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Cropping pattern and package of practices followed by farmers of selected crops in Halvad, Vijapur and Bayad Taluka of Gujarat

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Abstract

The present study was carried out with four objectives: to know about cropping pattern, package of practices, disposal pattern and problems of farmers in production and marketing of selected crops. Cumin was prominent in Halvad and Potato was prominent in Vijapur and Bayad. The primary data were collected from thirty-five farmers from each region. The primary survey was carried out with the help of a Semi-structured Schedule. The study highlights diversified cropping pattern in these regions. Cotton-Mustard-Cluster bean and Groundnut-Cumin-Sesame were major cropping patterns for Halvad. The most common cropping pattern in Vijapur was Groundnut-Potato and Groundnut-Potato-Sorghum. Bayad farmers were mainly grown Groundnut-Potato, Groundnut-Potato-Bajra and Cotton-Bajra. These patterns, influenced by climate, soil and market factors, demonstrate farmers' strategic decision-making based on their specific circumstances. While farmers generally followed recommended practices for sowing time, method and irrigation, variations were observed in FYM application, seed rate and spacing. Farmers mostly prefer a local agent for sell their produce because of ease of business and relation with the agents. Informal contracts were common for securing predetermined prices for potatoes. Challenges faced by cumin farmers in Halvad included diseases like blight and wilt, high input prices, climate and insects. Potato farmers in Vijapur encountered problems of diseases like scab, high input costs, less knowledge of practices, storage and transportation. Diseases were most and common challenges across both regions. This study provides insight into farming practices in all three regions and may be used to increase productivity by focussing on particular methods.

Keywords: Cropping pattern, disposal pattern, challenges, cumin and potato

Introduction

India possesses the second-largest agricultural land globally, making it a vital contributor to agriculture sector. This extensive agricultural land provides employment opportunities for nearly half of the Indian population. Consequently, farmers hold immense importance within the sector as they play a crucial role in ensuring our sustenance and well-being. The agricultural sector in India is undergoing a gradual transition from traditional farming practices to a focus on horticulture and livestock production (International Trade Administration, 2023) [1]. India produces the second-most fruits and vegetables worldwide. In the year 2020-21, India produced approximately 204.61 million tonnes of vegetables and 107.10 million tonnes of fruits across 10.35 million hectares of land for vegetables and 6.66 million hectares of land for fruits. India is also leading in the production of spice. During 2020-21, cumin cultivation in India was 12.41 lakh ha and production was 8.57 lakh tons (Ministry of Agriculture & Farmers Welfare, 2021) [2]. India, Syria, Iran, Turkey and China are the top five countries for cumin production (FAOSTAT, 2021) [3]. China, India, Ukraine, USA and Russia are the top five countries for potato production (FAOSTAT, 2021) [3].

With 328.7 million hectares total geographical area of the country, cropping pattern also varies within states and regions based on agro-climatic conditions, soil types and farmer preferences. Factors such as crop rotation, intercropping and multiple cropping are employed to maximize land utilization and enhance agricultural productivity. 52 percent of total area of the cultivation with a wide variety of Kharif and Rabi crops like Rice, Paddy, Wheat, Corn, Mustard and more. Rice is the first ranking crop and Potato comes second and at third place, corn is grown (Rahman, 2020) [4].

Access of markets to farmers directly influences their pattern of disposal. Farmers show a different selling pattern with their ease of access. Small and medium farmer mainly sell their produce through traders, cooperatives and preharvest contracts. Semi Medium farmers sell

their produce through traders and cooperatives (Kumar *et al.*, 2023) [5]. Different selling places like markets were also connected to each other like Agra market emerged as a prominent influencer, significantly impacting the potato prices in the other markets (Kumar *et al.*, 2022) [6]. Major production-related constraints expressed by vegetable growers were lack of information about the cultivation of vegetables, higher cost of fertilizers and seeds and labour unavailability (Kumar *et al.* 2019) [7].

Under this background the present study was taken with four objectives: to know about cropping pattern, package of practices, disposal pattern and problems of farmers in production and marketing of selected crops. To accomplish the objectives three talukas Halvad, Vijapur and Bayad were selected. Cumin crop for Halvad and Potato crop for Vijapur and Bayad were selected on the basis of higher area concentration under a particular crop. Thirty five respondents were surveyed from each area to meet the objectives with the help of semi-structured schedule.

Research Methodology

- i. **Type of Research:** Descriptive research.
- ii. **Sampling method:** Non-probability method.
- iii. **Sampling technique:** Purposive sampling technique.
- iv. **Sampling unit:** Farmers.
- v. **Sampling size:** 105 farmers (35 farmers from each region).
- vi. **Sampling area:** Halvad, Vijapur and Bayad Taluka of Gujarat.

vii. Research instrument: Semi-structured schedule.

- Specifically, for the study the Cumin practices Halvad was selected and for Vijapur and Bayad, Potato was selected because these crops were most prominent in these areas.

Analytical Tools

Tabular Analysis

- For study cropping pattern, package of practices and disposal patterns tabular analysis were used.

Garrett's Ranking Technique

- Garrett's ranking technique was used for the purpose of analysis of Problems faced by farmers and ranking given by respondents for each attribute were analysed.
- Garrett's ranking method was found by the Henry Garret and Woodworth (1969).
- Thus, ranks assigned by the individual respondents were converted into percent position values by using the formula.
- Percent position= $100(R_{ij}-0.5)/N_j$

Where,

R_{ij} stands for rank given for i^{th} factor by the j^{th} individual.

N_j stands for numbers of factors ranked by j^{th} individual.

Results and Discussion

Table 1: Age distribution in Halvad, Vijapur and Bayad

Age	Halvad	Vijapur	Bayad
<25 Year	0	0	0
26-30 Year	0	4 (11.4%)	8 (34.3%)
31-35 Year	10 (28.6%)	12 (22.9%)	12 (22.9%)
Above 35 Year	25 (71.4%)	19 (54.3%)	15 (42.9%)
Total	35 (100%)	35 (100%)	35 (100%)

Table 1 provides the percentage distribution of farmers' age in three regions: Halvad, Vijapur and Bayad. In the Halvad region, the majority of farmers (71.4%) are above the age of 35, indicating a relatively older farming population. In Vijapur, 54.3 per cent of farmers are above 35 years old, while in Bayad, 42.9 per cent fall into this age category. The age group of 31-35 is relatively consistent across all three regions. More younger farmers were seen in the Bayad region than Vijapur and Halvad. These findings highlight the age distribution differences among farmers in these regions, suggesting variations in generational involvement in agriculture.

Table 2: Education distribution in Halvad, Vijapur and Bayad

Education	Halvad	Vijapur	Bayad
Primary	14 (40%)	13 (37.1%)	3 (8.6%)
SSC	13 (37.1%)	13 (37.1%)	5 (14.3%)
HSC	6 (17.1%)	6 (17.1%)	12 (22.9%)
UG	2 (5.7%)	3 (8.6%)	10 (28.6%)
PG	0	0	5 (14.3%)
Total	35 (100%)	35 (100%)	35 (100%)

The table 2 presents the educational qualifications of farmers in the Halvad, Vijapur and Bayad regions. In Halvad and Vijapur, a significant proportion of farmers have completed primary education (40% and 37.1% respectively), followed by

SSC qualifications (37.1% in both regions). HSC completion was observed among 17.1 per cent of farmers in both regions. However, Bayad stands out with only 8.6 per cent of farmers having primary education, while 28.6% have pursued UG degrees. In Bayad taluka, farmers were more educated than Vijapur and Halvad taluka. These educational backgrounds provide insights into the farmers' level of formal education and may influence their farming practices and decision-making processes.

Table 3: Education distribution in Halvad, Vijapur and Bayad

Landholding	Halvad	Vijapur	Bayad
Marginal (<1 ha)	2 (5.7%)	2 (5.7%)	2 (5.7%)
Small (1-2 ha)	8 (34.3%)	5 (14.3%)	0
Semi medium (2-4 ha)	13 (37.1%)	24 (68.6%)	24 (68.6%)
Medium (4-10 ha)	12 (22.9%)	4 (11.4%)	9 (25.7%)
Total	35 (100%)	35 (100%)	35 (100%)

The table 3 provides information on landholding sizes among farmers in the Halvad, Vijapur and Bayad regions. In Halvad, 5.7 per cent of farmers have a marginal landholding size of less than 1 hectare, while the majority of farmers fall into the semi-medium category, with 37.1 per cent owning land holdings ranging from 2 to 4 hectares. In Vijapur and Bayad, the distribution is different, with 68.6 per cent of farmers in both regions having a semi-medium landholding size. Small

landholdings (1-2 hectares) are more prevalent in Halvad (34.3%) compared to Vijapur (14.3%) and Bayad (0%). Medium-sized landholdings (4-10 hectares) are seen in all regions, with varying percentages. No farmers in any of the surveyed regions reported having large landholdings (>10

hectares). These findings highlight the diversity in landholding sizes among farmers in the three regions.

Cropping Pattern of Halvad, Vijapur and Bayad Taluka

Table 4: Cropping pattern of Halvad

Sr. No.	Cropping pattern			No. of responses (n)	Percentage (%)
	Kharif season	Rabi season	Summer season		
1.	Groundnut	Cumin	Sesame	5	14.28
2.	Cotton	Cumin	-	4	11.42
3.	Groundnut	Wheat	Sesame	4	11.42
4.	Cotton	Mustard	Cluster bean	6	17.14
5.	Groundnut	Cumin	-	4	11.42
6.	Pigeon pea	-	Sesame	3	8.57
7.	Groundnut	Cumin	Sorghum	4	11.42
8.	Cotton	-	Cluster bean	3	8.57
9.	Cotton	-	Bajra	2	5.71
			Total	35	100.0

Table 4 shows the cropping pattern in the Halvad region. The most common pattern was Cotton-Mustard-Cluster bean (17.14%), followed by Groundnut-Cumin-Sesame (14.28%). Another set of patterns, including Cotton-Cumin, Groundnut-Cumin-Sorghum and Groundnut-Wheat-Sesame, accounted for 11.42 per cent of the cases. Other cropping patterns observed were Cotton-Cluster bean (8.57%), Pigeon Pea-Sesame (8.57%) and Cotton-Bajra (5.71%). These findings indicate the diverse range of cropping patterns practiced by farmers in the Halvad region, showcasing their agricultural practices and choices of crops. The data also highlighted that the most commonly grown kharif crops were Cotton, Groundnut and Pigeon pea, while the prominent rabi crops included Cumin, Mustard and Wheat. For summer crops, farmers preferred Sesame, Bajra, Cluster bean and sorghum. It was observed that some farmers in certain villages chose to cultivate cluster bean instead of sesame due to the possibility of rain during the harvesting period, as sesame is more sensitive to water availability. Crop were also grown in summer season mostly because of availability of water through canal.

limited cultivation during the summer can be attributed to water scarcity, which affects agricultural activities. The most common cropping pattern observed was Groundnut-Potato (28.57%), followed by Groundnut-Potato-Sorghum (22.85%). Other cropping patterns included Cotton-Potato, Groundnut-Tobacco, Cotton-Wheat, Potato-Sorghum, Groundnut-Cauliflower and Groundnut-Wheat-Sorghum.

Table 5: Cropping pattern of Vijapur

Sr. No.	Cropping pattern			No. of responses (n)	Percentage (%)
	Kharif season	Rabi season	Summer season		
1.	Cotton	Potato	-	3	8.57
2.	Groundnut	Potato	Sorghum	8	22.85
3.	Groundnut	Potato	-	10	28.57
4.	Groundnut	Tobacco	-	3	8.57
5.	Cotton	Wheat	-	3	8.57
6.	Groundnut	Wheat	Sorghum	2	5.71
7.	-	Potato	Sorghum	3	8.57
8.	Groundnut	Cauliflower	-	3	8.57
			Total	35	100.0

In the Vijapur region, the predominant crops grown during the Kharif season were Cotton and Groundnut, while Potato, Wheat, Cauliflower and Tobacco were commonly cultivated during the Rabi season. However, the summer season had limited crop cultivation, with only sorghum being grown. This

Table 6: Cropping pattern of Bayad

Sr. No.	Cropping pattern			No. of responses (n)	Percentage (%)
	Kharif season	Rabi season	Summer season		
1.	Groundnut	Potato	-	8	22.85
2.	Groundnut	Tobacco	-	2	5.71
3.	Cotton	Potato	Bajra	3	8.57
4.	Groundnut	Wheat	-	3	8.57
5.	Groundnut	Potato	Bajra	7	20.00
6.	Cotton	-	Bajra	5	14.28
7.	-	Potato	Bajra	2	5.71
8.	Groundnut	Potato	Sesame	2	5.71
9.	Papaya			3	8.57
			Total		100.0

In the Bayad region, the predominant crops grown during the Kharif season were Cotton and Groundnut, while Potato, Wheat and Tobacco were commonly cultivated during the Rabi season. In the summer season, Bajra and Sesame were the main crops grown, with some farmers also starting Papaya cultivation recently. The availability of water through canals and borewells contributed to increased cultivation during the summer. Papaya cultivation stood throughout the season, so that other crops were not grown in particular year. The most common cropping patterns observed were Groundnut-Potato, Groundnut-Potato-Bajra and Cotton-Bajra. Other patterns included Cotton-Potato-Bajra, Groundnut-Wheat, Papaya, Groundnut-Tobacco, Potato-Bajra and Groundnut-Potato-Sesame. These findings demonstrate the diverse cropping patterns practiced by farmers in the Bayad region, indicating varied agricultural practices and crop choices.

Package of Practices

Table 7: Cumin package of practices at Halvad

No.	Practices	Recommendation	No. of farmers follow recommendation	Farmers followed practices	No. of farmers do not follow recommendation
1.	FYM	10 tonnes/ha	4	0 to 11 tonne/ha	29
2.	Sowing time	First week of November	35	First week of November	0
3.	Sowing Method	Line sowing	35	Line sowing by Drill	0
4.	Seed rate	16-20 kg/ha	24	17 to 24 kg/ha	11
5.	Seed treatment	Thiram or carbendazim	21	Thiram	14
6.	Spacing	25 cm	16	20 cm	19
7.	Irrigation interval	15-30 days	35	15-25 days	0
8.	Method of irrigation	Drip, Flood	35	Flood	0
9.	Yield	800-1000 kg/ha	29	650 to 1700 kg/ha	6

The table 7 shows the extent to which farmers in the Halvad region followed recommended practices for cumin cultivation, based on guidelines from ICAR-National Research Centre on Seed Spices. While farmers generally adhered to recommendations for sowing time, sowing method, seed treatment, irrigation interval and method of irrigation, variations were observed in the adoption of practices such as FYM application, seed rate, spacing and

yield. Only a small number of farmers followed the recommended FYM application rate, while some deviated from the recommended seed rate and spacing. Additionally, there were variations in yield, with a few farmers obtaining yields more or less than the estimated range. These findings suggest that factors influencing farmers' decision-making processes may contribute to deviations from recommended practices in certain aspects of cumin cultivation.

Table 8: Potato package of practices at Vijapur

No.	Practices	Recommendation	No. of farmers follow recommendation	Farmers followed practices	No. of farmers do not follow recommendation
1.	FYM	25-30 tonne/ha	2	10 to 27 tonne/ha	33
2.	Sowing time	The second fourth night of November	35	The second fourth night of November	0
3.	Sowing Method	Planter	35	Planter	0
4.	Seed rate	3300-3500 kg/ha	12	2500 to 3700 kg/ha	23
5.	Seed treatment	Mancozeb or Sankh jiru	35	Mancozeb or Sankh jiru	0
6.	Spacing	45x15 to 60x20 cm	7	40x10 cm	28
7.	Irrigation interval	7 Days	18	7 to 11 days	17
8.	Method of irrigation	Flood, Drip	35	Flood	0
9.	Yield	30-35 tonne/ha	25	25 to 37 tonne/ha	10

The table 8 presents the recommended practices for Potato cultivation in the Vijapur region. While farmers generally followed the recommendations for sowing time, sowing method, seed treatment and method of irrigation, there were variations in the adoption of practices such as FYM application, seed rate, spacing, irrigation interval and yield. Only a few farmers followed the recommended FYM application rate and seed rate. Farmers also utilized different

spacing and irrigation intervals, deviating from the recommendations. Additionally, the actual yield varied, with some farmers achieving yields outside the estimated range. These findings suggest that local conditions and individual preferences play a role in farmers' decision-making processes and their selection of specific agricultural practices for Potato cultivation in the Vijapur region.

Table 9: Potato package of practices at Bayad

No.	Practices	Recommendation	No. of farmers follow recommendation	Farmers followed practices	No. of farmers do not follow recommendation
1.	FYM	25-30 tonne/ha	3	10-27 tonne/ha	32
2.	Sowing time	The second fourth night of Nov	35	The second fourth night of Nov	0
3.	Sowing Method	Planter	35	Planter	0
4.	Seed rate	3300-3500 kg/ha	9	3000 to 4000 kg/ha	26
5.	Seed treatment	Mancozeb or Sankh Jiru	28	Mancozeb, Sankh jiru, Vitavax	7
6.	Spacing	45x15 to 60x20 cm	5	40x10cm	30
7.	Irrigation interval	7 Days	8	3 to 11 days	27
8.	Method of irrigation	Flood, Drip	35	Flood, Drip	0
9.	Yield	30-35 tonne/ha	22	22 to 37 tonne/ha	13

The table 9 provides insights into agricultural practices followed by farmers in Bayad. While farmers generally adhered to recommendations regarding sowing time, sowing method, seed treatment and method of irrigation, there were variations in the adoption of practices such as FYM application, seed rate, spacing, irrigation interval and yield. Only a few farmers followed the recommended FYM

application rate and seed rate and there were differences in spacing and irrigation intervals. The actual yields achieved also varied, indicating the influence of local conditions and other factors. Similar deviations were observed in the other regions of Halvad and Vijapur as well, suggesting that local conditions and a lack of awareness may contribute to the deviation from recommended practices.

Table 10: Disposal patterns of Cumin at Halvad

No.	Particular	No. of responses	Percentage	Average Quantity n(kg)	Percentage
1.	Pre-harvest contract	2	5.71	750	5.22
2.	Local agent	22	62.85	9440	65.74
3.	APMC	11	31.41	4920	34.26
	Total	35	100	14360	100

Disposal Pattern

In Halvad, the majority of cumin farmers (58.3%) sold their produce to local agents, while 31.41% preferred the Agricultural Produce Market Committee (APMC). A small

portion (5.71%) entered into pre-harvest contracts with some organizations. Farmers in the region were not associated with Farmer Producer Organizations (FPOs).

Table 11: Disposal patterns of Potato at Vijapur

No.	Particular	No. of responses	Percentage	Average quantity (tonne)	Percentage
1.	Pre-harvest contract	13	37.14	168.00	36.40
2.	Local agent	22	62.85	293.50	63.60
	Total	35	100	461.50	100

In Vijapur, the majority of potato farmers (62.85%) sold their produce to local agents, while a significant portion (37.14%) engaged in pre-harvest contracts. There was limited utilization of the Agricultural Produce Market Committee (APMC) or

Farmer Producer Organizations (FPOs) for selling potatoes in this area. Factors such as convenience, accessibility and personal preferences likely influenced farmers' choices of selling channels.

Table 12: Disposal patterns of Potato at Bayad

No.	Particular	No. of responses	Percentage	Average quantity (tonne)	Percentage
1.	Pre-harvest contract	17	48.58	339.50	73.56
2.	Local agent	18	51.42	210.00	45.50
	Total	45	100	549.50	100

In Bayad region, the majority of farmers (51.42%) sold their agricultural produce through local agents, while a significant number (48.58%) engaged in pre-harvest contracts. Selling through the Agricultural Produce Market Committee (APMC) or Farmer Producer Organizations (FPOs) was not observed. Farmers' preferences for selling channels were mainly focused

on local agents and pre-harvest contracts, indicating their reliance on established local networks and agreements for selling their crops.

Problems faced by farmers

Table 13: Garrett's Ranking table for cumin problems at Halvad

Factor	Mean score	Rank
Diseases	64.66	1
High input price	62.91	2
Natural factors	55.06	3
Insects	53.97	4
Weed	53.63	5
Lack of seed availability	53.29	6
Poor knowledge	47.91	7
Lack of storage	39.46	8
Lack of transportation	35.60	9
Lack of credit facilities	31.51	10

From the above Table 10 it was seen that ten factors were taken for problems faced by farmers in the production and marketing in the study area. Major problems faced by the farmers were Diseases in cumin followed by High input price

and Natural factors like uneven rainfall, weather changes. The most serious problem as Blight and wilt diseases and due to high dew in winter diseases infestation were increase.

Table 14: Garrett's Ranking table for Potato problems at Vijapur

Factor	Mean score	Rank
Diseases	73.14	1
High input price	64.09	2
Poor knowledge	56.29	3
Insects	55.80	4
Weed	53.31	5
Lack of storage	49.34	6
Lack of transportation	45.80	7
Natural factors	36.63	8

Lack of seed availability	35.66	9
Lack of credit facilities	27.94	10

Table 15: Garrett's Ranking table for Potato problems at Bayad

Factor	Mean score	Rank
Diseases	65.80	1
High input price	61.60	2
Poor knowledge	59.49	3
Weed	56.17	4
Insects	55.00	5
Lack of storage	54.03	6
Lack of transportation	53.46	7
Natural factors	43.94	8
Lack of credit facilities	37.80	9
Lack of seed availability	33.57	10

Major problems faced by the farmers were Diseases in potato in Vijapur and Bayad followed by High input price and Poor knowledge of practices. The most serious problem is scab disease and due to diseases infestation input use also increases and farmers also feel a high price of input.

One notable difference between cumin and potato farmers is the storage and transportation challenges they face. While cumin is a relatively compact and lightweight crop, making it easier to store and transport, potatoes are bulkier and more challenging to handle. For storing potatoes requires proper infrastructure and facilities to maintain their quality and prevent spoilage.

Conclusions

The study highlights the adaptability and diversity of cropping patterns in Halvad, Vijapur and Bayad regions. These patterns, influenced by climate, soil and market factors, demonstrate farmers' strategic decision-making based on their specific circumstances. While farmers generally followed recommended practices for sowing time, method and irrigation, variations were observed in FYM application, seed rate and spacing. Farmers in these regions preferred selling their produce to local agents, as a convenience and transportation ease. Informal contracts were common for securing predetermined prices for potatoes. Challenges faced by cumin farmers in Halvad included diseases like blight and wilt, high input prices, climate and insects. Potato farmers in Vijapur encountered issues of diseases like scab, high input costs, less knowledge of practices, storage and transportation. Common challenges across both regions included diseases, input prices and lower knowledge of practices, while Bayad specifically deal with weed infestation due to labour availability. Storage and transportation were greater constraints for potatoes than cumin due to their bulkiness.

The research study provides a comprehensive understanding of the cropping patterns, package of practices, disposal patterns and challenges faced by farmers in the Halvad, Vijapur and Bayad regions of Gujarat. The findings contribute to the knowledge base for developing region-specific agricultural strategies and interventions to enhance productivity, sustainability and the well-being of farmers in these areas.

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