



Research Article

AN ECONOMIC ANALYSIS OF PRICE MOVEMENT OF MAJOR PULSE CROPS OF NORTH GUJARAT

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Abstract- India holds an important place in pulses being the world's largest producer, importer and consumer of pulses. Gujarat is one of promising state of India in terms of pulse production and consumption. Within Gujarat, northern part of state contributes higher in term of pulse production. This region specific pulses growth and instability in area, production, productivity and price, arrival seasonality affect overall pulses scenario in state. Therefore, this study focused on to study the growth and instability in area, production, productivity and also price, arrival seasonality with reference to North Gujarat. Overall, North Gujarat was observed positive growth in yield (3.77%), but it is not substantial to increase the production (-2.55%) of cluster bean over the study period. Except, Patan all other districts of North Gujarat was observed positive growth in yield resultant it increased production of cluster bean at regional level with 1.41 percent per annum. The growth (4.78%) performance of production of green gram during the study period had been satisfactory because yield increase (4.65%) favoured this crop even small decline in area (-0.74%). The growth (-5.21%) performance of moth bean production during the study period had been extremely poor even yield increased with 8.26 percent but growth in area decrease was substantial (-13.1%). Growth performance of tur crop during the study period had been marginalized even yield increased with 9.45 percent in North Gujarat because acreage decrease (-10.09) was more prominent phenomena. Growth performance of urad crop during the study period had been guided by the yield increase and marginal acreage increase as compared to any other major pulses in North Gujarat. Being an industrial crop and there is no spoilage, so price fluctuation was very low in cluster bean as compared to other pluses crops. The seasonal prices of green gram were higher in the month of April, May and June in most of the selected markets. In summer season, there is a scare of vegetables and green gram is supplement to it, so the prices were higher during April to June months. Tur prices were higher in month of April to July. The seasonal arrival indices of urad were higher in the month of October, November and December in the selected market of study area. In moth bean, there was no relationship between market arrivals and prices during study period.

Keywords- Pulses, Price, North Gujarat

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Introduction

India holds an important place in pulses being the world's largest producer, importer and consumer of pulses. Even being the world's largest pulses producer, India faces a serious supply shortage of pulses. Pulses production has increased by 3.35% per annum during the last decade. But, the costs of production and prices have also increased which makes it less affordable to the common man. A bigger challenge in pulses production lies in increasing production cost effectively. The earlier experience shows that technological efforts need to be supported by the right policy environment to harvest fruits of R&D in agriculture [1]. The average yield level of pulses in India has to be increased to 1 ton/ha from the present 694 kg/ha to make the pulses production internationally competitive. Over the years, while the country has accumulated a huge surplus of wheat and rice, the pulses remain in short supply. Consequently, the per capita availability of pulses has progressively declined from 65 gm/day in 1961 to merely 39.4 gm/ day in 2011. This is far less than the 80gm/capita/day (29 kg/capita/year) of pulses consumption recommended by the World Health Organization for India. Whereas, availability of cereals has gone up from 399.7 to 423.5 gm/day for a country that faces persistent protein inflation and has preference for vegetarian diet, pulses are the most economical source of vegetables protein. Higher consumption of pulses will help address the scourge of pervasive malnutrition caused by protein deficiency among large sections of the Indian population [2]. India is in the world

accounting for about 29 per cent of the world area and 19 per cent of the world's production. Even more importantly India is also the largest importer and processor of pulses in the world. Ironically, the country's pulse production has been hovering around 14– 15 MT, coming from a near-stagnated area of 22– 23 M ha, since 1990–91. Major pulse area in India comes under Madhya Pradesh (20.3%), Maharashtra (13.8%), Rajasthan (16.4), Uttar Pradesh (9.5%), Karnataka (9.3%), Andhra Pradesh (7.9%), Chhattisgarh (3.8%), Bihar (2.6%) and Tamil Nadu (2.9%). Pulse productivity which was 441 kg/ha in 1950 increased up to 689 kg/ha during 2011, registering 0.56% annual growth rate [Table-1] [3,4].

Table-1 Compound growth rate achieved in pulses production in India during the period 1950-2011

Particular	Pulses
Productivity (1950)	441 kg/ha
Productivity (2011)	689 kg/ha
Overall compound growth rate (%)	1.011
Compound growth rate (%) Area	0.52
Compound growth rate (%) Production	1.27
Compound growth rate (%) Productivity	0.73

Source: Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India

Production of pulses in 2008-09 was 14.66 million tons with an average yield of

655 kg/ha. In the Year 2013-14 India produced record 19.5 MT of total pulses. Share of chickpea, pigeonpea, mungbean and urdbean to total production has been worked out about 39, 21, 11 and 10%, respectively. 7- and 5% share of total production is accounted by lentil and field pea. India is importing pulses of quantity 2.5-3.5 MT every year for meeting the increasing demand of the population. By 2050, the domestic requirements would be 26.50 Mt, necessitating stepping up production by 81.50%, i.e. 11.9 Mt additional produce at 1.86% annual growth rates.

Demand and supply gap in pulses production is expected to be -24.9 MT in 2021 and it will be aggravated to -39.3 MT in 2026 (Mittal, S.2008.).Internationally on 21st December, 2013 the General Assembly of the United Nations in New York voted to proclaim the International Year of Pulses-2016. This was done to create the awareness about importance of pulses globally in health, nutrition, food security and environmental sustainability.

Objectives

1. To examine the growth and instability in area, production and productivity of major Pulse crops in North Gujarat.
2. To examine the seasonality in arrivals and prices of major Pulse crops of north Gujarat.

Methodology

For North Gujarat compound growth rates and instability index for area, production and productivity of major pulse crops was calculated for the period of 200-01 to 2013-14. The seasonality index of area, production and productivity of major pulses crops was calculated by taking Agricultural year 2000-01 as the base year. The compound growth rates were calculated by fitting the exponential function for area, production and productivity.

The following form of the exponential function was used;

$$Y = ab^t$$

Where,

Y = Dependent variable for which growth rate was estimated

a = Constant/intercept

b = Regression coefficient

t = Time variable in year (1, 2, 3,... 13)

The compound growth rate was calculated using logarithmic form of the equation as below:

$$\log Y_t = \log a + t \log b$$

Then the percent compound growth rate (g) was computed by using the relationship:

$$g = (\text{antilog of } \log b - 1) \times 100$$

Where,

g = Compound growth rate per annum in percent

The study cover the prices of selected major pulse crops from 2000-01 to 2012-13. The time series analysis was done for isolation of time component i.e. Trend, Seasonal, Cyclical & Irregular.

Following multiplicative model of time series was used;

$$Y = T \times S \times C \times I$$

Where,

Y = Monthly prices

T = Trend Index

S = Seasonal index

C = Cyclical index

I = Irregular index

For test of significance of regression coefficient t-test was used. To estimate instability in area, production, yield, arrival and prices the formula given by Cuddy and Della was used:

$$\text{Instability Index} = CV \sqrt{1 - R^2}$$

Result and Discussion

Growth Rate of Area, Production And Yield Of Major Pulse Crops In North Gujarat

Cluster bean

The most important pulse crop in North Gujarat is cluster bean, which occupied an area of about 178.4 thousand hectares during 2012-13. It constitutes nearly 60 percent share of the area of major pulses. It has observed that cluster bean have highest area, production and yield in Banaskantha, district of North Gujarat.

The compound growth rate of area, production and yield are presented district wise in [Table-1]. It reveals that the growth rates across the different districts follow some sort of stereotype pattern. Findings showed that growth in area across the districts varies from -2.07 to -7.98 percent. In cluster bean, contraction of area was highest in Banaskantha (-7.98 %) and Patan (-8.58 %) district, whereas Kutch and Mehsana was observed -5.13 and -5.74% growth, respectively. However, Gandhinagar was observed positive growth rate in terms of area expansion. Overall area contraction was observed -1.93 percent in North Gujarat. In general area contraction trend affects overall production of pulse production if yield is not increasing substantial. Therefore, Banaskantha Mehsana and Patan districts were observed -5.99, -7.73 and -10.94 percent deceleration in production. However, Kutch, Gandhinagar and Sabarkantha districts were observed positive growth. Analysis reveals that there was lot of disparities across the districts in terms of growth rates i.e. -2.03 to 7.67 percent. Acceleration in yield was observed across the Banaskantha (2.18%), Gandhinagar (3.31%), Kutch (7.67%) and Sabarkantha (1.45%) districts. But highest growth in yield (7.67%) was observed in Kutch district, resultant even contraction in area (-5.13%) production accelerated with 11.02 percent. However, Mehsana (-2.03%) and Patan (-2.50%) districts was observed negative growth in yield increase. Overall, North Gujarat was observed positive growth in yield (3.77%), but it is not substantial to increase the production (-2.55%) of cluster bean.

Instability, in area, production and yield was observed highest in Gandhinagar, Kutch and Banaskantha districts, respectively [Table-2].

Table-2 Compound Growth Rate and Instability of Area, Production and Yield of Cluster bean in North Gujarat

District	Area		Production		Yield	
	CGR (%)	Instability (%)	CGR (%)	Instability (%)	CGR (%)	Instability (%)
Banaskantha	-7.98*	14.14	-5.99	63.99	2.18	50.58
	(-6.677)		(-1.16)		(0.469)	
Gandhinagar	3.05	57.12	5.77	78.17	3.31	33.43
	(0.526)		(0.762)		(1.097)	
Kutch	-5.13**	25.84	11.02	327.32	7.67**	22.66
	(-2.462)		(0.512)		(2.363)	
Mehsana	-5.74**	33.18	-7.73	42.91	-2.03	26.86
	(-1.98)		(-1.988)		(-0.841)	
Patan	-8.58**	26.95	-10.94**	38.29	-2.50	27.68
	(-2.369)		(-2.328)		(-0.694)	
Sabarkantha	-2.07	51.28	0.71	69.94	1.45	37.54
	(-0.55)		(0.154)		(0.412)	
North Gujarat	-5.49*	17.29	-2.55	47.86	3.77	31.82
	(-4.49)		(-0.78)		(1.22)	

Note: * Significant at 1% level of significance.

** Significant at 5% level of significance.

Figures in parenthesis are calculated t-value.

Green Gram

The second most important pulse crop in North Gujarat is green gram which occupied an area of 67.9 thousand hectares during 2012-13. It constitutes around 23 percent share of the area of major pulses. It has been observed that green gram have highest area and production in Kutch, whereas Gandhinagar registered highest yield in North Gujarat.

The compound growth rates of area, production and yield are presented district wise in [Table-2]. Findings show that growth in area across the districts varies from -9.73 to 7.12 percent. In green gram, contraction of area was highest in Meshana (-9.73%), Patan (-5.94%) and Banaskantha (-4.19%) district, whereas Kutch and Gandhinagar was observed 7.12 and 1.51% growth, respectively. Overall area contraction was observed -0.76 percent in North Gujarat. Whereas, acceleration in production was highest in Gandhinagar due to the area expansion and yield increase. Kutch district was also observed positive growth in green gram production (7.32%) due to area expansion and yield acceleration. However,

Banaskantha was observed acceleration in production even deceleration in area, this is due to substantial yield increase (5.87%). Except Patan all other districts of North Gujarat was observed positive growth in yield resultant increased with 1.41 percent per annum in North Gujarat. The growth performance of production (4.78%) of green gram during the study period had been satisfactory, because yield increase (4.65%) favoured this crop even small decline in area (-0.74%) [Table-3].

Instability, in area and production was observed highest in Gandhinagar and Banaskantha districts.

Table-3 Compound Growth Rate and Instability of Area, Production and Yield of Green Gram in North Gujarat

District	Area		Production		Yield	
	CGR (%)	Instability (%)	CGR (%)	Instability (%)	CGR (%)	Instability (%)
Banaskantha	-4.19** (-2.225)	22.26	2.25 (0.387)	60.97 (1.189)	5.87 (1.189)	48.64
Gandhinagar	7.12 (1.416)	33.286	12.468 (1.659)	56.45 (1.843)	4.72 (1.843)	30.41
Kutch	1.51 (0.471)	32.15	7.32 (1.232)	39.62 (1.755)	5.73 (1.755)	22.89
Mehsana	-9.73* (-5.492)	23.15	-9.60* (-3.536)	36.48 (0.046)	0.11 (0.046)	24.13
Patan	-5.94** (-2.277)	10.29	-9.55** (-2.742)	31.56 (-0.922)	-3.74 (-0.922)	26.12
Sabarkantha	-1.31 (-0.653)	30.22	-5.59 (1.369)	53.17 (1.12)	2.71 (1.12)	26.57
North Gujarat	-0.74 (-0.38)	21.99	4.78 (1.17)	36.49 (1.84)	4.65 (1.84)	25.18

Note: * Significant at 1% level of significance.

** Significant at 5% level of significance.

Figures in parenthesis are calculated t-value.

Moth bean

Moth bean is fairly less important as a pulse crop in North Gujarat as it contributes 1.10 percent in area and 0.83 percent in production of major pulses at the regional level. It has been observed that Moth bean have highest area and production in Patan district and yield in Mehsana District of North Gujarat. The data indicates that in North Gujarat area, production and yield declined at the rate of -2.97, -5.85 and -0.31 percent per annum during the study period. At regional level district Gandhinagar (9.66%) followed by Sabarkantha (7.51%) were the major gainers while Banaskantha (-13.36%), Kutch (-6.51%), Mehsana (-4.59%) and Patan (-3.52%) were the major losers in Moth bean area during the study period. Surprisingly, production and yield of Moth bean in North Gujarat has declined at the rate of -5.58 percent and -0.31 percent during the study period. The performance of Kutch and Mehsana district was commendable in terms of production and yield growth. But these gains could not compensate for the losses in production and yield in North Gujarat. To conclude, growth performance of Moth bean production (-5.21%) during the study period had been extremely poor even yield increased with 8.26 percent but growth in area decrease was substantial (-13.1%) [Table-4].

Particularly, in Moth bean crop instability index shows higher instability as compared to other pulses especially in terms of area and production. Highest instability index was observed in Sabarkantha district in area (150.59%) and production (112.57%).

Tur

Tur is fairly important as a pulse crop in North Gujarat as it contributes 4.21 percent in area and 7.98 percent in production of major pulse crops at the regional level.

The estimates of growth rates of area, production and yield of tur in North Gujarat and major growing districts indicate [Table-4] that area under tur declined (-10.02%) during the study period. The districts with negative growth in area were Mehsana (-23.98 %) followed by Patan (-14.14%), Sabarkantha (-10.88%), Gandhinagar (-4.17%) and Banaskantha (-2.82%). However, production of tur in Banaskantha (2.99%), Gandhinagar (2.95%) and Sabarkantha (1.66%) were

observed positive due to substantial yield increase (1.18 % to 14.12% across the districts) in the study period.

Table-4 Compound Growth Rate and Instability of Area, Production and Yield of Moth bean in North Gujarat

District	Area		Production		Yield	
	CGR (%)	Instability (%)	CGR (%)	Instability (%)	CGR (%)	Instability (%)
Banaskantha	-13.36* (-4.264)	17.72	-10.32 (-1.748)	62.31	3.58 (0.729)	52.79
Gandhinagar	9.66** (2.225)	51.49	-	-	-	-
Kutch	-6.51 (-0.966)	37.21	15.17 (1.046)	56.87	23.52** (2.187)	43.25
Mehsana	-4.59 (-1.200)	38.65	5.38 (1.116)	57.23	10.72** (2.734)	31.23
Patan	-3.52 (-0.810)	23.21	-7.13 (-1.383)	36.63	-2.81 (-0.433)	52.42
Sabarkantha	7.51 (1.201)	150.59	-5.86 (-1.36)	112.57	-8.48 (-0.705)	52.42
North Gujarat	-13.16* (-3.80)	38.79	-5.21 (-0.87)	74.00	8.26 (1.76)	34.53

Note: * Significant at 1% level of significance.

** Significant at 5% level of significance.

Figures in parenthesis are calculated t-value.

Growth performance of tur crop during the study period had been marginalized even yield increased with 9.45 percent in North Gujarat because acreage decrease (-10.09) was more prominent phenomena [Table-5].

Table-5 Compound Growth Rate and Instability of Area, Production and Yield of Tur in North Gujarat

District	Area		Production		Yield	
	CGR (%)	Instability (%)	CGR (%)	Instability (%)	CGR (%)	Instability (%)
Banaskantha	-2.82 (-0.959)	31.023	2.99 (0.997)	28.08	3.39** (2.309)	12.75
Gandhinagar	-4.17 (-1.227)	37.55	2.95 (0.552)	41.89	6.25* (3.465)	10.57
Mehsana	-23.98* (-7.012)	50.79	-18.99* (-4.517)	56.84	6.25* (3.466)	10.57
Patan	-14.14* (-13.083)	11.39	-13.31* (-7.425)	19.52	1.18 (1.193)	8.27
Sabarkantha	-10.88* (-8.661)	16.81	1.66 (0.416)	41.51	14.12* (2.987)	37.36
North Gujarat	-10.09* (-9.00)	22.07	0.94 (0.27)	43.80	9.45* (3.64)	14.38

Note: * Significant at 1% level of significance.

** Significant at 5% level of significance.

Figures in parenthesis are calculated t-value.

Urad

Urad is one of the promising pulses crop in North Gujarat as it constitutes 9.78 percent in area and 9.87 percent in production of major pulse crops at the regional level. Majority of the districts of North Gujarat were observed positive growth in terms of area, production and yield [Table-5].

The data indicates that in North Gujarat area, production and yield increased at the rate of 0.16, 6.36 and 8.77 percent per annum during the study period. At regional level Patan (7.38%) followed by Gandhinagar (6.36%), Banaskantha (3.38%) and Mehsana (0.67%) were the major gainers in urad area during the study period. Similarly, production and yield of urad in majority of districts of North Gujarat has accelerated during the study period. The performance of Patan and Sabarkantha districts were commendable in terms of production and yield growth. Growth performance of urad crop during the study period had been guided by the yield increase and marginal acreage increase as compared to any other major

pulse crops in North Gujarat.

Particularly, in urad instability index shows stability as compared to other pulses especially in terms of area and yield. Lowest instability index was observed in Patan district in area (17.35%) and Gandhinagar in production (22.55%) [Table-6].

Table-6 Compound Growth Rate and Instability of Area, Production and Yield of Urad in North Gujarat (2000-01 to 2013-14)

District	Area		Production		Yield	
	CGR (%)	Instability (%)	CGR (%)	Instability (%)	CGR (%)	Instability (%)
Banaskantha	3.38 (0.838)	46.87	10.11 (1.741)	71.49	5.834** (2.531)	25.75
Gandhinagar	6.36 (1.351)	51.76	3.51 (0.669)	59.30	0.38 (0.159)	22.55
Mehsana	0.67 (0.169)	46.25	8.20 (1.468)	56.24	7.38** (2.184)	34.35
Patan	7.38** (2.463)	19.31	15.38** (2.178)	45.92	8.40 (1.486)	36.96
Sabarkantha	-9.35* (-7.032)	17.35	-3.67 (-1.316)	38.71	25.51 (1.745)	30.16
North Gujarat	0.16 (0.10)	19.86	6.36 (1.73)	37.56	8.77** (2.99)	22.04

Note: * Significant at 1% level of significance.

** Significant at 5% level of significance.

Figures in parenthesis are calculated t-value.

Seasonality in arrivals and prices of major pulse crops of North Gujarat Cluster Bean

Seasonal indices of market arrivals and price of cluster bean are shown in [Table-6]. The market arrivals were higher in the month of November to February in Tharad market and July to October in Patan market. Price was higher in the month of March and April in Patan and Tharad markets, respectively. Being an industrial

crops and there is no spoilage, so price fluctuation was very low in cluster bean as compared to other pulses crops [Table-7].

Table-7 Index of seasonal variation in arrivals and prices of cluster bean of different regulated markets

Sr. No.	Month	Patan		Tharad	
		Arrival	Price	Arrival	Price
1	April	19.53	101.99	79.46	106.11
2	May	17.44	103.84	53.27	105.36
3	June	64.53	101.42	45.67	98.23
4	July	254.35	98.52	63.23	100.63
5	August	162.94	91.71	52.44	96.48
6	September	135.73	95.73	53.74	100.58
7	October	267.59	96.78	46.16	93.55
8	November	119.56	104.76	137.92	96.74
9	December	50.28	101.12	265.50	98.05
10	January	64.39	104.55	191.23	100.43
11	February	41.64	103.81	139.15	100.83
12	March	2.30	105.68	72.24	103.02

Green Gram

Green gram is the one of the best pulses for human diet. Due to its more digestive nature it is also used as a weak person's food. Generally the production comes to start from September and the highest in the month of October in Palanpur and Patan markets, while arrivals were highest in January and February months in Tharad market and in Himmatnagar market arrivals were highest in July month. The price of green gram has lower in the month of February (91.12%) in Palanpur and Patan market, while in Tharad and Himmatnagar, it was lowest in September over the study period. The seasonal prices of green gram were higher in the month of April, May and June in most of all market. In summer season there is a scare of vegetables and green gram is supplement to it so the prices were higher during April to June months [Table-8].

Table-8 Index of seasonal variation in arrivals and prices of green gram of different regulated markets

Sr. No.	Month	Palanpur		Patan		Tharad		Himmatnagar	
		Arrival	Price	Arrival	Price	Arrival	Price	Arrival	Price
1	April	100.52	111.20	0.63	100.83	98.61	104.68	0.00	96.76
2	May	197.28	110.64	0.69	100.71	58.96	100.63	126.11	101.75
3	June	97.55	105.68	1.76	102.08	31.85	98.36	218.53	107.90
4	July	33.02	106.53	1.66	100.34	39.60	98.86	337.48	103.91
5	August	67.23	95.85	29.04	99.15	18.22	92.84	130.61	93.03
6	September	284.33	96.09	264.44	96.94	35.11	92.41	56.97	92.13
7	October	33.21	99.17	502.26	108.81	50.27	102.05	53.27	100.73
8	November	45.46	95.98	261.70	107.73	39.46	101.69	75.71	95.28
9	December	18.53	95.23	78.11	99.53	22.03	99.92	144.20	106.63
10	January	5.11	93.40	50.71	95.06	286.97	102.12	20.31	101.88
11	February	12.63	95.25	6.92	91.12	179.74	103.10	23.51	103.01
12	March	5.13	94.88	2.07	97.72	85.19	103.35	15.30	96.97

Moth Bean

Seasonal indices of market arrivals of moth bean for the study period is presented in [Table-7]. The market arrivals were higher in month of November to February about 78% of the total market arrivals comes in the market. Seasonal price index

were higher in the month of August and September in Palanpur market whenever it was higher than the month of June, December and January in Patan market February and March in Tharad market April and May in Himmatnagar market.

Table-9 Index of seasonal variation in arrivals and prices of Moth bean in different regulated markets

Sr. No.	Month	Palanpur		Patan		Tharad		Himmatnagar	
		Arrival	Price	Arrival	Price	Arrival	Price	Arrival	Price
1	April	14.38	98.90	63.99	93.01	113.53	101.91	-	108.49
2	May	12.05	98.29	2.18	100.61	70.42	101.67	-	103.33
3	June	7.13	99.22	1.88	108.70	51.19	100.74	-	102.15
4	July	8.67	100.02	2.70	100.14	56.66	100.18	-	94.99
5	August	7.58	104.96	3.94	84.67	33.13	101.47	-	98.04
6	September	15.57	105.32	4.24	85.68	45.71	98.93	-	102.77
7	October	51.84	100.95	26.55	102.94	55.75	91.17	-	102.39
8	November	320.68	103.25	167.68	103.88	60.62	97.89	-	101.00
9	December	546.10	96.15	383.44	108.21	180.06	101.74	-	103.20
10	January	171.55	98.42	310.59	105.12	241.99	97.42	-	102.79
11	February	23.43	97.90	204.03	104.11	192.94	104.47	-	84.58
12	March	21.05	96.63	28.88	102.94	98.01	102.43	-	96.27

They were no relationship between market arrivals and prices of moth bean crop during study period [Table-9]

Tur

Seasonal indices of market arrivals and prices of tur are shown in [Table-9]. The market arrivals were higher in month of December to February about 67% products comes to sell in market during this period. The prices were higher in month of April to July [Table-10].

Table-10 Index of seasonal variation in arrivals and prices of tur in regulated market

Sr. No.	Month	Palanpur	
		Arrivals	Price
1	April	68.40	104.95
2	May	65.78	102.75
3	June	63.39	100.00
4	July	107.56	103.29
5	August	60.93	99.88
6	September	62.70	98.60
7	October	63.58	101.30
8	November	73.17	98.58
9	December	228.46	95.09
10	January	155.78	99.93
11	February	154.25	99.69
12	March	96.01	95.95

Urad

Seasonal indices of market arrivals and prices of urad are shown in [Table-10]. The seasonal indices of market arrivals were higher in the month of October, November and December in all the selected market of study area. The seasonal price indexes were higher in the month of November in Palanpur market, March in Patan market and August in Himmatnagar market, respectively [Table-11].

Table-11 Index of seasonal variation in arrivals and prices of Urad bean in different regulated markets

Sr. No.	Month	Palanpur		Patan		Himmatnagar	
		Arrivals	Price	Arrivals	Price	Arrivals	Price
1	April	2.54	97.01	0.19	103.38	126.55	99.27
2	May	2.28	98.06	0.04	102.67	190.18	97.98
3	June	6.75	98.13	0.64	97.78	57.53	98.22
4	July	5.79	96.43	1.93	96.56	29.79	101.30
5	August	5.32	96.17	0.45	96.25	25.09	103.91
6	September	51.80	101.42	8.68	101.50	61.79	103.46
7	October	462.01	102.77	298.01	101.74	163.41	103.23
8	November	460.05	116.87	525.53	103.20	167.48	91.99
9	December	150.83	95.40	256.66	96.41	138.17	102.63
10	January	15.83	95.65	80.77	94.91	11.83	99.90
11	February	31.19	102.79	22.95	94.87	76.69	98.44
12	March	5.62	99.32	4.16	106.72	51.48	99.69

Conclusions

- Overall, North Gujarat was observed positive growth in yield (3.77%), but it is not substantial to increase the production (-2.55%) of cluster bean.
- Except Patan all other districts of North Gujarat was observed positive growth in yield resultant yield increased at regional level with 1.41 percent per annum in North Gujarat. The growth performance of production (4.78%) of green gram during the study period had been satisfactory because yield increase (4.65%) favoured this crop even small decline in area (-0.74%).
- The growth performance of moth bean production (-5.21%) during the study period had been extremely poor even yield increased with 8.26 percent but growth in area decrease was substantial (-13.1%).
- Growth performance of tur crop during the study period had been marginalized even yield increased with 9.45 percent in North Gujarat because acreage decrease (-10.09) was more prominent phenomena.
- Growth performance of urad crop during the study period had been guided by the yield increase and marginal acreage increase as compared to any other major pulses in North Gujarat.

- Being an industrial crops and there is no spoilage, so price fluctuation was very low in cluster bean as compared to other pulses crops.
- The seasonal prices of green gram were higher in the month of April, May and June in most of all the selected markets. In summer season there is a scare of vegetables and green gram is supplement to it, so the prices were higher during April to June months.
- Tur prices were higher in month of April to July.
- The seasonal arrival indices of urad were higher in the month of October, November and December in all the selected market of study area.
- In moth bean there was no relationship between market arrivals and prices during study period.

Policy Implications

Study point out following suggestions:

- Encouraging inclusions of pulse crops in crop rotations inter and mixed cropping, so that area can expand under pulse crops, as over the years fertility of soil in fragile eco-system (North Gujarat) decreases mainly due to over utilization of land resources. In this regarding government should provide production subsidy to the farmers for increase acreage under pulse crops.
- Government should encourage farmers by increasing minimum support price (MSP) and procurement of stock when prices move below side of MSP in majority of APMCs'.
- The farmers are advice to store scientifically their product at least for 5-6 months so that they can higher prices as compare to post harvest sell.
- Value addition in pulses should be started by the farmers at the home scale level.
- The government should bring long term import-export policy, so it will guide the farmers in long run.
- Government of India and Gujarat Government should campaign along with Agriculture Universities/ Institutes/ Agriculture Department for higher consumption of pulses (enhances health, nutrition, food security, environmental sustainability) as year 2016 declared "International Year of Pulses" by the United Nation.

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Abbreviations: CGR- Compound Growth Rate

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