

Working Paper 2017/01

**Estimation of Changes in Income and Cost of
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Hybrid Seeds for Major Crops of Gujarat**

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Agro-Economic Research Centre

For the States of Gujarat and Rajasthan

(Ministry of Agriculture & Farmers Welfare, Govt. of India)

Sardar Patel University

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Estimation of Changes in Income and Cost of Production owing to Changes in Inputs and Hybrid Seeds for Major Crops of Gujarat*

S.S. Kalamkar, M. Swain and S. R. Bhaiya¹

Abstract

The present study attempts to analyze the role of various agricultural inputs, particularly hybrid seeds in enhancing the crop productivity and farmers income for the major crops in the state of Gujarat. Seed is the basic and most critical input for sustainable agricultural growth. The response of all other inputs depends on quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15 – 20 per cent depending upon the crop and it can be further raised up to 45 per cent with efficient management of other inputs. The Green Revolution in India during the late sixties and seventies bears witness to this truth. The volume growth has come through increased Seed Replacement Rate (SRR) of major crops like wheat and cotton. However, the major concern has been on the front of improvement in seed replacement rate (SRR) of majority of other crops. The SRR of moong, urad and arhar has also been very low (37%, 40%, 33%, respectively) during 2013-14. Among rabi and summer crops, the SRR of wheat, gram and summer groundnut has been only 33 per cent, 27.5 per cent, 10 per cent, respectively during the corresponding period. The main limitations as reported by the respondents were lack of awareness about the seeds, seed treatment methods and government programmes on subsidy on seeds etc. Thus it is necessary to generate awareness among the farmers about the nature, quality and usefulness of the seeds they are using. Some of selected farmers also faced difficulties in getting good quality seeds at right prices. The seeds were mostly purchased from local markets. There is a need to improve marketing regulations so as to keep the check on prices and the black marketing of seeds. The study also found that the level of awareness and use of organic fertiliser is very low among the farmers.

Keywords: *Agricultural Inputs, Seed, Cost of Cultivation, Income*

JEL Classification: *Q12, Q16, Q12, D24, D61*

* This is abridged version of research project carried out for Directorate of Economics and Statistics, Government of Gujarat, Gandhinagar.

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1. Introduction

The introduction of high-yielding-varieties of seed (HYVs) and the increased use of chemical fertilizers and irrigation were the major features of the Green Revolution, which provided the increase in production, needed to make India self-sufficient in food grains in India. Among the inputs, seed is a critical and basic input for enhancing agricultural production and productivity in different agro-climatic regions. Most of the breakthrough in agricultural research is packed in the form of seed delivered to the farmers. In fact, efficacy of other agricultural inputs such as fertilizers, pesticides and irrigation is largely determined by the quality of seed. Availability and use of quality seeds is not a one-time affair. Seed quality is estimated to account for 20-25 percent of productivity. The Green Revolution in India during the late sixties and seventies bears witness to this truth. And lately, during the decade of 2000s, Bt cotton seeds, single cross corn hybrids and hybrid vegetables have shown spectacular results. The volume growth has come through increased Seed Replacement Rate (SRR) of major crops like wheat and cotton. It is, therefore, important that quality seeds are made available to the farmers. However, due to use of hybrid seeds, fertilizers, insecticides and pesticides, cost of cultivation has also gone up considerably. On the other hand, the constraints such as unavailability of good quality seeds in time and at reasonable price considerably affect the yield potential of crops.

In this context, the present study attempts to analyze the role of various agricultural inputs, particularly hybrid seeds in enhancing the crop productivity and farmers income for the major crops in the state of Gujarat.

2. Data and Methodology:

The study is based on both primary and secondary data. The secondary data were mainly drawn from various issues of Fertilizer Statistics (various years) of Fertilizer Association of India (FAI); Seasons and Crops Reports (various years) of Gujarat Government; Agricultural Statistics at a Glance (publication of Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India; Government Offices (unpublished data), other publications, research article/papers as well as related websites. The

primary data have been collected from 1800 sample farmer households selected from 60 village clusters of Gujarat on major eleven crops, viz. paddy, bajra, maize, wheat, tur, groundnut, castor, sesamum, rapeseed-mustard, cotton and onion. Total 1800 sample farmers, 30 each from 60 village/village clusters were selected for the study (Table 1).

Table 1: Selection of Sample Farmers from different Agro-Climatic Zones of Gujarat


Zone	Agro-climatic Zones	No. of Sample Talukas	Allotment of 60 Clusters	Area under Study Crops as % to GCA of Zone	Total sample farmers
I	South Gujarat (Heavy rain area)	2	2	58.71	60
II	South Gujarat Zone	2	2	51.75	60
III	Middle Gujarat Zone	7	7	83.09	210
IV	North Gujarat Zone	13	13	78.28	390
V	Bhal and Coastal Area Zone	3	3	84.51	90
VI	South Saurashtra Zone	13	13	94.17	390
VII	North Saurashtra Zone	12	12	89.81	360
VIII	North West Zone	8	8	67.47	240
	All	60	60	80.51	1800

Note: A cluster is comprised of 1-3 villages as per sample requirement.

Source: Field survey

3. HYV Seeds Economy of Gujarat

Gujarat has aggressively pursued an innovative agriculture development programme by liberalizing markets, inviting private capital, reinventing agricultural extension, improving roads and other infrastructure (Dholakia, 2010; Kumar et al., 2010; Swain et al., 2012). The mass-based water harvesting and farm power reforms in dry Saurashtra and Kachchh, and North Gujarat have helped energise Gujarat's agriculture (Shah et al., 2009). These semi-arid regions have out-performed the canal irrigated South and Central Gujarat. The shift in agriculture to 8 per cent growth rate during last decade was mainly responsible for the shift of the overall state economy to higher growth path with 10.6 per cent annual growth rate (Dholakia, 2010).




Gujarat is the one of the fastest growing states of India. Among various states, Gujarat has been a leading one in technology led growth in agriculture. Technology development and diffusion is a key driver of agricultural growth, fuelling cotton production other farm output and raising the farmers' income substantially. Due to technology intervention, the share of cash crops like cotton and horticultural crops has increased substantially during the last two decades. During 2000s, Bt cotton seeds and hybrid maize seeds have shown spectacular results in the state. The volume growth has come through increased Seed Replacement Rate (SRR) of major crops like cotton, groundnut and other crops in the state. To complement with good agricultural growth in the state, the availability of quality/certified seeds has been made available as required in various part of Gujarat. Both private seed sector and public seed sector have contributed to the agricultural growth story in the state. While the public sector has played a role in production and distribution of HYV seeds of cereals crops like wheat, paddy, bajra, jowar and maize, the private seed sector has played a pivotal role in developing and promoting the use of Bt cotton seeds. In Gujarat alone, about 26 private seed companies have registered 113 varieties of Bt cotton seeds.

3.1. Role of HYV Seeds in Agricultural Performance in Gujarat

Seed is the basic and most critical input for sustainable agricultural growth. The response of all other inputs depends on quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15 – 20 per cent depending upon the crop and it can be further raised up to 45 per cent with efficient management of other inputs (GOI, 2014b). Seed is a carrier of technology and the medium for translating scientific achievement to the field. However, Indian farmers do not distinguish between grain and seed (Chand, 2007), and use common farm produce as seed. The reasons for this are: (1) lack of awareness about the potential of quality seed, (2) the non-availability of good quality seed, and (3) high seed price. To a greater extent, this also explains the large gap between attainable levels of productivity achieved in front line demonstration plots and the actual productivity at farm levels (Singh and Chand, 2011).


Seed is considered to be a catalyst of change in agriculture. The Green Revolution in India during the late sixties and seventies bears witness to this truth. And lately, during the decade of 2000s, Bt cotton seeds, single cross corn hybrids and hybrid vegetables have shown spectacular results (GOI, 2012b). The volume growth has come through increased Seed Replacement Rate (SRR) of major crops like wheat and Cotton.



The Indian seed industry is now occupying a pivotal place in Indian agriculture and is well poised for continued growth in the years to come. National Seeds Corporation (NSC), which is the largest single seed organization in the country with such a wide product range, pioneered the growth and development of a sound industry in India. NSC, State Farms Corporation of India Limited (SFCI), States Seeds Corporations and other seed producing agencies are continuously and gradually expanding all its activities especially in terms of its product range, volume and value of seed handled, level of seed distribution to the un-reached areas, etc. Over the past four decades, these seed producing agencies have built up a hard core of competent and experienced seed producers and seed dealers in various parts of the country and have adequate level of specialization and competence in handling and managing various segments of seed improvement on scientifically sound and commercially viable terms (GOI, 2014b). As a result of these years of refinements and revolution, the Indian seeds Industry is one of the most mature and vibrant ones in the world, currently occupying sixth position with nearly Rs. 9000 crores turnover. In the last five years, the Indian Seeds Industry has been growing at the rate 12 per cent per annum as compared to global growth of 6-7 per cent per annum (Khan, 2014).

The Indian Seeds Industry is undergoing a wide ranging transformation including increased role of private seed companies, entry of MNCs, joint ventures of Indian companies with multinational seed companies and consolidations. At present, the number of companies engaged in seed production or seed trade is of the order of 400 or 500. The main focus of private seed companies has been on the high value low volume seeds and market for low value high volume seeds. The Indian hybrid seed sector has been mainly benefitted due to these wide ranging transformations. The hybrid sector in India has now pegged at around Rs 12, 000 crores. The Indian hybrid seed market, with over 300 companies, has been growing at 15-20 per cent annually in recent years (Anonymous, 2014). About 10 domestic and multinational companies are controlling over 80 per cent of total hybrid seed market. It is observed that the Indian hybrid market has been gradually saturating. The growth is saturated in cotton in spite of Government push. After introduction of Bt (*Bacillus thuringiensis*) Cotton, it has occupied about 98 per cent of total cotton area in less than a decade. The HYV paddy has occupied only 10 per cent of total area, only popular in North and North-East regions of the country.

Among various states, Gujarat has been a leading one in technology led growth in agriculture. Technology development and diffusion is a key driver of agricultural growth, fuelling cotton production other farm output and raising



the farmers' income substantially. Due to technology intervention, the share of cash crops like cotton and horticultural crops has increased substantially during the last two decades. During 2000s, Bt cotton seeds and hybrid maize seeds have shown spectacular results in the state. The volume growth has come through increased Seed Replacement Rate (SRR⁵) of major crops like cotton, groundnut and other crops in the state. To complement with good agricultural growth in the state, the availability of quality/certified seeds has been made available as required in various part of Gujarat (Swain et al, 2012). Both private seed sector and public seed sector have contributed to the agricultural growth story in the state. While the public sector has played a role in production and distribution of HYV seeds of cereals crops like wheat, paddy, bajra, jowar and maize, the private seed sector has played a pivotal role in developing and promoting the use of Bt cotton seeds (Gulati and Shreedhar, 2009). In Gujarat alone, about 26 private seed companies have registered 113 varieties of Bt cotton seeds. Not only has the yield more than doubled in just five to six years, at present more than 80 per cent of the total cotton area in the state has come under Bt cotton.

3.2. Growth in Area and Production of HYV Crops in Gujarat

During the initial phase of green revolution, the cereal crops were given priority for technological interventions. The total area HYV cereals have tremendously increased during the first decade of technological intervention. The total area under HYV cereals has increased from 33.4 thousand ha in 1966-67 to 2170.9 thousand ha in 2000-01, an increase by around 65 times (Table 2). During last five decades, the total area under HYV cereals has increased by a growth rate of 11.03 per cent from 33.4 thousand ha in 1966-67 to 2999 thousand ha in 2009-10. Among the HYV cereals, the share of area under HYV bajra in total area under HYV cereals has declined, whereas the share of paddy and wheat has increased over last four decades.

⁵ Seed Replacement Rate is the percentage of area sown out of total area of crop planted in the season by using certified/quality seeds other than the farm saved seed.

Table 2: Growth of Area under HYV Cereal Crops in Gujarat (1966-67 to 2009-10)

(Area in 00' ha)

Year	Paddy	Wheat	Jowar	Bajra	Maize	Total Cereals
1966-67	4	7	4	288	31	334
	(1.2)	(2.1)	(1.2)	(86.2)	(9.3)	(100.0)
1970-71	491	1743	48	5573	46	7901
	(6.2)	(22.1)	(0.6)	(70.5)	(0.6)	(100.0)
1980-81	3051	4750	841	11959	1105	21706
	(14.1)	(21.9)	(3.9)	(55.1)	(5.1)	(100.0)
1990-91	5051	5204	2498	10886	2103	25742
	(19.6)	(20.2)	(9.7)	(42.3)	(8.2)	(100.0)
2000-01	4240	2600	480	9720	2270	19310
	(22.0)	(13.5)	(2.5)	(50.3)	(11.8)	(100.0)
2009-10	5980	8540	660	6460	3300	24940
	(24.0)	(34.2)	(2.6)	(25.9)	(13.2)	(100.0)
Compound Annual Growth Rates (%)						
1966-67 to 1970-71	383.10	192.40	117.22	112.00	37.73	118.66
1970-71 to 1980-81	20.15	11.67	25.81	7.24	36.48	10.15
1980-81 to 1990-91	5.73	1.25	13.57	0.09	3.83	2.28
1990-91 to 2000-01	-1.74	-6.70	-15.21	-1.13	0.77	-2.83
2000-01 to 2009-10	3.89	14.13	3.60	-4.44	4.24	2.88
1966-67 to 2009-10	18.07	17.53	12.30	7.33	11.19	10.30

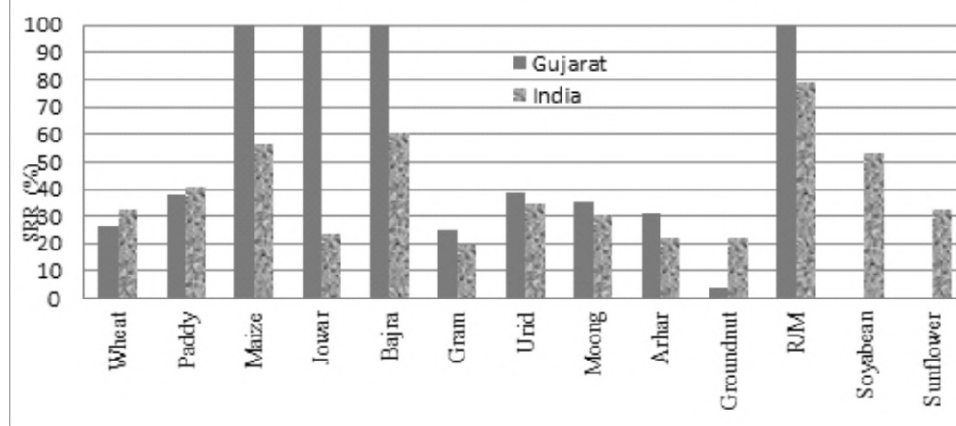
Note: Figures in parentheses are the percentages of total

Sources: Fertilizer Association of India (1992) and other issues; GOI (2013)


Though there has been substantial increase in area under HYV in the state, the inter-district variations in area under HYVs of five major cereal crops have also increased. There has been a very good growth in total area sown under some major crops such as groundnut, Bt cotton, bajra and maize. The area under groundnut and HYV cotton has increased from 3.2 lakh ha and 2.99 lakh ha in 2003-04 to 16.6 lakh ha and 21.75 lakh ha in 2013-14. Similarly, there has been also an impressive growth in certified seed distribution in case of majority of selected crops except bajra and sesamum. The HYV seed distribution has declined by 59.6 per cent and 36.7 per cent respectively for these two crops (bajra and sesamum) during 2013-14 over 2003-04.

The growth in SRR for HYV cotton, maize, bajra jowar and Rapeseed-mustard has been quite good (Figure 1). The SRR for all these crops have been around 100 per cent. However, in the case of variety groundnut and variety cotton which are the pride of Gujarat, SRR has been as low as 10.0 per cent and 65.0 per cent respectively. The SRR of moong, urid and arhar has also been very low (37%, 40%, 33%, respectively) during 2013-14. Among rabi and summer crops, the SRR of wheat, gram and summer groundnut has been only 33 per cent, 27.5 per cent, 10 per cent, respectively during the corresponding period.

Figure. 1: Seed Replacement Rate (%) of Selected Crops in Gujarat and India (2011)



Among the HYV cotton seeds distributed, about 99.5 per cent was truthful labelled seed. Out of 43.5 thousand quintals of seeds of cotton distributed, 43.3 thousand quintals were truthful labelled during 2013-14. Among other crops, maize, bajra and summer groundnut were having more proportion of truthful labelled seeds among them. Out of 69.8 thousand quintals of maize seeds distributed, 43.3 thousand quintals (96.4%) were truthful labelled during the corresponding period. Out of 257.4 thousand quintals of seeds of kharif groundnut distributed, 198.3 thousand quintals (77.0%) were truthful labelled. Among rabi and summer crops, majority of seeds (except wheat and moong) were found to be truthful labelled. While entire summer groundnut seeds were truthful labelled, the entire summer moong were certified labelled.



The seed scenario in the state has undergone rapid change. The participation of private sector agencies in production and distribution of HYV seeds has increased tremendously in recent years. The share of private sector in distribution of total certified/quality seeds during kharif 2013 was 71.6 per cent compared to 28.4 per cent of government seed sector share. In the case of paddy, the share of private and public seed sectors was as high as 82.8 per cent and 17.2 per cent respectively. The share of government seed sector in the cases of HYV cotton, maize and bajra was as low as 1.9 per cent, 8.0 per cent and 2.1 per cent, respectively during kharif 2013. Though the private seed sector has dominated the HYV seeds production and distribution with larger share in case of almost all crops during all three seasons (except summer groundnut with 61.3% share), the performance of government seed sector is relatively better in the case of kharif groundnut (41.7%), variety cotton (37.9%), gram (29.2%) and rapeseed-mustard (24.6%). Among government agencies, Gujarat State Seeds Corporations Ltd (GSSC) and National Seeds Corporations Ltd (NSC) were the major players.

3.3. Share of Seed Cost in Total Cost of Cultivation in Gujarat (CACP Data)

As per CACP data, among various input costs, the share of seed cost in total operational cost was as high as 46.1 per cent for onion and as low as 3.5 per cent for Sesamum (Table 3). The share of seed cost in total operational cost for cotton, groundnut and wheat was 7.1 per cent, 27.3 per cent and 16.8 per cent, respectively. The share of fertilizer cost varied from 22.8 per cent in case of maize to 8.5 per cent in case of onion. The share of fertilizer cost in total operational cost for cotton, groundnut and wheat was 13.4 per cent, 11.7 per cent and 14.2 per cent, respectively.

Table 3. Share of Seed Cost in Total Cost of Cultivation of Selected Crops (2004-05 to 2010-11)

(Percentage to total operational cost C1)

Year	Wheat	Paddy	Maize	Bajra	Tur	Groundnut	R&M	Sesamum	Cotton	Onion
2004-05	12.7	10.8	7.9	4.5	5.7	23.5	1.8	3.0	12.2	21.5
2005-06	13.3	10.8	7.9	5.6	3.5	23.3	1.7	2.6	13.2	21.5
2006-07	15.7	11.1	11.6	6.0	3.6	24.4	2.3	2.7	10.8	34.3
2007-08	15.6	16.0	5.5	6.0	3.8	29.2	2.7	3.3	9.3	42.9
2008-09	13.4	10.9	8.4	5.6	3.1	25.7	2.4	2.5	7.6	42.9
2009-10	15.5	10.7	10.4	6.2	4.8	25.3	2.1	3.5	8.2	35.8
2010-11	16.8	10.7	6.9	6.1	6.5	27.3	4.2	3.5	7.1	46.1
TE 2010-11	15.2	10.8	8.6	5.9	4.8	26.1	2.9	3.2	7.7	41.6
CAGR (%) (2004-05 to 2010-11)	4.7	-0.2	-2.2	5.3	2.1	2.5	14.9	2.4	-8.6	13.6

Source: Commission of Agricultural Cost and Prices (CACP), Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India

The share of seed cost in total cost varied a lot for different study crops. Though the average seed cost was lowest for rapeseed-mustard (2.9% in TE 2010-11), the CAGR in share of seed cost during last seven years was the highest (14.9%), followed by onion (13.6%). The share of seed cost has, in fact, declined for cotton, maize and paddy by a rate of 8.6 per cent, 2.2 per cent and 0.2 per cent, respectively. The declining share of cost of cotton seed may be due to availability of more Bt cotton variety in the market as lower rate as compared to seed rate paid in initial years (after introduction of Bt in July 2002). It is very important to note here that in case of onion, seed cost is more than one third of operation cost which indicates the importance of seed availability and cost of seed in the market.




4. Findings from Field data

4.1 Socio-Economic Profile of Study Area and Sample Households

The analysis on number of households and population of selected villages as per agro-climatic zone reveals that scheduled tribe population dominates in Zone I, II and III. The rate of literacy was found higher in male than female population. On average more than 50 percent households were agriculture households. The land holding distribution of farmers as per classification of land size indicates the dominance of marginal and small land holders, indicating large number of farmers having small piece of land, which may be due to continuous fragmentation of land over the period of time. The details on the distance to important facilities available in and around the selected villages indicated that these villages have pucca approach road and villagers need to travel around 10-15 kms distance to avail these facilities.

The main occupation of more than 96 percent of selected households was agriculture. The average family size of household was 6.2 members. The social categorization of selected households indicates that about 60 percent households belong to general category followed by other backward classes (24.94 per cent), scheduled tribe (8.78 per cent) and scheduled caste (5.50 per cent). It is very pleasant to note that on average 17.39 percent households possessed kisan credit card. As expected, more than 24 percent of large farmer had availed kisan credit card facility. Thus, the selected sample indicates the dominance of middle age literate male member in decision making in farming business with modern facilities of credit supply.

The average owned holdings size of selected households was 3.37 ha and operational holding size was 3.39 ha. The negligible land was not under cultivation. The land leased-in tendency was prominent in large size farmer category followed by semi-medium and medium land size group farmer. Around 7.4 percent of farmers had taken land on lease, of which about 60 percent preferred term of fixed rent in cash, followed by share cropping (24.1 percent) and fixed rent in kind (15.0 per cent). The fixed rate in cash ranges from as low as Rs. 8192/ha to as high as Rs.14033/ha. As large farmer had taken more land on lease-in which must have helped in getting rate of lease lower than the other farmers.



Out of the total operational land holdings of 3.39 ha, 85 percent land was under irrigation. This indicates the heavy support of irrigation in the crop production in the state. In fact the percentage land under irrigation to total operational holdings was more than 80 percent in all groups of farmers which is surprising to note. All the major sources of irrigation such as canal, dugwell/tubewell, and tank contributed around 20 percent in total irrigated area. Thus, availability of water through these sources has made agriculture in the state to grow with fast rate as compared to other states in India.

4.2. Cropping Pattern, Access and Use of Seeds and Other Inputs

It was observed from the data that more than 66 percent selected farmers had grown cotton crop. It was expected because Gujarat is the one the largest producer of cotton in India, accounts for 20.87 percent of area and 35.68 percent of total production in the country during 2012-2013. The second most important crop which large number of farmers had grown was wheat, followed by bajra, groundnut, paddy, castor, rapeseed mustard, tur and other crops. Though onion crop was grown by very few numbers of farmers, it is one of the important crops and plays very important role in food basket. Gujarat accounts for about 6 percent area and about 9 percent production of onion in country during 2012-13, with record productivity level of 24.11 tonnes per ha. Among the different categories of farmers, less number of marginal and small farmers had preferred to grow crops like maize, seamum, castor and onion, whereas the share of these group of farmers in cultivation of remaining crops is comparable to other groups of farmers.

During the reference year 2012-13, around 30 percent of gross cropped area of sample farmers was under cotton crop. Wheat crop accounted for about 11 percent area in cropping pattern of selected households (Table 4). Groundnut and paddy were other two important crops grown by selected farmers which accounted 8 percent each in gross cropped area.


As a crop group, it was observed that cereals crops accounted for about 30 percent of gross cropped area, oilseeds accounted for about 17 percent area whereas pulses accounted for about 3 percent area. The area under spices (cumin, fennel, garlic, etc) has been increasing in the state and it accounted for about 2.3 percent area of cropped area of selected households.

Table 4: Cropping Pattern of Selected Households during 2012-13

Sr.	Crops	Cropping Pattern- Area in % to GCA					
		MF	SF	SMF	MDF	LF	All Farms
1	Paddy	8.41	8.29	8.46	8.78	8.40	8.58
2	Maize	2.80	1.95	2.31	1.88	2.70	2.48
3	Bajra	10.28	6.83	5.38	5.33	4.90	5.64
4	Jowar	0.93	0.98	1.79	1.57	1.90	1.58
5	Ragi	0.00	0.00	0.00	0.00	0.00	0.00
6	Wheat	12.15	11.71	11.79	11.60	10.10	11.06
7	Tur	1.87	2.44	2.56	1.72	2.10	2.03
8	Math	0.00	0.00	0.00	0.00	0.00	0.00
9	Udid	0.93	0.49	1.03	0.63	1.10	0.90
10	Gram	0.00	0.00	0.00	0.00	0.00	0.00
11	Groundnut	7.48	8.78	8.46	8.93	7.30	8.35
12	Sesamum	0.93	0.98	0.51	0.94	0.70	0.68
13	Soybean	0.00	0.49	0.51	0.47	0.70	0.45
14	Rapeseed- Mustard	2.80	2.93	2.82	2.35	1.90	2.26
15	Cator	1.87	4.39	4.87	4.55	5.60	4.74
16	Cotton	31.78	30.73	27.69	28.84	30.80	29.57
17	Sugarcane	1.87	0.98	2.05	1.72	2.50	2.03
18	Fruits and Veg	0.00	0.98	1.28	1.57	1.20	1.13
19	Spices	2.80	1.95	2.31	2.66	1.80	2.26
20	Other	13.08	15.12	16.15	16.46	16.30	16.25

Source: Field survey

The analysis on use of HYV seed during the agriculture year 2012-13 by the selected farmer households reveals that the percentage of farmers cultivating the HYV crop total number of farmers cultivating that particular crop were found as low as 19.05 percent in onion to as high as 99.35 percent in bajra. It indicates that almost all the farmers those who had grown bajra during kharif and summer seasons during 2012-13 used hybrid seed. Onion crop generally grown in late kharif/rabi season mostly in Bhavnagar, Rajkot and Jamnagar district of state and farmer generally produced seed on their farm, or purchase from fellow famer or they use kanzi (half grown bulb of onion) for onion production. That may be the reason behind very low share of onion farmers using HYV seed to total farmers. The crops in which share of farmer cultivating HYV crop to total farmer had recorded significantly in case of



cotton, castor, rapeseed mustard. Except tur which had only 44 percent farmer households, the share of farmer in remaining crop ranged between 48-67 percent of total area. Across the different size groups of farmers, almost similar trend was noticed.

The percentage of area under HYV seed to total cropped area of particular crop found highest in case of castor (99.1 percent) followed by bajra (90 per cent), cotton (75.9 percent) and the lowest was recorded in groundnut (9.0 per cent). It indicates that almost all the farmers those who had grown castor crop during kharif season during 2012-13 used hybrid seed. Groundnut crop generally grown in kharif season and farmer generally use seed produced on their farm, or purchase from fellow famer. That may be the reason behind very low rate of use of hybrid seed in groundnut cultivation. Unlike share of farmers in total number of farmers growing hybrid seed, more than 54 percent of onion area was covered with hybrid seed.

4.3 Cost of Cultivation of Selected Crops (Total) *

Wheat:

Wheat is the important rabi crop grown in Gujarat, occupies about 12 percent gross cropped area. This crop is mostly grown as irrigated crop (98 percent in 2010-11), where as wheat production in Khambat is generally taken as rainfed crop. Wheat crop was grown on 1.05 million ha area with production of 3.14 million tonnes, accounted for 3.54 per cent area and 3.4 percent production of the country. The per ha productivity of wheat in the state (2990 kg/ha) was lower than national average of 3118 kg/ha in 2012-13. On an average around Rs.30104/- cost was incurred by the selected farmers to cultivate a hectare of wheat crop. The irrigation accounted for about 30 per cent of total cost of cultivation followed by harvesting and threshing (around 23 per cent), fertiliser and its application (16 per cent) and seed with sowing cost (about 15 per cent). The share of seed cost excluding the sowing cost in total cost of cultivation was about 12 per cent. The same of kind of trend in input use share in total cost across land holding was observed except marginal higher expenditure on seed with sowing and fertiliser cost by marginal farmers.

* For details, please see Kalamkar et al., 2014.



Paddy:

In the Gujarat State, paddy occupies around 6 percent of the gross cropped area of the State in 2011-11. During 2012-13, paddy crop was grown on about 0.7 million ha area with production of 1.5 million tonnes. About 61.5 percent of area under paddy in the state was under irrigation during 2010-11. The state of Gujarat had accounted for about 1.65 percent of area and about 1.44 percent of production of paddy of the country (2012-13). The productivity level of rice in the state was 2143 kh/ha which was lower than all India average of 2462 kg/ha during 2012-13. On an average around Rs.30979/- cost was incurred by the selected farmers to cultivate a hectare of paddy crop. The harvesting and threshing accounted the highest share in total cost (about 23 percent) followed by seed with sowing cost (about 21 percent), fertiliser and its application (about 18 percent) and land preparation (about 12 percent). Across the land holding size, it was observed that small farmers have paid less for harvesting and threshing whereas irrigation and its application cost them more as compared to other size group farmers.

Maize:


Among the coarse cereals, maize occupies important place in cropping pattern of state which accounts for about 4.3 percent of gross cropped area. This crop has occupied about 0.48 mha area with production of 0.84 mt, accounts share of 5.51 percent in area and 3.75 percent in production of maize at all India level. About 12.5 percent area under maize was irrigated as compared to 34.30 percent area at national level. Thus, productivity level of maize in the state was 1750 kh/ha as compared to 2552 kg/ha as all India average. Selected farmers had spent around Rs. 25516/- per hectare on cultivation of maize. The cost of cultivation of maize indicated that among the various inputs used in cultivation of maize crop by selected farmers, harvesting and weeding together accounted for more than 50 per cent of total cost of cultivation, accounted for about 30 and 22 per cent respectively. The other major inputs were fertilizers, seed with sowing cost and irrigation application. Across the land holding size, it was observed that small farmers had applied lower irrigation and spent lower amount on seed and sowing, whereas fertiliser cost was found relatively high as compared to other size group farmers.

Bajra:

Bajra is the most important coarse cereal crop grown in the state which occupies about 6.6 percent of gross cropped area during 2010-11. Gujarat is the third largest prouder of bajra in our country, accounted for 12.24 percent of production (1.07 mt) and 8.61 per cent of area (0.62 mha) in 2012-13. The productivity level of bajara in the state was second highest after Haryana with 1725 kg/ha as compared to 1214 kg/ha at national level. As compared to 8.3 percent area irrigated at national level, 22.3 percent area in the state under irrigation during 2010-11. Around Rs. 23318/- per hectare cost was incurred by the selected farmers on cultivation of bajra crop. The cost of cultivation of bajra indicated that among the various inputs used in cultivation of bajara crop by selected farmers, harvesting and irrigation together accounted for more than 50 per cent of total cost of cultivation, accounted for about 33 and 19 per cent respectively. The other major inputs were fertilizers, weeding, seed with sowing cost. The share of seed cost including sowing cost in total cost of cultivation was about 11.1 per cent whereas the share of seed cost excluding the sowing cost in total cost of cultivation was 6.0 per cent. Across the land holding size, it was observed that small farmers had spent more on fertiliser as compared to other size group farmers.

Tur:

Tur is the main pulse crop grown in Gujarat. It accounts for about 2.2 percent of gross cropped area and about 4 percent of total food grains production in the state. It was grown on about 0.23 mha area with production of 0.27 mt, which accounted for 6.04 per cent and 8.79 percent in total area and production of the country. The productivity level of tur in the state was 1174 kg/ha which was far better than national average of 806 kg/ha). The top five major tur growing districts in the state are Vadodara, Bharuch, Surat, Pachmahal and Sabarkantha. Per hectare cost of cultivation of tur is estimated to be around Rs. 18625/-. The cost of cultivation of tur indicated that among the various inputs used in cultivation of tur crop by selected farmers, weeding and harvesting together accounted for about 50 per cent of total cost of cultivation, accounted for about 24.7 and 24.8 per cent respectively. The cost on land preparation and seed with sowing were other major costs. The share of seed cost including sowing cost in total cost of cultivation was about 8.8 per cent




whereas the share of seed cost excluding the sowing cost in total cost of cultivation was only 3.6 per cent. Across the land holding size, it was observed that small farmers incurred relatively high cost in cultivation of tur crop than other size group farmers.

Groundnut:

Groundnut is the main kharif oilseed crop grown in Gujarat. Gujarat is the second largest grower (1.29 mha) and third largest producer (0.76 mt) of groundnut in the country, accounting for 27.04 percent area and 16 percent production during 2012-13. Despite of high share in area, low share in production was due to low level of productivity of 631 kg/ha as compared to 995 kg/ha at all India level. Therefore, the area under the groundnut in the state has been continuously declining from more than 21 lakh ha in TE 1983-81 to 19.7 lakh in TE 2003-04, further declined to 18.6 lakh in TE 2009-10 and 12.9 lakh ha in 2012-13. It accounts for about 14.5 percent of gross cropped area and about 50 percent of total oilseed production in the state. The top five major groundnut growing districts in the state are Junagarh, Jamnagar, Rajkot, Amreli and Bhavnagar. Around Rs. 36495/- per hectare cost was incurred by the selected farmers on cultivation of groundnut crop. The cost of cultivation of groundnut indicated that among the various inputs used in cultivation of groundnut crop by selected farmers, seed with sowing cost accounted the highest in total cost of cultivation (about 34.5 per cent), followed by harvesting (16.31 per cent), fertiliser (15.3 per cent) and weeding (around 15 per cent). The share of seed cost excluding the sowing cost in total cost of cultivation was 31.2 per cent. As like in other cases, it was also observed in this case that small farmers had incurred more cost on crop cultivation than other size group farmers.

Rapeseed Mustard:

Rapeseed Mustard is another important rabi oilseed crop grown in the state. This crop had occupied about 1.7 percent gross cropped area having about 2.23 lakh ha in 2010-11. More than 95 percent of rapeseed mustard area was under irrigation during 2010-11 as compared to 693.90 percent at all India level. As seen earlier, area under groundnut has declining in the state, while area under rapeseed mustard has increasing over a period of time, from 2.13 lakh ha in TE 1983-84 to 2.83 lakh ha in TE 2009-10. It accounts for about 10.4



percent of total oilseeds production in the state. It was grown on about 0.21 mha area with production of 0.34 mt, which accounted for 3.31 per cent and 4.35 percent in total area and production of the country in 2012-13. The productivity level of rapeseed mustard in the state was 1619 kg/ha which was far better than national average of 1233 kg/ha. The top five major rapeseed mustard growing districts in the state are Banaskantha, Patan, Mahsana, Kachchh and Sabarkantha. Around Rs. 23899/- per hectare cost was incurred by the selected farmers on cultivation of rapeseed mustard crop. The cost of cultivation of rapeseed mustard indicated that among the various inputs used in cultivation of rapeseed mustard crop by selected farmers, irrigation cost accounted for about 37 percent of total cost, followed by fertiliser (about 15 percent) and land preparation cost (about 11 percent). The share of seed cost including the sowing cost in total cost of cultivation was about 7.1 per cent whereas the share of seed cost excluding the sowing cost in total cost of cultivation was only 3.6 per cent. Similar kind of trend was observed across the land holding size.

Sesamum:

Sesamum crop which is mostly grown in kharif season had occupied about 1.9 percent share in gross cropped area of the state having about 2.51 lakh ha area under this crop in 2010-11. It accounts for about 2.6 percent of total oilseeds production in the state. The state of Gujarat contributed about 17.6 percent in total national production of sesamum. The top five major rapeseed mustard growing districts in the state are Surendranagar, Kachchh, Bhavnagar, Banaskantha and Rajkot. Around Rs. 15541/- per hectare cost was incurred by the selected farmers on cultivation of sesamum crop. The cost of cultivation of sesamum indicated that among the various inputs used in cultivation of sesamum crop by selected farmers, cost incurred harvesting and weeding together accounted for about 49 per cent of total cost of cultivation, accounted for about 27 and 22 per cent respectively. The share of seed cost including sowing cost in total cost of cultivation was about 13.5 per cent whereas the share of seed cost excluding sowing cost in total cost of cultivation was 6.4 per cent. The other major costs were fertilizers, and land preparation. Across the land holding size, it was observed that large farmers had incurred lowest cost of cultivation followed by marginal farmers.


Castor:

Castor is another kharif oilseed crop grown in the state which occupies about 4.04 mh area and accounts for 13.9 percent share in gross cropped area of the state (TE 2009-10). It accounts for about 20.2 percent of total oilseeds production in the state. The state of Gujarat contributed about 17.6 percent in total national production of castor. The top five major rapeseed mustard growing districts in the state are Banaskantha, Kachchh, Mehsana, sabrakantha and Patan. Around Rs.32586/- per hectare cost was incurred by the selected farmers on cultivation of castor crop. The cost of cultivation of castor indicated that among the various inputs used in cultivation of castor crop by selected farmers, about 29 per cent of total cost was incurred on irrigation followed by cost incurred on harvesting and threshing (26 per cent). The share of seed cost including sowing cost in total cost of cultivation was about 8.3 per cent whereas the share of seed cost excluding sowing cost in total cost of cultivation was 4.4 per cent. Similar trend was observed across the land holding size.

Cotton:

Cotton is important commercial crop in the state which occupies about 2.62 mha area and accounts for 19.7 percent share in gross cropped area of the state (TE 2009-10). The state of Gujarat is the second largest grower (2.5 mha) and first largest producer (8.73 mbales) and accounted for 20.87 percent area and 25.68 percent of production of the country during 2012-13. The cotton productivity in the state (594 kg/ha) was higher than national average of 482 kg/ha. Also about 58.7 percent of area under cotton was irrigated in 2010-11 as compared to national average of 33.8 per cent. The top five major rapeseed mustard growing districts in the state are Rajkot, Bhavnagar, Vadodara, Surendranagar and Ahmedabad. Around Rs. 40,224/- per hectare cost was incurred by the selected farmers on cultivation of cotton crop. The cost of cultivation of cotton indicated that among the various inputs used in cultivation of cotton crop by selected farmers, harvesting cost accounted the highest share in total cost of cultivation accounting for about 23 per cent, followed by fertiliser cost (about 21 per cent) and irrigation cost (about 17 per cent). The share of seed cost including sowing cost in total cost of cultivation was about 12.4 per cent whereas the share of seed cost excluding sowing cost in total cost of cultivation was 9.3 per cent. Similar trend was observed across the land holding size.

Onion:

Onion is the important vegetable crop grown in the state. It is generally grown as late kharif or rabi crop. It accounts for about 5.3 percent of total area under vegetable crops and 6.7 percent of total vegetable production in the state. Though, state has shared hardly 2.7 percent area and 4.2 percent production of Country, the highest productivity level (24415 kg/ha) was recorded as compared to all India average of 15989 kg/ha in 2012-13. The top five major onion growing districts in the state are Bhavnagar, Rajkot, Junagarh, Amreli and Jamnagar. Around Rs. 80,724/- per hectare cost was incurred by the selected farmers on cultivation of onion. The cost of cultivation of onion ranged from as high as Rs. 132334/- in case of marginal farmers and lowest cost was recorded in case of medium farmer (Rs 69154/-). Among the various inputs used in cultivation of onion crop by selected farmers, about 28 per cent of total cost was incurred on harvesting followed by cost incurred on seed and sowing (25.7 per cent). The share of seed cost excluding sowing cost in total cost of cultivation was 11.7 per cent (Table 4). Across the groups, marginal farmers had spent relatively larger share of total cost on irrigation and use of insecticides. Whereas fertiliser and seed with sowing cost share was lower in marginal group than other group farmer.

Table 4: Share of Seed Cost in Total Cost of Cultivation of Major Crops in Gujarat (%)

Sr. No.	Crop	Seed Cost (Rs/ha)	% share in total cost
1	Wheat	3346.9	12.0
2	Paddy	2535.9	9.0
3	Maize	1445.9	6.0
4	Bajara	1282.9	6.0
5	Tur	578.5	3.6
6	Groundnut	10413.6	31.2
7	Rapeseed-Mustard	818.4	3.6
8	Sesamum	795.4	6.4
9	Castor	1131.2	4.4
10	Cotton	3096.7	9.3
11	Onion	7738.1	11.7

Source: Field survey

4.4 Agro-Climatic Zone - wise Cost of Cultivation*

After having discussed about the breakup of cost of cultivation and profitability of selected eleven crops, this section discussed about the agro-climatic-wise pattern of total cost of cultivation and profitability of these crops.

Wheat:

In case of production of wheat, highest share of seed cost in total cost was recorded in ACZ II (i.e. 15.6 percent of total cost) and the lowest was in ACZ VII (8.1 per cent). The profit per ha as well as per quintal of main product production was recorded highest in ACZ IV and the lowest was in ACZ III. Wheat crop is grown mostly in ACZ IV, whereas rainfed wheat (bhaliya wheat) is grown in Khambhat areas of Anand district which fall under ACZ III.

Paddy:

There is huge variation in share of cost of seed in total cost of cultivation of paddy across the zones of the state. Paddy was grown in five zones. In case of production of paddy, highest share of seed cost in total cost was recorded in ACZ IV (i.e. 9.6 percent of total cost) and the lowest was in ACZ V (5.3 per cent). The profit per ha as well as per quintal of main product production was recorded highest in ACZ IV whereas same was lowest in ACZ III.

Maize:

Maize crop was grown in four zones. There was huge variation in share of cost of seed in total cost of cultivation of maize across the four zones of the state. The share of maize seed cost in total cost of cultivation in ACZ IV was more than four times higher than ACZ VII. It may be due to higher use of hybrid seed in Zone II than IV. In case of production of maize, highest share of seed cost was recorded as high as 11.0 percent and as low as 2.7 percent of total cost. The level of profit per ha was recorded the highest in ACZ IV whereas profit per quintal of main product observed in zone ACZ II. Whereas profit was negative in Zone VII where lowest share of seed cost was recorded, may be because of use of local seed. Thus, there is direct positive relationship between the use of hybrid seed and profit level.

* For details, please see Kalamkar et al., 2014.



Bajra:

Bajra crop was grown in seven zones. The share of cost of seed in total cost of cultivation of maize across the seven zones of the state ranges from 4.1 percent to 6.8 percent of total cost. The level of profit in cultivation of bajra was recorded highest in ACZ VI whereas profit per quintal of main product was recorded in ACZ V.

Tur:


Out of eight zones, tur crop was grown in six zones. The average share of tur seed cost in total cost of production was 3.5 per cent whereas across the zones, it ranges from 2.8 to 6.0 per cent. Tur crop is consumed as green as well as dry product. In fact green produce of tur is heavily demanded in the state. It was observed that farmers from zone II, III and VII had sold green product of tur in the market. The share of seed cost in total cost of cultivation of tur in ACZ VII was two times higher than ACZ III. The level of profit per ha in tur cultivation was highest in zone VIII (i.e. Rs. 24384/ha) which was mainly due to low cost of cultivation. However, the profit was negative (Rs. 15643/ha) in zone VI mainly due to high cost of cultivation.

Groundnut:

Groundnut is the important oilseed crop grown in all the eight climatic zones of the state. The average share of seed cost in total cost of production was estimated to be 32.2 percent whereas across the zones, it ranges from as low as 20.3 percent in zone III to as high as 42.0 per cent in zone I. Thus, share of seed cost in total cost of cultivation of groundnut in ACZ I was more than two times higher than ACZ III. It can be further seen from the table that level of profit per ha as well as per quintal of production was negative in four zones. The reason for same may be low productivity level of groundnut in these areas. Thus, it is important to increase level of productivity by introducing new hybrid variety suitable to climatic zones of the state.

Rapeseed Mustard:

Rapeseed-mustard was grown in four zones only. On an average, about 7.1 per cent of total cost of cultivation was incurred on seed. Across the zones, seed cost share ranges from as low as 2.8 percent in zone VII to as high as 7.0



per cent in zone III. Thus, share of seed cost in total cost of cultivation of groundnut in ACZ III was almost three times higher than ACZ VII. It can be further seen from the table that level of profit per ha as well as per quintal of production was recorded lowest in zone VII where seed cost share was also lowest one. Thus, it can be attributed to the use of local seed which had effect of total crop production. Thus, low productivity level of rapeseed mustard in this zone has resulted the cultivation of this crop un-remunerative. Thus, it is important to increase level of productivity by introducing new hybrid variety suitable to climatic zones of the state.

Sesamum:

Sesamum was grown in four agro-climatic zones of the state. The average share of seed cost in total cost of cultivation was estimated to be 10.9 percent whereas across the zones, it ranges from as low as 3.5 percent in zone IV to as high as 7.1 per cent in zone VI. Thus, share of seed cost in total cost of cultivation of sesamum in ACZ IV was double than ACZ IV. It can be further seen from the table that level of profit per ha as well as per quintal of production was the highest in zone IV where share of seed was recorded the lowest one. The production level was relatively better in zone IV and VIII, therefore return as well as profit released was recorded better in these zones as compared to other two zones.

Castor:

Castor was grown in six climatic zones of the state. The average share of seed cost in total cost of cultivation was 8.3 percent. Across the zones, it ranges from 2.8 percent to 6.9 percent. From the data on seed and level of profit, we did not find any relation between the both. In case of profit per hectare of cultivation of castor, it was positive in all zones. The profit per hectare of cultivation and production per quintal of castor was significantly higher in zone IV and VIII. It was very strange to note that despite significant expenditure towards purchase of seed by zone VI, level of profit per /ha as well per quintal of production was the lowest. Thus, it may be due to low quality seed or other factors are responsible for low crop production.

Cotton:

As far as zone-wise cost of cultivation of cotton is concern, it was observed that use of cotton seed incurred 12.4 percent cost of total cost of cultivation. Mostly Bt cotton has been grown in the state. The share of seed cost in total cost was highest in zone VI (11.8) and lowest was in zone IV (6.6 per cent). It was observed that profit per ha cultivation of cotton was highest in zone VIII followed by zone III and the lowest was in zone VI. Despite of having higher share of seed cost in total cost in zone VI and VII, the profit per quintal of production was relatively lower in both zones. Low level of productivity and low price realized for product would be the reasons behind lower profit level in these zones. Overall per ha Rs. 23669/- profit was earned by the farmers. Per quintal cost of production of cotton is estimated to be Rs. 1377/-.


Onion:

The seed cost of onion accounts for around 26 percent of total cost of cultivation. Across the zones, the share of seed cost in total cost ranges from 9.0 percent to 46 percent. The lowest seed cost share was recoed in zones I whereas the heist cost was recorded in zone VIII. Thus, huge variation in cost of onion seed was observed. It is one of the most profitable crop having profit of Rs. 1.77 lakh ha or Rs. 7.2 per kg of production. It can be seen from the table that in case of zone I, farmer had underestimated the cost of his own seed. As it is short duration crop and with high level of productivity level in the state, area under onion has been increasing over a period of time. Big onions produced in the state are exported from Pipavav port to Dubai, Kuwait, Saudi Arabia, Middle East, Malaysia, Singapore and other country.

4.5. Cost of Cultivation of Selected Crops: HYVs vs LYVs

Cost of Cultivation (HYV)

The cost of cultivation is worked out putting alone crop production with hybrid seed. The share of hybrid/bt seed cost in total cost of cultivation of cereal crops ranges from as low as 6.0 percent in bajra to as high as 13.3 percent in Maize. In case of tur, cost of hybrid seed accounted for 4.6 percent. In case of oilseed crops, groundnut accounted highest share of 29 percent in total cost of



cultivation and lowest share of cost on seed was recorded in case of rapeseed mustard. The cost of hybrid/bt seed in case of cotton cultivation accounted for 9.5 percent of total cost. The cotton seed available in the market and which has demand for is bt cotton seed which provides the safeguard against bollworm attack. The only vegetable crop onion for which farmers had to purchase seed from market at very high rate and thus accounted for around one fourth of total cost on seed only.

Cost of Cultivation (Local)

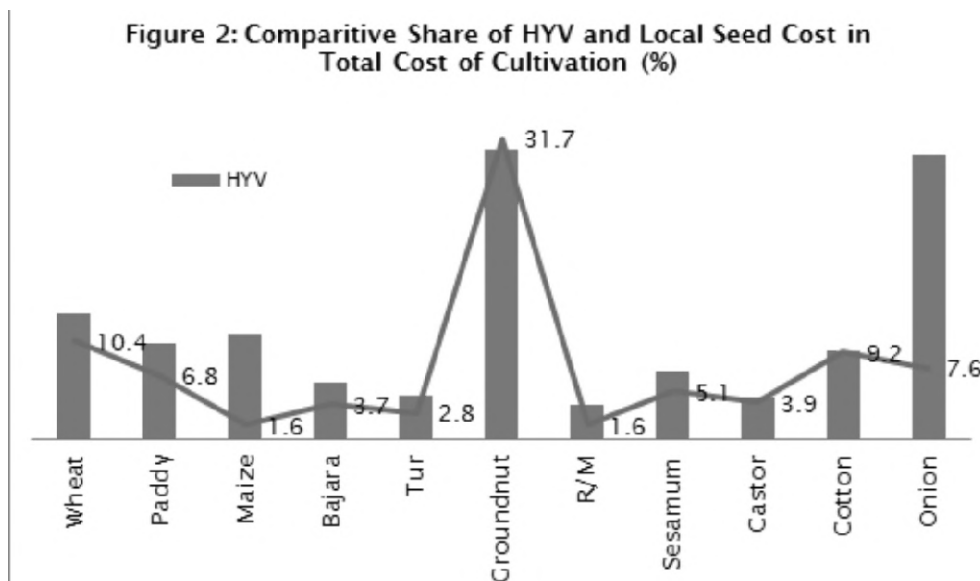
The share of local seed cost in total cost of cultivation of cereal crops ranges from as low as 1.8 per cent in maize to as high as 6.8 per cent in paddy. In case of tur, cost of local seed accounted for 3.5 per cent. In case of oilseed crops, as seen earlier, groundnut accounted highest share of 31.9 per cent in total cost of cultivation and lowest share of cost on seed was recorded in case of rapeseed mustard (1.3 per cent). The cost of local in case of cotton cultivation accounted for 7.4 per cent of total cost. The cost of onion seed accounted for about 28 per cent in total cost of cultivation. The share of cost of seed of local variety was estimated to much lower than hybrid seed. The profit analysis indicated that the profit per hectare cost of cultivation using local seed was recorded highest in case of onion (Rs. 63209/-) followed wheat (Rs. 22063/-) and rapeseed mustard (Rs. 21736/-). The same was negative in case of maize (Rs.2679/-).

Share of HYV and Local Seed Cost

The share of hybrid/bt seed cost in total cost of cultivation ranges from as low as 3.6 per cent in rapeseed-mustard to as high as 30.1 per cent in onion. Among cereals, the share of hybrid/bt seed cost in total cost of cultivation varied from as low as 6.0 per cent in bajra to as high as 13.3 per cent in wheat. In case of tur, cost of hybrid seed accounted for 4.6 per cent. In case of oilseed crops, as seen earlier, groundnut accounted highest share of 30.6 per cent in total cost of cultivation and lowest share of cost on seed was recorded in case of rapeseed mustard (3.6 per cent). The cost of hybrid/bt seed in case of cotton cultivation accounted for 9.3 per cent of total cost. The cotton seed available in the market and which has demand for is bt cotton seed which provides the safeguard against bollworm attack. The only vegetable crop, i.e. onion for

which farmers had to purchase seed from market at very high rate and thus accounted for around one fourth of total cost on seed only (30.1 per cent).

As evident from Figure 2, the gap between HYV seeds cost and local seeds cost as a percentage of total cost of cultivation was observed to be much larger in case of onion and maize. In both the cases, the share HYV seeds cost is much higher than the share of local seeds cost. Groundnut was the only crop, in which case, the share of local seeds cost was found to be much larger than the share HYV seeds cost.

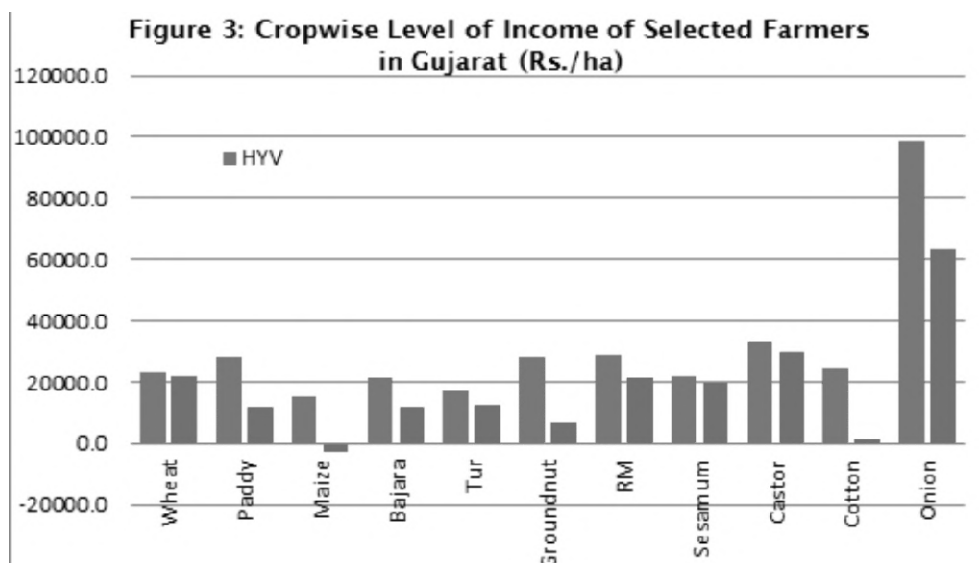


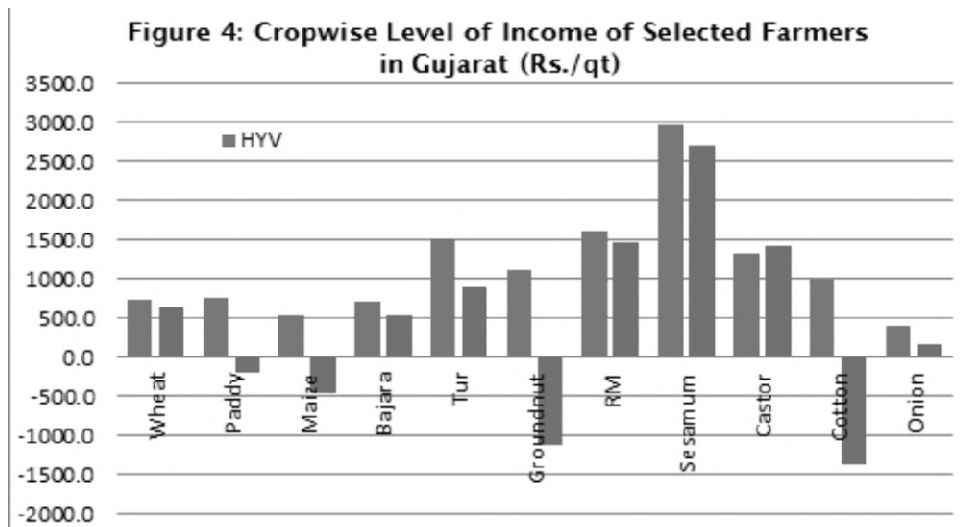
4.6 Changes in Productivity and Farmer's Income

Selection of the right variety of seed is extremely important when it comes to the cultivation of a crop. Different seeds behave differently according to the soil, climate, irrigation and other inputs of an area. A variety of seed that produces a quality crop and fetches a premium price in one region may be totally rejected in another region. This rejection may sometimes occur over districts and even through villages. Since, every farmer aims to get the maximum return for his produce, prudent selection of the seed variety is vital. High yields and good produce can be achieved only when seeds are used wisely. The main advantages of High Yielding Variety seeds are yielding of farms with the use of HYV seeds in high compared to the use of traditional

seeds. HYV seeds give better quality yielding. The study reveals that almost in all crops, productivity level of HYV crop was found higher than local seed crop. The highest difference was recorded in case of cotton crop, which may be due to high yield level of Bt cotton. It is important to note here that due to use of HYV seed and other supporting inputs, the cost of cultivation of most of the selected crops was higher than the local seed crops. Thus increase in productivity may help in increase in income subject to realisation of remunerative prices.

Thus, it is very much clear from the results that the average yield of crop as well as level of income under HYV seed crop was higher than the local seed crop. Except local variety of maize, no other crops yielded negative returns per hectare to the farmers (Figure 3). However, the farmer's income per quintal of output was found to be negative in case of four local varieties of crops (paddy, maize, groundnut and cotton) (Figure 4). This is mainly because of poor quality of local seeds and cultivation of these crops under rainfed conditions that resulted in poor yields compared to high costs incurred.






4.7. Adoption and Constraints in Use of HYV Seeds and Other Inputs

The main constraints faced by the respondents in adopting HYVs were poor crop germination, unavailability of seed in adequate quantity and in appropriate time and lack of latest knowledge. The main limitations as reported by the respondents were lack of awareness about seeds tag colour (foundation seeds, certified seeds and truthful seeds), seed treatment methods and government programmes on subsidy on seeds. Thus, it indicates that farmers are unaware about the stages of seed made available to them, about seed treatment as well as government programme related to seed. The state seed certification agency as well as state extension agency should work out plan to disseminate knowledge and technical knowhow to the farmer.

The selected farmers had faced constraints in use of other inputs as well. Among the various problems faced by farmer, more severity was observed in case of non availability of credit, non-availability of other inputs, poor quality of other inputs, poor pod/grain setting and Incidence of insect/pest/diseases. Besides, inadequate knowledge about disease and pest management, weed infestation, non-availability of human labour, risk of crop failure/yield variability due to biotic & a biotic stresses as well as high cost of other inputs were some of the problems faced by the farmers in cultivation of selected crops.




In order to improve the production and productivity of selected crops, the suggestions from the selected farmers were collected during the field survey. About 30 percent of farmer households had suggested that good quality seeds should be made available. Around 20 percent of farmer household had suggested that new insect pest resistant variety should be developed in order to minimize the use of and cost on insecticides and pesticides. Besides, farmers had suggested that timely availability seed (about 15 percent) with adequate quantity of seed (about 9 percent) should be ensured by the government. About 11 percent of farmer households had suggested that prices of seed should reduced as well as black marketing of seed should be checked by local authority in order to benefit the resource poor farmer. It was also suggested that more number of farmers should be involved/ given training through farm demonstration/ Krishi Mahostav/ KVK/ SAUs. It was very upsetting to note here that very few farmers had made suggestions on important issues related to seed which has direct impact on improvement of production such increasing seed replacement ratio, seed treatment, failure of certified seed and compensation thereof, over use of seed, etc.

5. Conclusions and Policy Implications:

Seed is the basic and most critical input for sustainable agricultural growth. The response of all other inputs depends on quality of seeds to a large extent. It is estimated that the direct contribution of quality seed alone to the total production is about 15 – 20 per cent depending upon the crop and it can be further raised up to 45 per cent with efficient management of other inputs. Seed is a carrier of technology and the medium for translating scientific achievement to the field. Seed is considered to be a catalyst of change in agriculture. The Green Revolution in India during the late sixties and seventies bears witness to this truth. The volume growth has come through increased Seed Replacement Rate (SRR) of major crops like wheat and cotton.

However, the major concern has been on the front of improvement in seed replacement rate (SRR) of majority of other crops. The SRR of moong, urad and arhar has also been very low (37%, 40%, 33%, respectively) during 2013-14. Among rabi and summer crops, the SRR of wheat, gram and summer groundnut has been only 33 per cent, 27.5 per cent, 10 per cent, respectively



during the corresponding period. Thus, the SRR of majority crops in the state need further improvement.


Some of the constraints and feedback given by the farmers have already been discussed. The main limitations as reported by the respondents were lack of awareness about the seeds they are using such as the tag colour of seeds, seed treatment methods and government programmes on subsidy on seeds etc. Thus it is necessary to generate awareness among the farmers about the nature, quality and usefulness of the seeds they are using.

Some of selected farmers also faced difficulties in getting good quality seeds at right prices. The seeds were mostly purchased from local markets. Since the farmers did not have sufficient knowledge about the available seeds and they did not have any other alternatives, they were forced to purchase those seeds from the local traders, who are normally profit seekers. There is a need to improve marketing regulations so as to keep the check on prices and the black marketing of seeds.

The study found that the level of awareness and use of organic fertiliser is very low among the farmers. It is suggested to promote the organic farming through some policy incentives.

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1.	1.	A Study of Wheat Prices in the States of Gujarat and Rajasthan, by V. S. Vyas, 1963.
2.	2.	The Organization and Disintegration of a Collective Farming Society: A Case Study of a Gramdan Village, by K. M. Choudhary, July, 1966.
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02	2014/01	“Problems and Prospects of Oilseeds Production in Gujarat”	Mrutyunjay Swain	May 2014, pp. 1-52
03	2015/01	“Adoption of recommended doses of fertilizer on soil test basis by farmers in Gujarat”,	Mrutyunjay Swain, S. S. Kalamkar and	May 2015, pp. 1-36.
04	2015/02	“Impact of National Food Security Mission (NFSM) on Input use, Production, Productivity and Income in Gujarat”	R.A. Dutta, S. S. Kalamkar & M. R. Ojha	June 2015, pp.1-42.
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