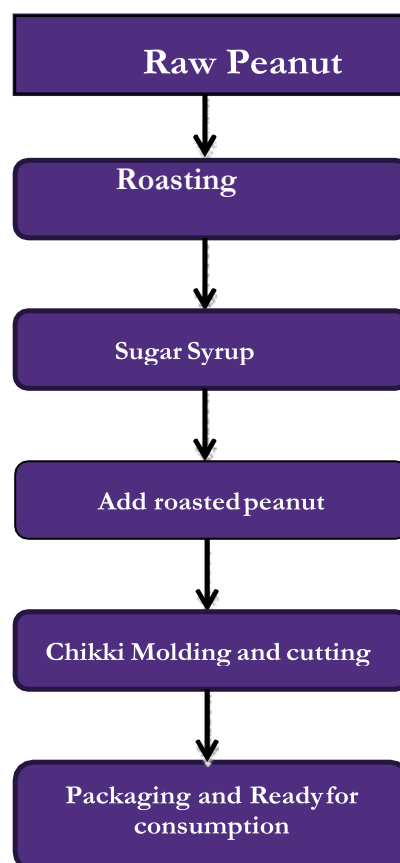
²⁶ http://www.doingoilmachine.com/PRODUCTS/Pretreatment_Press_Process/peanut_oil_press_production_line_396.html#sthash.zhpAijNK.dpuf

The peanut butter processing line developed and launched by AGICO is according to market demand and controlled by electricity. One independent of fully automated peanut butter line process should be like this: raw materials-pick stone-shelling, baking-cooling-picking-grinding-mixing-cooling-degassing-filling. This device can produce a variety of peanut butter, for instance stable peanut butter, creamy peanut butter, salty peanut butter, sweet peanut butter and other peanut butter. We are able to produce peanut butter line with different capacity in accordance with customers' needs and requirements.²⁷

c. Chikki

Chikki is manufactured, as per regular conventional method in which peanut are first roasted and skin is peeled out by hand rubbing then concentrated sugar syrup is added in grounded peanuts. Then this mixture of sugar syrup and peanuts are placed in moulding tray when it is still hot small pieces are made with regular knife.

Figure 23 Chikki Processing Flow



²⁷ <http://www.peanutbuttermachines.com/Peanut-Butter-Making-Machine.html>

6.2. Stakeholder's Share in Consumer Rupee

The price spread along with margin at every stage of value chain starting from the farmer till retailer is shown in the table given below.

Table 28 Price spread table: representative value chain Ground nut oil

Activity	Value per Quintal (Rs.)	Stakeholders share over consumer rupee in %
Retailing: Sale by retailer to consumer	About Rs. 16022 per quintal which makes a profit margin of 10%	9%
Wholesaling: Sale by wholesalers to retailers	Rs. 14565 per quintal with a margin of 5%	4%
Secondary processor to distributor: Sale of oil after processing to wholesalers (Processor gets 50% oil, rest oil cake)	Rs. 1387 per quintal (Gross value on sale with gross profit margin in processing 20%).	43%
Primary processor to secondary processor: Realizes 70% of ground nut after de shelling, supplies to further channel (Oil millers, distributors)	Rs 6936 (Includes Rs 250/quintal as de shelling and 30% weight loss after conversion into ground nut)	16%
Wholesaler to primary processor	Rs 4567 (Incl of 6% aadat)	2%
APMC trader to Wholesaler: Sale upon trading at mandi	Rs 4680 per quintal (1.6% mandi tax, 0.4% handling charge and 2% agent commission).	1%
Farmer to APMC trader: Production: Cost of production is Rs. 43,000 per acre	Rs. 4,500 per quintal (Gross value on procurement at Rs. 4500; net value accrual to producers after cultivation costs is Rs. 2957 per Quintal)	25%

6.3. Price build up & Marketing Efficiency Analysis

The price spread and values accrued to stakeholders across the chain as shown in reflects the profit margins accrued to different stakeholders. Much of the value accruals are accrued to processors and retailers. Producers' incomes are apparently dependent on yield only.

Due to limited infrastructure facilities at the dispersal of various stakeholders, marketing efficiency is adversely affected. The price spread of ground nut is highest in case of ground nut oil. In such case, the farmers' share to the consumer rupee is around 25%. The share of traders is 1-3 % depending upon his nature of trade i.e. whether APMC trader or stockist. The share of primary processor is 16%, Secondary processor is 43%, wholesaler-4% and retailer is 9% over the consumer rupee. However, net margins for processors would not be higher than 5% due to process losses and increasing cost of production.

6.4. Consumer preference analysis

The use of ground nut is wide spread. The lower end products are Roasted ground nut with shell and are a favourite past time for both urban and rural consumers in India. People love to de-shell the roasted pods using their hands. The sale of roasted nut along with shell could be found almost at all public places including buses, trains etc. The sale of this nut is associated with the livelihoods of many such street vendors who sell them in trains and buses and across stoppages during transit. Ground nut biscuits mixed in combination with is a favourite sweet during winter season in North India. Most of the products of ground nut except oils and packaged nuts are not required to have any brand value and people prefer to purchase them from street vendors or those produced by small/micro enterprises. However, with the rise in consumerism, the demand for packaged and branded ground nuts either roasted and salted or fried and salted or a mixture of fried pulses and fried ground nuts is on the rise. As per CGR survey, the market for Ground nut is stagnant in India as it is growing at 1%. However, the market is so vast that every player can enjoy a small share in the large market.

For oils segment, consumers however prefer branded products. Some of the major brands are Fortune, Natraj, Patanjali, Dhara and Vimal. Now a days, the plastic pouches of 1 L pack are more popular along with the five liter packs in ground oil.

Generally, large uniform size grains are used for direct consumption. Medium sized ground nuts are used for as food additives or for preparing snacks. It is the small and damaged nuts which find their way into processing. The processors try to procure nuts at the lowest cost to reduce the cost of production.

Chapter 7. Existing Institutional support and infrastructure and facility

7.1. Support at cultivation stage

A range of support institutions support value chain activities as described below.

7.1.1. Department of Agriculture, Govt. of Rajasthan:

The department has various verticals through which it supports production, productivity and market linkage in the state. It has a well-established structure and network of State/District and panchayat level officials to provide extension services to farmers. The department issues licenses to various agri-input marketing companies including seeds, fertilizers and insecticides and ensures quality assurance to farmers through regular reporting from suppliers and random quality checks of agri inputs. The licenses are issued first at the State level by registering input/service providers. The registered companies can only supply inputs to district and regional level distributors who in turn make availability of the products at the retailers. All handlers of agri inputs and produce have to take license from competent authority either at district or state level. Similarly, the department also issues mandi licenses for traders at different APMCs for trading in specific commodities. The same are described below.

A. Extension vertical:

- **Extension support:** The extension wing recommends good agricultural practices for various crops as per various agro-economic zones, promotes seed replacement through distribution of Minikits containing improved variety of seeds. It also provides grant support of upto 50 percent of the price of notified varieties of less than 10 years or Rs 1500 per quin whichever is less. For hybrid varieties subsidy is - 50% of the price of seeds notified for less than 10 years or Rs 5000 per quin whichever is less. The department also provides upto 50% subsidy on micro-nutrient (50% of total cost or upto Rs 500/ha) and bio-fertilizer application (50% of total cost or Rs 300/ha) under various schemes viz. National Agriculture Development Scheme/ National Composite Safety Mission/ National Food Security Mission. The application can be submitted to the office of Agriculture Supervisor-Asst. Agriculture Officer/ Asst. Director (Extn.)/ Dy. Director (Extension) by eligible farmers at Panchayat/Sub-district and District level respectively. Under the head “Subsidy on Crop Demonstrations”, subsidy upto Rs 7500/ha is available for Ground nut cultivation through flagship programs like State Plan/NFSM.
- **Seed Mini kits:** Mini kits distribution is taken under State plan, National Mission on Oilseed and Oil palm and National Food Security Mission. Minikits are distributed to

farmers on the basis of priority to Schedule caste, Schedule tribe small, marginal and below poverty line farmers. 10% of total cost of minikit will be charged as token money from the farmers.. Minikits are given to Women farmers even if land owner is her husband/father/father in laws. One minikit is given to only one woman in a family. If in a Gram Panchayat, Schedule caste and Schedule tribe farmers are not available or negligible then only minikits are to be distributed to general category women farmers. Minikits are distributed to those farmers who were not benefit during last three years. Priority will be given to those farmers having irrigation facilities.

- **District level farmer help desk:** Under this head, farmer help line are established at district level with nominated district level officials from the office of Dy. Director, Agriculture Extension to support farmers on various farming related problems. Apart from this, a state level help desk is also maintained whose telephone no is 0141-5102578
- **Agriculture information dissemination:** At the state level, technical dissemination is being done through the daily newspapers, agricultural papers, monthly publication of "Kheti Ri Bataan" bulletin is also being done. Apart from this, information about advanced agricultural methods of major crops during crop season, publishing posters, agricultural guides on various topics, and Rabi / Kharif package of practice books at the block level and farmers, people's representatives and farmers by producing farmer friendly literature. Is being distributed to the institutions related to. From day-to-day basis to all the radio stations of the state, from 7.45 to 8.15, share the information related to farming and phone in these programs is being broadcast on Tuesday, Thursday and Saturday. The program is being sponsored by the Department of Agriculture on Monday, Tuesday and Wednesday for three days a week. "Farming" program on Doordarshan- produced by the Agriculture Department, is broadcast from Doordarshan Kendra, Jaipur on every Thursday from 7.30 am to 8.00 pm. In this program, information about departmental schemes / programs being executed by the Agriculture Department, discussions with experts, problem-solving, confusion-solving, fortnightly work, message, success stories, innovation, short films, eclipse etc. The tax program is made simple, interesting and farm-making. The technical information on agriculture and related subjects to the farmers has been done by the Indian government to provide "Kisan Call Center" in the state through telephone. Farmers can get any kind of information related to farming by making free calls to phone number 1800 180 1551/1551, from basic / mobile telephone to 6.00 pm to 10.00 pm.
- **Water use efficiency promotion:** Under the Farm Pond Program, rain water harvesting is promoted with the provisioning of 50% subsidy or maximum amount of Rs 52,000/- on raw farm pond and Rs 75,000/- on farm pond with plastic lining whichever is less. This scheme is available under the Rashtriya Krishi Vikas Yojana.

For Dighi construction (under National Agriculture Development Scheme/RKVY), 50% of the unit cost or 350 / - per cubic meter filling capacity and 50% of the cost of the unit cost, on the construction of plastic lining (raw) diggings, by constructing a minimum of 4.00 lakh liters of Filler capacity and more than 50% of the unit cost. The amount of rupees 100 / - per cubic meter will be filled up or maximum Rs 2.00 lakh, whichever is less the grant will be payable.

For Water Houze construction under the national Agriculture Development Scheme, support is provided for areas where deep water is used for irrigation. For constructing a minimum of one lakh liters of Fill Capacity water shed Houz for all categories of farmers, 50

percent of the unit cost or Rs. 350 / - per cubic meter fill capacity or maximum Rs. 75000 / - whichever is less is the subsidy element.

Under the irrigation pipeline head (of National Agricultural Development Plan, National Food Security Mission, NMOP) water use efficiency is promoted for irrigation water. Under this scheme, PVC / HDPE of prescribed size for carrying water from source to farm on irrigation pipeline is supported. On the purchase of pipes, the farmers of all categories are given 50 percent of the cost or maximum amount Rs. 50 / - per meter on HDPE pipes or Rs. 35 / - per meter on PVC pipe or Rs. The maximum amount of Rs.15000 / - on the 20 / - per meter HDPE laminated le-flat tub pipe will be payable, whichever is less proportionate.

Under the Fountain Irrigation program through National Food Security Mission; Pulses and Wheat - Under the Fountain Irrigation Program, subsidy is 50% or the amount is Rs. 10000 / - per ha, whichever is less.

Under the Mobile Raingun support program, for irrigation of grains and pulses crops, subsidy of 50 percent of the cost under the Mobile Renganization program or Rs.15000 / - per unit whichever is less, grant is payable. This subsidy is available under the NFSM scheme

- **Agricultural equipment grants distribution program:** Grants upto 40 to 50 per cent are given as per the category of farmers on the purchase of approved agricultural machinery viz. Seed cum Fertilizer Drill, Plow, Thresher etc.
- **Gypsum distribution program:** 50% Subsidy is given to farmers on district wise rate of Gypsum for maximum area of 2 hectares. This support is for soil reclamation of alkali soils.
- **Plant protection inputs:** Segment, viz. Plant Protection Chemicals / Bio Agents / Bio Pesticides / Pheromone Trap / Liyos Distribution, including weeds in crops; 50% of the price or Rs. 500 any less per hectare is payable as subsidy.
- **Plan Protection equipment segment:** Human transport * (napsek, foot sprayer, duster etc.) are given 40-50 percent of the cost or maximum 600-800 / - Per device as subsidy. Under Power Drives egment * (Nepasek Power Sprayer) are given 50-60 percent of the price or maximum 3000-3800 / - Per device. For tractor mounted sprayers, 50% of the price or Rs 10,000 per device is subsidized. These schemes are as per targets allotted for respective districts.
- **Assistance for area specific integrated farming systems** like livestock based, horticulture based and tree based farming systems: Assistance is provided for farmers of selected village/cluster having land from 0.25 to 2 ha area per farmer. It is implemented on cluster basis with 100 ha of land. Subsidy applicable is: 50% of cost or 52500/-for farm pond, 50% of cost or 468/-per SQM for green house, 50% of cost or 30/- per SQM for low tunnel, 40% of cost or 800/-per colony for bee keeping, 50% of cost or 15000/-for diesel pump, 50% of cost or 50000/-for vermicompost unit Pucca @ 125/ per cubic ft, 50% of cost or 8000/-for HDPE vermi bed
- **Organic production:** Organic ground nut also has a great potential. For support under the head, Promotion of Organic Farming, subsidies are available for heads like Conversion of land Cropping systems and organic seeds, traditional organic input production unit, botanical extracts production unit, use of phosphate rich organic manure, construction of vermicompost pit, use of liquid bio fertilizer and support for packing labelling and branding material support are subsidized for consecutive two years at a rate specified in the manual.

- **Prime-minister Crop insurance scheme:** Farmer have to pay 2% of insured amount in Kharif, 1.5% of insured amount in Rabi and 5% of insured amount in horticulture & commercial crops, subject to maximum of 7 hectares per farmer. Rest of the premium amount will be borne by central and state government in equal ratio. Beyond 7 hectares, farmer has to pay whole premium amount, i.e. without any subsidy. **Weather based Crop Insurance Scheme (WBCIS):** The WBCIS is based on actuarial rates of premium but to make the scheme attractive, premium actually charged from farmers have been restricted to at par with NAIS. Kharif season groundnut is covered under the scheme.
 - **Soil health card:** Under this, component, district level soil and water testing labs support farmers on soil testing and providing soil health card for integrated nutrient management.
- B. Rajasthan State Seed Production and Certification agency** helps in ensuring production of certified seeds for farmers. The department is mandated to; Recognize varieties eligible for Seed Certification and annually publish lists indicating the names of such varieties, Maintain a list of sources of Breeder & Foundation seeds approved by the Central Seed Certification Board, Outline the procedure for submission of application for growing, harvesting, processing, labelling and tagging of seeds intended for certification, Undertake inspection of seed fields, seed processing plants and lots in accordance with the procedures outlined by the Central Seed Certification Board in accordance with Indian minimum seed certification standard (IMSCS), Regulate the processing of seeds at seed processing units and Ensure that the seeds certified by it conforms to the standards prescribed by the Central Seed Certification Board. Thus the department ensures availability of quality seeds for growers.
- C. Rajasthan State Seeds Corporation** helps availability of quality seeds at affordable prices through the cooperative network and private distributorship channel under the trade name “Raj Seeds”. During Rabi and Kharif seasons Rajseeds are made available at the door steps of the farmers through Beej raths operating at almost every panchayat samitee of the state.
- D. Rajasthan Kisan aayog (Rajasthan State farmer Commission):** It is mandated to Investigate and review of agriculture and allied sectors, keeping in mind the economic ecology and environment for sustainable development of agriculture and To inform the State Government for taking necessary measures to solve timely problems of agriculture, animal husbandry and fisheries, so that farmers can be protected against difficult situations, Talk to different farming organizations / associations to make the government aware of their demands and suggestions and To bring the difference in demand and supply to the attention of the State Government, so that its adverse effects are not on the peasantry.
- E. State Agricultural Management institute (SIAM), Durgapura Jaipur:** The institute is mandated to organize training programmes on functional areas of Agriculture and its allied sector namely; Induction courses on fresh recruitees, Refresher courses for in service officials, Crop production technologies, Management of Technology and Input, Irrigation Management, Dry land Farming, Crop Economics, Extension technique, Communication skills, National Workshop / Seminars etc.
- F. Agricultural Conservation Testing Centres (ATCs):** The department of Agriculture has ten ATCs who are mandated to find out the usefulness of the research recommendations received from the agricultural research centres under the agricultural universities of the state in various agricultural and regional conditions and local conditions and to amend the tests in the research recommendations according to local conditions. On the basis of the tests, preparations of agricultural climatic package of practice and amendment of the advanced agricultural methods

are amended. Apart from this, the agri-certified testing centres also solve the technical problems in the day-to-day work of the extension workers.

7.1.2. ICAR and allied institutions:

The Indian Council of Agricultural Research (ICAR) is an autonomous organisation under the Department of Agricultural Research and Education (DARE), Ministry of Agriculture and Farmers Welfare, Government of India. The Council is the apex body for co-ordinating, guiding and managing research and education in agriculture including horticulture, fisheries and animal sciences in the entire country. With 101 ICAR institutes and 71 agricultural universities spread across the country this is one of the largest national agricultural systems in the world. The ICAR has played a pioneering role in ushering Green Revolution and subsequent developments in agriculture in India through its research and technology development that has enabled the country to increase the production of food grains by 5 times, horticultural crops by 9.5 times, fish by 12.5 times, milk 7.8 times and eggs 39 times since 1951 to 2014, thus making a visible impact on the national food and nutritional security. It has played a major role in promoting excellence in higher education in agriculture. It is engaged in cutting edge areas of science and technology development and its scientists are internationally acknowledged in their fields.

State Agriculture Universities (SAUs):

The state four major Agriculture Universities namely; 1. Swami Keshwanand Rajasthan Agricultural University, Bikaner, 2. Maharana Pratap University of Agriculture and Technology, Udaipur, 3. Sri Karan Narendra Agriculture University, Jobner, 4. Agriculture University, Kota and affiliated colleges who contribute to research, education, training and knowledge dissemination on agriculture technology. The Agriculture Universities also provide research and extension support through attached Krishi Vigyan Kendras and Agriculture Research Stations.

Following are the varieties of Ground nut developed by various Agriculture Universities in Rajasthan.

Name of university	Variety of seeds developed
SKRAU Bikaner	It is addressing critical issues of the farmers for sustainable development of agriculture in the state through 36 All India Coordinated Research Projects with a contingent of 172 scientists working at 7 Research Stations and 8 Research Sub-Stations covering 7 agro-climatic zones spread over 21 districts of the state. Development of improved varieties having quality traits are of paramount importance for enhancing crop production. In this direction two varieties of groundnut (RG 425 and HNG 69) have been developed by the university.

Note: Much research has been done in the field of ground nut seeds but the same should reach to the farmers for their benefit. Research institutions should also therefore focus on commercialization of the varieties introduced by them so that private firms can take up their distribution.

Krishi Vigyan Kendras;

The State has 42 Krishi Vigyan Kendras affiliated through ICAR. The mandate of the KVKs is to: 1. Organize Frontline Demonstrations (FLDs) to establish production potential of various crops and enterprises on farmer's field (Facilitate technology dissemination from Lab to field) 2. To conduct on farm testing to identify the location specificity of agricultural techniques under various farming

systems, 3. Organize need based training to farmers on agri and allied activities, 4. Production and supply of good quality seeds and planting materials and various farming products to the farming community and 5. Work as resource center of agricultural technology for supporting initiatives of private, public and voluntary sector for improving agricultural economy of the district. The KVKs also offer soil testing facilities to farmers.

Agriculture Research Stations: Apart from the above, there are several agriculture research stations and sub-stations attached to the universities to undertake research/trial and demonstration of agriculture technologies.

Central Arid Zone Research Institute (CAZRI): To arrest this degradation process and for scientific and sustainable management of the resources, Desert Afforestation Station was established in 1952 at Jodhpur. This was later expanded into Desert Afforestation and Soil Conservation Station in 1957, and finally upgraded to Central Arid Zone Research Institute (CAZRI) in 1959 under Indian Council of Agricultural Research, New Delhi. The CAZRI operates through Six Divisions, located at the headquarters in Jodhpur. There are four Regional Research Stations located in different agro-climatic zones to work on location-specific problems.

7.1.3. Credit facilities: Agricultural credit facilities in the state has both formal and informal sources. Under the formal sources, various banks are extending credit facility at subsidized interest rates under KCC schemes for farmers having land title. The Gram Seva Sahakari Samitis run by Cooperative Department also extends crop loans to farmers. However, as many farmers live in hindu-undivided families, i.e. land title is still with father and sons undertake farming in their share of land as mutually agreed in the village panchayat. In such cases, getting a formal source of crop loan is difficult. Hence many farmers resort to informal sources of loans from village level money lenders at exorbitant rates and exploit them later by forcing to supply the produce also through the money lenders.

7.1.5. Agri input availability: A number of input service providers (in seeds, fertilisers and pesticides) operate in the important Ground nut producing clusters of Jaipur, Bikaner and Ganganagar districts. They are registered through the office of Dy. Director, Agriculture Extn. Of respective districts.

7.1.Support at post-harvest stage

Following are the major support institutions for post-harvest handling of agriculture produce in the state.

A. Department of Agriculture marketing (DAM): The department offers upto 50% subsidy on various sorting/grading machines as specified in the circular dated 19/07/2017.

B. Post-harvest storage: Department of Agriculture provides subsidy for metal storage bins to farmers. Apart from this, following storage infrastructure is available in the state.

- **Rural Godowns:** There are 139 rural godowns in Rajasthan which stores mustard, gram, wheat, bajra, gaur, soybean, groundnut etc. The list of godowns in Rajasthan that store Ground nut is attached in Annexure-4
- **Central Warehousing Corporation²⁸:**
The Central Warehousing Corporation (CWC) is the largest public sector warehouse operator with their godowns established in almost all the states of the country. At present, CWC have already established and operating more than 450 warehouses with a capacity of 93.25 lakh

²⁸Farmers' portal, CWC Link (http://farmer.gov.in/CWC_Link.aspx) (retrieved on April 9,2017)

tonnes (as on 29/02/2004). These are scientifically constructed warehouses which facilitate the farmers to store their produce safely and to derive the benefit of pledge finance during the period of glut situation in the markets. (Annexure - 2 List out CWCs in Rajasthan)

- **State Warehousing Corporation:**

State Warehousing Corporations (SWCs) were established in different states under the purview of concerned state governments and constructed godowns at distant places. The total share capital of SWCs is contributed equally by CWC and concerned state governments and SWCs under dual control. The SWCs also provide storage facilities for green gram. (Annexure – 3 Lists of SWCs in Rajasthan)

C. Market information through Agmarknet:

The Directorate of Marketing and Inspection (DMI), an attached Office of the Department of Agriculture, Cooperation and Farmers Welfare under Ministry of Agriculture & Farmers Welfare, was set up in the year 1935 to implement the agricultural marketing policies and programmes for the integrated development of marketing of agricultural and other allied produce in the country with a view to safeguard the interests of farmers as well as the consumers. It maintains a close liaison between the Central and the State Governments.

The Directorate is headed by Agriculture Marketing Adviser to Government of India and has its Head Office at Faridabad (Haryana), Branch Head Office at Nagpur (Maharashtra) and 11 Regional Offices at Delhi, Mumbai, Chennai, Kolkata, Hyderabad, Chandigarh, Jaipur, Lucknow, Bhopal, Kochi and Guwahati and the Central Agmark Laboratory at Nagpur²⁹

D. Support on agri produce marketing through APMCs:

The state has 136 Krishi upaz mandi samitis (KUMS) and 310 market sub yards for trade of agriculture commodities. Among them, grain mandis in Jaipur, Ganganagar, Bikaner, Hanumangarh, and Sikar are major grain mandis in the state as far as Ground nut is concerned.

These APMCs are intended to be responsible for:

- Ensuring transparency in pricing system and transactions taking place in market area;
- Providing market-led extension services to farmers;
- Ensuring payment for agricultural produce sold by farmers on the same day;
- Promoting agricultural processing including activities for value addition in agricultural produce;
- Publicizing data on arrivals and rates of agricultural produce brought into the market area for sale; and setup and promote public private partnership in the management of agricultural markets

E. Support on post-harvest value addition: The Farm Gate Agro processing and Agri-marketing scheme of Govt. of Rajasthan has provisioning for subsidy upto Rs 20 lakh for a sorting/grading/ value addition project of Rs 50 lakh. Ministry of Food Processing, Govt. of India also has a scheme in the name of Kisan Sampada (Backward & forward linkage scheme) through which there is a provisioning of 35% subsidy for Farmers/Farmer Groups for establishing value addition facility for agri produce.

²⁹ Agmarknet (<http://agmarknet.gov.in/>) (retrieved on April 9,2017)

Chapter 8 Gap & Constrains Analysis

8.1. As Perceived by Producers and others Stakeholders

Producer case illustration

A typical farmer has about 2 ha land holding. About 1 ha is deployed to Groundnut production as single harvest. The variety opted is Gajraj. The gross yield is 30 quintals per ha. The market rate of the sale is about Rs. 4000 per quintal Rs. 120000 per ha. The cost of cultivation is about Rs. 58000 per ha. Net realization per acre is about Rs. 60800/ha. Out of this about Rs.8000 is cost of land preparation, seed cost is about Rs. 20000, fertilizer and pesticide cost is about Rs. 10000 per ha, weeding related (labour cost) is about Rs. 3000, watering cost Rs 2000, Harvesting cost Rs 10000 and Thrashing cost Rs 5000. Apart from these, the farmers spends Rs 1200 in packaging the produce in 50 kg gunny bags and transporting it to the mandi The fluctuation in prices of Groundnut is between Rs. 3300 to Rs. 4800 in a year. The crop gives a net profit of around Rs 2027 per quintal.

Some constraints are; White grub attack is a major threat to the crop and can damage 50-60% to the entire crop if infested. At the time of sowing, a sudden increase in seed price is observed often which hamper the margins of the farmer at the later stage. As there are many seed suppliers in the market, sometimes farmer gets confused what to buy and sometimes there is very little germination which leads to re-plough the field.

Processor case illustration

Chittor Oil Mill is the only groundnut oil mill in the entire region and owned by Mr. Shyam Agarwal. It processes and sells groundnut oil with the brand name "Chittor Marka". Chittor oil mill was incepted in year 1981 by Mr. Agarwal and It has shown significant growth over the years and in last financial year they booked turnover of Rs. 6 crore with the profit margin of 2%.

Groundnut is procured from Fathehnagar, Nimbahera and Neemuch APMCs. Groundnut is procured from Jodhpur APMC through commission agents. Normally commission agents earn 1.5% as a margin. Transportation cost is around Rs. 100-120/quintal. It is difficult to procure directly from farmers as farmers are not professional and won't be able to supply same kind of quality throughout the year. There is a huge demand in the market but due to shortage of raw material it is not getting possible to fulfill their need therefore they are able to function the machines only for 6 to 8 months in a year. Also due to fewer margins, the business does not appear as viable and has fewer competitors in the market.

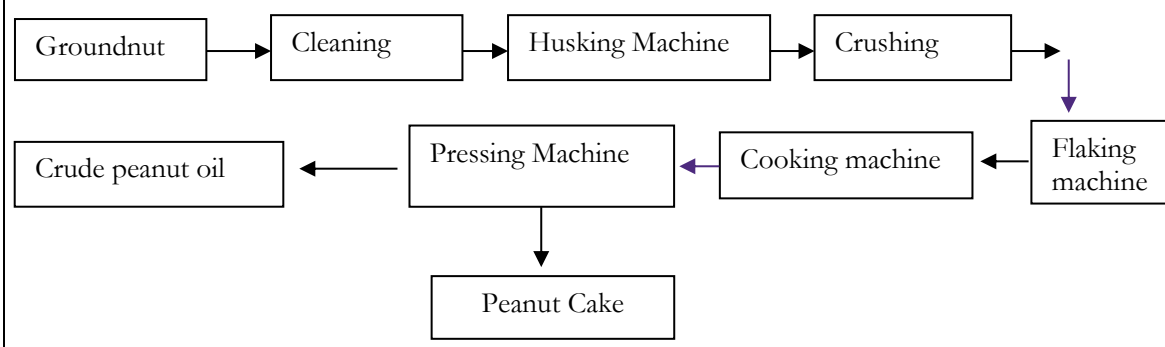
He also explained the parameters which affect the quality of the groundnut-

1. Thickness of shell
2. Amount of mud over the groundnut
2. Oil percentage

Normally 32% of oil content is available in groundnut. The unit runs for 12 hours every day and mills 5-6 ton per day and produce 1.5 MT groundnut oil, 2MT of oil cake and rest as waste. The

processing cost comes about Rs 100/ quintal. Selling price of oil cake is Rs.20-30/quintal. There are two kinds of packaging Material viz. tin bottle of 15 liter capacity that costs around Rs. 55-70 per bottle and that of 1 liter of bottle that costs around Rs. 3-4 per bottle. The bottle of one litre (910 gms) oil carries price tag of Rs. 130. At present, they are supplying at the district level only and have selected clientele.

Oil extraction process flow chart-



8.2. SWOT analysis of the indicative Value Chain of Green Gram

Strength	Weakness
<ul style="list-style-type: none"> India ranks 2nd in production of Groundnut with global contribution of 17.40%. Rajasthan stands 4th in India contributing to 9.3% share in total production It is an important oilseed crop suitable for cultivation in tropical climate and is the third largest oilseed produced in the world. It is also a rich source of thiamine, riboflavin, nicotinic acid, vitamin E and all B vitamins except B12. Groundnut is consumed in mainly two forms. The kernels are widely used for table purpose as a snack and in the manufacturing of ground nut oil. The oil cake obtained after the extraction of oil is used as animal and poultry feed as well as an organic fertilizer and also for fuel purposes. The shell of Ground nut is used to prepare card board. It is also used in husk power plants in Rajasthan. 	<ul style="list-style-type: none"> Groundnut is vulnerable to attack by Aspergillus flavus fungus, which produces Aflatoxin Inadequate infrastructural facilities with producers, traders, millers and at market level results in marketing inefficiencies Limited processing facilities for groundnut near the cluster and its by-products such as groundnut oil units, roasted groundnut units, etc. Inadequate grading, sorting and processing facilities around the clusters. The production of the crop is seasonal. Thus, adequate storage facilities are required. Large number of intermediaries in the chain leads to low producer’s income. Highly labor intensive processing Obsolete techniques are used in processing, which reduces output. Lack of market information regarding prevailing prices, arrivals etc. force farmers to sell in the village itself.
Opportunity	Threat
<ul style="list-style-type: none"> Reducing cost of cultivation through FPCs by undertaking joint input 	<ul style="list-style-type: none"> Adverse climatic conditions impact crop production and productivity

<p>sourcing activities for seeds, fertilizers, pesticides, etc. under the umbrella of PC</p> <ul style="list-style-type: none"> • Scope for establishment of quality sorting, grading and storage facilities by PCs as part of Farmers Common Service Centre (FCSC), along with facilities for packaging and vehicle to facilitate transportation. • Scope for tie up of FPOs through PC with firms like Fortune, Dhara, Nature Fresh, Sundrop, etc. • Scope for tie up of PCs ground nut processing associations/MSME firms • Scope for facilitation of start-ups from amongst FPOs or individual entrepreneurs, in secondary processing of value added products of groundnut like oil, paste, powder, butter, DOC, etc. • Promotion of good agricultural practices with regard to planting, harvesting, use of inputs, disease management, pest control, etc. through FCSC • PCs to also undertake custom hiring services and hence lead farm mechanisation through PC 	<ul style="list-style-type: none"> • Abrupt or less rainfall during various developmental stages of groundnut may reduce production or cause pest/disease attack
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8.3. Key constraints in Ground nut crop:

The constraints observed under Ground nut are divided under from different categories, viz Production related constraints, Post-Harvest related constraints and Processing and market infrastructure related constraints.

8.3.1. Production related constraints: Ground nut is a major water consuming crop and requires 6000 Cubic Meter. In case of poor rainfall, farmers have to provide additional irrigation which may increase cost of cultivation. White grub as another major challenge in ground nut cultivation. Sometimes the entire crop gets damaged due to this infestation. Ground nut is a labor intensive and high risk crop for farmers due to high investment in land preparation, inputs and harvesting. Farm mechanization is limited upto land preparation. Harvesting operations have to be done manually. Temperature is a major environmental factor that determines the rate of crop development. Temperatures above 35°C inhibit the growth of groundnut. Poor cultivation practices are also a major challenge and farmers are not aware of proper nutrient and pest management. Understanding of nutrient availability in soil is very limited and farmers have to resort to high doses of fertilizers.

8.3.2. Post-Harvest related constraints:

Aflatoxin contamination is the major challenge in post harvest management of ground nut. This is a major concern area for ground nut processors. This is mainly because of poor post harvest handling like harvesting un-matured pods, less drying of pods etc. The storage facility for farmers is there at all APMC level and additional warehouses are available in the area through private interventions. However, a community storage structure at village level would help with better storage efficiency for

the farmers. it is also being noted that, most of the storage structures in APMC have been under control of traders and are out of reach of farmers or farmers are not aware on their availability.

8.3.3. Processing and market infrastructure related constraints:

Processing of Ground nut involves high volume and investment in working capital which is out of reach of common farmers. They therefore sell ground nuts in shell and therefore earn less. At the FPO level, farmers can at least undertake splitting of Ground nut for onward supply to the large processors and can earn higher margins on the same.

Lack of market intelligence services: Farmers do not receive information on market prices. Some farmers sell crops through village level traders, because due to which they are not realising fair price.

Lack of primary processing infrastructure:

- i. There is a non-availability of facilities for primary processing: cleaning, grading & sorting at the farm level.
- ii. There is no practice and provision of producer level storage.
- iii. There is acute lack of awareness among farmers regarding FAQ (Fair Average Quality) standards.
- iv. Farmers do not practice the usage of basic equipment like moisture meter and weighing machine.

Distant markets: Due to the distance of APMC from farmers field, they resort to sell the produce to traders at non-competitive prices.

Speculation: Generally during harvesting period, prices are on lower side and reach highest after 5-6 months of harvesting. However, farmers do not have any option but sell immediately at lower prices as they need cash to meet out their expenses. They could realize higher price if they can hold the stock for 2-3 months. However, the situation in Ground nut has become even more complex as the prices have been below MSP.

Malpractices in markets: Many malpractices prevail in the markets of Ground nut i.e. excess weighment, delay in payment, high commission charges, delay in weighing and auction, different kinds of arbitrary deductions for religious and charitable purposes etc.

Infrastructure facilities: Due to inadequate infrastructural facilities available with the producers, traders, millers and at market level, the marketing efficiency is affected adversely.

Agribusiness policy related constraints:

Contract farming: Rajasthan has adopted a model APMC Act, 2007. In Rajasthan Contract farming of desired variety and quantity as per buyer's/processor's need, has been allowed. Buyer/processors may supply inputs and technical know-how and farmers may produce the crop for sale to buyers at an agreed price. However, this price shall not be lower than minimum support price and title of land shall remain with farmer. Produce will be purchased at buyer/processor's business/factory place. But processors found less interested in registering under contract farming. Team ABPF discussed contract farming issues with some of the processors and related challenges are given below:

- i. **Rule 5** – Each agreement shall be written on stamp paper of the value of Rs.100. This increases cost of procurement and procurement time.

- ii. **Rule 9** – Separate registration form shall be filled for each agreement. Large amount of paper work can be reduced by group registrations or procurement directly from FPCs.
- iii. **Rule 17**-In case the contract farming buyer fails or refuses to purchase the agreed quantity of the agriculture produce from the contract farming producer, he is to pay the amount of the difference between the agreed price and the actual sale price of the contracted produce in the market committee concerned to the producer. Mutual termination of contract should be allowed.
- iv. **Rule 19** – The contract farming buyer need furnish an undertaking equal to 20% of the value of the contracted amount. This amount can be reduced and this will motivate big players to participate in contract farming.

8.4. PIESTEC Framework

Ground nut can be summarily considered within the adapted PIESTEC framework as follows:

8.4.1. Political circumstance

The procurement of ground nut has a large political footmark. Many times, the mandi prices are below MSP during harvesting season and farmers resort to selling the crop below MSP as their holding capacity is limited. By the time MSP procurement starts, it is the traders who have already procured the stock from the farmer and are the maximum gainer as they purchase at a very low price and undertake an immediate gain of 30-40% just by selling the crop at the MSP procurement centers in the name of the farmers. This creates unrest among farmers. Currently lots of farmer agitations have been undertaken to pressurize Governments to start procurement. State Governments of Rajasthan and Gujarat have started MSP procurement of ground nut in for Kharif crop 2017. The situation for other kharif crops is no different where the crop price has fallen below MSP in the mandi. High level of political will is needed to protect the farmers against the downfall of prices. FPCs and cooperatives can also help farmers store the crop after de-shelling so that farmers share is increased over consumer rupee.

8.4.2. Institutional context

The small and marginal farmers can hardly be expected to invest in better farming technologies, nor aggregate adequate volumes of commodities as to develop alternate marketing channels away from typical APMC or multiple-trader led channel in vogue. There is, therefore, need for aggregation of such farmers into FPOs / FPCs. Typically, such FPOs / FPCs may have a combined holding of 1000-1500 acres. Agriculture Produce Marketing Committee (APMC) markets have an important role to play in the supply chain. The APMC market (also called mandis) provides a platform for aggregation and operation for various players operating at the wholesale level like traders, stockists, etc. These markets have peak arrivals of Ground nut seed in the month of November and December.

Though Ground nut industry associations exist in the country, there is lack of farmers groups/ associations and lack of coordination among different associations. Hence, it should be a national level federation of Ground nut industry and farmers' associations with close coordination for a better information flow as a backward linkage and product flow as forward linkage Promotion of direct marketing and contract farming in Ground nut seed is suggested for linking farmers to buyers. Development of hinterland ICDs linked with railway network, and cleaning & grading units in market yards will facilitate the industry. Use of commodity futures as risk management tool by

farmers/ groups need to be promoted. These limitations need to be corrected to encourage and up-scale contract farming practices. However, there are some limitations in the Contract Farming Act and mechanism in Rajasthan.

8.4.3. Economics

Ground nut is a high investment crop and therefore the risks associated with the crop are very high. Presently, the gross yield per acre is 30 qtls per ha. The market rate of sale is about Rs.4000 per quintal or Rs.120000 per ha. The cost of cultivation is about Rs 59200 per ha. Net profit per ha is Rs 69800 including fodder realization of Rs 9000 per ha. The investment of crop is Rs 1973 per quintal and gives a net profit of Rs 2027 per quintal in irrigated conditions.

The share of farmer over consumer rupee in case of ground nut oil is 25%. APMC has 1%, Trader has 2%, De-sheller has 16%, oil processor has 43%, Wholesaler has 4% and retailer has 9% share over the consumer rupee. On the first hand, it seems that the share of both primary and secondary processors is very high. However, there is significant volume loss upto 30% in case of de-shelling (Primary processor) and around 40-50% oil recovery in case of secondary processor. The retailer is actually the largest gainer with around 9% share over consumer rupee.

8.4.4. Social

While the traders are organized, the farmers are not. Ground nut is a cash crop and has a high income potential. Hence ground nut has a great significance for the farming community. The crop is being cultivated under rain fed conditions but additional irrigation is necessary as it is a high water consuming crop. The crops need to be approached with a commercial perspective and the farmers need to be trained to adopt irrigation, better inputs and better cultivation practices, Ground nut producers intend to reap benefit in the short run by taking advantage of the short term storage facilities. The long run benefits can be accrued by focusing on yield enhancement. Use of High Input technology (HIT) needs to be fostered in the area of good rainfall and Low Input Technology (LIT) in rain fed cropping areas. A judicious balance between HIT and LIT will be helpful in getting better returns from cultivation. there is lack of farmers groups/ associations and lack of coordination among different associations. Hence, it is suggested that there should be a national level federation of Ground nut industry and farmer's associations with close coordination for a better information flow as a backward linkage and product flow as forward linkage

8.4.5. Technology

The major challenges in Ground nut processing as opined by the stakeholders were: poor research and development in the country for processing technology, and development of value-added products of the nut for use in different industries. High cost of processing technology is also a major barrier for small scale processors.

8.4.6. Environment

Ground nut is a high input intensive crop and abundant quantity of fertilizers and pesticides are applied for nutrient and pest management. The application of agro chemicals deteriorates both soil and ground water quality. More over, the crop is highly water intensive and requires 6000 cum of water. Dragging this much water through tubewells without rain water harvesting might be a risk factor for depleting ground water.

8.4.7. Competition

The concerns on Ground nut value chain indicated that there was a fragmented supply chain in Ground nut seed and products with lack of skilled manpower and lack of knowhow on technical & emerging market requirements among the small split manufacturers. The measures to strengthen the value chain include development specialized manpower and capacity building of fragmented industry on the food safety aspects. While the use of ground nut in snacks is stable, the share of ground nut in the oil industry is constantly under threat due to the availability of Rice bran oil, mustard oil, Soyabean oil and palm oil. The prices of ground nut oil are higher than these oils and hence consumers prefer low cost oils.

8.5. Impact of GST over Ground nut value chain:

The Goods and Services Tax is one indirect tax for the whole nation. GST is a single tax on the supply of goods and services, right from the manufacturer to the consumer. It will be levied at every stage of the product distribution chain by giving the benefit of Input Tax Credit (ITC) of the tax remitted in the previous stages. Therefore, the final consumer will bear only the GST charged by the last dealer in the supply chain, with set-off benefits at all previous stages. GST will replace all Central level taxes such as excise, service tax, custom duty as well as state level taxes like VAT, CST, entertainment tax among others.

Table 29: Tax Structure

Transaction	New Regime	Old Regime	Remarks
Sale within the state	CGST+SGST	VAT+ Central Excise/Service tax	Revenue will be shared equally between the Centre and the State
Sale to another state	IGST	Central Sales Tax + Excise/Service Tax	There will only be one type of tax (central) in case of inter-state sales. The Center will then share the IGST revenue based on the destination of goods.

The impact on the Food Processing Businesses:

- With the latest information suggesting that the minimum GST rates will be 18% on all products.
- Implementation of the GST is said to increase the prices of agricultural goods. However, the products will be able to reach the consumer faster due to state-level taxes such as Octroi and entry taxes which will significantly reduce the time and hassle of transporting goods across state borders.
- GST will also favour the National Agricultural Market on merging all the different taxation on agricultural goods will improve the marketing and virtual market growth.
- Because GST is a consumption tax, it will be levied only when food products are sold by the manufacturer and not when they are manufactured.
- The Confederation of Indian Industries (CII) has also in its representation called for a zero rate tax on products which have a rate of up to Rs. 10/- and Rs. 20/-. It also demanded that all packaged material used as inputs by the food processing industry should have a zero-percent rate.

Impact on Restaurants and Food Joints:

Service tax liability with the credit of input VAT on goods consumed will get submerged into GST and irrespective of goods and services, the credit of input will be available for adjustment against the

output liability. This will further optimize the working capital of these restaurants and consumers can expect the superior quality of goods and services.

Please refer to Annexure 6 for product wise GST rates of Food Products.

Chapter 9 Proposed Intervention & Investment

9.1. Intervention areas of value chain strengthening

The intervention plan of Ground nut may be broadly considered in the context of activities and stakeholders as follows.

Table 30 Intervention Plan of Value Chain of Potato along with Stakeholder matrix

#	Stake holder	Roles and responsibilities	Pre-intervention constraints	Post intervention action	Action By	Timeline
1	Farmer	<ul style="list-style-type: none"> Land Preparation Cultivation of crops Harvesting of crops Sell the raw produce 	<ul style="list-style-type: none"> Farmers do not follow recommended PoP 	<ul style="list-style-type: none"> Awareness campaigns for motivating farmers to use recommended PoP on soil testing, land preparation, line sowing, INM, IPM and seed rate Crop demonstrations for use of seeds developed by research institutions 	RACP in partnership with ATC and local NGO	Ongoing process during the project period.
			<ul style="list-style-type: none"> Seed is available mostly through private companies High cost of insecticides Non availability of nutrient management 	<ul style="list-style-type: none"> Facilitating formation of FPC Pooled purchase of agri inputs through FPC at bulk price and onward sale to member farmers at wholesale price keeping minimum operating margins Tie-up of FPC with ATC for 	<ul style="list-style-type: none"> RACP, ABPF, NGO for FPC formation and further operation. RACP to tie up with ATC for supporting technology transfer 	3 months for FPC formation, share collection and issue of business licenses

#	Stake holder	Roles and responsibilities	Pre-intervention constraints	Post intervention action	Action By	Timeline
			solutions at right time/ High cost of transportation as farmer takes in loose quantity	multiplication of foundation seed produced by research institutions through member farmers of FPC and onward sale of improved variety seed at a lower cost	of seed multiplication through FPC members	
			<ul style="list-style-type: none"> • High moisture content of harvested crop • Chances of Aflatoxin contamination during sun drying on open field • Chances of contamination with foreign materials viz. dust, other seeds 	<ul style="list-style-type: none"> • Subsidized distribution of tarpaulin sheets • Promotion of solar dryers/ community drying platforms • Safe storage practices promotion 	RACP to provision for the same and facilitate distribution to FPC members with support from local NGO	3 months from formation of FPC
			High dirt content /foreign material in harvested shells (Usually resulting in 10% lower income arrival to farmer)	Ensure availability of community cleaning & Grading facility to farmers through FCSC established and maintained by FPC	RACP, SPs with input from ABPF team	6 months from formation of FPC
			Lack of market information related to price	Price discovery through NCDEX, eNAM.	ABPF, FPC	Subsequent cropping season after formation of FPC
			Farmers resort to immediate sale due to immediate requirement of cash	Pledge financing through FPC/FCSC, Spot/future trading through e-platforms	ABPF, FPC	Subsequent cropping season after formation of FPC
			During bumper harvest, prices collapse and hence storage option could help and distress sale.	Storage facility for farmers as part of FCSC. Facilitate MSP procurement. Storage by FPC for 3-4 months.	RACP, SPs with input from ABPF team	Subsequent cropping season after formation of FPC

#	Stake holder	Roles and responsibilities	Pre-intervention constraints	Post intervention action	Action By	Timeline
2	Processors	<ul style="list-style-type: none"> Process the raw produce Value addition Packaging of value added product 	Limited adoption of direct procurement and contract farming Limited processed product available in the market which limits the marketing potential of the commodity Many existing processors and budding entrepreneurs are not aware of schemes of the GoI Including CLCSS, cluster Development scheme or "Sampada" for technology upgrading.	Setting up alternate channel to sell directly from PC to processor or large retail shops.	Large Processor/ Buyer and ABPF, RACP, FPC, RSAMB	Subsequent cropping season after formation or 6 months whichever is earlier
				Awareness seminars for processors	ABPF, RACP, FPC	
				Policy conference, investors meet	ABPF	As required and as per schedule of RACP
3	NGOs	<ul style="list-style-type: none"> Extension services to farmers Disseminate RACP Schemes to the farm level Distribution of seeds and farm kits as per various schemes Hand holding support to the farmers regarding 	<ul style="list-style-type: none"> Lack of skilled personnel Poor field-farm level coordination Outdated extension activities Lower level of interaction and adoption of RACP/govt. schemes 	<ul style="list-style-type: none"> Training of NGO field staff on market led extension services Business planning training Monthly/Fortnightly review meetings with RACP Feedback of farmers from service area Exposure visits of NGO staff to successful FPCs 	RACP/ ABPF	Within 3 months from formation of FPC
4	RACP	<ul style="list-style-type: none"> Establish the feasibility of sustainably increasing agricultural productivity and farmer income Integrate agriculture water management and 	<ul style="list-style-type: none"> Lack of clarity on the form of FPO-Cooperative or FPC among field staff Selections of capable leaders for the 	<ul style="list-style-type: none"> Create basic understanding among the RACP PMU staff about concepts of FPC Clear understanding on fundamental differences between FPC & Cooperative 	<ul style="list-style-type: none"> ABPF RACP PMU Line staff NGO 	Within the lifetime of the project as on-going process

#	Stake holder	Roles and responsibilities	Pre-intervention constraints	Post intervention action	Action By	Timeline
		agricultural technology, <ul style="list-style-type: none"> Establish farmer organizations (FPCs) and market innovations in selected locations 	proposed FPO <ul style="list-style-type: none"> Low level of awareness among the PMU staff and farmers regarding the concept of FPC Poor or no Market linkages of the value chain crops in clusters Lack of active NGO staff deployed in the cluster 	<ul style="list-style-type: none"> Create market linkages by bringing more big players and processors to the cluster Conduct training of the potential farmer leaders about FPC and its functioning Capacity building training of the NGO staff regarding the extension services to be provided to the farmers 		

There have been limited efforts in capacity building of farmer leaders (entrepreneurs) and BODs at the field- level. In this regard, it may be appropriate for ABPF to enable formation of FPOs to meet minimum scale requirements for upgrading as well as developing alternate market channels. Also, bank linkages under KCC scheme etc. may be explored. The RACP and line departments need also work in coordination with the NGO/service providers and the KVK etc. on high content of foreign materials in harvested gram, harvesting of immature grains and inadequate post-harvest infrastructure facilities for storage. The storage facility may be established as an FCSC with assistance under the project.

There is also need for awareness seminars and b2b meets amongst processors and producers on the options for Special Licence and to source directly from producers (effectively aggregated into FPOs/ FPCs). Scope for re-orientation of Agri- marketing policy with reduced mandi taxes on direct procurement; and related capacity building interventions for farmers is a necessity that may be facilitated by the ABPF.

9.2. Proposed Post Intervention Value Chain Map of ground nut

The restructured value chain of ground nut will have FPCs and their FCSCs replacing Mandi's and undertaking aggregation plus grading and sorting and packaging services. The FPCs will work on input facilitation, custom hiring and marketing of produce. The post intervention value chain map for groundnut may be visualised as one with three production-distribution or activity-marketing channels: table variety, edible oil and DOC, value added products like peanut butter. It is also envisaged that PCs of producers with FCSCs is evolved. Such FCSCs only undertake storage, grading and sorting and packaging of produce activity. However, FPC may enter into oil production in a phased manner. It can start with de-shelling and further grading of ground nut in the first year and supply de-shelled ground nut to processors, traders. This will ensure 10-15% higher margins and lower risk of FPC. Gradually when it understands the dynamics of oil market, it may enter into full value addition i.e. oil processing.

These FCSCs may offer other related services in terms of input facilitation, custom hiring, facilitating B2B connectivity etc.

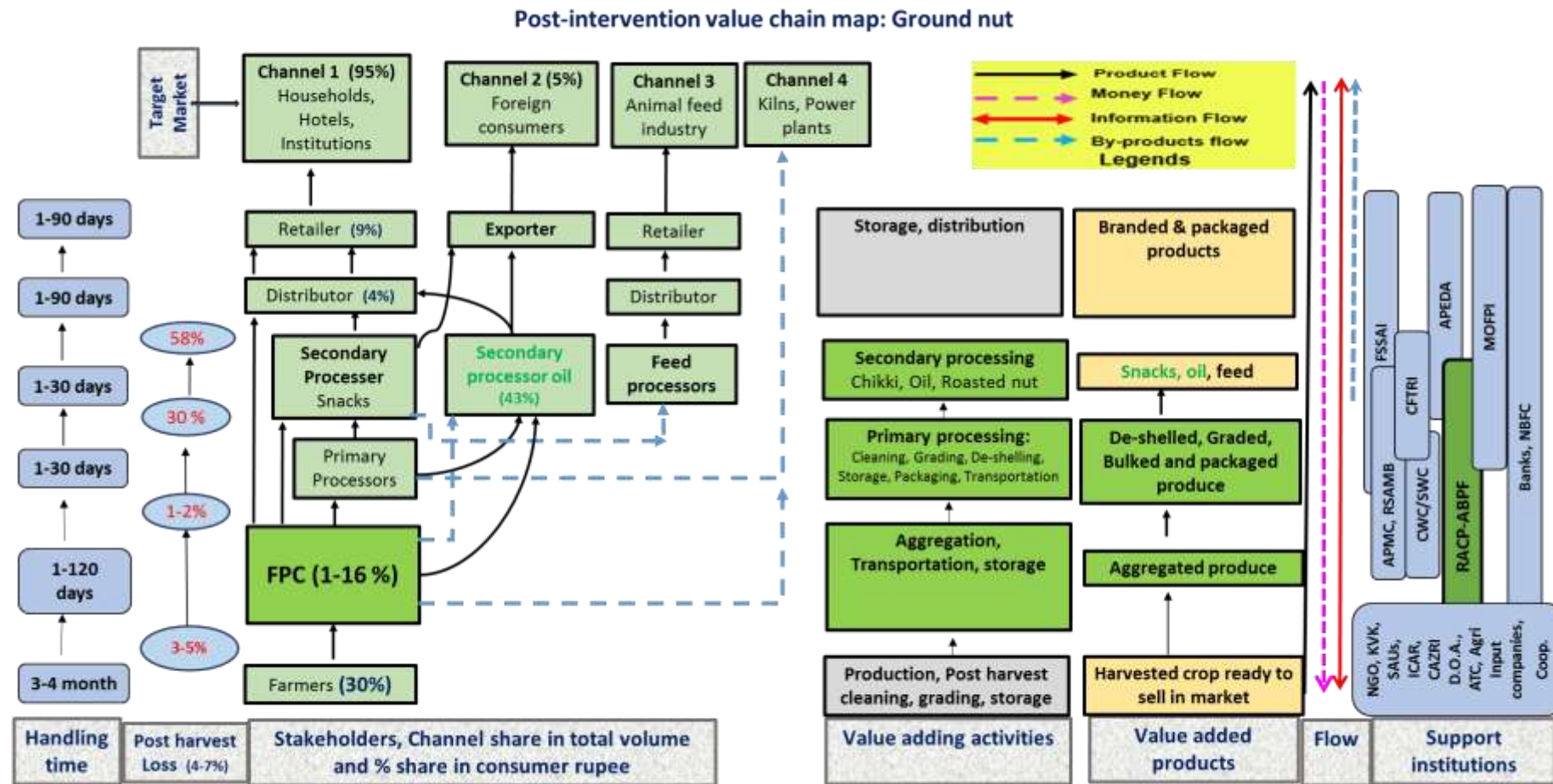
In the re-structured value chain, the FPC may start with aggregation and primary processing like de-shelling of the nuts. The nuts may further be graded. Grade A may be directly sold to the traders in the channel of fresh nut. The medium size nuts may be supplied to the snacks/food additives industry and the small size and broken nuts may be supplied to the oil industry. The FPC may also through the FCSC commission its own oil processing plant and market branded ground nut oil in the brand name of the FPC to increase their share over the consumer rupee.

In the pre-intervention stage, farmers' share in consumer rupee was around 25%. In the re-structured value chain, the farmers' share would increase upto 30% (a gain of 5%) due to direct linkage with processors through the FPC and reduced losses during the sale process. The post harvest losses from farmer to primary processors would reduce by around 2-5% due to direct handling by of procurement from farm gate or village point by the FPC.

The FPC would also sell the shell of ground nut at Rs 300 per quintal and if it enters into oil processing, the oil cake would be sold at around Rs 2000 per kg to animal feed processors. The holding time at farmers place including crop rearing time would also reduce by a month as farmer does not need to store the produce. The farmer can store the produce at the FPC after de-shelling and therefore reduce handling cost and wastage.

The support of RACP –ABPF apart from other chain supporters would be crucial for the successful running of the FPC. RACP will provision for initial hand holding support to FPC in terms of cost of registration, office and admin expenses support upto Rs 7.5 lakh and FCSC support upto Rs 22.5 lakh. Apart from these, RACP would also facilitate technology demonstrations, crop demonstrations and would also encourage entrepreneurs to take up secondary processing of ground nut.

Proposed post intervention chain of Ground nut:



9.2.1. Intervention through FPC Model in Guar value chain:

Aggregation is the proposed solution of the constraints farmers are facing at present. It is proposed to form Farmers Producers' Company by bringing farmers together in the form of voluntary groups of about 15 to 20 active farmers and federating 20 to 25 such groups into a Producer Company. These Producer Companies will be functioning on behalf of member farmers and will strive to undertake a range of activities which will result in added value accruals to farmers and value to farmers produce. To form a producer company, producer groups will be mobilized (in some cases, this initiative may have already been completed by NGO's).

It is envisaged that an elected committee of members of Producers Groups will form a management committee and oversee the performance of an incentivized manager/CEO. The manager will be trained in technical issues of post-harvest management, marketing and in operating a transparent accounting system. The ABPF will support the operation of the Producer Company, and accelerate the cross learning of best practices.

FPC Development Approach

The FPC development approach may be viewed as depicted below:



Figure 24 FPC Development Approach

Following are the steps to be followed for formation of the FPC:

- PRI of the MTG: The MTGs will be made aware on the FPC model through PRI and individual farmers will be motivated to join the FPC as shareholder through respective MTGs.
- Initial discussions with MTG leaders: After PRI is done, discussion will be done with the MTG leaders for further orientation on FPC concept.
- Identification of MTG leaders: MTG leaders who show inclination to the concept will be selected in the executive committee for FPC formation.

- Resource mobilization and FPC planning: The executive committee will meet 2-3 times to plan further activities of FPC viz. crops, strategy for business etc.
- Election of BoD and Share collection: 10-12 BoD will be identified along with 2-3 expert directors one each from Agri, Horti, AH and WS dept. The BoD will decide on share value and initiate collection of share through MTG leaders.
- FPC registration: Following identification of FPC BoD, registration will be done. This may take 1-2 months as DIN no of BoD has to be generated first. Care should be take that all elected BoD should have PAN no so that there is no delay in paper formalities for registrations.
- FPC business: Following registration of FPC, ABPF will prepare business plan for the FPC and facilitate market linkage for input and output.
- Setup of processing/ financing – ABPF will further facilitate establishment of processing unit setup along with feasibility studies and planning business linkage with market players.

Policy and Management

A FPC will function within the overall policy and regulatory framework as per the Producer Company Act. The management of a FPC will vest with the elected Board from amongst the members. The provision about constitution of managing committee will be made in the byelaws. The management of FPCs will be by an elected Board of Directors. Therefore, the representatives of farmers will actually oversee and manage the affairs of a FPC..

The selection criteria for membership of FPC may be viewed as follows:

1. A member will express his willingness to become a member of MTG.
2. A member will actively participate in all functions and activities of MTG
3. A member will contribute his equity to the FPC
4. A member will bring all or part of his produce to the FPC for sale.
5. A member will purchase all or part of his farm inputs through the FPC.
6. A member will produce and prepare his produce for marketing as per directions of FPC.
7. A member will contribute his share to the Producer Association as upfront payment for the business development plan of a FPC as needed.
8. A member will contribute his share to the Producer Company towards the reserves of FPC as needed.

Illustrative list of components of a common facility of a Producer Company (Food Grain)

- Godown for storage, drying platforms
- 2-3 MT per hour grain cleaning, grading, and packing machinery with shed
- Additional need based Agricultural Equipment
- Computer with internet connectivity for market information
- Display Board with Accessories
- Auction Hall
- Input Suppliers Shops
- Toilets
- Drinking water & Electricity

Note: Though the illustrative infrastructure proposed is shown in the above tables, the actual infrastructure to be developed will be need based and on participative consultation process.

Typically, start-up may be involved in secondary and tertiary processing activities while FPO's may be involved in post-harvest and primary processing activity. In many cases, start-up may emerge firm within FPO members.

The evaluation of success should be evaluated on the parameters as under:

- I. PCs operating without financial support by the end of 36 months.
- II. The PC operates with a reserve fund to cover short term cash flow deficit and with potential for reinvestment in various activities
- III. The PC has an effective governing structure.
- IV. The PC has a transparent accounting system.
- V. The PC can function as a working example for other farmer organizations to observe and learn from.
- VI. Contribution towards increasing farmers'/members incomes.

9.3. Conclusion

Ground has been a major crop of economic significance for farmers in semi-arid areas of Rajasthan having source of water for irrigation. Some major constraints in production stage are in-consistent weather pattern, high cost of seeds and farmers not following PoP. Aflatoxin infestation is a major constraint in this value chain. The seed replacement is very low in Phoolasar and can be improved with crop demonstration. That of Kheruwala is at par with state average but still can be improved.

The cost of seeds and fertilizers could be reduced upto 5-10% if the farmers' institution "FPC" purchases them in bulk and sells to member farmers. The FPC may not sell the farmers at a discounted price but may give bonus to farmers at a later stage who participated in trade of the FPC. The cost can further be reduced with implementation of improved PoP as recommended by the department.

Aflatoxin contamination has to be checked for the goods traded through FPC as bulk buyers or institutional suppliers would not prefer to purchase contaminated Nuts or finished products. Special focus should be therefore given by the project on safe handling of post harvest stages. Farmers may be trained to proper cleaning and drying of the produce on cemented floor or tarpaulin sheets to avoid aflatoxin contamination.

Currently, the farmers' share in the consumer rupee is on lower side and much of the share earned by the processors can be reaped back to farmers by direct procurement through FPC and supplying to large companies. FPC of farmers would be an ideal intervention for evolving the role of farmers from being chain actors to chain partners by doing both backward and forward integration of activities related to Ground nut value chain. At the back end, the FPC would help in reducing cost of cultivation by undertaking bulk purchase of agri input at wholesale price and selling farmers at a price equal to or lower than the retail price. Similarly, in the front end of the value chain, the FPC would undertake direct collection of Ground nut-in shell from the farmers and thereby reduce both the wastage and cost of visit to mandi for farmers. The FPC can further undertake primary processing of the seeds and supply directly to large processors and other value chain actors.

For this, a strong base has to be facilitated for the FPC by motivating farmers to contribute in terms of equity and business participation with the FPC. The Board and FPC staff has also to be handheld for a period of 2-3 years to train them on all processes of FPC management and business processes.

All stake holders including RACP, NGO, ABPF, Bankers and other support institutions therefore need to work cohesively towards the common goal of facilitating a strong community organization which can run in a sustainable manner after the project period.

Proposed outcome:

- 5% direct benefit due to direct procurement through FPC, 15% benefit through profit accumulated by FPC
- 2-5% price benefit on cost of inputs
- 1% saving on cost of transportation to APMC and associated charges
- Increased competition in input and output market resulting in higher earning potential for farmer
- Increased bargaining power of farmers
- Sustainable operations through community institution and assets through FPC and FCSC

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Annexure 1: Stakeholder's consulted over the study of Groundnut

Producers

1. 10 farmers in Phoolasar Cluster
2. 10 Farmers in Kheruwala cluster
3. 5 Farmers in Jaipur

Processors

1. Chittor Marka Oil, Amit Agarwal, Chittorgarh, 9602230165
2. Sanjay Oil Mills, Sanjay Kr Daman, Bikaner, 9829217801
3. Godara Agro Products, Ramswaroop, Bikaner, 9414648768
4. Diya Enterprises, Mr. Ajay Jain, Bikaner, 8800111181
5. Arihant Solvex Pvt Ltd, Mr. Sharma, Bikaner, 0151-2259907
6. Jindal Industries, Mr. Rajesh Jindal, Bikaner, 9414146568
7. Dhanji Agro Foods Pvt ltd, Hemraj saraswat, Bikaner, 9928621693

Traders

1. Jain Sales Agency, Krishi Upaj mandi, Kheruwala, 9414416517
2. M/S Mohanlal Motilal, Krishi Upaj mandi, Kheruwala, 9414031115
3. Sethia & Co., Krishi Upaj mandi, Kheruwala, 9414138403
4. Gharsana Trading Co., Mr. Pratik, Bikaner, 9414139703
5. M/S Ramchandra Bhanwarlal
6. Mr. Ramswaroop, Bikaner, 9414648768

Government agencies

1. Prem Singh (DPM), Bikaner, 9829232998
2. Dr. Inder Mohan Verma (Head), KVK, Bikaner, 9414230566
3. Mr. Mahesh Bissa (Head), Zila Udyog Kendra, Bikaner, 9166631111
4. Bhuendra Kumar, Agriculture Assistant, Bikaner, 9460408059
5. Dr. Govind Singh (Director of Research), Bikaner, 9414429766
6. Special thanks to Dr. Harish Verma, Scientist, KVK Jhalawar for validating the PoP of the crop. M: 7014601457

Others

1. Kalu Ram, TL, NGO, Ganganagar, 9672855292
2. Kajod Kumawat, Farmer, Jaipur, 9950194527
3. Shivraj Gurjar, Farmer, Sawai Madhopur, 9950258672
4. Subhalkaxmi FPO, Bikaner, Ravinder Gaur, Director, 09001093190
5. Babu Lal Saini, farmer, Sawai Madhopur, 9461338080

Annexure 2: List of Central Warehousing Corporation (CWCs) in Rajasthan

Warehouse	Project Description	Manager	Phone	Capacity
BHIWADI	C/o Jaquar & Company Pvt. Ltd., SP-496, RIICO Indl Area, Bhiwadi – 301019	A. C. Yadav	01493 297825	4356
ALWAR	A-315, NSC, Oppt. ED, Paryware Pvt. Ltd. Co. Alwar	R. N. Meena	0144 23721	3574
BARAN	Spl. No. 01 ,RIICO Indl Area, Baran Road, Baran	V. K. Jaiswal	9460079493	5000
BHARATPUR	Plot No. G-162 to 165 & F-166 to 171, Brij Ind. Area, Behind Nafed Plant, Phase-II, Hathni Road, Bharatpur	Devendra Prakash	05644-228654	9674
BIKANER	Behind Sabzi Mandi, Pugal Road, Unit-I, Bikaner	Prit Pal	0151 2212399	25400
BIKANER-II	Opposite Govt. Engineering College, Karni Industrial Area, Ph.II Bikaner-334004	R. D. Punia	0151 211003	5000
SRIGANGANGR-I	Near Power House Sriganganaga-335001	S.S. Brar	0154 2440107	25200
SRIGANGANGR-II	Udyog Vihar Plot No. E-194 to202 Sriganganaga-335001	N.K. Chabra	0154 2494403	10000
KESARISINGHPUR	C/o ARDC Godown,Mizewali Road,Kesrisinghpur Distt.Srigangar	Dhanwat Singh	01501-233710	10176
HANUMANGARH TOWN	C/o FCI, Opp. Railway Station, Hanumangarh Town	K. D. Dhiman, FCI		13262
HANUMANGARH-I	Sector - 8, New Mandi, Hanumangarh Junction, Hanumangarh	J. R. Sharma	01552 260602	21200
HANUMANGARH-II	RICCO Phase-II , Opposite RICCO, Water Works, Hanumangarh	Bhart Bhushan	01552 211794	15000
TIBBI	10, GGR, Hanumangarh Road, Tibbi, Distt. Hanumangarh	Anupam Kumar	01539 224111	1000
SITAPURA-I	Plot No.SPL-1296,EPIP Sitapura, Ind. Area, Jaipur-302002	S.K. Sharma	0141 2771710 , 2770227	14870

Warehouse	Project Description	Manager	Phone	Capacity
SITAPURA-II	Plot No.SP-1,RIICO Industrial Area,Sitapura, Jaipur	Y.K. Dubey	0141 2770223	11729
KOTPUTLI	Near Cement Factory,Vill.-Ramsinghpura Gopalpura Road,Kotputli, Distt. Jaipur.	Desh Raj	01421 215112 97	5000
JHUNJHUNU	Plot No. SP-287 RICCO Industrial Area,	Raghunath Singh	01592 250138	5000
SURAJGARH	Bhuana Road, Surajgarh-333029	Rampal Singh	01596 2238349	2868
KOTA I	Ind. Area DCM Road, Nr New Grain Market Kota-324007	S N Meena 0744 2363638		36830
KOTA II	Indraprasth md. Area, Road,No. 1, Near Daknia Railway Station Kota-324005	S.S.Meena	0744 2438019	49300
KOTA III	Plot No. SP-1, Kuber Ind. Area, Ranpur, Kota III	S N Panchal		25000
RAMGANJ MANDI	Khairabad Road, Ramganj Mandil Distt.-Kota	OP Mudgil	07459 22264	9893
NAGOUR	Nr. All India Radio Basni Road, Nagaur- 341001	R.S. Mathur	01582 241002	7401
PARABATSAR	C/o ARDC Godown, Near Old Rly. Station.Parbatsar, Distt. Nagaur	Ram Behari	9460462881	28093
SIKAR	Jagmalpura, Via-Katrathal, Post-Bhadwasi ,Sikar-33200 1	Nand Lal Verma	01572 272013	5000
SRIMADHOPUR	Hanspur Road, Srimadhampur-332715	Kishore Prasad	01575 251699	20600
DEOLI	C/o Juptier Metal Pvt. Ltd., NH—12, Deoli Distt : Tonk 01434 239249	Kailash Narayan	01434-239249	5000
FATEHNAGAR	MOR Mills Product, Plot No. H-49 Road No.2, RICCO Indl Area, Fatehnagar-313205	V. P. Singh	02955-220411	3106
Central Warehouse	Opposite Krishna Dharma Kanta, Udaipur By Pass. Beawar, Distt. Ajmer	Raj Raj Kumar Sharma		14849
Central Warehouse	Katori Wala Tibara, Near Water Works, Tizara Road, Alwar	Rajendra Prasad	1442731026	8133
Central Warehouse	Village MOR ,Kushalgarh Distt.Banswara.	D.C. singh	2965274517	3400
Central Warehouse	Plot No.G-162 to 165,F-166 to 171, Behind NAFED Plant, Phase-II, Brij Industrial Area, Hahteni Road, Bharatpur-321301	N. S. Meena	5644228654	9674

Annexure 3: List of State Warehousing Corporation (SWCs) in Rajasthan

Sr. No	District	Name of Warehouse	Warehousing Capacity			Utilization including Reservation	Percentage Utilization
			Own Constt.	Other than own Constt.	Total		
1	Ajmer	1. Ajmer	13350	0	13350	13733	103
		2. Beawar	6300	0	6300	5086	81
		3. Kekri	3500	0	3500	3704	106
		4. Kishangarh	5400	0	5400	4141	77
2	Alwar	5. Alwar	22650	0	22650	18967	84
		6. Khairthal	7400	0	7400	3265	44
3	Banswara	7. Banswara	12200	0	12200	7608	62
4	Baran	8. Baran	27520	0	27520	15344	56
		9. Antah	9200	0	9200	7472	81
		10. Atru	5400	0	5400	1767	33
		11. Chhabra	11550	0	11550	2079	18
		12. Siswali	6750	0	6750	5304	79
5	Barmer	13. Barmer	6840	0	6840	7533	110
		14. Balotra	3600	0	3600	2463	68
6	Bharatpur	15. Bharatpur	22000	0	22000	19499	89
		16. Bayana	4700	0	4700	3995	85
		17. Nadbai	6950	0	6950	4722	68
7	Bhilwara	18. Bhilwara	6750	8950	15700	16366	104
		19. Gulabpura	7550	2000	9550	9505	100
		20. Mandalgarh	3600	0	3600	1497	42
8	Bikaner	21. Khajuwala	10800	0	10800	8694	81
		22. Kolayat	4050	0	4050	0	0
		23. Nokha	2700	8900	11600	12460	107
		24. Loonkarasar	5400	0	5400	1510	28
9	Bundi	25. Bundi	24620	0	24620	18536	75
		26. Kapren	6750	0	6750	6523	97

Sr. No	District	Name of Warehouse	Warehousing Capacity			Utilization including Reservation	Percentage Utilization
			Own Constt.	Other than own Constt.	Total		
		27. Keshoraipatan	6000	0	6000	1161	19
10	Chittorgarh	28. Chittorgarh	17250	0	17250	17656	102
		29. Nimbahera	13500	0	13500	13095	97
11	Churu		0	0	0	0	0
12	Dausa	30. Dausa	12900	0	12900	2521	20
		31. Bandikui	13680	0	13680	6031	44
		32. Lalsot	1260	1620	2880	1218	42

Annexure 4: List of rural godowns in Rajasthan

Rural Godowns in Rajasthan storing ground nut

Sr. No.	Name & add. of rural godown	Capacity in MT	Ownership	Commodity stored
1	RG of Shri Sita Ram, vill-Bana, tehsil-Dungargarh, Bikaner	100	Private	Gram Guar, Ground Nut ,etc.
2	RG of Shri Shiv Lal,vill- Bana, tehsil-Shri Dungargarh, Bikaner	150	Private	Gram Guar, Ground Nut ,etc.
3	RG of Shri Ram Swaroop NH-89,vill-deshnoke, Bikaner	150	Private	Gram Guar, Ground Nut ,etc.
4	RG of Shri Mangi Lal, vill- Berasar, tehsil-Dungargarh, Bikaner	100	Private	Gram Guar, Ground Nut ,etc.
5	RG of Smt Kesar Devi and Ganesh Ram vill- bana ,tehsil- Dungargarh, Bikaner	100	Private	Gram Guar, Ground Nut ,etc.
6	RG of Sri Uda Ram,vill- Barjangsar, tehsil –Dungargarh, Bikaner	100	Private	Gram Guar, Ground Nut ,etc.
7	RG of Shri Madan lal vill- Barjangsar, tehsil- Dunagharh, Bikaner	100	Private	Gram Guar, Ground Nut ,etc.
8	RG of Shri Rupa Ram,vill- Jakasar, tehsil – Dfungargarh, Bikaner	100	Private	Gram Guar, Ground Nut ,etc.
9	RG of Shri Kishore Daswani, Kh. No.251/241, vill- Punpalsar,tehsil-Dungargarh, Bikaner	100	Private	Gram Guar, Ground Nut ,etc.
10	RG of Shri Brij Lal and Smt Dhapu Devi, vill- Dhaneru, tehsil –Dungarpur, Bikaner	100	Private	Gram, Guar, Ground Nut ,etc.
11	RG of Shri Shankar Lal Bishnoi, vill-Salundia, tehsil- Nokha, Bikaner	100	Private	Gram, Guar, Ground Nut
12	RG of Shri Rameshwar Lal and Ram Swaroop, vill- Sindhu, tehsil –Nokha, Bikaner	100	Private	Gram, Guar, Ground Nut

13	RG of Shri Hari Ram, Vill.-Akhisar, Tehsil-Nokha, Bikaner .	100	Private	Gram, Guar, Ground Nut ,etc.
14	RG of Shri Ishar Ram, vill-Akhisar, tehsil-Nokha, Bikaner	100	Private	Gram, Guar, Ground Nut ,etc.
15	RG of Shri Surja Ram, Vill- Ankhisar, Tehsil- Nokha, Bikaner .	100	Private	Gram, Guar, Ground Nut ,etc.
16	RG of Shri Badri Ram, Vill-Ankhasar, tehsil- Nokha, Bikaner .	100	Private	Gram, Guar, Ground Nut ,etc.
17	RG of Shri Madan lal, vill- Ankhisar, tehsil- Nokha, Bikaner	100	Private	Gram, Guar, Ground Nut ,etc.
18	RG of Shri Prhalad, vill- Ankhisar, tehsil-Nokha, Bikaner	100	Private	Gram, Guar, Ground Nut ,etc.
19	RG of Smt. Shanti Devi, vill-Ankhisar, tehsil- Nokha, Bikaner	100	Private	Gram, Guar, Ground Nut ,etc.
20	M/s Rekha Goyal and Sarika Goyal, near Narendra Bhawan,, Gandhinagar, Bikaner ,	5000	Private	Gram, Guar, Ground Nut ,etc.
21	RG of Shri Dayal Ram, vill- Sanwalias, tehsil- Meretacity, Nagour .	836	Private	Mustard, Guar, Gram etc.
22	M/s Shri Shyam warehouse, vill- Bikasar, tehsil- Nokha, Bikaner .	1887	Private	Gram, Guar, Ground Nut ,etc.
23	RG of Shri Roopa Ram, vill- Tinwari, tehsil- Osian, Jodhpur .	100	Private	Mustard, Ground Nut, Gram, Guar
24	RG of Shri Ghasi Ram, vill-Balarwa, tehsil- Osianm Jodhpur .	100	Private	Mustard, Ground Nut, Gram, Guar
25	RG of Shri Jaswant Singh and Mrs. Tubi Devi, vill- Tinwari, tehsil- Osian, Jodhpur .	100	Private	Mustard , Ground Nut, Gram , Guar
26	RG of Shri Bhanwar Lal ,vill- Chirwai, post- Gagri, tehsil- Osian, Jodhpur .	100	Private	Mustard, Ground Nut, Gram, Guar
27	M/s Manfool ram Bhadoo, vill- Govindnagar, tehsil- Nokha, Bikaner	2530	Private	Gram, Guar, Ground Nut ,etc.
28	RG of Shri Bhanwar Lal ,vill- Chirwai, post- Gagri, tehsil- Osian, Jodhpur .	100	Private	Mustard, Ground Nut, Gram, Guar
29	M/s Manfool ram Bhadoo, vill- Govindnagar, tehsil- Nokha, Bikaner	2530	Private	Gram, Guar, Ground Nut ,etc.
30	M/s Prabhu Dayal. Vill- Chidwai, tehsil-Shergarh, Jodhpur .	100	Private	Mustard, Ground Nut, Gram, Guar



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