RAJASTHAN AGRICULTURAL COMPETITIVENESS PROJECT

Value Chain Analysis

Guar

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AGRI BUSINESS PROMOTION FACILITY

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Executive Summary: Guar

Guar (cluster bean) is grown in India indigenously as fodder, feed, food and cover crops mainly in complex, diverse, risky and under-invested rain fed (arid and semi-arid) regions. Guar seed is grown as a kharif crop in India. The crop is generally sown after the monsoon rainfall in the second half of July to early August and is harvested in late October to early November. Guar gum is extracted from the seed and its derivatives have very unique properties of solubility over wide range of temperatures, as hydro collider, emulsifier, thickener, stabilizer, coating/ filming agent, binder, thixotropic, non-ionic, cross-linking, gelling, preservation, non-calorific fibrous food etc. Guar gum and its derivatives are critical ingredients in about 100 products or processes in 21 sectors of food, petroleum/gas exploration, explosives, pharmaceuticals, cosmetics, paper industry, textile, paints/distempers, aerial firefighting etc. Its recent utility in the production of highly commercial and rapidly growing shale gas extraction has created upheaval in its demand, trading among more than 100 countries and unprecedented volatility in prices. There was more than 900% increase in scandalous future markets for 6 months after November, 2011. More than twice of the total annual production of guar (cluster bean) was traded in the future market in a single day. Various regulatory measures of Forward Markets Commission (FMC) of India did not work and future trading was suspended on March 27, 2012 which was re-launched after 14 months.

The processing of guar gives three products mainly viz. guar splits, Churi and Korma. Guar split is used as a main product for different industrial uses while Churi and Korma are used as cattle feed. By-products or meals after gum extraction are a rich source of proteins, nutrients and fibres with high digestibility and have high importance in animal and fish feed industry.

India is the largest producer of guar seed and its derivative products with a share of about 80 per cent of world production of guar seed. Pakistan is the next largest contributor with 15 percent share. Other producers include US, Brazil, South Africa, Malawi, Zaire, Sudan, Australia and China. After the recent rise in guar products prices, many countries such as Australia and China are encouraging the cultivation and production of guar, challenging India's monopoly. Nearly 75-80% of the Guar Gum or other derivatives of Guar seed are being produced in India and are exported mainly to the USA, China and European countries. As per statistics from January 2014 to November 2016, the total value of global guar exports has been calculated to be 22,00,960,997 (in USD).

Rajasthan has 83.25% of area under guar followed by Haryana 9.6%, Gujarat.6.6%. Guar is grown in almost all the districts of Rajasthan except Kota and Baran but 96.53% of the area is confined to 13 districts which produce 94.06% of guar in the state. However, Rajasthan's share in the total production in India is 64.8% followed by Haryana 24.30% and Gujarat 9.33%. The average productivity of Guar in Rajasthan is lowest i.e. 319kg/ha whereas that of Haryana is 1096 kg/ha, Gujarat 582 kg/ha, Punjab 769 kg/ha and UP 1000kg/ha. The key reason for low productivity in Rajasthan is because most of the crop is grown in the semi-arid zones of the state depending upon only rain fed condition and hence there is very little investment on good agriculture practices like

land labelling, seed treatment, use of improved variety seeds, line sowing, weeding, providing irrigation at important stages of crop cycle etc. However, Guar still is a major crop of economic and livelihood significance in Rajasthan as the farmers do not have any alternative to guar in case of rain fed agriculture in the Area. It has however been seen in recent years that, moth bean has come up as a substitute in major rain fed areas of Bikaner as the prices in current condition are little more favourable for moth bean. Guar is taken as a value chain crop in Z Distributory and Phoolasar clusters under RACP.

Some important support institutions for Guar in Rajasthan are Department of Agriculture, Govt. of Rajasthan who provides extensive support through their team of State/District/ Tehsil and Panchayat level officials on; recommended package and practices for the crop, mini kits for crop demonstration and subsidy support on certified seed distribution to farmers. Other support structures of the Department of Agriculture are the Rajasthan State Seed and Organic Production Certification Agency, The Rajasthan State Seeds Corporation Ltd, the State Institute of Agriculture Management, Rajasthan State Warehousing Corporation, Department of Agriculture Marketing and Rajasthan State Agriculture Marketing Board who contribute to the productivity, storage and market linkage of the crop. Apart from this, there are various Krishi Vigyan Kendras around Jaipur, Alwar and Kota attached through State Agriculture Universities/ ICAR also contribute in terms of seed production, technology demonstration and postharvest management of the crop. Other support institutions in Rajasthan include the ATCs of the State Government who help in technology demonstration and scientific trial of various varieties for recommending PoP for the various agro-climatic regions for the crop. All India Coordinated Research Project on Arid Legumes including research in Guar as a mandate is the only research effort towards guar crop in the country. The progress in research and development has been made at CAZARI, Agriculture Research Station (ARS), Durgapura, and CCS Haryana Agricultural University. R&D efforts have focused to produce good quality seed of notified varieties of guar.

The physical market for guar seed trading remains with Agricultural Produce Market Committees (APMCs) of the states. Mandi fee for Guar in Rajasthan is chargeable at the rate of 1.60%, while in Haryana it is 1.0%, in Gujarat- 0.50% and in Punjab there is no mandi fee chargeable on Guar. These markets have peak arrivals of guar seed in the month of November and December. The major channel for selling the guar seed is through commission agents who charge a prescribed brokerage of 2% as per APMC Act. Although AGMARK grades are defined, market is run by industry grade as defined by the traders. Due to the fact that the product has a very long storage life, most of the product purchased from the mandi by traders is released in a staggered way as per the demand for coming years. The price in the market (trader to miller) is influenced by the stock positions. Most of the traders store guar seed in their own storage structures instead of storing in accredited warehouses as they do not want to declare stock volume.

The gross yield is 3.5 to 4 quintal per ha. The market rate of the sale is about Rs. 3,500 per quintal Rs. 14,000 per ha. The cost of cultivation is about Rs. 7,900 per ha. Net realization is about Rs. 6,100 per ha without the fodder value. Prices of Gur are highly un-predictable and depend upon speculators. Farmers expect the price should be at least above Rs. 4,000 for them to show much interest in the crop and spend on INM/IPM. Currently, they use very limited inputs so that the loss factor could be neutralized in cases of prices dipping further.

Key strengths of Guar value chain are; highly suitable for the rain fed conditions in Rajasthan and in project cluster areas, it has various by-products with high demand for industrial usage and the crop is a high earner of foreign exchange, Rajasthan is the leading producer of Guar in India. Key weaknesses of Guar value chain are: Low productivity due to cultivation in marginal land, high level of speculative market and large number of intermediaries in the value chain.

Key opportunities in guar value chain are: Scope of establishing FPC in Guar can help increase share of farmer over consumer rupee due to forward integration of bulking activities through FCSC.
Key threats in Guar value chain are: Climatic variations, speculative market and farmers may prefer other crops over guar if prices are low.
In case of Guar value chain, when we consider the share of farmer over consumer rupee, the share is very low at around 24% of the total rupee value consumer has paid. This is mostly because of high levels of value addition in the end product of guar. The trader at the APMC receives around 1% of the value, primary processor who does guar splitting gets around 6% of the total share, secondary processor who prepares guar gum and guar churi/korma gets around 20% of the total rupee value and the tertiary processor who prepares further value added products such as hydroxyl guar receives around 45% of the total rupee value.
The price spread along with margin at every stage of value chain starting from the farmer till retailer is presented in the table below.

- **Pre Intervention Value Chain: Guar**

The pre intervention value chain of Guar has essentially three value chains. In the recent years, farmers are mostly selling to commission agents as Guar has become a highly speculative commodity and farmers are getting mandi price from their door step due to commission. The Guar then reaches the mandi from where it is being traded by whole sellers. However, NCDEX e-portal has become a big tool for determining the market price for Guar and many small commission agents apart from wholesalers are also trading in Guar in NCDEX platform. Most of the guar finds its way to guar split/dal making units locally situated in Bikaner/ Jodhpur/ Ganganagar/ Jaipur from where, the split is being supplied to further processing to secondary processors or is directly exported. The husk (Guar churi and korma) is supplied by the primary processors to animal feed industry. It also has a good demand in the international market. There is no such distribution network through Dealers and retailers as guar is not traded in open market and specific processors supply to specific target market directly as institutional suppliers.

- **Post Intervention Value Chain: Guar**

Guar gum making is quite high tech and hence it would not be suggestive to engage FPC directly into Guar gum making. The post indicative value chain suggests FPC to undertake primary value addition by sorting, grading and making guar split replacing middle men, mandi and primary processors. The farmers can earn at least 12-15% more only by trading through the FPC. The FPC in turn will undertake sorting, grading and either hedge the stock with NCDEX or will directly supply it to processors.

Intervention Plan:

The intervention plan may be considered in three critical stages that are production, post-harvest and processing. At the production stage there are two critical challenges i.e. use of local variety seeds resulting in low productivity and non-adoption of good agriculture practices. This can be acted upon by FPC through FCSC by going for seed production programs. In case of post-harvest handling, lack of storage facility is an issue which will be taken up by FCSC. The processing related constraints may be viewed in terms of limited awareness on the special licence option to source directly from farmers/FPCs. Also, at the post-harvest and processing stage there is scope to evolve FPCs to farmers with FCSCs which undertake primary processing and storage activity.

Chapter1. Introduction

Origin and Importance

The origin of Guar is unknown, since it has never been found in the wild. It is assumed to have developed from the African species Cyamo psissenegalensis. It was further domesticated in India and Pakistan, where it has been cultivated for many centuries. Guar grows well in semi-arid areas, but frequent rainfall is necessary.

This legume is a very valuable plant within a crop rotation cycle, as it lives in symbiosis with nitrogen-fixing bacteria. In fact, agriculturists in semi-arid regions of Rajasthan follow crop-rotation and use guar as a source to replenish the soil with essential fertilizers and nitrogen fixation, before the next crop. Guar as a plant has a multitude of different functions for human and animal nutrition but its gelling-agent-containing seeds (guar gum) are today the most important use.[2] Demand is rising rapidly due to industrial use of guar gum in hydraulic fracturing (oil shale gas).[2] About 80% of world production occurs in India and Pakistan, but due to strong demand, the crop is also being introduced into new areas like Kazakhstan, Russia and Portugal. A vast range of value added products or derivatives appeared in the market with more than one lakh patents globally and guar has become an important commercial crop of Rajasthan, Haryana and Gujarat. There are various grades of Guar gums pure or derivative. Guar gum is a white to creamy colored, free flowing powder and free from extraneous matter. Its ability to suspend solids, bind water by hydrogen bonding, control the viscosity of aqueous solutions, form strong tough films have accounted for its rapid growth and use in various industries. For example guar gum is used in paper, textile, oil drilling, mining, explosives, ore flotation and other various industrial applications.

Table 1 Application wise global consumption of guar derivatives

Type of application	Target industries	Global consumption
Food grade	Bakeries (Bread), Dairy (Ice cream, Sherbets, Cheese etc.), Dressing (Sauces, Ketchup's) Beverages (Chocolate drinks), Pet Food (Thickener)	**20%**
Fast Hydrated Gum	Oil drilling (as a well stimulant and fraction reducer), Mining (increased yield, filter aid) Explosives (Gelling agent),Coal Mining (fraction reducer, binding)	**70%**
Industrial grade	Textile printing (Thickening agent for dyes) Paper (increase strength and decrease porosity) Tobacco (binding and Strengthening) Photography (Gelling and Hardening) Cosmetics & medicines (as binder and thickener) Slimming (Reducing weight & laxative)	**10%**

Source: Guar Outlook 2015, NIAM

A by-product of the guar processing is guar meal (mixture of husks and germ) which is a potential source of protein. It is used for cattle as well as poultry feeding. Toasting of guar meal improves its nutritive value. It can be used up to 10% in poultry diet and can replace up to 100% protein supplements such as ground nut oil cakes in ruminants.

Guar is more than 6 times as effective as starch in thickening power and is used for upgrading starches. Various derivatives of Guar Gum are available that will stiffen gels even up to a water content of 99%. Commercially important derivatives of Guar gum are: a) Hydroxy and Carboxy Alkylated Guar gum b) Oxidised Guar gum c) Acetates of Guar gum d) Cationic derivatives of Guar gum e) Sulphated Guar gum f) Guar gum formate g) Guar gum acryl amide h) Borate cross linked Guar gum i) Reticulated Guar gum j) Carboxy methyl hydroxy propyl Guar gum, k) Depolymerised Guar gum

Guar gum has emerged as India's top farm export overtaking traditional heavyweights rice and cotton and looks set to power into the league of top 10 shipments from the country, thanks to the demand from the US oil and gas industry. The guar gum exports have shot up nearly 139% on a year-on-year basis between April and January 2013 with shipments of about $4.9billion. In the previous year, it rose 374% in January alone compared to the same month of 2011. (The Economic Times 2013). Guar meal is basically used for domestic consumption.

1.1. Global Scenario

Guar Production

India is the largest producer of guar seed and its derivative products with a share of about 80 per cent of world production of guar seed. Pakistan is the next largest contributor with 15 percent share. Other producers include US, Brazil, South Africa, Malawi, Zaire, Sudan, Australia and China. After the recent rise in guar products prices, many countries such as Australia and China are encouraging the cultivation and production of guar, challenging India's monopoly.[1]

Nearly 75-80% of the Guar Gum or other derivatives of Guar seed are being produced in India and are exported mainly to the USA, China and European countries. The value added derivatives of Guar Powder are used by various industries in India as well as abroad. In Pakistan, Guar seed is mainly grown in Punjab and Sindh province with about 80% of total guar area under irrigated conditions.[2]

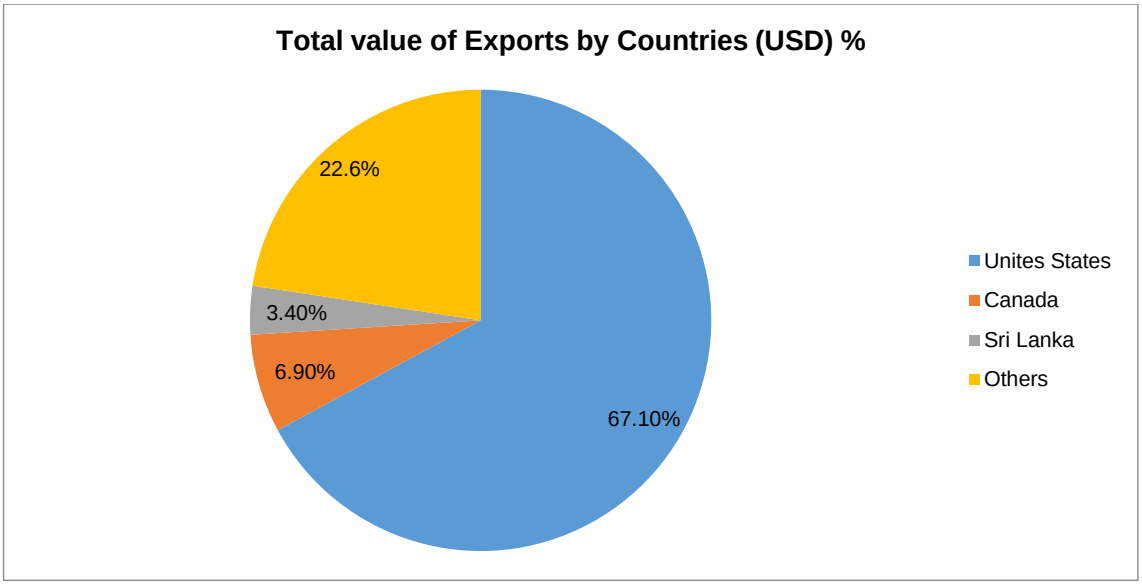
Guar Export

As per statistics from January 2014 to November 2016, the total value of global guar exports has been calculated to be 22,00,960,997 (in USD). The following figure shows the total value of exports (in USD) of global Guar in percentage share.

[1] http://icrier.org/pdf/Working_Paper_311.pdf

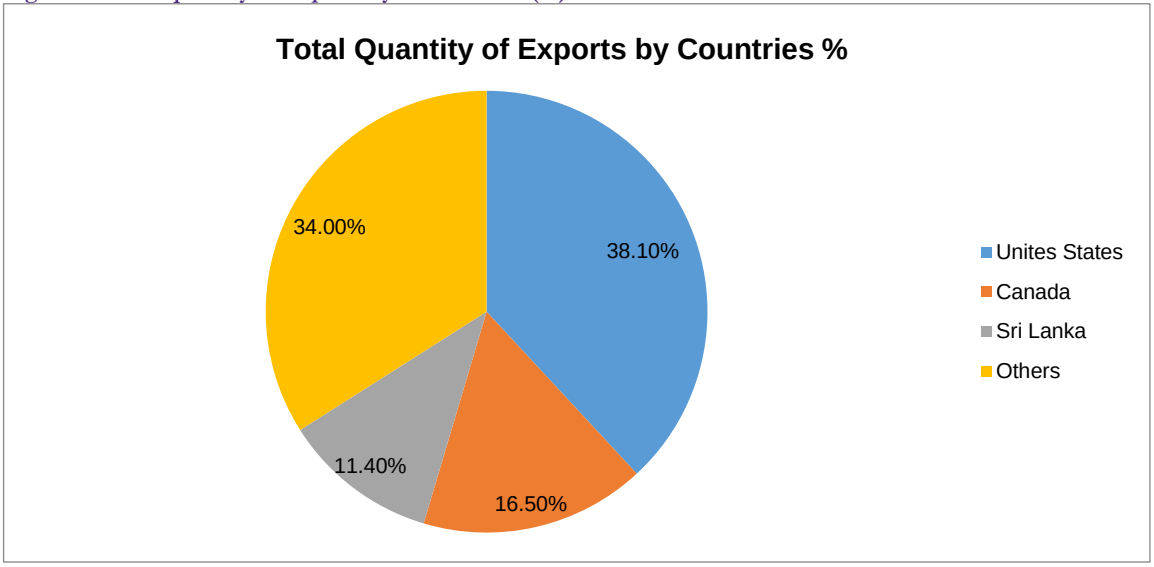
[2] https://ccsniam.gov.in/images/pdfs/GUAR_Booklet_03122013.pdf

Figure 1: Total value of Exports by Countries (USD %)[3]



The total quantity of exports is 16,50,231,479 MT. United states, being the leader, accounts for 38.1% of the total quantity of global guar exports for the period January 2014 to November 2016 and it is followed by Canada and Sri Lanka. The figure given below represents the share of the top countries which lead in total value of global guar exports:

Figure 2: Total quantity of Exports by Countries in (%)[4]



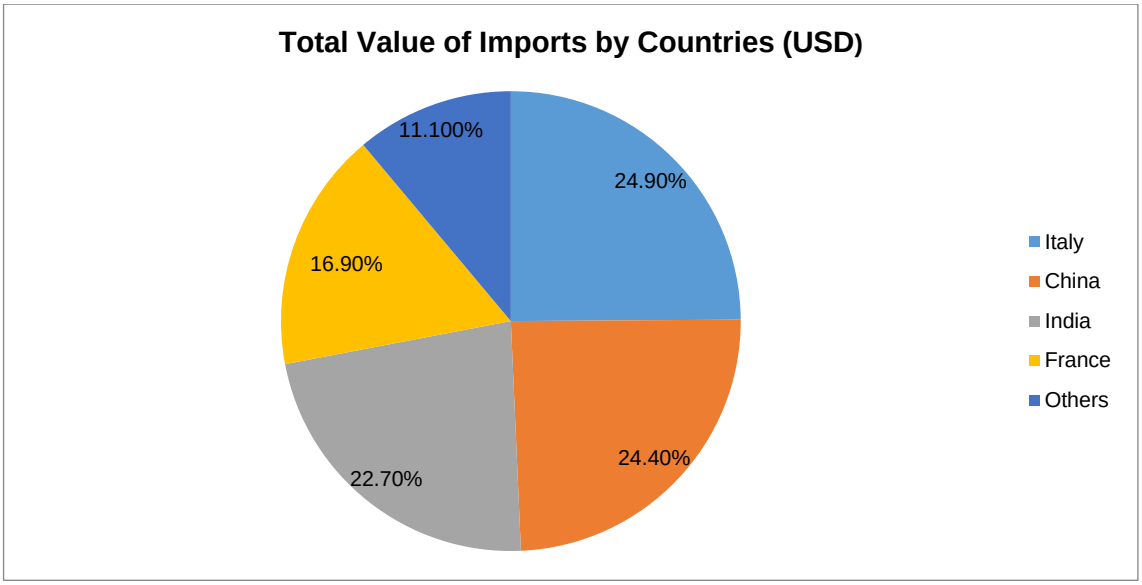
Global Import of Guar Gum

The total value of global guar gum imports for the period January 2014 to November 2016 amounts to 8990246 $. The details of global imports of guar gum in terms of value for the period January 2014 to November 2016 have been given in the figure below:

[3] https://www.zauba.com/exportanalysis-guar-report.html?type=import#

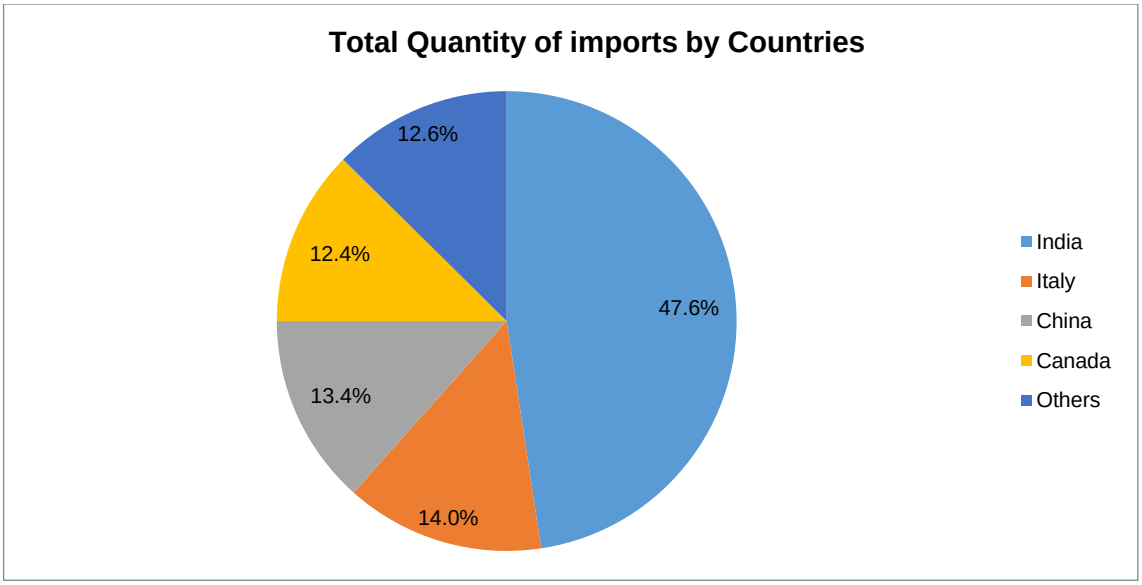
[4] https://www.zauba.com/exportanalysis-guar-report.html?type=import#

Figure 3: Total value of Imports by Countries (USD)[5]



India is the major importer of Guar Gum with the percentage of 47.6 % and it is followed by Italy, China and Canada. The details of global imports of guar gum in terms of quantity for the period January 2014 to November 2016 have been given in the figure below:

Figure 4: Total Quantity of imports by Countries[6]

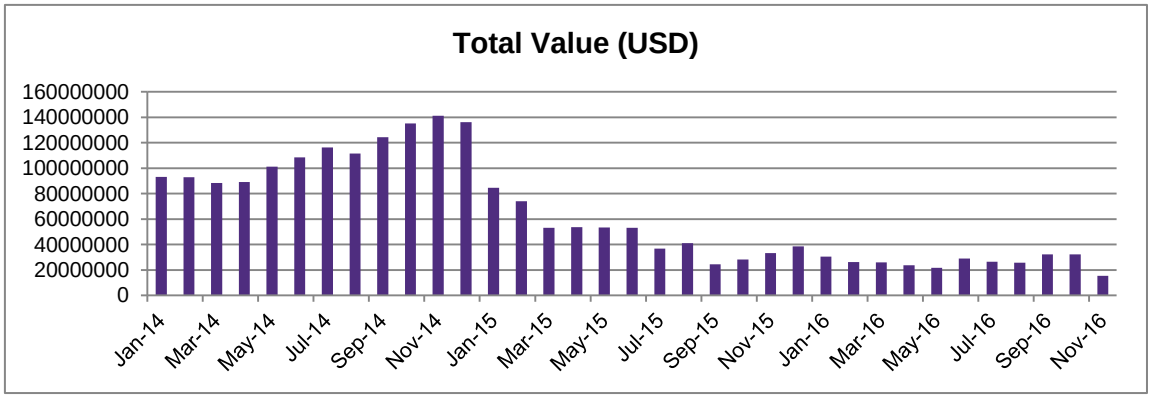


As per statistics from January 2014 to November 2016, the total value of global guar exports has been calculated to be USD 22,00,960,999. The values were observed to be high during the 2014 but started declining in the subsequent years. The highest value of USD 1,41,181,987 was observed in November 2014. During the year 2016, the prices remained at lower levels as compared to the

[5]https://www.zauba.com/importanalysis-guar+gum-report.html
[6]https://www.zauba.com/importanalysis-guar+gum-report.html

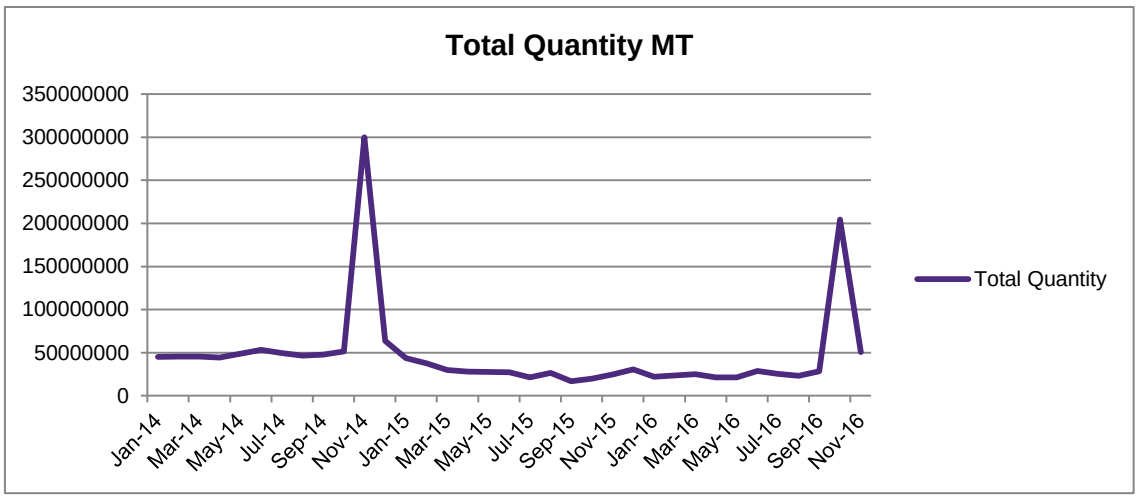
previous years. The following figure shows the total values (in USD) of global guar exports month wise for the period January 2014 to November 2016:[7]

Figure 5: Total value of Guar (USD)



The total quantity of global guar exports for the period January 2014 to November 2016 amounts to 16,50,231,478 MT. The quantity has more or less remained stable below 50,000,000 MT with a few ups and down in between. But November 2014 and October 2016 has seen drastic increase in value with quantity reaching 2,99,873,150 MT and 2,04,450,995 MT respectively. The details of global exports of guar in terms of quantity for the period January 2014 to November 2016 have been given in the figure below:[8]

Figure 6: Total Quantity of Guar in MT



The average price per unit of global guar exports during the period January 2014 to November 2016 was USD 1.58. Average prices during the said period had more or less remained in the range of USD 1-2 throughout the years. October 2014 recorded the highest average price of USD 2.64 and the very next month of 2014 recorded the lowest average price of USD 0.47. The monthly average prices of guar export are mentioned in the figure below:[9]

[7] https://www.zauba.com/exportanalysis-guar-report.html
[8] https://www.zauba.com/exportanalysis-guar-report.html
[9] https://www.zauba.com/exportanalysis-guar-report.html

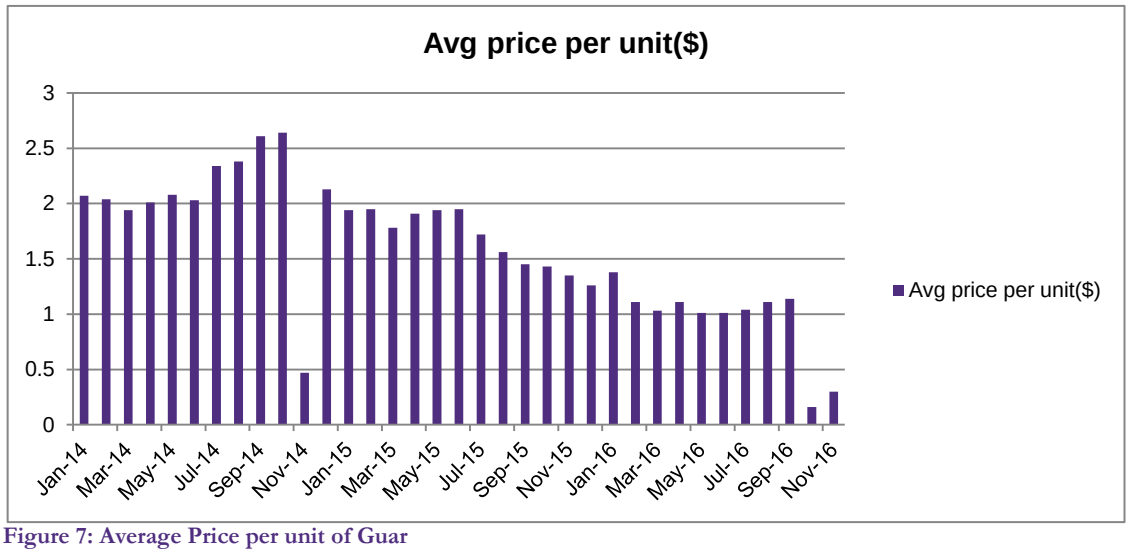


Figure 7: Average Price per unit of Guar

1.2. Indian Scenario

Guar accounts for 18% of total farm exports which is at the value of Rs. 21287crores in 2012-13. This makes it as a second largest exported commodity after Basmati rice.

There has been 76.29% growth in the value of guar refined split traded in year 2012-13. The value of trade of treated guar gum has also recorded a growth of 22.59% over a year. India continues to be a major exporter of refined split. Although India is the biggest exporter of guar seed to US, the countries like Spain and Italy are continuously increasing their share in US market. Due to high demand of guar in world market and also the increasing price, Research and Development activities in these countries are aiming to obtain maximum benefit of the existing opportunities. The main reason behind the near monopoly of India is due to production constraints in Italy, Spain, and UK etc. Fluctuation in production of Guar in India creates opportunity for many countries to capture the market share in world trade of Guar by undertaking research and development activities in production and processing sectors. Such efforts are already on progress in Australia, some states of USA, Sudan and South Africa etc.

Nearly 75-80% of the Guar Gum or other derivatives of Guar seed are being produced in India and are exported mainly to USA and European countries. The value added derivatives of Guar seed are used by the various industries in India as well as abroad. Pakistan, Sudan and parts of USA are the other major Guar growing countries which produces nearly 20% of world guar seed production. The derivatives of Guar seed like guar refined splits, guar gum powder and guar meal are being exported from India. Nearly 80 per cent of Guar gum and split produced in the country is being exported which fetches good amount of foreign exchange. The export composition of guar derivatives shows that export of refined guar splits was 15.93% and guar gum treated and pulverized was 83.41% in the year 2012-13. The proportion of refined guar split, an intermediate product, has dropped to 30% of total guar derivatives export from the country, but still a sizeable quantity of exports is contributed by this raw material used for processing into different industry specific guar gum products. The major share of the guar processed in India is exported either in form of semi processed product i.e. refined splits or in form of guar powder.

Table 2 Area, Production and Yield of Guar seed in India (1997-1998 to 2014-2015)

Year	Area (In ' 000 Hectare)	Production (In ' 000 Tonne)	Yield (In Kg./Hectare)
1997-98	2301.2	962.7	418
1998-99	1922.1	488.5	254
1999-00	2933.9	375.1	128
2000-01	3497.4	658.8	188
2001-02	2903.1	1089.9	375
2002-03	974.1	202.6	208
2003-04	2854.0	1513.4	530
2004-05	2867.4	903.3	315
2005-06	2955.5	1059.0	358
2006-07	3343.7	1169.3	350
2007-08	3472.6	1788.5	515
2008-09	3862.5	1935.8	501
2009-10	2995.2	594.7	199
2010-11	3382.2	1965.3	581
2011-12	3444.2	2222.1	644
2012-13	5151.7	2457.8	477
2013-14	5962.5	3587.9	602
2014-15	5345.9	3286.6	615

Source: Ministry of Agriculture and Farmers Welfare, Govt. of India (ON1521)

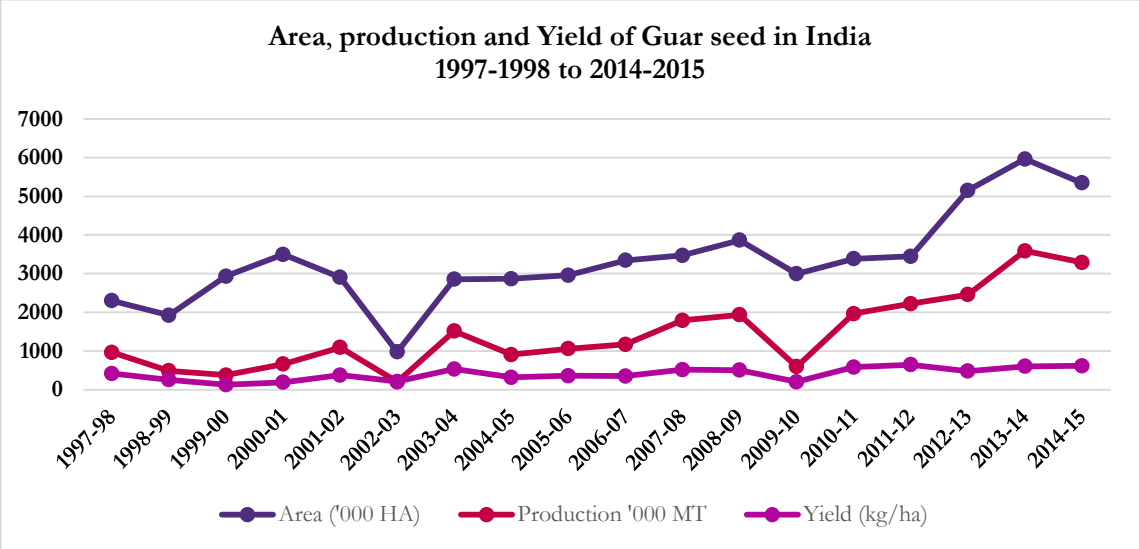


Figure 8 Area, production, Yield analysis of Guar seeds in India from 1997 till 2015

The graph above shows, the area under guar has almost tripled over 18 years and the production of guar has also followed the similar pattern. However, productivity has not increased much as most of the area under cultivation is rain fed and farmers do not adopt any PoP except sowing of seeds, little bit of nutrient and weed management and only harvesting.

Table 3 State-wise Value of Output from Guarseed in India {(At Constant 2011-2012 Prices) (2011-2012 to 2013-2014)}

States/ UTs	2011-2012		2012-2013		2013-2014	
	Value	%Share	Value	%Share	Value	%Share
Gujarat	98083	4	169177	7	410764	11
Haryana	48578	2	77954	3	73362	2
Punjab	775	0.03	3513	0	3513	0.09
Rajasthan	2082021	93	2283673	90	3224744	87
Uttar Pradesh	182	0.01	191	0	191	0.01
India	**2229639**	100	**2534508**	100	**3712574**	100

The share of Rajasthan over total value of guar trade in India is reducing since 2011-12 due to increased importance of the crop in other states viz. Gujrat, and Punjab. Gujarat is the maximum gainer and has almost tripled its share during the reported period.

1.3. State Scenario

Rajasthan has 83.25% of area under guar followed by Haryana 9.6%, Gujarat.6.6%. However, Rajasthan's share in the total production in India is 64.8% followed by Haryana 24.30 and Gujarat 9.33%. The average productivity of Guar in Rajasthan is lowest i.e. 319kg/ha whereas that of Haryana is 1096 kg/ha, Gujarat 582 kg/ha, Punjab 769 kg/ha and UP 1000kg/ha. [1] The key reason for low productivity in Rajasthan is because most of the crop is grown in in the semi-arid zones of the state depending upon only rainfed condition and hence there is very little investment on good agriculture practices like land labelling, seed treatment, use of improved variety seeds, line sowing, weeding, providing irrigation at important stages of crop cycle etc. However, Guar still is a major crop of economic and livelihood significance in Rajasthan as the farmers do not have any alternative to guar in case of rainfed agriculture in the Area. It has however been seen in recent years that, moth bean has come up as a substitute in major rainfed areas of Bikaner as the prices in current condition are little more favourable for moth bean. Guar is grown in almost all the districts of Rajasthan except Kota and Baran but 96.53% of the area is confined to 13 districts which has more than one percent guar area and produces 94.06% of guar in the state. Average productivity of these 13 districts namely Jaipur, Sikar, Jhunjhunu, Bikaner, Churu, Jaisalmer, Sri ganganagar, Hanumangarh, Jodhpur, Barmer, Nagaur, Jalore and Pali is 405.83 kg/ha. Top five districts having maximum area area are Bikaner, Barmer, Jaisalmer, Churu and Hanumangarh having 72.07% area under Guar and contributing to 61.80% of total production of the state. The average productivity of these districts are 357.12 kg/ha.

Table 4 Area, production and productivity of Guar in the state for ten years

Details	2006-07	2011-12	2012-13	2013-14	2014-15	2015-16	Average of 10 Years
Area	2807913	3094163	4533270	5070076	4625206	4786781	**3670753.10**
Production	658426	1846609	2026671	2861835	2743968	2223474	**1660745.20**
Productivity	234	597	447	564	593	465	**430.28**

Table 5 State-wise Availability of New Varieties of Seeds of Guar for Kharif Season in Rajasthan -2016

States	Variety	Year of Notification	Availability (Quantity in quintals)
Rajasthan	HG 884	2010	307
	HG2-20	2010	15018
	Gaur Lathi (RGC-1066)	2007	1688
	Gaur Uday (RGC-1055)	2007	2596
	Guar Kranti (RGC-1031)	2005	18
	HG-563	2004	2825
	RGC-1017	2002	9
	Kanchan Bahar (M-83)	2001	13
	Total		**22474**

The above table shows, 22,474 quintals of Guar seed is available in the state for use as improved varieties.

1.4. District & Cluster Scenario: Production

Table 6: District wise Guar Production in Rajasthan in catchment districts of RACP project

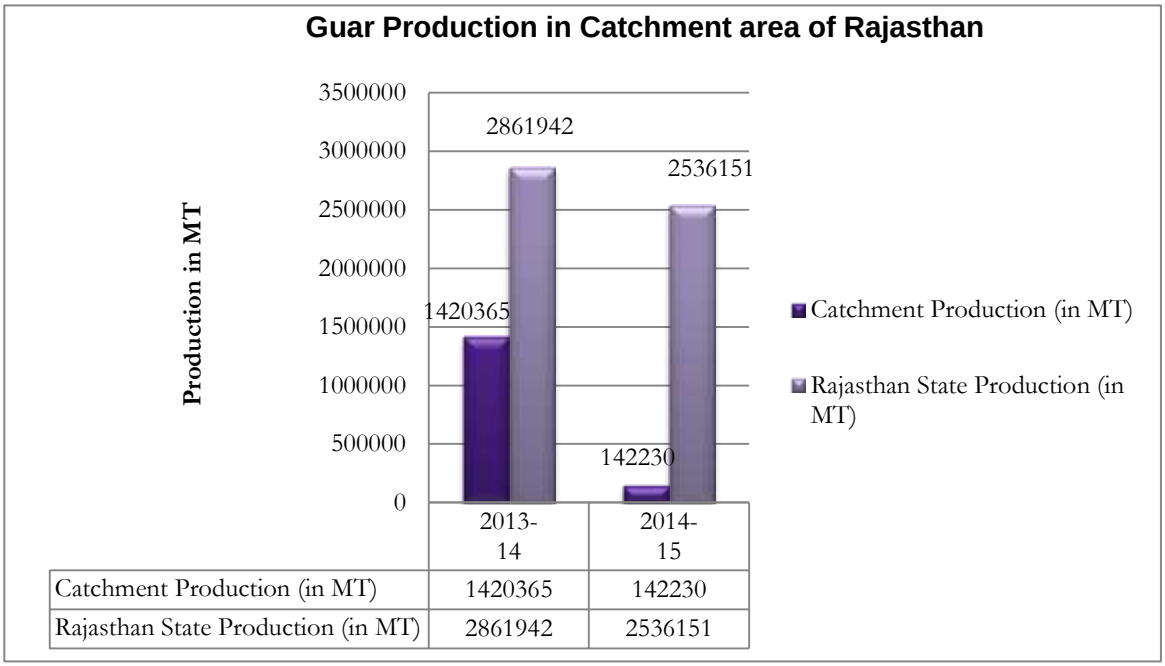
Total Production in the catchment Area (2015-16) MT			1,388,193
Total Production in Rajasthan (2015-16) MT			2,223,474
Percentage share in the State Production			62%
Top Producing Districts in the catchment zone			Ganganagar, Bikaner, Jaisalmer
Sr. No.	**District in the Catchment Area**	**Production in MT**	**Rank of District in The catchment**
1	Ganganagar	563,987	1
2	Bikaner	408,082	2
3	Jaisalmer	203,745	3
4	Nagaur	87,130	4
5	Jaipur	50,226	5
6	Alwar	47,732	6
7	Ajmer	10,465	7
8	S. Madhopur	6,420	8
9	Chittorgarh	4,511	9
10	Tonk	4,412	10
11	Dholpur	666	11
12	Bundi	400	12
13	Banswara	207	13
14	Baran	144	14
15	Kota	59	15

16	Jhalawar	7	16
17	Pratapgarh	-	17
Total Production in Catchment Area		**1,388,193**	

Table 7: Catchment production of Guar in Rajasthan

Year	Catchment Production (in MT)	Rajasthan State Production (in MT)
2013-14	1420365	2861942
2014-15	142230	2536151
2015-16	1388193	2223474

Figure 9: Guar Production in Catchment area of Rajasthan



In the catchment area, Guar has been taken as a value chain crop in Z Distributory and Phoolasar clusters of RACP. The area under Guar in Z Distributory is 2282 ha and has increased at 2.62% over last ten years. The SRR of Guar in the cluster has increased from 17% in 2011-12 to is 31% in 15-16 due to increased area under irrigated guar in the cluster. The area under crop in Phoolasar is 8000 ha in 15-16 and ten years average is around 4650 ha taking around 31% of the total cropped area under kharif.

Table-7.1: Area, Production and marketable surplus in RACP Clusters

Cluster	Area (Ha)	Production (MT)	Marketable surplus (MT) @ 100%	Value of surplus Rs in lacs
Phoolasar	8,000	3,600	3,600	1,260
Z-Distributary	1,835	1,773	1,773	621
Total	9,835	5,373	5,373	1,881

The total area under Guar in The Value chain clusters is 9835 Ha and the total production is 5373 MT. Out of these, 100% crop is considered as marketable surplus and its value would be around Rs 18881 lacs.

Resource mapping

Cluster	Major mandi/s around cluster	Distance from major cities nearby	Major Processing areas	Warehouses/ Cold store with Capacity	No of FPCs targeted
Phoolasar	Bajju, Bikaner, Khajuwala, Nokha, Lunkaransar, Sridungargarh	150 kms from Bikaner, 160 kms from Nokha, 160 kms from Khajuwala, 95 kms from Phalodi	Bikaner, Jodhpur, Jaipur, Ganganagar	SWC – 31,850 MT, CWC – 30,400 MT	1
Z-Distributary	Sri Ganganagar, Hanumangarh, Gajsinghpur, Jaitsar, Padampur, Sri Karanpur, Sri Sadulshahar, Abohar (Punjab)	48 kms from Abohar, 63 kms from Hanumangarh, 70 kms from Suratgarh, 33 kms from Sadul sahar	Bikaner, Jodhpur, Jaipur, Ganganagar	Sri Ganganagar – CWC – 35,200 MT, SWC – 6000 MT, Rural godown – 23,300 MT	2

1.5. Approach to Value Chain Analysis

In order to evaluate the value chain of Guar, consultations were held with major stakeholders in the chain including farmers, Consumers, Processors, traders, supporting public and private service providers and institutions etc. in various parts of the state. Major Guar producing clusters were considered for survey within Rajasthan.

Table 8: Surveyed Major stakeholders for Value chain Analysis of Guar

Surveyed Markets for the Value Chain Analysis	
Within and outside Rajasthan	• 5 Farmers in Bansur cluster • 5 Farmers in Kheruwala Cluster • 5 Farmer in Phoolasar cluster • 5 Farmers in Z Distributary cluster • Coke Cola (Processor) • Chopra Guar Gum Industries (Processor) • Choudhary Gum P. Ltd. (Processor) • Vikash WSP Ltd (Processor) • Dev Ashish Guar Pvt. Ltd. (Processor) • Badar Enterprises,Jodhpur (Trader) • Durga Enterprises,Jodhpur (Trader) • Gandhi Enterprises,, Jodhpur (Trader) • Ganpati Global Pvt Ltd, Jaipur (Trader) • Dinesh Enterprises, Jodhpur (Trader) • Coordinator,RACP, Sri Ganganagar • Asst. Director, Agriculture Ext., Sri Ganganagar • DIC, Sri Ganganagar • DPM,Bikaner • Head,KVK, Bikaner • Head, Department of Extension, Bikaner • Head,Zila Udyog Kendra, Bikaner • Joint Director, Agri. Marketing, SriGanganagar • Director of Research,Bikaner • T.L, NGO, Bikaner

Chapter 2 Pre Harvest Management

2.1. Major commercial varieties Grown in Rajasthan

1. Kanchan Bahar

Group Name: Forage Crops
Crop Name: Guar (Cluster been/Field vetch)
Variety Name: Kachan Bahar (M083)
Maturity in Days: 85 to 90 days
Seed Rate (Kg/Ha): 12-15

The said variety was selected from the multiple options available with centre for recommendation to Rajasthan. It is early maturing variety which takes about 85-90 days to mature. It is does not bear branch with flower, plant height 70-98 cm regular bearing of cluster of pods .At each nod of the stem checks are carried to for major under field condition i.e. bacterial blight-powdery mildew alternatira leaf spot, thizoctonia rot.

2. GuarLathi

Guar Lathi grows well in rain fed and well-drained soil. Its plants mature in about 97-105 days with height reaching between 86-110. It is characterised by unbranched leaves and hairy with entire leaf margin. Plants are light pink, flat and bold (3.38 Gram/100 seed Weight). It is moderately resistant to bacterial and Alter air Bligh. Root Rot and Wilt. Seed Rate (Kg/Ha):12-15

3. HG-20

Group Name: Forage Crops
Crop Name: Guar (Cluster been/Field vetch)
Variety Name: HG-20
Maturity in Days: 90 to 100 Days
Seed Rate (Kg/Ha):12-15

It is widely grown in states of Punjab, Gujarat, Rajasthan and Uttar Pradesh, under timely sowing normal fertility and rainfed condition. The plant matures in about 90-100 days. Crop is sown during last week of June to first week of July at 45 cm row spacing to maximise the output. The plant grows upto height of 70 cm with distinguishing morphological characters, pubescent leaves. The variety has exhibited field tolerance to bacterial blight, moderately resistance to alter nary blight and root rot. Seed Rate (Kg/Ha):12-15

4. HG (HG884)

HG884 is a medium maturity crop, sowing should be done during last week of June to last week of July at 45 cm row spacing to maximise the production. The plant grows upto height of 70-80 cm with fishing morphological characters pubescent leaves, serrated leaf margin and pink flower The varieties is resistant to bacterial blight and moderate resistance to alter aria bight & Root Rot.

5. Guar Kranti

Group Name: Forage Crops
Crop Name: Guar (Cluster been/Field vetch)
Variety Name: Guar Kranti (RGC- 1031)
Maturity in Days: 90 to 100 Days
Seed Rate (Kg/Ha):12-15

This variety is a medium maturity, suitable under rainfed well drained and Sandy loam soil. It is grown in Kharif season & fodder yields under irrigated condition. The plant goes upto height of 74-108 cm with highly branched leaves broad and pubescent (trip innate with serrated leaf margin). This variety is tolerant to drought condition, moderately resistant to bacterial blight Alter aria blight, Root Rot, wilt and other diseases. Seed Rate (Kg/Ha): 12-15

6. Rajasthan Guar(RGC1038)

It's a medium maturity crop, resistant to lodging, shattering and responsive with 30 cm row spacing. It is suitable for late sowing, with wider adaptability to rainfed condition. The plant goes upto height of 76-93 cm. Habit erect, medium tall and highly branched leaves with medium broad and pubescent (Trip innate with serrated leaf margin) seed are dark grey in colour. This variety is tolerant to drought condition.

7. RGC- 936

This variety is recommended for release and cultivation to drought prone areas. The plant reaches upto height of 85-90 cm, profusely branched leaves are pubescent, serrated leaf margin, flower white in colour and seed light fawn in colour. Not prone to pest under filed and store conditions.

8. Gujarat Guar

This variety is recommended for release and cultivation in guar growing states of India to grow under low fertility rainfed condition in kharif season The plant heights upto 80-100 cm dark green foliage with less serrated margin and Branched The proposed variety GAUG-34 is found resistant to Bacterial Blight and Alternatia leaf Spot under field condition along with Epiphytotic condition at cazri .The variety GAUG -34 show 0.66 MEAN JassidInderwhick designated free from symptom.

2.2. New Initiatives & Practices

The new initiatives and practices developed for guar include Low Input Technologies (LIT) and High Input Technologies (HIT) which are given in the table below. The adoption of technology differs on the basis of farmer's perception, environmental conditions, existing area and productivity of the region.

Table 9: New initiatives and practices in Guar farming

Sr. No	Regions/ Districts	Technology LITs/HITs	Varietal Priority	Planting Priority	Fertility package Priority	Cropping sequences/ rotations	Inter/mixed cropping
1	Churu	LITs	RGC-936	Line sowing	Nil	Monocropping,	Guar+Bajra (3:1),if delayed rains upto 1st week of August Guar + Moth Bean+Bajra+Til+Cow pea (25% seed of each crop)
	Jaisalmer Bikaner Badmer		RGM-112 HG-365 HG-563	60×10cm, hand weeding, Intercultural upto30-40 dos		Guar-Guar,Guar-Guar-Bajra,Guar-Bajra	
2	Ganganagar Hanumangarh	HITs	RGC-1066 RGC-1031	Line sowing 40×10cm,Deep intercultural upto 30- 40 days, full prod. Package	Full fertility package	Sole Cropping, Guar-Mustard, Guar-Wheat crop, substitutions Groundnut,, Cotton,, Bajra	Limited mix or Intercropping
3	Nagpur, Jodhpur Sikar Jhaunjnu	HITs/LITs	RGC-1002, RGC-1003, RGC-1017, RGC-936	Line sowing 45×10cm, Deep intercultural upto 40 days	Urea spray@ 1- 2% at 50-60 DAS	Guar-Mustard, Guar-Guar, Guar- Bajra, Guar-Guar-Bajra/Sorghum Guar-B.tournifortii	Guar:Bajra (3:1)

4	Pali, Jalore Jaipur, Bheelwara Alwar	HITs	RGC-1038, HG-884, HG-1031, RGC-986	Line sowing 40×10cm, Deep intercultural upto 40 days, production package	Fertility package	Guar-Wheat Guar-Mustard	Guar+Bajra/Sorghum (3:10)

2.3. Seasonal Availability Pattern

The seed is normally sown during the second half of July to August after the monsoon rainfall starts, and harvested during October and November. The crop requires 3-4 spells of rain during seed setting and maturing, which is during first week and the end of September.

Table 10: Seasonal Availability of Guar

Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
						Sowing			Harvesting		

2.4. Land Preparation

Land preparation is not required for guar, two or three ploughings of the field is sufficient for fine tilth which is helpful to the plant in early growth for ample soil aeration and root development. Each plough is followed by planking. At the time of sowing, field should be well drained and free from weed to ensure good germination.

2.5. Sowing/Planting/Cultivation

Seed treatment is essential for early seedlings mortality and prevention from diseases at later stages.

a) For killing the spores of dry root rot fungus, seed is treated with Ceresan or Thiram at the rate of 3 gm/kg seed.

b) Seeds can be treated with Imidachlorpid at the rate of 6 ml/kg seed to control sucking pest like Jassids and Aphids.

c) Immersion of seeds in hot water at 50^{0}C for 10 minutes followed by drying at room temperature before sowing helps in killing fungus mycelium and inactivating their spores.

Inoculation of seeds

Guar is a legume crop and its roots bear nodules with special kind of bacteria that converts atmospheric free nitrogen to fertilizer available form. This symbiotic relation between bacteria and root nodules helps to reduce the cost of nitrogen fertilizer for crop. Therefore, to maintain the population of bacteria in the soil with respect to growth of plant seeds of Guar are to be inoculated with these bacteria before sowing. This is done by preparing a 10 percent sugar or gur solution in boiling water. This sugar solution is allowed to cool. After cooling, 3-4 packets of bacterial culture (Rhizobium sp.) are mixed to make a thin paste. This paste is coated over to the seed. Seed is dried under shade for 30-40 minutes before sowing.

In India, farmers sow Guar mainly by traditional method of broadcasting. Broadcasting is done manually spreading seed over the soil surface. After broadcasting the seeds, one ploughing is required for proper seed incorporation in the soil. In this method inter and intra row spacing is not followed which creates problem in intercultural operations like hoeing, weeding and removing excessive water in the field. Strategy for proper line and row spacing may help in enhancing the productivity of the crop. Line method normally is done by seed drill which ensures sowing with proper spacing and depth. This

method results in good germination and proper weed management and drainage of excess water in the field.

Sowing time basically depends on availability of rains (30-40 mm at a single stance) and closely follows monsoon rains in the Kharif season. Studies indicate that yield is reduced considerably when sowing is delayed to last week of July or first week of August. First to second week of July is the ideal time of sowing for normal crop in arid Rajasthan (Table-5). However, for Haryana, it is end of June to first week of July and first fortnight of August

Table 11: Seasonal Crop

Season of Crop	Sowing Time
Summer Crop	25 February to 15 March
Kharif Crop	First to Second week of July after effective monsoon shower

Spacing

Spacing is required to ensure proper utilisation of inputs like nutrients, moisture and light resulting in better production performance of the plant. The sowing strategy involves inter and intra row spacing. The spacing depends on the optimum plant stand/ population required for different regions having varied rainfall intensities.

Trials on sowing methodologies conducted under the aegis of National Network Research Projects on Arid Legumes reveal that the recommended spacing should be 10-15 cm plant to plant distance in a row and 35-60 cm row to row distance on the basis of rainfall, soil type and inputs availability. For instance, for low rainfall (200- 350 mm) zones like Jaisalmer, Barmer, Bhuj, Jodhpur, etc optimum plant population is 110,000 plant/ha, the same can be obtained with sowing strategy of 60 x 10 cm (inter and intra row spacing). Similarly, for the regions particularly semi-arid, having moderate rains (450-500 mm), the optimum sowing strategy has been found to be 45 x 10 cm, which may give required plant population of 150,000 plant/ha. For those regions having still higher rainfalls (550-600 mm) planting pattern of 30x 10 cm has been observed optimum and maximum grain yield can be harvested with 200,000 plants/ ha. All these strategies are for branching type behaviour of varieties. However, for the varieties having un-branched growth pattern with main shoot only (RGC-1066, RGC-1031), the optimum plant spacing having been observed to be 25 x 10 cm. Under late sown conditions, close planting from more seeds and closer interspacing have proved optimum. The plant population with respect to location and rainfall is shown in table below.

Table 12: Plant population with respect to location and rainfall

Inter and Intra Row Distances (cm)	Locations	Rainfall (mm)	Plant Population (000/ha)
60 x 10	Jodhpur, Bikaner (Arid)	200-350	110 plants
45 x 10	Durgapura (Semi-arid)	450-500	150 plants
30 x 10	Agra (Semi-arid)	550-600	200 plants

(Source: D Kumar, Guar International Conference 2013, Jaipur)

Note: Under normal sown conditions, invariably a plant population of 125000-150000 plants per hectare is optimum at 45 cm spacing for branched type varieties. In late sown condition, inter row spacing of 30 cm was observed better than 45 cm.

2.6. Climatic and Soil Requirement

Climate:

Guar is a photosensitive crop and requires specific climatic condition to grow. For proper germination of soil, ideal temperature should be around 20 to 25 degree Celsius. Being a drought tolerant crop it performs well under arid and semi-arid condition. In arid condition Guar grows as rain fed crop which requires 300 to 400 mm rainfall in 3 to 4 spells. It grows under wide range of rainfall from 300 to 550 mm, but heavy rainfall invites many diseases. Guar crop performs better in warm climate and grows well in sub-tropics during summer. It can tolerate high temperature even upto 40 degree Celsius. The seed is normally sown in second week of July after rainfall starts, sowing may get extended upto August depending on rainfall and is harvested during October and November. It usually takes 90 to 110 days for crop to mature, for getting better yield, germination is very important that makes the basic phase of Guar life cycle. Germination is dependent on different factors like seed viability, seed size, seed vigour, soil type -soil moisture, soil temperature and relative humidity. Bolder seeds give higher germination compared to small or medium sized seeds. Bolder seeds may give better shoot length and higher dry matter production. Maximum germination occurs at 25 to 30 degree Celsius and it takes about 6 days for complete germination. Guar seeds are known to germinate only after sufficient imbibition, approximately twice their original weight. Guar is not able to germinate well under high saline and submergence conditions. Pre-soaking of Guar seed in good quality water for 2 hours followed by half an hour shade drying may enormously increase germination percentage.

Soil

Guar can grow in different type of soils but light textured sandy soils are more suitable for the crop. It performs well on medium-fertile, medium textured; un-logged conditions with neutral pH and well-drained subsoil. Soils with pH 7.0 are considered best for Guar production than acid soils. Guar is a moderately salt tolerant crop. Increase in soil salinity affects the nodulation and reduces pod formation and also yield. Being a legume crop it has ability to fix extra nitrogen in the soil so that it can perform well even in poor fertile soil and nutrient depleted soil. Guar has the ability to fix nitrogen to the tune of 30-40kg/ha.

2.7. Nutrient Management

Nitrogen

Being a leguminous crop, it does not respond much to nitrogen, yet a small starter dose (20 kg N/ha) stimulates growth of the plants in early stages. Application of small dose of nitrogen improves the nodulation and nitrogen fixation in Guar whereas application of excessive amounts of nitrogen results in slow nitrogen fixation process. Application of 20 kg N/ha results in higher grain and straw yield. On sandy loam soil it leads to significant increase in physiological parameters like crop growth rate, leaf area index, yield attributes, grain yield and stalk yield of Guar.

Phosphorus

The application of phosphoric fertilizer is important for effective nodulation, bolder seed size and consequently improved yield. Application of phosphorus helps in better plant growth lead by better root system (elongate) and increased number of seeds per pod and per 1000-seed weight. Application of 40kg P2O5/ha increase the seed and stalk yield, dry matter accumulation, crop

growth rate, leaf area index and yield contributing characters viz, number of pods per clusters, number of pods per plant and seed yield per plant. In sandy loam soil a dose of 30 kg/ha P2O5 is found as optimum and economical. Higher application of phosphorus results in lowering of gum content. Application of 20 kg P2O5 per hectare to Guar increased both the gum and protein content in seeds. Inoculation or 40- 60 kg P2O5 per hectare increases the protein content but reduced the gum contents.

Zinc

In general, arid zoned/ rain-fed soils are deficient in micro nutrients particularly Zinc and Iron, hence same must be ensured through soil application. Results of coordinated trails over locations and years 23 indicate that Guar responds very well to ZnSO4 upto 25-30 kg/ha. Hence it is recommended to supply basal dose of 25 kg ZnSO4/ha. Zn has been found to increase earliness and gum content. It also provides resistance towards BLB disease to some extent.

2.8. Water Management

Guar is a drought-tolerant summer legume that requires only 300-400 mm annual rainfall. Adequate moisture ensures maximum production of forage and grain. Areas with low humidity are best for growing guar as grain crop. Guar is highly sensitive to water logging throughout development period. Drainage is very important during kharif. The crop responds well to supplementary irrigation. The seed protein content improves when irrigation is given at 50-60 days of sowing but the irrigation at later stages deteriorates the seed quality.

2.9. Weed Management

Weed management is very important in cultivation of guar as the initial growth of the crop is very slow posing serious exposure to weeds. It is therefore very important to clear the field from weed mainly within 20 days; another weeding is required after 35-40 days. Weeds in guar may cause reduction in yield in the range of 30-50 percent and loses may go upto 70-90 percent depending on the intensity of weed infestation. Weed control alone may help in increasing the seed yield in guar by more than 60 percent (Kumar, 2009).

2.10. Inspect Pest & Disease

- **Insect Management**

Guar is a rainy season crop. Therefore, a number of insect pests feed and grow on its leaves and pods. Some important ones are described here.

Hairy caterpillars: Hairy caterpillars cause heavy damage to guar. The adult lays eggs in clusters over the surface of the leaves. The larvae cause characteristic 96 Potential of Rainfed Guar (Cluster bean) Cultivation, Processing and Export in India skeletonisation of leaves during the early gregarious stage and later they completely defoliate the plant. The pest can easily be controlled by systematic collection of larvae during the early gregarious stage or spraying with Endosulfan @ 0.05 percent.

Jassid (Tidda in hindi): Empoascafabae, EmpoascaKraemeri and Amrascakerri are serious pest of the crop. The nymph is wingless and found in abundance on the lower surface of the leaves. The nymph and adult pierce the plant tissues and suck the cell sap. Leaves become yellow at the margin. They can be controlled by: (i) soil application of systemic granular insecticides such as Aldicarb 10 G

at the rate of 10 -15 kg per hectare. (ii) spray of Dimethoate 30 EC at the rate of 2litres in 1000 liters of water, or (iii) dusting of Quinolphos 1.5% dust at the rate of 20 -25 kg per hectare.

Sanitary and Phytosanitary requirements and export procedures

The agreement on Sanitary and Phytosanitary (SPS) measures is to prevent the risk of introduction of new pests and diseases in new regions, i.e. importing countries. The main purpose of the agreement is to protect human health, animal health, and Phytosanitary situation of all member countries and protect the members from arbitrary or unjustifiable discrimination due to different Sanitary and Phytosanitary Standards.

The SPS agreement applies to all sanitary and Phytosanitary measures, which may directly or indirectly, affect international trade. SPS measures are applied in four situations for the protection of human, animal or plant health:

- Risks arising from the entry, establishment or spread of pests, diseases, disease- carrying organisms or disease causing organisms.
- Risks coming from additives, contaminants, toning or disease-causing organisms in foods, beverages or feed stuffs.
- Risks arising from diseases carried by animals, plants or products thereof, or from the entry, establishment, or spread of pests.
- Prevention or limitation of damage caused by the entry, establishment or spread of pests.

The SPS standards common applied by Governments, which affect imports are:

- **Import ban** (total/partial) is generally applied when there is a significant rate of risk about a hazard.
- **Technical specifications** (process standards/technical standards) are most widely applied measures and permit import subject to compliance with pre-determined specifications.
- **Information requirements** (labelling requirements/control on voluntary claims) permit imports provided they are appropriately labelled.

Phytosanitary certificate for export can be obtained in Rajasthan from the following offices which are listed below:[10]

- Joint Director (Plant Protection), Rajasthan Department of Agriculture, Pant Krishi Bhawan Jaipur(Raj).
- Director of Horticulture, Govt. of Rajasthan, Jaipur (Raj.).
- Joint Director of Agriculture, Directorate of Agriculture, Govt. of Rajasthan, Jodhpur(Ext.),Rajasthan
- Joint Director of Agriculture, Directorate of Agriculture, Govt. of Rajasthan, Kota(Ext.),Rajasthan.
- Joint Director of Agriculture, Directorate of Agriculture, Govt. of Rajasthan, Sriganganagar(Ext.), Rajasthan
- Joint Director of Agriculture, Directorate of Agriculture, Govt. of Rajasthan,Jaipur(Ext.), Rajasthan
- Joint Director of Agriculture, Directorate of Agriculture, Govt. of Rajasthan, Udaipur(Ext.),Rajasthan

[10]http://howtoexportimport.com/How-to-obtain-Phyto-sanitary-certificate-What-is-p-364.aspx

- Joint Director of Horticulture, Room No. 303,Directorate of Horticulture, Pant Krishi Bhawan, Jaipur, Rajasthan

2.12. Harvesting

A growing season of guar is 14 to 16 weeks and requires reasonably warm weather and moderate flashing rainfall with plenty of sunshine. Too much rain can cause the plant to become more 'leafy' resulting in reducing the number of pods or the number of seeds per pod which affects the size and yield of seeds. The crop is generally sown after the monsoon rainfall in the second half of July to early August and is harvested in late October and early November. Guar is a naturally rain fed crop. Depending on the monsoon rainfall the total size of Guar crop varies from year to year. After harvesting, when the pods become dry through sunlight, they are beaten off and during this process, the seeds come out of the pods.

2.13. Pre Harvest Constraints

Cultivation of guar 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 the low prices for guar seeds as the major hindrance and conveyed readiness to invest in guar good agriculture practices when prices go at-least above Rs 4000/quintal.

Chapter 3: Post-Harvest Management

3.1. Grade Specification & Grading at producer level

1. Grade Designation and Quality of Guar Seed

Guar seed shall be obtained from clean, healthy and mature pod or bean of Cyamo psistetragonolobus (L) of family Leguminosae.

2. Minimum requirements:

Guar seeds shall be.-

- Wholesome, mature and dried seeds;
- Of characteristic size, shape and colour,
- Free from live and dead insects, insect fragments, mites, larvae;
- Free from fungal infestation;
- Free from rodent contamination;
- Free from the seeds of Argemone mexicana (Linn.) and other weeds;
- Free from rancidity and mustiness;
- The odour and flavour of the seeds when ground and moistened shall be fresh;
- Free from objectionable taste and flavour;
- Free from kesari dal.
- Guar seeds shall comply with the residual limits of heavy metals, pesticides and other food safety requirements as lay down by the Codex Alimentarius Commission or the requirement for exports of the importing country.
- Guar seeds shall comply with the restrictions in regard to residual levels of metal contaminants, insecticides and pesticides, crop contaminants, naturally occurring toxic substances and other food safety requirements as specified under the Prevention of Food Adulteration Rules, 1955.

3. Criteria for Grade Designation of Guar Seed

Table 13: Grading of Guar

Grade designation	Special requirements									
	Limit of tolerance percentage by mass									
	Extraneous matter		Other edible seeds (Max)	Damaged seeds including mechanical injuries (Max)	Immature Shrivelled seeds (Max)	Moisture (Max)	Gum % (by difference) (Min)	Protein (on dry basis) (Max)	Total ash (on dry basis) (Max)	Residue insoluble in acid (Max)
	Organic (Max)	Inorganic* (Max)								

Special	0.1	0.05	Nil	0.3	1	7	40	33	4	16
Standard	0.5	0.3	0.5	1	3	8	35	35	5	18
General	1	0.6	1	2.5	5	9	30	37	6	20

(*Note: Impurities of animal origin shall not be more than 0.10%.)

4. Other requirements:

The guar seeds shall be in such condition to enable it to withstand transport and handling and to arrive in satisfactory condition at the place of destination.

Guar seeds shall be stored in appropriate cool and dry place maintained in a clean and hygienic condition.

In special grade, ninety eight percent by weight of guar seeds shall be in whitish colour.

Explanation - For the purposes of these rules,-

- "Extraneous matter" means any extraneous matter comprising of -
- Organic matter consisting of husk, straws, weeds seed and other in-edible seeds.
- Inorganic matter consisting of metallic pieces, sand, gravel, dirt, pebbles, stones, lumps of earth, clay, mud and animal filths.
- "Immature shrivelled seeds" means seeds which are not properly developed.
- "Damaged seeds" means seeds or pieces of seeds that are sprouted or internally damaged as a result of heat, weather and moisture.

5. Grade Designation and Quality of Un de-husked Split (Crude) Guar gum

Guar gum un-dehusked split (crude) shall be obtained from clean, wholesome and healthy Guar seeds obtained from Guar pods or beans of Cyamo psistetragonolobus (L.) of family Leguminosae by milling in a hygienic condition.

Minimum requirements:

- Guar gum un-dehusked split (crude) shall be of characteristic size, shape and colour, and free from: living and dead insects, insect fragments, mites, larvae; fungus infestation and visible mould growth ; added artificial colouring and bleaching matter; rodent hairs and excreta and animal filth; cobweb; the seeds of Argemone mexicana (Linn.) and kesari dal; rancidity and mustiness; objectionable taste and flavour; added starch and stabilizing agents.
- The odour and flavour shall be fresh when ground and moistened.
- Guar gum un-dehusked split (crude) shall be of white to greyish white colour.
- Guar gum un-dehusked split (crude) shall comply with the residual limits of heavy metals, pesticides and other food safety requirements as laid down by the Codex Alimentarius Commission or the requirement of the importing country or as per buyers' requirement for exports.
- Guar gum un-dehusked split (crude) shall comply with the restrictions in regard to residual levels of metal contaminants, insecticides and pesticides, crop contaminants, naturally occurring toxic substances and other food safety requirements as specified under the Prevention of Food Adulteration Rules, 1955

Table 14: Criteria for grade designation of underused split (crude) guar gum

Grade designation	Special requirements									
	Limit of tolerance percentage by mass									
	Extraneous matter		Other edible seeds (Max)	Damaged seeds including mechanical injuries (Max)	Immature Shriveled seeds (Max)	Moisture (Max)	Gum % (by difference) (Min)	Protein (on dry basis) (Max)	Total ash (on dry basis) (Max)	Residue insoluble in acid (Max)
	Organic (Max)	Inorganic* (Max)								
Special	0.1	Nil	8	3	0.4	22	50	3	10.5	13
Standard	0.5	0.3	9	3.5	0.5	24	45	5	11	14
General	0.7	0.6	10	4	0.6	26	40	7	11.5	16

Other requirements

The guar gum undehusked split (Crude) shall be in such condition to enable it to withstand transport and handling and to arrive in satisfactory condition at the place of destination.

It shall be stored in appropriate cool and dry place maintained in a clean and hygienic condition.

It shall be kept away from direct sunlight and moisture.

The mesh or sieve size in micron may be marked on the packages (Optional)

Explanation- For the purposes of these rules, "extraneous matter" means any extraneous matter comprising of-

Organic matter consisting of husk, straws, weeds seeds and other inedible seeds.

Inorganic matter consisting of metallic pieces, sand, gravel, dirt, pebbles, stones, lumps of earth, clay and mud.

6. Grade designation and quality of dehusked split (refined) guar gum

Guar gum dehusked split (Refined) shall be obtained by milling clean, wholesome and healthy Guar seeds obtained from Guar pod or bean of Cyamopsistetragonolobus (L.) of family Leguminosaein a hygienic condition.

Minimum requirements:

1. Guar gum dehusked split (refined) shall be:-
   - of characteristic size, shape and colour,
   - free from living and dead insects, insect fragments, mites, larvae;
   - free from fungus infestation, visible mould growth ;
   - free from added artificial colouring and bleaching matter;
   - free from rodent hair and excreta and animal filth;
   - free from cobweb;
   - free from the seeds of Argemonemexicana (Linn.) and kesari dal;
   - free from rancidity and mustiness;
   - free from objectionable taste and flavour;
   - free from added starch and stabilizing agents.

2. The odour and flavour of the Guar gum de-husked split (refined) shall be fresh when grind and moistened;

3. Guar gum de-husked split (refined) shall be white to whitish in colour.
4. Guar gum de-husked split (refined) shall comply with the residual limits of heavy metals, pesticides and other food safety parameters as laid down by the Codex Alimentarius Commission or the requirement of the importing country for exports.
5. Guar gum de-husked split (refined) shall comply with the restrictions in regard to residual levels of metal contaminants, insecticides and pesticides, crop contaminants, naturally occurring toxic substances and other food safety requirements as specified under the Prevention of Food Adulteration Rules, 1955.

Table 15: Grade Specification

Grade designation	Special requirements									
	Limit of tolerance percentage by mass									
	Extraneous matter		Other edible seeds (Max)	Damaged seeds including mechanical injuries (Max)	Immature Shriveled seeds (Max)	Moisture (Max)	Gum % (by difference) (Min)	Protein (on dry basis) (Max)	Total ash (on dry basis) (Max)	Residue insoluble in acid (Max)
	Organic (Max)	Inorganic* (Max)								
Special	Nil	Nil	8	0.5	0.15	83	5	2	1	4
Standard	0.5	0.1	9	1	0.15	80	6	3	2	5
General	1	0.5	10	1.5	0.15	78	8	4	2.5	6

Other requirements

- Guar gum powder shall be stored in appropriate cool and dry place maintained in a clean and hygienic condition.
- Guar gum powder shall be kept away from direct sunlight and moisture.
- The gum percentage in the guar gum shall be marked on the package.
- It shall be marked on the package guar gum powder 'Food Grade.'
- The mesh or sieve size in microns or IS number, if any, may be marked on the packages

a) 100 Mesh – 95% of guar gum powder shall pass through 100 Mesh
b) 200 Mesh – 95% of guar gum powder shall pass through 200 Mesh.
c) 300 Mesh – 90% of guar gum powder shall pass through 300 Mesh.

or as per specific requirements of the buyer.

Explanation - For the purposes of these rules, "extraneous matter" means any extraneous matter comprising of -

- Organic matter consists of husk, straws, weed seeds and other indelible grains.
- Inorganic matter consists of metallic pieces, sand, gravel, dirt, pebbles, stones, lumps of earth, clay and mud, animal filth.

3.2. Major Storage Dieses and Pest & their control measures

Guar is a hardy crop and can be stored easily by farmers at normal temperatures for three to five years. Guar seeds are not much attracted by pests and hence many farmers opt to store guar of a particular

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

A typical farmer in the cluster has diploid about 1.6 ha under rainfed condition to Guar production. The gross yield is 4 quintal per ha. The market rate of the sale is about Rs. 3500 per quintal Rs. 14000 per ha. The cost of cultivation is about Rs 7900 per ha. Net realization is about Rs. 6100 per ha without fodder and is Rs 7600 per HA including fodder. Out of total expenses made per ha, about Rs. 1000 is made on cost of land preparation (only levelling), seed cost is about Rs. 1000(Actual seed cost is Rs 100 per kg but farmer uses around 70% seed stored from previous year, fertilizer and pesticide cost is about Rs. 2000, weeding related (labour cost) is about Rs. 500 and harvesting cost is about Rs. 2800. Packing and transportation cost is Rs 200 per ha. The farmer uses fertilizers and pesticides only when he sees that the crop has a good scope of return seeing rainfall pattern and prevailing market prices. Fertilizer and pesticides are procured from local input supplier. Seeds are procured either from Raj seeds or from in house. The typical farmer is selling produce at nearest Mandi at price range of Rs 3,500 per quintal. Farmers in the region are not satisfied with the market price as they expect it to go at least beyond Rs 5,000/quintal. Many farmers are therefore holding stock since last three years in hope for higher market price. Sometimes the production also gets reduced due to sudden change in climate.

Table 16 Cost of Production, Guar, rain fed

Sr. No.	Particular	Amount (in Rs. Per ha)
A.	**Income (4 qtl./ha @ Rs 3500/qtl)**	**14000**
B.	**Cost of Production**	
1	Land Preparation Cost (Generally one levelling by tractor @ Rs 1200/ha)	1000
2	Seed Cost(20 kg/ha@ Rs 50/kg)	1000
3	Broadcasting of seeds (Generally direct broadcasting. Line sowing method not followed for rainfed Guar)	400
4	Input Cost (1 DAP-1300, Weedicide and FYM if available)	2000
5	Weeding Cost (Manual if needed)	500
6	Harvesting Cost (6 labour day/ha) and thrashing cost	2800
7	Packing and Transportation Cost	200
C.	**Total Cost of Production**	**7900**
D.	**Net Profit per ha**	**6100**
E.	**Yield of fodder (5 qtls/ha @ Rs 300/qtl)**	**1500**
F	**Net profit per HA @ Rs 3500/qtl**	**7600**
G	**Cost per qtl**	**1975**
H	**Profit per quintal of Guar grain**	**1525**

Chapter 5: Supply Chain of the Commodity

5.1. Seasonal Availability and Price Pattern

5.1.1. Seasonal Availability

Guar seed generally arrives in the markets in months of October to December. The part of produce (5-10%) is retained by farmers for seed and animal feed purpose. The rest of the produce is sold in the market. The guar seed is mainly traded in Agriculture Produce Market Committees (APMC) of Rajasthan. However, many farmers are keeping the stock at home and are selling in small volumes as per their cash requirement. This is due to the fact that, guar seeds can be easily stored for 3-4 years in normal storage conditions and farmers have also become speculative seeing the exorbitant price rise of Guar seeds.

Figure 10: Peak and lean period of Guar Marketing

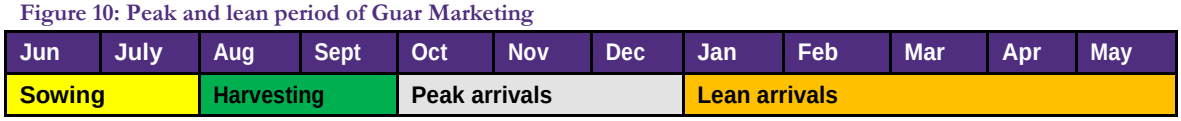


Table 17: Availability of guar in Various Market of Rajasthan

State	Mandi
Rajasthan	Jodhpur, Bikaner, Sriganganagar, Hanumangarh, Churu, Sikar, Jaipur, Jaisalmer, Barmer, Nagaur, Nokha, Renwal
Haryana	Adampur, Fatehabad, Hisar, Sirsa, Bhiwani, Ellanabad
Gujarat	Kachch, Banaskanta, Sabarkanta, Mehsana, Patan, Ahemdabad
Punjab	Bhatinda

5.1.2. Market Arrivals & Prices in Major markets of Rajasthan

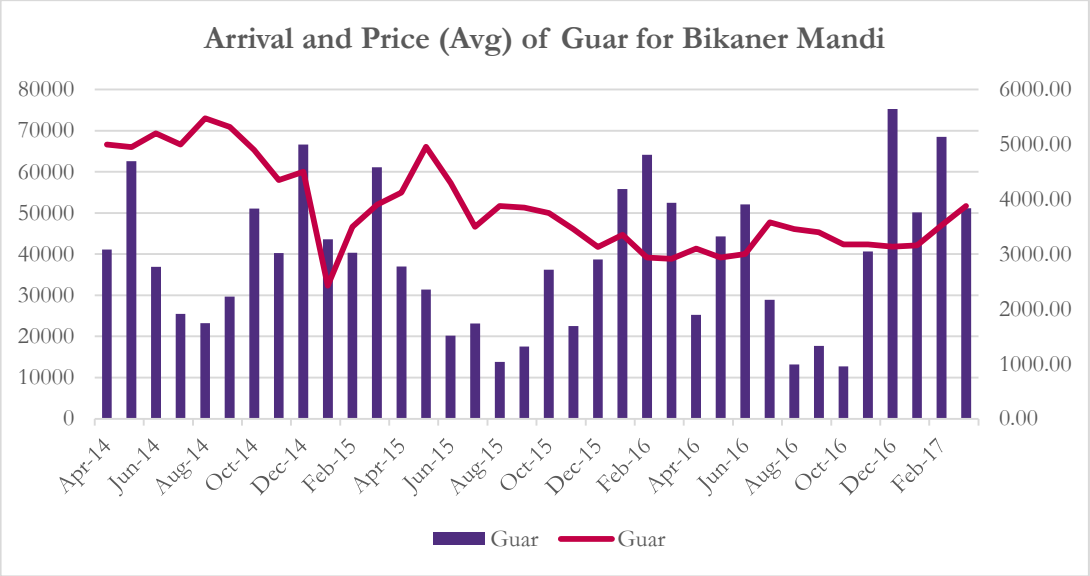
Table 18: Arrival and Average Price of Guar in Bikaner Mandi

Year 2014-15			Year 2015-16			Year 2016-17		
Month	Guar		Month	Guar		Month	Guar	
	Arrival	Price (Avg.)		Arrival	Price (Avg.)		Arrival	Price (Avg.)
Apr	41086	5000	Apr	36987	4122	Apr	25285	3100
May	62557	4950	May	31410	4957	May	44332	2940
Jun	36931	5200	Jun	20190	4300	Jun	52111	3002
Jul	25465	5000	Jul	23153	3500	Jul	28920	3580
Aug	23208	5476	Aug	13801	3880	Aug	13208	3460
Sep	29719	5320	Sep	17587	3850	Sep	17682	3401

Oct	51059	4900	Oct	36203	3750	Oct	12734	3180
Nov	40242	4350	Nov	22555	3455	Nov	40619	3180
Dec	66630	4500	Dec	38672	3128	Dec	75238	3135
Jan	43613	2424	Jan	55825	3350	Jan	50161	3160
Feb	40306	3500	Feb	64182	2940	Feb	68475	3525
Mar	61084	3900	Mar	52496	2915	Mar	51171	3880

The prices of Guar have been stagnant for the entire year of 2016 fluctuating between Rs 3000 to Rs 4000 per quintal. However, the trend from Jan 2017 is showing some positive signs with prices rising above Rs 4000 mark.

Figure 11: Arrival and Prices of Guar in Bikaner Mandi



The spot price of guar seed for 7 years i.e., from 2007 to 2013 reflects high volatility of prices. The Spot price at Jaipur market and Sri Ganganagar are analyzed.The price fluctuate highly during monsoon period i.e. July to October. Guar seed traded at Jaipur market between Rs 4000/qt. during Oct, 2012 to Rs 15000/qt. in the month of December, 2012. In 2013 the highest price at Jaipur was recorded in the month of January at Rs. 14400/qt. and lowest recorded was Rs. 4200/qt. in August. Highest fluctuation in prices of guar seed has been observed in the year 2012. During the year 2012, prices at Sri Ganganagar market ranged from Rs. 7752/qt. to Rs. 28556.2/qt. The price of Guar seed ranged from Rs 4000/- per quintal to Rs 11000/- quintal at Jaipur market in 2013. While for the same period the price range at Sri Ganganagar was from Rs. 7752/- per quintal to Rs. 28556/- per quintal. In the year 2013 the ranges of price at Jaipur and Sri Ganganagar market were Rs. 4361/- per quintal to Rs. 11482/- per quintal and Rs. 5004/- per quintal to Rs. 11743/- per quintal respectively.

The high price fluctuation in guar is mainly on account of higher fluctuation in area and production of guar seed depending on the spread and level of monsoon rainfall in the producing centers and the export demand of guar gum from the importing countries.

Factors Influencing Guar Price:

1. Rainfall during sowing and critical stages of growth
2. Area sown under the crop in major states like Rajasthan, Haryana, Punjab, Gujarat, etc.
3. Pattern of arrivals on a regular basis in markets like Jodhpur, Bikaner, Sriganganagar, Adampur, Bhiwani, Siwani etc.
4. Demand from millers or processors and export demand.

Futures Trade for minimizing Price risk:

Futures trade in Guar seed started in the month of April, 2004 on NCDEX platform with the objective of price discovery and price risk management. Futures contracts for Guar Gum are traded mainlyon NCDEX platform. Futures trade in agri-commodities provides good hedging platform for the farmers, processors, exporters, etc in the value chain. The total value of output of guar seed is estimated at Rs 1,238 crore during 2005-06 (June – July), which has enjoyed a futures turnover of Rs 299,305 crore (242 times of guar output) during May 2005- March 2006.

Total value of guar seed and guar gum traded on NCDEX has continuously increased in the initial years and reached to the peak during 2006-08. In 2006 Guar seed and Guar Gum together contributed to 45% of total agricultural commodity traded at NCDEX and 37% of overall commodity trade of the exchange. The trend was continuing till 2008 as 39% of agricultural commodity trade was from Guar only. From the year 2009 the share of guar in agricultural commodity trade and overall commodity trade of NCDEX started declining. In the year 2010 the share of guar in total agricultural commodity trade of NCDEX was only 13%. Up to November 2013, the share of guar in total commodity trade of NCDEX is only around 9%.

The total quantity traded on commodity bourses was 88 times of total quantity of guar seed produced in the year 2004-05, 179 times in the year 2005-06, 146 times in the year 2006-07 and 53 times in the year 2007-08.

5.2. Existing Marketing Channels

The pre intervention value chain of Guar has essentially three value chains. In the recent years, farmers are mostly selling to commission agents as Guar has become a highly speculative commodity and farmers are getting mandi price from their door step due to commission. The Guar then reaches the mandi from where it is being traded by whole sellers. However, NCDEX e-portal has become a big tool for determining the market price for Guar and many small commission agents apart from wholesalers are also trading in Guar in NCDEX platform. Most of the guar finds its way to guar split/dal making units locally situated in Bikaner/ Jodhpur/ Ganganagar/ Jaipur from where, the split is being supplied to further processing to secondary processors or is directly exported. The husk (Guar churi and korma) is supplied by the primary processors to animal feed industry. It also has a good demand in the international market. There is no such distribution network through Dealers and retailers as guar is not traded in open market and specific processors supply to specific target market directly as institutional suppliers.

Guar has many industrial usages domestically in paints, gum, noodles and pharmaceutical industry. However, the demand is stagnant. Most of the speculations in Guar have happened due to use of guar gum is fraking shell for extraction of petroleum in the US. The demand has however again reduced due to low oil prices internationally. It can be noted that, the USA promotes fraking only when the prices of crude oil increase beyond a certain point to check expenditure on imports. Hence it can be inferred that, Guar prices are directly linked to the international crude oil price now a days'.

Figure 12: Pre Intervention Value Chain map of Guar

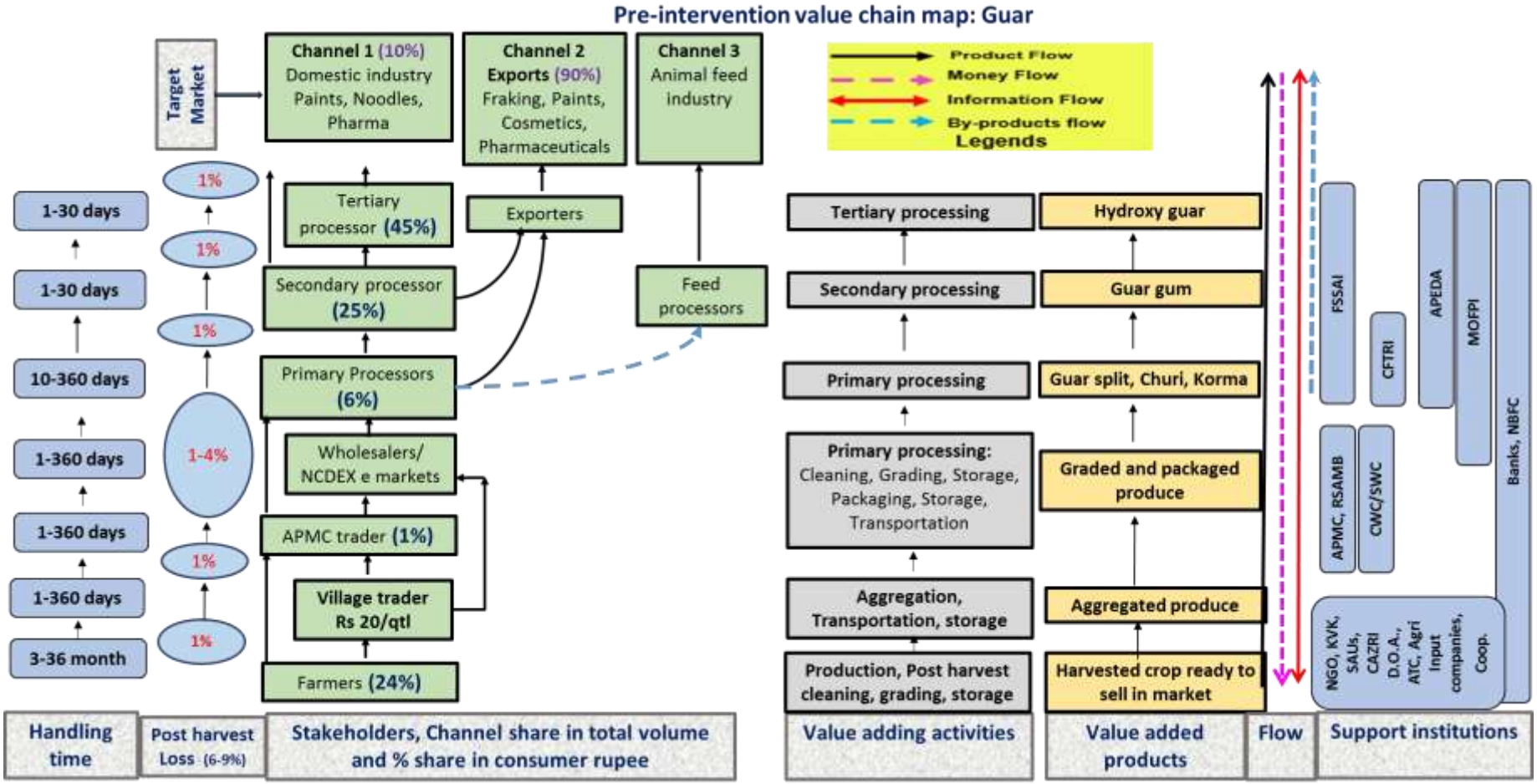


Figure 12 presents all the production-distribution channels possible for Guar in the cluster. These channels were identified based on the consultation with various stakeholders.
According to sources from Industry there are more than 150 guar processing units in India, and the total installed capacity is more than 6 lakh tonnes per annum. There are two types of guar seed processing industries, guar seed to guar powder and guar powder to guar gum. All the split units have indigenous plant and machinery and are mainly located in Jodhpur, Sri Ganganagar and Bikaner districts of Rajasthan. The pulverized gum is largely sold as commodity, and about 20% of the exports are still in the form of refined splits.

In regards to guar gum, although chemical analysis of different varieties is available and the processors could exercise preference for varieties with higher gum contents, but it is constrained by technical knowledge, machinery and resources as felt by industry to leverage the advantages of global market.

Guar supply Chain

Guar seed is used for animal feed, extracting guar split, powder and guar gum. There are number of guar processing units in Jodhpur, Bikaner, Sri Ganganagar, Alwar and Jaipur of Rajasthan state, Bhiwani and Sirsa of Haryana state and Deesa, and Ahmedabad of Gujarat state. These units can be grouped into guar split manufacturers, and guar gum processors.

There is very little or no loss in the guar supply chain due to handling as it is highly stable and non-perishable in nature and there are instances of farmers storing above three years under normal conditions. In the processing stages, losses are negligible as all products and by-products are efficiently used by the industry. The by-product of guar split industry is actually an input for animal feed industry.

A great trend is seen in the handling and holding time of the produce/product from farmers to primary processors because of the price volatility of the industry and everybody in the trade expects price increase and is speculative of the prices.

The map also details various support institutions. At the cultivation stage, NGOs, State Government Agriculture Dept., State Agriculture University, CAZRI, ATC, Input companies and cooperatives serve the farmers for technology transfer and input service.

In the post harvest stage, RSAMB, NCDEX and various APMC channels are the service providers. Financial institutions provide their services all across the value chain. At the secondary processing stage, CFTRI, MNOFPI, FSSAI, APEDA etc are major support institutions in the regulatory and technology service provide arena.

Marketing Cost

Marketing costs are the actual expenses incurred in bringing goods and services from the producer to the consumers. The marketing costs normally include:

- Handling charges at local points
- Assembling charges
- Transport and storage charges
- Handling charges by wholesaler and retailer

Market fees, commission charges and taxes on Guar in Rajasthan are described in table below.

Table 19: List of market fees

S. No	Particulars	Charges (%)
1	Mandi tax	1.6%
2	Commission charge	2%
3	Tax	---
4	Miscellaneous charges (Handling, weighing, loading, unloading, cleaning etc)	It varies from market to market. In Bikaner mandi Rs 15 is the loading and unloading charges per quintal
5	Overall addition to purchase price from farmer	6%

Marketing margin

Total marketing margin is cost involved in moving the guar from producer to consumer and profit of various market functionaries. Absolute value of the total marketing margin varies from market to market, channel to channel and time to time. Generally, traders from mandi undertake onward supply adding 2-6% margin to bulk handlers.

5.3. Alternative Systems of Marketing

Marketing information is a key to regulate the competitive marketing processes and to restrict the monopoly or profiteering stakeholders in the market. It is needed by producers in planning production and marketing of their produce, and is equally required by other market participants. Farmers need to be fully familiarized in different areas of agricultural marketing in order to improve their price realization. Marketing information is important at all the stages of marketing right from farm level to ultimate consumption level and simultaneously for all participants in these stages i.e producer ,trader (millers),consumer etc. The Government of India has started Agricultural marketing information network scheme through Directorate of Marketing and Inspection to improve the present market information scenario by linking all agricultural produce markets in the States and Union Territories. This has been established to an extent in Rajasthan.

APMC draft law* 2017 proposes private market yards. Single licence for all traders; caps on mandi fees: retail chains can buy directly from farmers. The draft model of APMC Bill proposes private market yards, farmer-consumer markets, electronic trading platforms and converting warehouses into smaller mandis to provide better linkages and prices to farmers. The draft State/UT Agricultural Produce Marketing (Development and Regulation) Bill, to replace the 2003 model APMC Act, also proposes a uniform licence for all traders within a state and a single national licence for the electronic National Agriculture Market (e-NAM) within six months of enactment of the new law.

5.3.1. Direct Marketing through private market yards

Guar seeds as a crop have huge scope of direct marketing. NCDEX e markets and CGR Mandi online offer scope for direct marketing of Guar through their e-portals. Farmers can store the seeds in their accredited warehouses nearby and take 80% financing against the warehouse receipt. They can later sell the produce directly to any bidder from any part of India. For the services of the warehouse provider, they are charged a nominal fee. Generally, crops like guar are of high priority to the direct marketing companies. However, farmers should be trained more on the direct marketing

operations through private e markets as these can be sometimes risky and the net gain after cost of warehouse receipt might be negative sometimes.

5.3.2. Contract Farming

Contract farming is defined as a system for the production and supply of agricultural/horticultural produce under forward contracts between producers/suppliers and buyers. The essence of such an arrangement is the commitment of the producer/ seller to provide an agricultural commodity of a certain type, at a time and a price, and in the quantity required by a known and committed buyer.

There is apparently limited contract farming initiatives in the commodity due to various challenges in the contract farming act of Rajasthan. The key challenges are detailed in PIESTEC in 8.4.

A number of companies are coming up for contract farming of guar in Rajasthan, haryana, Punjab, Maharashtra, Andhra Pradesh and Karnataka. Some of these companies are purely engaged in contract farming while others are also offering consultancy services. Some of the companies and their activities are described below:

5.3.2.1. Vikas WSP Ltd.

Vikas WSP ltd. Is a company engaged in processing of guar with registered office at Siwani in haryana and plants at Siwani and Sri Ganaganagar in Rajasthan (www.vikaswspltd.in) In April 2013 at the beginning of the sowing season this company distributed around 100,000 bags (a quintal each) of guar seed to farmers in Rajasthan, Punjab and haryana and invited them to sow this crop, for which the company guaranteed a minimum assured purchase price of Rs 5000 per quintal. According to Mr. Jitendra Jindal, vice-president of Vikas WSP ltd. the company is committed to procure at that price, irrespective of price movement during the harvesting season. The company had planned to commence procurement from November 1 at Rs 50 a kg. This company also made some contracts with farmers in Andhra Pradesh for guar production involving state department of agriculture. State department of agriculture only facilitated the process.

5.3.2.2. AGRILOGIX:

AGRIlOGIX is a hyderabad based company engaged in various farming activities like agriculture, horticulture, animal husbandry and aqua culture in Andhra Pradesh. Annually the company has been cultivating different cash crops like Rice, Black gram, Sugarcane, Maize, Turmeric, horse gram, Mango and Banana. The company is embarking upon a very aggressive growth strategy in the contract farming and seed industry. The entrepreneurs of the company hail from a rural background with wide ranging experience and passion towards agriculture. A team of experienced employees professionally manages AGRIlOGIX by rendering managerial and technical services to the company.

The company has taken up guar cultivation as a pilot project 250 acres, in Anantapur district of Andhra Pradesh in rainfed conditions during the Kharif season in the year 2012. AGRIlOGIX encourage the farmers to take up the production of guar bean as an alternative cash crop in rotation with other major cash crop grown in the area69. The project is implemented in two ways

- Own farming - The Company will be taking up farming on its own by taking the farmland on lease from the farmers. The firm will procure and manage all the inputs for the cultivation and the farmer becomes just a supplier of land and if required, of labor

- Contract farming (with buy back of harvested seed) – This is mainly a procurement contract under which sale and purchase conditions are specified. The firm provides quality seed and technical assistance to the growers for better growth and yield.

The two players in the chain are farmers, as producer and AGRIlOGIX, as buyer of the produce. Farmers are principally interested in earning increased incomes from the sale of guar seed and the firm is interested in accessing adequate quantities of good guar seed by promoting the crop in the region. Company is trying about five varieties of guar namely RGC 936, hG 365, hG 563, RGC 1066, RGM 112. The seeds are produced, processed and marketed by AGRIlOGIX under the brand name " VIMo SEEDS".

5.3.2.3. Pacific Agro

Pacific Agro is a Nagpur based company (An offshoot of Pacific herbs Agro Farms Pvt. ltd) conducting trial and providing consultancy services on all aspects of guar production since 2010 in Maharashtra, Madhya Pradesh, Chattisgarh, Gujarat, Bihar, uttar Pradesh and southern States like Andhra Pradesh, Karnataka and Tamil Nadu. Pacific Agro is organizing Seed Production program of different varieties of guar (RGC-936, hG-563 and hG-365 as these varieties are more suitable in these areas) in the state and providing certified and truthful seed to the cultivators. They are also providing the buyback arrangement for the produced seeds by purchasing from the growers and selling it to Bikaner, Jodhpur and hisar.

In addition to seed production company is also engaged in promotion of guar cultivation in collaboration with NABARD and Department of Agriculture through ATMA at Nagpur and Chandarpur districts of Maharashtra. In chandarpur district company distributed seed and other relevant inputs for 150 acre to ATMA. This company also distributed two ton of guar seed during 2010-11, five ton in 2011-12, ten tons in 2012-13 and during 2013-14 company has a target of distribution of twenty five ton of seed. During 2012 the company organized two national level seminars on guar production one at Nagpur on 14th October and another at hyderabad on 11th November.

5.3.2.4. Bhavya sri traders

Other organization on contract farming is Bhavya sri traders in Andhra Pradesh70. This company provide all concerned services like quality seed, crop agronomy and assured support at different places. The company claims to be a pioneer company in Andhra Pradesh for guar cultivation and doing very well. It handles guar cultivation project on mass scale in which all concerned services like selection of soil, soil amendment if required, Selection of the correct Variety of the Seed suitable for particular region provided by the company.

5.3.2.4. Silonex

Silonex gums and chemicals (Silonex) is a company based in hyderabad71 and is entering into guar farming in Andhra Pradesh and Karnataka on contract farming. like Bhavya sri traders this company also provide all concerned services like certified seed agronomy and assured "Buy back" support. Company also arrange/ conduct on field training and take up large cultivation of guar on 50 acres or more.

5.3.3. Work on Traceability in Guar Crop:

Birla Hichem (Hindustan Gum and Chemicals Ltd.)

A new trend has emerged in the Guar industry where, the foreign clients mostly into Cosmetics like (Loreal and Solvay) have entered into contract with Hichem for supplying traceability standard Guar. For this, both Solvey and Loreal have contributed CSR budget for promoting sustainable guar crop with around 5000 farmers in rain-fed areas of Bikaner division. The farmers are trained on packaged and practices of the crop and are organized into Producer Groups. The ground level project is being implemented through an International NGO TechnoServe where TechnoServe is responsible for formation of Producer Groups, transfer of PoP to project farmers with support from SAU and facilitate tracebility for purchase of Guar seeds from project farmers upto the plant of Hichem at Jodhpur. The guar procured in such a manner is tagged separately and is also processed separately than conventional guar. The Guar Gum excrated from such traceable system is expected to have less pesticide content and is exported to Solvey for preparing high level of cosmetic additives. Loreal is the client of Solvay which uses such extracts in its cosmetic brands.

Chapter 6: Processing Infrastructure Availability and Utilization

6.1. Processing

The Guar seed consists of three parts namely the seed coat (14-17 percent), the endosperm (35-42 percent), and the germ (43-47 percent). The different constituents of the Guar seed are presented in Table. Guar gum the prime marketable processed product of the plant comes from the endosperm. The other by-product of the processing like Churi and Korma are used for Cattle feed. Various steps involved in the processing of guar seed is presented in Figure.

Table 20: Constituents of Guar grain

Part of Seed	Protein	Ether Extract	Ash	Moisture	Fibers	Types of Sugar
Hull (14-17%)	5	0.3	4	10	36	D-glucose
Endosperm (35-42%)	5	0.6	0.6	10	1.5	Galactomannan
Germ (43-47%)	55.3	5.2	4.6	10	18	Glucose

Guar Splits

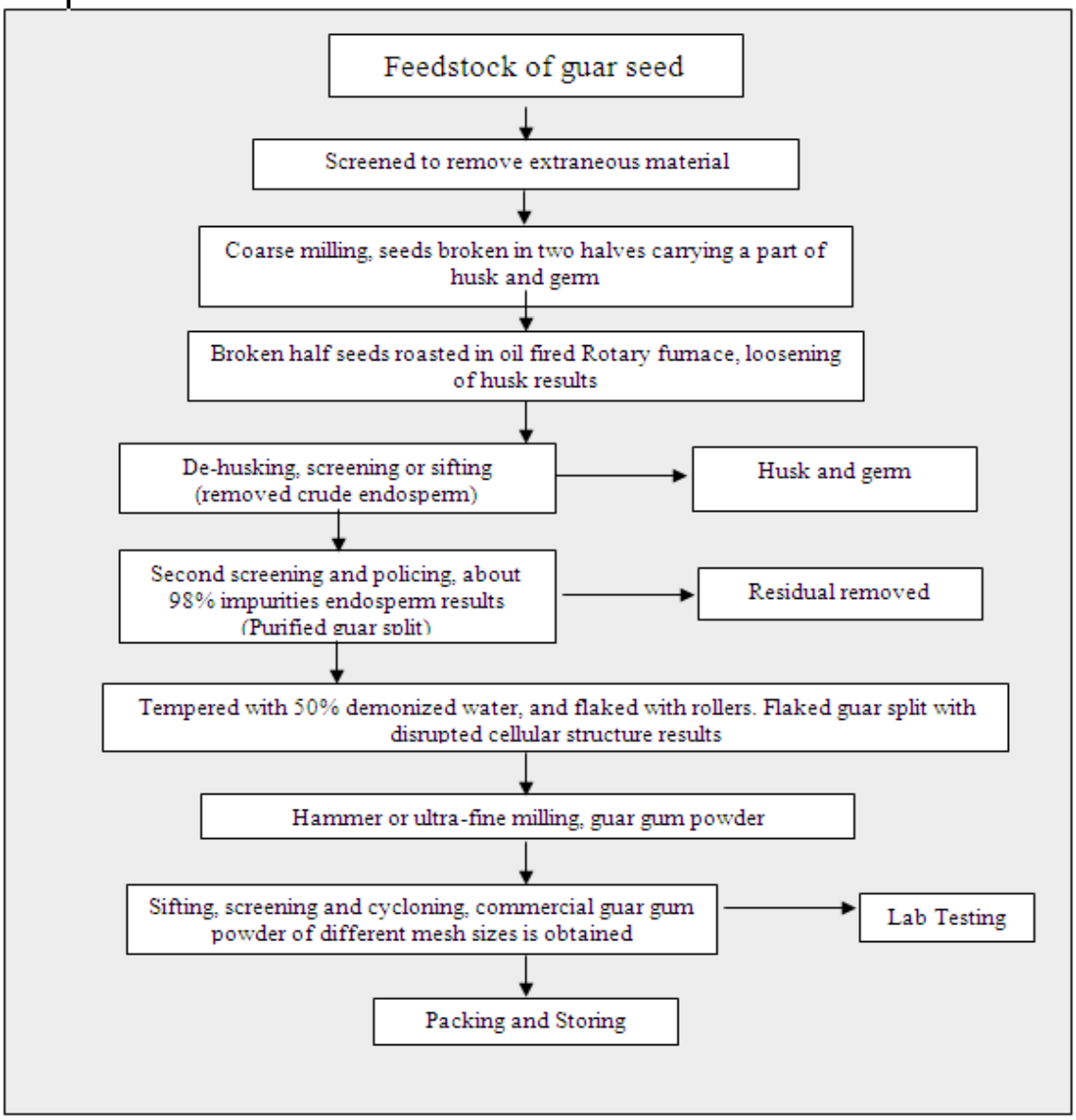
When the polished endosperm are removed and separated from the fine layer of fibrous material a husk and refined Guar splits are obtained.

Guar Powder

These refined splits are then pulverized, treated and processed for specialty grade products for usage in industries. After pulverization, sieving is done to get the required mesh size i.e. fine, coarse, etc. and is converted into powder by a variety of means and processing techniques depending upon the desired end product. The Guar gum powder is mechanically extracted by roasting, differential attrition, sieving and polishing of Guar seeds. The sieved gum is then passed through the blenders to make it homogenous and later it is packed for marketing. The gum is refined to make yellowish white powder as per the quality specifications required by user industries and grades specified.

The processors dominated marketing of Guar seed operates on the trade defined standards. However; specifications for Guar seed have also been defined by Directorate of Marketing and Inspection through AGMARK standard.

Figure 13: Steps in Processing of Guar Seed



Guar Gum

Refine guar splits are the sole raw material for manufacturing Guar gum powder for pharmaceutical and food grade material. The properties of Guar powder, which make it useful in various applications, are:

- Easy solubility in cold and hot water
- Film forming property
- Resistance to oils, greases and solvent
- Better thickening agent
- Water binding capacity
- High viscosity
- Functioning at low temperatures

Uses of Guar and its derivatives

Guar is traditionally used for feeding animals in Rajasthan and green pods were used for vegetable purpose. With the development in processing technology in the country, Guar seed is being used

for extracting gum powder, which has many applications including food preparations, beverages, textiles, paper industry, petroleum industry, mining, explosives, pharmaceuticals and cosmetics

Human Consumption:

- Immature pods are dried, salted and preserved for future use
- Immature pods are dried and fried like potato chips
- Green pods are cooked like French beans
- Mature seeds are used as an emergency pulse in time of drought

Cattle Feed:

- Plants are cut and used as green forage.
- Beans are used as high protein feed.

Medicinal Purposes:

- Plants are mashed, then mixed with oil and used as a poultice on cattle boils.
- Leaves are eaten to cure night blindness.
- Seeds are used as a chemotherapeutic agent against smallpox.
- Boiled Guar seeds are used as poultices for the plague, enlarged livers, head swellings and also for swellings due to broken bones.
- Seeds are used as laxative.

Crop and Soil Improvement:

- Plants are used as shade for ginger
- Guar commonly is used as a cover crop and green manure.

Industrial Use

The guar gum is being consumed in variety of industries ranging from oil drilling, textile, paper, explosive, food processing, pharmaceuticals, cosmetics, etc. The Industry wide applications of Guar gum is presented in table below

Table 21: Industry wise applications of Guar gum derivatives

Sr.No	Industry	Uses	Derivatives	Functions
Industrial/ Technical				
1	Oil well drilling	Driling Fluids hydraulic fracturing	Borate cross-linked guar gum, hydroxy alkyl ether derivatives	Control of water loss, viscosity, suspension, turbulence, mobility, friction reduction
2	Textile Printing	Cotton, Rayon silk, wool sizing, carpet printing	Carboxy-methyl guar, hydroxy propyl guar, modified guar gum	Reduces wrap breakage, reduces dusting film forming thickening for dye
3	Paper	Wrapping paper, kraft, photographic paper, filter	Oxidized guar gum, cross-linked guar gum, amino ethyl gum, modified guar gum, guar gum formate,	Replaces hemi cellulose, increase strength, fold, pick, pulp hydration, retention of fines, decreases porosity

4	Mining	Concentration of ore, filtration	Aminoethyl guar gum, sulphate of guar gum	Flocculating and settling agent, filter aid
5	Explosive	Stick explosive, blasting slurries	Reticulated guar gum, cyanoethyl ether of guar gum	Water proofing, gelling agent
6	Water Treatment	Industrial water, drinking water	Food grade guar gum	Coagulant aid (food approved)
7	Tobacco	Reconstitution of fragmental tobacco	Reaction product of carboxymethyl cellulose and guar gum	Binding agent, strengthening agent
8	Coal Mining	Coal suspension,	Borate cross-linked guar	Friction reducing suspending
		shock impregnation	Gum	Agent
9	Fire fighting	Water for fighting fires	Guar gum with ethylene glycol and glycerol	Friction reducing, dispersion and direction control
10	Ceramic	Enamels, electroceramics	Chlorinated guar gum	Fixing, binding thickening agent
11	Photography	Emulsions, gelatine solutions	Borate cross linked guar gum, hydrolysed guar gum	Gelling, hardening agent
12	Synthetic Resins	Polymerization, suspension, collagen dispersion	Suspension of guar gum with CMC	Thickening, Binding agent
Food Applications				
13	Frozen foods	Ice creams, Soft serves, frozen	Food grade guar gum with CMC	Water retention, ice crystal inhibitor, stabilizer
14	Bakery	Bread, Cakes, Pastry, Icing	Non-metabolised guar gum	Dough improvement, greater moisture retention, prolonged self life
15	Proceed Cheese	Cottage cheese, cream cheese	In combination with other water soluble gums	Increase the yield of curd solids, improves tenderness
16	Dairy Products	Yoghurts, desserts, molasses	In combination with other water soluble gums	Inhibits when separate keeps texture after
17	Dressing and Sauses	Salad cream, pickles, barbecue relish	In combination with other water soluble gums	Fast, cold dispersible thickening and texturising agent
18	Instant mixes	Pudding sauces, desserts, beverages	In combination with other water soluble gums	Fast, cold dispersible thickening and texturising agent
19	Canned Foods	Pet foods, corned meat, baby foods	In combination with other water soluble gums	Acid resistant thickening and suspending agent
20	Beverages	Cocoa drink, fruit nector, sugarless beverages	In combination with other water soluble gums	Acid resistant thickening and suspending agent
21	Animal Feed	Veterinary preparations, calf milk replacer	In combination with other water soluble gums	Suspending agent, granulating agent
Pharmaceuticals				
22		Laxative, slimming aids , Gastric hyperacidity, Diabetic treatment, Cholesterol, Vitamin formation Preparation	Food grade guar gum	Bulking agent, bulk forming appetite depressant Synergistic activity with bismuth salt, Reduction of Urinary glucose loss, Reducing aid, Stable water soluble suspension

Cosmetics				
23	Cosmetics	Ointment Lotions, Hair Shampoos, Hair Conditioners	Hydroxypropyl guar(HPG), Food grade guar gum, Cationic guar, Hydroxypropyl guar (HPG),	Thickening agent gives unctuousness Lubricating, suspending agent, Detergent compatible thickener, Protective colloid film

(Source: NIAM, 2010)

The major consumer of Guar gum is oil drilling and mining with the global consumption of 60-65 percent followed by food processing industry accounting for 25-30 percent consumption.

Table 22: Application-wise Global consumption of Guar Derivatives

Type of Applications	Target industries	Global Consumption
Food grade	Bakeries (Bread), Dairy (Ice cream, Sherbets, Cheese etc.), Dressing (Sauces, Ketchup's), Beverages (Chocolate drinks) & Pet Food (Thickener)	25-30%
Pharmacy grade	Cosmetics & medicines (as binder and thickener) Slimming, (Reducing weight & laxative)	05-10%
Industrial grade	Oil drilling (as a well stimulant and fraction reducer), Mining (increased yield, filter aid), Explosives (Gelling agent), Coal Mining (fraction reducer, binding)	60-65%
Other	Textile printing (Thickening agent for dyes), Paper (increase strength and decrease porosity), Tobacco (binding and Strengthening) & Photography (Gelling and Hardening)	5-10%

A by-product of the Guar processing is Guar meal (mixture of husks and germ) which is a potential source of protein. It is used for cattle as well as poultry feeding. Toasting of Guar meal improves its nutritive value. It can be used up to 10 percent in poultry diet and can replace up to 100 percent protein supplements such as ground nut oil cakes in ruminants. Various derivatives of Guar gum are available that will stiffen gels even up to a water content of 99 percent. Commercially important derivatives of Guar gum are:

- Hydroxy and Carboxy Alkylated Guargum
- Oxidized Guargum
- Acetates of Guargum
- Cationic derivatives of Guargum
- Sulphated Guargum
- Guar gumformate
- Guar gum acrylamide
- Borate cross linked Guargum
- Reticulated Guargum
- Carboxy methyl hydroxy propyl Guargum
- Depolymerized Guargum

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 23: Price spread table of Guar

Activity	Value per Quintal (Rs.)	Stakeholders' share in consumer rupee
Tertiary processor (Hydroxyl guar) to Industry: Value added products of Guar as per specific requirement of the industry like hydroxyl guar etc. High end technology.	Rs. 12322 (Gross value on sale of guar gum derivatives like hydroxyl guar). Net profit margin includes 30% profit margin and 50% processing cost including processing loss)	45%
Secondary processor (Guar gum): Sale after processing (Guar gum by product), (Gum 35%, wastage 5%, Churi/korma – 65%)	Rs. 6821 per quintal of guar gum (Gross value on sale with net profit margin in processing 30% and around 50% yield loss and processing cost during processing)	20%
Primary Processor (Splitting): Trader charges 6% commission. Processor pays around Rs 50/quintal for onward transport to their processing unit. VAT	Rs 4411 (Includes 6% commission, Rs 50/quintal as transportation to warehouse of processor, Rs 10 as loading/unloading charges and splitting expenses 4%, production losses 5%).	6%
Purchases from trader at APMC: They pay commission agent charges 2% and mandi tax 1.6% apart from auction price. Does sorting, grading, storage and sells to processors.	Rs 3626 (2% commission agent charge and 1.6% mandi tax)	1%
Sale by farmer at APMC: Cost of production is Rs. 6,800 per acre. Farmer incurs a cost of Rs 30/quintal towards transportation to mandi and Rs 15/quintal as loading, weighing and unloading (Paldhari) charges at Bikaner mandi	Rs. 3,500 per quintal (Gross value on procurement at Rs. 3,500; gross cost to producers is Rs 1975/qtl and net margin from seeds is Rs 1525/qtl at the given price	28%

The farmer sells guar at Rs 3500/quintal at mandi, but his net realization after deducting transportation, paldhari and cost of bag and weight deduction of 1 kg per bag makes net realization of farmer at Rs 1525/qtl. If the farmer goes through FPC channel, he will not have to incur bag and transportation cost to mandi and hence may directly save Rs 100/quintal if he sells to FPC at mandi prices. The FPC can then supply directly to the processor earning the margin enjoyed by the APMC traders and commission agent which may be to the tune of 6%. The earning of 6% by the FPC is also an indirect earning of the farmers. Further integration of farmers can be made possible in the value chain by promoting sorting/grading and guar splitting for the farmers. This can help the FPC earn around another 5-6% margin. Overall, farmers can earn 15-20% higher if they work through the FPC instead of selling the produce at APMC through traders. The farmers could also save around 2-35 due to less wastage and bypassing the APMC and saving on cost of transacting with the mandi.

The existence of a long chain of middle men including the APMC and related commission agents, producers share in consumers' rupee is adversely affected. This mirrors the need for promotion of contract farming options eliminating/minimising the role of the APMC. However, the limitations in contract farming policy & statutes merit correction.

6.3. Price build up & Marketing Efficiency Analysis

The price spread and values accrued to stakeholders across the chain reflects the profit margins accrued to different stakeholders. Much of the value accruals are accrued to processors speculators and exporters. Producers' incomes are apparently dependent on yield as well as their dependency on the type of end product. Due to limited infrastructure facilities at the dispersal of the farming community, marketing efficiency is adversely affected. Currently the farmers are just one actor in the value chain supplying guar seeds. They have to be integrated to the value chain by increasing their stake on primary processing – sorting/grading/storage and secondary processing by entering into guar splitting and powder making. This will enable them to be the value chain owners too. This can be achieved through formation of FPCs.

Generally in case of sale of Guar value added products, farmers share in consumer rupee is 28%, trader – 1%, primary processor-6%, secondary processor – 20% and end user industry 45% of the consumer price.

The margin enjoyed upto the primary processor can be reaped back to the farmers if the FPC starts with aggregation of Guar seeds for e-trading and finally enters into guar split making (i.e. primary processing).

6.4. Consumer preference Analysis

Guar is mainly used as a vegetable in households and mostly taken as a fresh vegetable in many parts of India. However, the seed harvested from the dried pod has very limited usage in household level. The guar gum derived from the seed has much wider usage in food, health, cosmetics, animal feed and shell gas fraking industry. Around 90% of the Guar gum from India is exported to different parts of the globe.

6.5. Packaging of Guar derevetives:

Farmers pack Guar seeds in second grade juite bags having capacity from 50-80 kgs for either storage in home or selling it in APMC. For packaging of splits processors use plastic bags and each bag contains up to 50 kg of splits. Guar powder is packed in paper bags and each bag contains 25kg of powder. Then these packets are being filled in the containers and each 20 feet container consists of 800 packets. These processed products are being stored at the trader/ processor level by their own arrangements.

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 retailors. 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 Guar of less than 10 years or Rs 1200 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 guar cultivation through flagship programs like State Plan/NFSM.

- **District level farmer help desk**: Under this head, farmer help line are established at district level with nomitated 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 grant 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, Threser etc.
- **Gypsum distribution program**: 50% Subsidy is given to farmers on districtwise rate of Gypsum for maximum area of 2 hectare. 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 equipments 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 Drivesegment * (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 guar also has a great potential for the food ingredient industry. 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 hectare per farmer. Rest of the premium amount will be borne by central and state government in equal ratio. Beyond 7 hectare, farmer has to pay whole premium amount, i.e. without any subsidy.
- **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. The department sold around 5144 quintals of Guar seeds in kharif 2016-17. However, the trend in guar sales from RSSC has been declining and various un-organized private players are trying to take benefit in the guar seed industry speculating the price. During the price rise in 2011, the seeds store for guar was also sold out by many and hence seed availability of guar of proper quality has been a challenge since then.

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 Centers (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 centers 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):

State's four major Agriculture Universities are; 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 Guar developed by various Agriculture Universities in Rajasthan.

Name of university	Contributions in seed development in guar
SKRAU Bikaner	The university is pioneer in support system of Guar in Rajasthan. The directorate of research of SKRAU has developed eight research varieties in Guar i.e. M 83, RGC 1017, RGM 112, RGC 1031, RGC 1066, RGC 1055, RGC 1038, RGC 1033. In the year 13-14, it has produced a total of 396 quintals of improved guar seeds out of which, 220 quintals are breeder seeds and balance 196 quintals are TL seeds. Apart from this, it has three Agriculture Research Stations one each at Bikaner, Ganganagar and Hanumangarh who continuously work with the Research wing to work on promoting improved varieties of Guar and related package and practices. To fulfil the seed requirement of Rajasthan, the National Seed Project was established in 1987 under SKRAU, Bikaner.
ICAR-Central Arid Zone research institute (CAZRI), Jodhpur	Guar genotypes having 32-33% galatomannan gum content, high viscosity profile (3000-5000 m.p.a.s.), Inoculation of guar seed with Rhizobium + PSB gave maximum net return of Rs. 31070/ha at S.K. Nagar and Rs. 15814/ha at Hisar. More than 500 FLDs have also been conducted by the project, indicating increased yield by about 23%, 30% and 28% in gua

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 farmers field (Facilitete 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.

7.1.3. Credit facilities: Agricultural credit facilities in the state have 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 guar producing clusters of Z Distributory and Phoolasar.. They are registered through the office of Dy. Director, Agriculture Extn. of respective districts.

7.2. 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 guar is attached in Annexure-5
- **Central Warehousing Corporation**[11]**:**
  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 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)

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

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 Nagpur[12]

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, Kota, Bikaner, Hanumangarh, Alwar and Sikar are major grain mandis in the state as far as guar 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.

F. NCDEX accredited warehouses:

Star Agri and NCML have around 64 NCDEX accredited warehouses in the region whose services are mostly used by traders for storage and future trading of Guar through NCDEX portal and direct supply to processors. All primary and secondary processing is being done by the processors themselves.

[12] Agmarknet (http://agmarknet.gov.in/) (retrieved on April 9,2017)

Chapter 8 Gap & Constrains Analysis

8.1. As Perceived by Producers and others Stakeholders

Producers' case illustration

A typical farmer in the cluster has deploid about 1.6 ha to Guar production. The gross yield is 10.5 quintal per ha. The market rate of the sale is about Rs. 3000 per quintal Rs. 31500 per ha. The cost of cultivation is about Rs 14700 per ha. Net realization is about Rs. 16800 per ha. Out of total expenses made per ha, about Rs. 3600 is made on cost of land preparation, seed cost is about Rs. 800, fertilizer and pesticide cost is about Rs. 2800, weeding related (labour cost) is about Rs. 3200 and harvesting cost is about Rs. 4000. Packing cost is Rs. 40 per 100 kg or about Rs. 1200 per ha. Transportation cost to mandi is about Rs. 300 per ha- all totaling is around Rs. 14700 per ha. The farmer uses fertilizers and pesticides only when he sees that the crop has a good scope of return seeing rainfall pattern and prevailing market prices. Fertilizer and pesticides are procured from local input supplier. Seeds are procured either from Raj seeds or from in house. The typical farmer is selling produce at nearest Mandi at price range of Rs 3,000 per quintal. Farmers in the region are not satisfied with the market price as they expect it to go at least beyond Rs 5,000/quintal. Many farmers are therefore holding stock since last three years in hope for higher market price. Sometimes the production also gets reduced due to sudden change in climate.

Constraints:

High production cost: Availability of quality Guar seed is an issue and sometimes the prices are exorbitantly high. Farmers purchase seeds and pesticides from local shops at MRP and have not tried bulk purchase through groups. Hence their cost of production is higher.
Lack of infrastructure: Small farmers sell most of their produce immediately after harvest due to want of cash and there is no nearby community storage facility.
Malpractices in market: traders cheat farmers on net weight and through other deductions.
Lack of an alternate marketing channel: Farmers are not aware of alternate marketing channels like NCDEX platform and traders take the benefit of future trading.
Lack of market information: Farmers generally have mandi reference price on regular basis but get tempted to sell to village level traders due to want of cash
Typical Processor's Circumstances

Expert Opinion:
Mr. Shashikant Bhageria (8042956631) plant manager of "Sree Bhageria Chemicals" is of the opinion that Guar Gum has significant potential. Apparently, Rajasthan produces about 118,843 tonnes. The important mandis for Guar Gum are Jodhpur, Bikaner, Sri Ganganagar, Gangapur city, Jhunjhuna, Sanganer.

Guar Gum he produces is used in textile industry for dye making. It is adhesive which is mixed with colour while printing. They supply finished product to textile companies at Sanganer. It is in powder form. The largest of the Guar Gum processing units in Rajasthan is "Supreme Gums Pvt Ltd" with a turnover of 200 crores. It is now exporting guar gum to 45 countries in the world with an annual production of over 20000 MT. Annual production of "Sree Bhageria Chemicals" is 200 MT. They procure Guar seed from Jodhpur, Jhunjhunu and Sanganer Mandis.

Cost of Production and Value Arrivals:

A sample unit Sree Bhageria Chemicals has a turnover of about Rs 2 crores. The unit has installed capacity of 15 MT/Monthly. The particular unit has investment of about Rs 50 lakhs in buildings and Rs 35 lakhs in Plant and Machinery. The unit procures Rs 3,500/qtl from APMC commission agent (which include 1.5 % commission, transportation cost). Cost of processing per qtl is Rs 1,500/- or Rs 15 per kg. Packaging cost is Rs 26 per qtl. They sell Guar gum powder to textile companies on credit. They sell at price range of Rs 5,000 - 6,000 per qtl. Net margin is around 10% on sale price. Out of turnover of Rs 2.5 crores, raw material costs are expected to be effectively almost Rs 1.60 crores. Out of manpower (10 full time persons) about Rs 15 lakhs per annum, power about Rs 12-15 lakhs per annum, packaging and interest costs about Rs 20 lakhs. Profits are dependent on rapidly fluctuating input and output prices.

Constraints: 1. Processor are dependent on "Arthiya's" traders in APMC for supply of inputs. 2. Guar Gum arrivals in the market from Rajasthan is in Oct - Dec.**, 3.** Processing margins are barely 8-10 percent.**, 4.** Processor have to sell their Guar gum powder to textile companies on credit. **5.** There is tough competition from processor plants in Gujarat**,** Price fluctuation is a major concern for processor, sometime they incur loss due to price fluctuation.

Discussion with Mr. Shashikant Bhageria (Plant Manager) at VKI, Jaipur

8.2. SWOT analysis of the indicative Value Chain of Guar

Strength	Weakness
• About 80% of world production occurs in India • Rajasthan is the leading producer of Guar in India • Guar is very drought-tolerant and sun-loving crop highly suited for semi-arid climate of Rajasthan. • Being a leguminous crop, guar fixes nitrogen, making the soil fertile. • Guar as a plant has a multitude of different functions for human and animal nutrition but its gelling-agent-containing seeds (guar gum) are today the most important use • Demand is rising rapidly due to industrial use of guar gum in hydraulic fracturing (oil shale gas) • Guar meal korma and Guar meal Churi are widely used as prime raw material for producing various kinds of Cattle feeds, Aqua feeds, fish feeds, poultry Feeds, dairy feeds. • Only 10% of Indian production stays within the country and remaining 90% is exported for shale gas and oil industries	• Low productivity as cultivation on marginal lands in states like Rajasthan • Non-involvement of community level organizations in value chain of Guar resulting in maximum share of crop value going to the pocket of traders/ processors/ speculators/ exporters • No community processing i.e. on guar split, powder etc. All processors are private enterprises. • Trade mostly controlled by speculators. • Large number of intermediaries in the chain leads to low producer's income. • No grading on the farm level .
Opportunity	**Threat**
• Scope for FPCs to undertake joint input sourcing activities for seeds, fertilizers, pesticides, etc. under the umbrella of FCSC reducing cost of cultivation • FPCs to also undertake custom hiring services and hence lead farm mechanisation through FCSC • Scope for establishment of quality processing facilities by FPCs as part of Farmers Common Service Centre (FCSC), along with facilities for storage, packaging and vehicle to facilitate transportation. • Scope for tie up of FPCs through FCSC with guar processors/MSME firms • Scope for facilitation of start-ups from amongst FPCs or individual entrepreneurs, in secondary processing of value added products of Guar like guar gum, guar vegetable, etc.	• Adverse climatic conditions like frost can impact crop production and productivity • Lack of higher remuneration in guar may reduce farmer's interest from cultivating it. • Unpredictability of the market due to speculators

8.3. Key constraints in Guar crop:

The constraints observed under guar 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: Unavailability of high yielding varieties of guar for farmers forces them to use local varieties and the productivity decreases. It is grown mostly on rain fed conditions and farmers do not want to spend on productivity enhancement unless the price of crop reaches above Rs 4000/quintal.

8.3.2. Post-Harvest related constraints:

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 effeiciency 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 guar involves high end technology and hence is out of reach of farmers/farmer institutions. However, at the FPO level, farmers can atleast undertake splitting of guar 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 guar has become even more complex and every body in the value chain from farmer to processors and even seed companies start speculating. Many times seed availability also becomes an issue due to this.

Malpractices in markets: Many malpractices prevail in the markets of Guar 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

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

8.4.1. Political circumstance

As knows Guar is the highly industrial crop less in human and animal consumption mostly cultivation areas in Rajasthan include the northern districts of Bikaner, Ganganagar, Hanumangarh and Churu, and the western belt of Jaisalmer, Barmer and Jodhpur, Due to land ceiling norms, typically farmers in Rajasthan have barely 2-3 acres of holdings each. 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 Guar seed in the month of November and December. Majority of the processed product is being exported and only a small quantity is being consumed in the local markets. Stocks maintained mainly by traders and processors play a vital role in marketing and price discovery of Guar as it can be stored for long period without any significant loss to quality and quantity even under normal conditions. Farmers mainly large and medium have shown some instances of retaining the commodity at farm level in expectation of price hike as farmers are having information on the development of market. Mandies- for guar Jodhpur, Bikaner, Sriganganagar, Hanumangarh, Churu, Sikar, Jaipur, Jaisalmer, Barmer, Nagaur, Nokha, Renwal

8.4.2. Institutional context

The issues pointed out by the stakeholders related to research and development on guar production included lack of availability of high-yielding varieties with high viscosity gum, poor access of farmers

to production technology and quality seeds, low seed replacement ratio, etc. It was suggested that State Agriculture Universities'/ research centres should develop varieties taking care of the requirements of the industry. The easy availability of production technology and HYV seeds were the main requirements of farmers. Though guar 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 guar industry and farmers' associations with close coordination for a better information flow as a backward linkage and product flow as forward linkage

However, there are some limitations in the Contract Farming Act and mechanism in Rajasthan. Promotion of direct marketing and contract farming in guar 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.

8.4.3. Economics

Guar bean has shelf life of more than 3 years without losing out on any of its properties or qualities. It requires the minimum maintenance and handling environment. Therefore, traders or stockist store guar for as long as 6-7 years. However, prices of Guar bean as well as its derivatives very much depend on the monsoon condition and its likely production. The prices are observed to be highly volatile during monsoon months due to market speculation. There is a good correlation between rainfall and production in Rajasthan as the Guar crop is rain-fed. The effect of rainfall on production is seen less in case of Haryana where Guar is an irrigated crop. The other factors like pattern of arrival, demand from millers and export also cause volatile price movement. Factors Influencing Guar Price including Rainfall during sowing and critical stages of growth , Area sown under the crop in major states like Rajasthan, Haryana, Punjab, Gujarat, etc. , Pattern of arrivals on a regular basis in markets like Jodhpur, Bikaner, Sriganganagar, Adampur, Bhiwani, Siwani, etc., Demand from millers or processors and export demand and Carryover stock.

During the year 2012, prices at Sri Ganganagar market ranged from INR 7752/qt. to INR 28556.2/qt. The high price fluctuation in Guar is mainly on account of higher fluctuation in area and production of Guar seed depending on the spread and level of monsoon rainfall in the producing centres and the export demand of Guar gum from the importing countries.

On March 21, 2012, spot prices of guar-seed hit a record of Rs 30,432 per quintal in Jodhpur. On the same day, the three-month futures price for guar-gum at the National Commodity and Derivatives Exchange peaked at Rs 96,660 per quintal. The excessive price volatility and speculation led to the Forward Markets Commission even banning futures trading in guar-seed and guar-gum. Guar represents a classic case of a crop in a traditional agrarian economy linked to global trade and vulnerable to market shocks. India produces around 80 per cent of the world's guar-seed, 70 per cent of India's guar-seed, in turn, is produced in Rajasthan, followed by Haryana (10 per cent) and Punjab and Gujarat (5 per cent each). Guar has also witnessed price volatility and uncertainty owing to limited area of production, increasing demand, speculation, lack of reliable market information system etc

8.4.4. Social

The crop is being cultivated under rain fed conditions as low-input crop. The farmers use minimal off-farm inputs and provide limited intercultural care. 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, Guar producers intend to reap benefit in the short run by taking

advantage of the price rise. 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 guar 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 guar processing as opined by the stakeholders were: poor research and development in the country for processing technology, and development of value-added products of gum for use in different industries. It is suggested that a part of revenue from export taxes need to be diverted to create a national level research and development institute for the purpose.

By shifting guar cultivation in summer season, where 4-5 irrigations are available, grain yield can be increased by 2.5 – 3.0 times over traditional cultivation in rainy season. Summer crop will enhance gum yield and improve its quality. Hence, it is new concept of farming system encouraging taking two crops every year in arid and semi-arid regions. Certain promising genotypes and varieties of guar, consisting 6 (RGC-986, RGC-936, RGC- 1066, RGC-936-1-5-1, HG-884 and HG-563) during rainfed conditions of kharif 2011; and 10 (RGC-986, RGC-936, RGC-1066, RGC- 936-1-5-1, RGC-1031, RGC-1003, RGM-112, HG-884, HG-365, HG-563) were evaluated during irrigated conditions of summer

8.4.6. Environment

For farmers, the main attraction of guar — traditionally used to feed animals and eaten as a vegetable — is its low input cost, comparatively short duration of 90 days, little water requirement and also being a nitrogen-fixing leguminous crop. The area, production and yield of the crop are inconsistent due to its overdependence on weather and production confined to limited geographical area largely arid regions Guar bean yields vary by as much as 300 percent year on rainfall and weather conditions, making production forecasting extremely difficult compared to other field crops.

8.4.7. Competition

The concerns on guar value chain indicated that there was a fragmented supply chain in guar 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. Guar crop has experienced a remarkable journey from a traditional crop grown on marginal lands mainly for food, animal feed and fodder to a crop with various industrial usages ranging from food, cosmetics, printing, pharma textile, etc. The unique binding, thickening and emulsifying property of guar gum powder obtained from guar seed has made it a much sought after product in international market. The analysis of historical data and of relative share of different states in total production and area shows that Rajasthan is the leading producer but suffers from high fluctuation in production. On the other hand Haryana has significant contribution in terms of production based on high productivity. This has been achieved by using high yielding short duration varieties by farmers and assured irrigation.

8.5. Impact of GST over guar 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, customs duty as well as state level taxes like VAT, CST, entertainment tax among others.

Table 24: 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 Guar may be broadly considered in the context of activities and stakeholders as follows.

Stakeholder wise roles, responsibilities, pre-intervention constraints and post intervention actions:

S.No	Stake holder	Roles and responsibilities	Pre-intervention constraints	Post intervention action
1	Farmer	• Land Preparation • Cultivation of crops • Harvesting of crops • Sell the raw produce • Storage	• Around 70% farmers use local variety of seeds from last season from their field resulting in low yield • Farmers do not follow recommended PoP	• 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
			• High cost of insecticides • Non availablity of nutrient management solutions at right time/ High cost of transportation as farmer takes in loose quantity	• 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 • Tieup of FPC with ATC for multiplication of foundation seed produced by research institutions through member farmers of FPC and onward sale of improved variety seed at a lower cost
			High dirt content /foreign material in harvested guar (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
			Lack of market information related to price	Price discovery through NCDEX, eNAM.
			Farmers resort to storing the seeds for three years due to speculation	Pledge financing through FPC/FCSC, Spot/future trading through e-platforms

			During bumper harvest, prices collapse and hence storage option could help and distress sale.	Storage facility for farmers as part of FCSC
2	Processors	• 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. Awareness seminars for processors Policy conference, investors meet
3	NGOs	• 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	• Lack of skilled personnel • Poor field-farm level coordination • Outdated extension activities • Lower level of interaction and adoption of RACP/govt. schemes	• 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
4	RACP	• Establish the feasibility of sustainably increasing agricultural productivity and farmer income • Integrate agriculture water management and agricultural technology, • Establish farmer organizations (FPCs) and market innovations in	• Lack of clarity on the form of FPO-Cooperative or FPC among field staff • Selections of capable leaders for the proposed FPO • 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	• Create basic understanding among the RACP PMU staff about concepts of FPC • Clear understanding on fundamental differences between FPC & Cooperative • 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

		selected locations		

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 - Guar

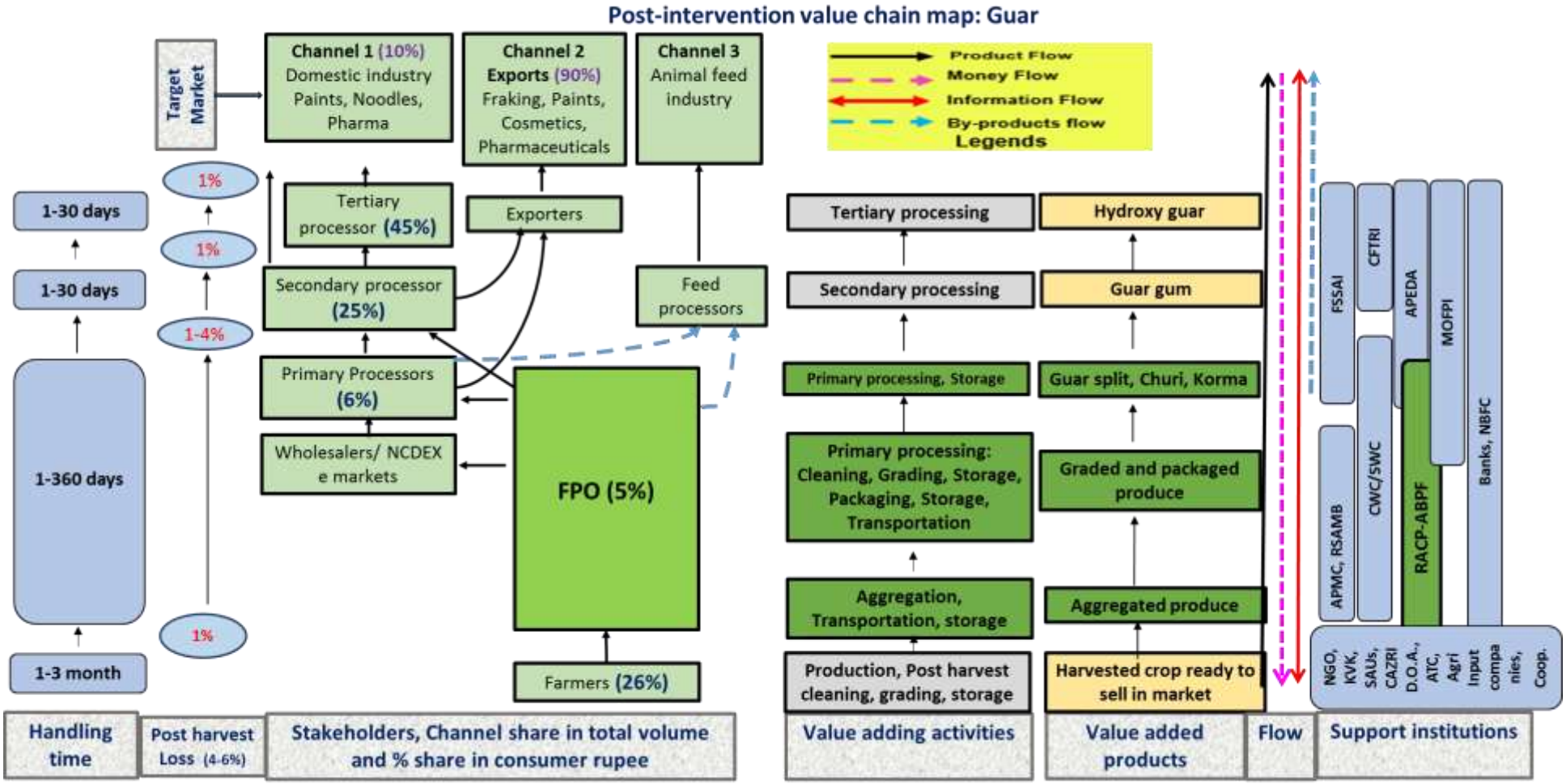
The restructured value chain will have FPCs and their FCSCs replacing Mandi's and undertaking aggregation plus grading and sorting and packaging services. The FPCs will work on input facilitation, custom hiring and marketing of produce. In the post intervention value chain, a third channel may be developed by targeting value addition of guar by doing guar splitting and supplying it to large processors engaged in making guar gum.

The FPCs could undertake a gamut of activities ranging from input facilitation (seeds, pesticides, fertilisers), custom hiring in addition to providing common facility storage and primary processing facilities. These could help in increasing net value accruals to farmers by 15-30%.

Seed availability has been a major issue for Guar due to speculation. In this context, a seed production programme may be launched availing the services of Raj seeds/ University for FPCs. At the post-harvest stage farmers would be promoted to store guar in the FCSC through FPC for trading directly in e markets like that of NCDEX. Well-designed FCSCs could help address these vices issues at the farm/producer level. At the processing stage, gaps are most apparent, in terms of awareness amongst processors and inadequate producer processor links etc. These may be reduced through information dissemination and B2B initiatives matched with policy incentives (like mandi tax exemption) to facilitate the same may be addressed through inputs in start-up for related enterprises/links with large players like Cargill etc. Dissemination of benefits of direct Purchase licence and apt contract farming modes are other related interventions.

Apparently, the FPC can hold the stock from one day to one year releasing the burden of stock from the farmers. The green shaded portions of the map shows the intervention areas of FPC in the value chain

Figure 14: Indicative Post-Intervention Value Chain of Guar



Additional support institutions in the value chain would be RACP and ABPF who would help the FPCs to implement its business plan. The FPC will earn a share of around 5-15% in the market depending upon the kind of business it wants to enter i.e. whether purely doing aggregation and selling or doing guar splitting also.

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 15 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, initial 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

Guar has been a major crop of economic significance for farmers in semi-arid areas of Rajasthan due to low water requirement and production of grain and fodder. The productivity in RACP clusters has been lower than the state average due to pure rain-fed condition and sandy soil. However, some major constraints in production stage are in-consistent weather pattern, high cost of seeds and farmers not following PoP. Many times farmers return to the field after sowing during harvesting if rainfall is not adequate. In case of adequate rainfall and prices being higher than Rs 3500/quintal, they would like to invest little bit in weeding and nutrient management. Guar has therefore been a low input crop for most of the farmers in the region.

It is also envisaged that, the crop productivity can be increased from 1.5 quintal at many places to at least 4 quintals per ha just by seed replacement. The current seed replacement ration is around 30% in the clusters. Many farmers replace seeds only when they have a source of water to meet out deficit rainfall requirements. There is very little scope of reducing the cost of cultivation as farmers are already investing the least among all crops for guar cultivation. However, irrigated guar can give a productivity of up to 10 quintals per ha with little increase in cost of cultivation but can still be a better option if the farmer has source of water. Many farmers shift to Moth beans if the price of Guar dives below Rs 3000 per quintal. Generally, they sow moth beans in plain lands and guar is sown in undulated lands. 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 like Hindustan Gums who are into traceable guar procurement. 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 Guar 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 guar 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 grain 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:

- 2% direct benefit to farmer due to direct procurement through FPC
- 5% 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 farmers
- Increased bargaining power of farmers
- Sustainable operations through community institution and assets through FPC and FCSC

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12. Acknowledging inputs from RACP officials, related producers, processors, industry associations, NGOs, ATMA, Dept of Agriculture

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

Producers

1. 5 Farmers in Bansur cluster
2. 5 Farmers in Kheruwal Cluster
3. 5 Frmer in Pholasar cluster
4. 5 Farmers in Z Distributary cluster

Processors

1. Shakti Agro Food Pvt. Ltd, Shriganganagar
2. Chopra Guar Gum Industries, M.L Chopra, Jodhpur, 0291-2741138
3. Choudhary Gum P. Ltd., Heera Lal Chuodhary, Jaipur , 9414371337
4. Vikash WSP Ltd, R N Goswami, SriGanganagar, 0154-2494552
5. Shashikant Bhageria, Sree Bhageria Chemicals VKI, Jaipur, 8042956631

Traders

1. Badar Enterprises, Suresh B Shah, Jodhpur, 0291-2741273
2. Durga Enterprises, M.L Chopra, Jodhpur, 9314709071
3. Gandhi Enterprises, Jeewanlal Gandhi, Jodhpur, 93147153349
4. Ganpati Global Pvt. Ltd., Pankaj Murarka, Jaipur, 9414045743
5. Dinesh Enterprises, M. D Dhoot, Jodhpur, 0291-2745567

Government agencies

1. Lokendra Singh (Coordinator), RACP, SriGanganagar, 7615875911
2. Harbans Singh (Asst. Director), Agriculture Ext., SriGanganagar, 9468971228
3. Ashok Sharma, DIC, SriGanganagar, 9413795503
4. Prem Singh (DPM), Bikaner, 9829232998
5. Dr. Inder Mohan Verma (Head), KVK, Bikaner , 9414230566
6. Mr. Mahesh Bissa (Head), Zila Udyog Kendra, Bikaner , 9166631111
7. Shiv Singh Bhatti (Joint Director), Agri. Marketing, SriGanganagar, 9829270446

Others

1. Manav Maiti, team leader, Technoserve, Bikaner, 9799495795
2. Dr. Suchi Mathur, NIAM, Jaipur, 9829183421
3. Kalu Ram, TL, NGO, Ganganagar, 9672855292

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 Inld 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 Indutrial 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,Kotputll, 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
NAGAUR	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, Srimadhopur-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
		27. Keshoraipatan	6000	0	6000	1161	19

Sr. No	District	Name of Warehouse	Warehousing Capacity			Utilization including Reservation	Percentage Utilization
			Own Constt.	Other than own Constt.	Total		
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: GST on commodities

- **GST-28%**

1. Molasses
2. Chewing gum/bubble gum and white chocolate
3. Cocoa butter, fat and oil
4. Cocoa powder
5. Cocoa chocolates
6. Malt extract (other than for infant use and mixes and doughs of bakers)
7. Waffles and wafers coated with or containing chocolate
8. Extract, essences and concentrates of coffee
9. Mustard flour and sauces thereof
10. Sugar, lactose and glucose syrups
11. Food flavouring material
12. Churan for pan
13. Custard powder
14. Aerated waters containing added sugar or other sweeting matter

- **GST-18%**

1. Condensed milk
2. Malt, whether or not roasted
3. Refined sugar, sugar cubes
4. Sugar confectionery
5. All preparations of cereals, flour, starch or milk for infant use and sold retail
6. Pasta, spaghetti, macaroni, noodles
7. Corn flakes and other cereal flakes
8. Waffles and wafers (other than chocolate coating)
9. Pastries and cakes
10. Extracts, essences and concentrates of tea or mate
11. Soups and broths
12. Ice cream and other edible ice

13. Instant food mixes, soft drink concentrates, sharbat, betel, supari, packaged food

14. Water, including natural or artificial mineral waters and aerated waters not sweetened

15. Ethyl alcohol and other spirits

16. Vinegar and substitutes

17. Curry paste, mayonnaise and salad dressing; mixed condiments and mixed

- **GST – 12 %**

1. All meat in unit containers put up in frozen, salted, dried, smoked state

2. All meat and marine products, prepared or preserved.

3. Butter, ghee, butter oil, cheese

4. All goods under Chapter 20 (preparations of vegetables, fruits, nuts or other parts of plants, including pickle, murabba, chutney, jam, jelly)

5. Ketch-up & sauces, Mustard sauces

6. Dry fruits 2

7. Starches

8. Animal fats and oils

9. Fruit and vegetable juices

10. Roasted chicory and coffee substitutes

11. Yeasts and prepared baking powders

12. Namkeens, bhujiya, mixture, chabena

13. Bari made of pulses including mungodi

14. Soya milk drinks

15. Fruit pulp or fruit juice based drinks

16. Tender coconut water (in unit container with brand name)

17. Beverages containing milk

- **GST – 5 %**

1. All fish variants (except seeds of fish, prawn& shrimp) processed, cured, frozen state

2. Ultra-high temperature milk

3. Milk and cream including skimmed milk powder but excluding condensed milk

4. Yoghurt and other fermented milk and cream

5. Chena or paneer in unit container and branded

6. Egg yolk, fresh or dried

7. Natural honey in branded unit container

8. Vegetables frozen or preserved (but unsuitable in that state for immediate consumption)

9. Edible fruits and nuts; peel of citrus fruit or melons, in frozen or preserved state

10. Coffee, tea, pepper, vanilla, cloves, cardamoms

11. Seeds of anise, coriander, cumin

12. Ginger (other than fresh ginger), saffron, turmeric, other spices

13. Cereal groats, meal and pellets in branded unit container
14. Cereal grains worked upon (hulled, rolled, flaked)
15. Meal, powder, flakes, granules and pellets of potatoes
16. Meal and powder of the dried leguminous vegetables (pulses, sago, tamarind)
17. Wheat gluten
18. Soya beans
19. Ground nuts
20. Copra
21. Linseed, rape seeds, sunflower seeds, other oilseeds like mustard, poppy,
22. Flour and meals of oilseeds
23. Sugar beet and sugar cane (frozen and dried)
24. Vegetable fats and oils (groundnut, olive, palm, sunflower oil etc)
25. Beet sugar, cane sugar, khandsari sugar
26. Cocoa beans, shells and paste
27. Mixes and doughs for preparation of bread, pastry and other baker's wares
28. Pizza bread
29. Seviyan
30. Rusks, toasted bread
31. Sweetmeats
32. Flours, meals, and pellets of meat, fish meant for animal consumption
33. Cashew nuts and cashew nut in shell
34. Raisin 3
35. Ice and snow

- **GST – Nil**

1. Meat (Other than in frozen state and put up in container)
2. Bones and horn cores, bone grist, bone meal etc., hoof meal, horn meal, etc
3. Fish, prawn and shrimp seeds
4. All fish, fresh or chilled (but not processed, cured and frozen)
5. Fresh milk, pasteurized milk but not concentrated, sweetened
6. Eggs (in shell)
7. Curd, lassi, buttermilk
8. Chena or paneer (except in unit container with brand name)
9. Natural honey (no container-no brand)
10. Fresh fruits and vegetables, roots and tubers (except in frozen state or preserved)
11. Dried fruits
12. Leguminous vegetables, shelled or unshelled
13. Dried leguminous vegetables, shelled, whether or not skinned or split (pulses)

14. Coffee beans, unprocessed tea leaves, fresh spices
15. All cereals (no container-no brand)
16. Cereal grains hulled
17. Flour
18. Atta, maida, besan (no container-no brand)
19. Wheat or meslin flour
20. Cereal flour, groats and meals (no container-no brand)
21. Flour of potato, dried leguminous vegetables (no container-no brand)
22. Oilseeds of seed quality
23. Cane jiggery (gur)
24. Palmyra jaggery
25. Puffed, flattened and parched rice
26. Pappad (except when served for consumption)
27. Bread (branded or otherwise) (except when served for consumption and pizza bread)
28. Prasadam
29. Water (other than aerated, sealed etc)
30. Non-alcoholic toddy
31. Tender coconut powder
32. Acquatic, poultry and cattle feed
33. Salt, all types

Annexure-5: List of Rural Godown

Sr. No.	Name & address 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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