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District-wise procurement plan for agricultural produce of selected districts of Gujarat

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Abstract
Organic and natural agricultural produce is gaining importance globally due to increasing concerns about food safety, environmental sustainability, and farmers' livelihoods. Gujarat, with its diverse agricultural conditions and growing adoption of natural farming, has considerable potential as a sourcing hub, particularly in tribal districts such as Chhotaudepur, Tapi, and Dahod. The present study adopted a descriptive research design, with primary data collected through structured interviews from 300 natural farming farmers in each district using probability sampling, supplemented by secondary information from government reports, APMCs, and certification agencies. Crop production was estimated using appropriate production formulas, while procurement periods and centre locations were determined through crop-calendar analysis and a cluster-based approach, respectively. The findings revealed that most farmers were above 51 years of age, predominantly male, and small or semi-medium landholders with low to moderate education levels. Maize was the major crop in Chhotaudepur and Dahod, while paddy dominated in Tapi. Procurement of Kharif crops was recommended from October to January and Rabi crops from February to April. A total of 24 procurement centre locations were identified across the three districts, with storage requirements estimated at 50 per cent of total production after accounting for household consumption and seed retention. The study provides a practical basis for efficient procurement and storage planning of natural agricultural produce in tribal regions of Gujarat.

Keywords: Natural farming, procurement planning, agricultural produce, crop calendar, storage capacity, procurement centres

1. Introduction

1.1 Background

Agriculture remains the backbone of India's rural economy, providing livelihoods to a vast section of the population. Among emerging segments, organic and natural agricultural produce represents a rapidly growing market, driven by increasing awareness of food safety, environmental sustainability, soil health, and farmer livelihoods. Procurement- the process of planning, sourcing, purchasing, and managing goods at the right quality, quantity, time, cost, and location- is central to connecting producers with markets (Mogale *et al.,* 2019) [13].

Natural farming goes beyond organic farming by relying almost entirely on on-farm, nature-based inputs such as bio-inoculants, cow-based formulations, and soil microbial management. According to the Department of Agriculture and Farmers Welfare, under the operational frameworks of the National Mission on Natural Farming (NMNF), over 23 lakh farmers have been enrolled and more than 8.80 lakh hectares of land brought under natural farming cultivation clusters across the country. A deliberate social procurement framework within the farm sector effectively bridges the gap between regenerative, environmentally responsible producers and conscious consumers while actively securing fair labour valuation (Access Development Services, 2025) [1].

1.2 Global, Indian and Gujarat scenario in Natural Farming

The global organic food and beverage market was valued at approximately USD 280 billion in 2024 and is projected to reach USD 500 billion by 2030 (The Business Research Company, 2026) [19]. India ranks 1st globally in total number of organic producers (over 1.7 million farmers) and 2nd in organic land area (FiBL & IFOAM, 2024) [9]. Despite growing production, farmers often face challenges such as lack of assured procurement, fragmented

markets, inadequate storage infrastructure, price volatility, and limited processing facilities (APEDA, 2024) [2].

Gujarat, with over 8.5 lakh farmers across 7 lakh+ acres under natural farming, is the national pioneer in Cow-Based Natural Farming (CBNF). Furthermore, the Dang District in South Gujarat has been officially declared India's first 100 per cent Natural Farming District (Agriculture, Farmers Welfare and Co-operation Department [AFWCD], 2017) [3], and Tribal and rainfed districts such as Dahod, Chhotaudepur, and Tapi show strong potential for natural farming due to traditional practices and lower chemical usage. However, procurement in these districts remains largely unorganised, leading to distress sales and reduced incentives for farmers to continue sustainable practices (APEDA, 2024) [2].

Therefore, the current study was undertaken to assess the socio-economic profile of natural farming farmers; estimate the taluka-wise and crop-wise area under cultivation and agricultural production; determine the procurement timeline based on the sowing and harvesting periods of major crops; and propose suitable locations for establishing procurement centres and storage units in the study area.

2. Review of Literature

Bassi (2020) [4] analysed major crops grown in Gujarat, detailing their exact sowing schedules, harvesting times, total crop durations, and yields. According to the study, cotton is cultivated over approximately 15.19 lakh hectares with a long crop duration; it is sown during the second fortnight of June to the first fortnight of July with the monsoon onset, and its harvesting occurs progressively across three to four pickings after boll bursting, producing yields of 1,200-1,500 kg/ha and 2,500 kg/ha for non-hybrids and hybrids, respectively. Maize is sown during the second to third week of June or with the monsoon onset, reaching its harvesting time when the cobs turn yellow and grains harden, yielding 3,000-4,000 kg/ha in the Kharif season and 2,500-3,500 kg/ha in the Rabi season. Pigeon pea (red gram) is sown during the Kharif season in June-July, requiring a long crop duration of roughly 160-180 days to reach its harvesting time, with a yield of 1,000-1,200 kg/ha under normal conditions. Finally, bajra (pearl millet) is sown with the onset of the monsoon in June-July, with a crop duration of 75-90 days, delivering a yield of 1,500-2,000 kg/ha.

Choudhary (2019) [6] conducted a study entitled "Crop Weather Calendar: A Crop Guideline", in which crop-wise sowing and harvesting periods were systematically documented to aid crop planning and agro-advisory services. The study reported that rice was sown during June-July and harvested during October-November, maize was sown in June-July and harvested in September-October, and cotton was sown during June-July with harvesting extending from November to January. Among rabi crops, wheat was sown in October-November and harvested during March-April, mustard was sown in October-November and harvested in February-March, and gram (chickpea) was sown during October-November with harvesting in February-March.

3. Methodology

The present study was conducted from 26th December 2025 to 26th March 2026 in Chhotaudepur, Tapi, and Dahod districts of Gujarat. Primary data were collected through personal interviews using a structured questionnaire from 300 natural farming farmers in each district (n=900) using the probability sampling method. Secondary data were collected from government reports, APMCs, agricultural records, certification agencies, and published sources.

Table 1: Materials and Methods

Particular	Description
Type of Research	Descriptive research
Study Area	Chhotaudepur, Tapi and Dahod Districts of Gujarat
Data Collection Method	Probability Method
Sampling Unit	Natural farming farmers
Sample Size	300 farmers per district (Total 900)
Time Period	90 days
Analytical Tools	Tabular analysis, Percentage analysis, Graphical analysis, Production & Yield calculations

For the socio-economic profile, tabular and percentage analysis were used. Production was estimated as (Gupta *et al.,* 2019) [11];

Production (MT) = Area (ha) × Average Yield (kg/ha) / 1000

Procurement timelines were derived from crop calendar analysis based on secondary sources. A cluster-based approach with a 10 km service radius was adopted for identifying procurement centre locations, and required storage capacity (RSC) was computed as recommended by FAO & CWC (FAO, 2011; CWC, 2018) [10];

RSC = Average Production × Procurement Percentage,

4. Results and Discussion

Objective 1: Socio-Economic Profile of Natural Farming Farmers

4.1 Age of Farmers

The majority of farmers engaged in natural farming belong to the older age group (51 years and above), accounting for 57 per cent in Chhotaudepur, 54 per cent in Tapi, and 59 per cent in Dahod. Middle-aged farmers (36-50 years) form the second largest category, contributing 34 per cent, 37 per cent, and 33 per cent respectively, while young farmers (up to 35 years) represent only 9 per cent, 9 per cent, and 8 per cent across the three districts. This dominance of older farmers can be attributed to the fact that procurement surveys are typically conducted in the name of the original landowner, who is usually the senior family member. Similar findings were reported by Kumari and Rana (2025) [12], who observed a majority of middle-aged to older farmers in natural farming studies from Himachal Pradesh.

Table 2: Age distribution of sample farmers

Sr. No.	Age Group	Chhotaudepur (%)	Tapi (%)	Dahod (%)
1	Young (up to 35 years)	9.00	9.00	8.00
2	Middle (36-50 years)	34.00	37.00	33.00
3	Old (51 years and above)	57.00	54.00	59.00
Total		100.00	100.00	100.00

Source: Field survey

4.2 Gender Distribution

Table 3 revealed that male farmers constitute the dominant majority in all three districts, with 9 per cent in Chhotaudepur, 66 per cent in Tapi, and 93 per cent in Dahod. Female participation, though limited overall (6%, 34%, and 7% respectively), is comparatively higher in Tapi district, suggesting greater women's involvement in agricultural activities there. This reflects the broader pattern of male dominance in farm decision-making and procurement activities observed.

Table 3: Gender distribution of sample farmers

Sr. No.	Gender	Chhotaudepur (%)	Tapi (%)	Dahod (%)	Average (%)
1	Male	94.00	66.00	93.00	84.33
2	Female	6.00	34.00	7.00	15.67
Total		100.00	100.00	100.00	100.00

Source: Field survey

4.3 Land Holding Size

The land holding analysis (Table 4) showed that the majority of farmers belong to small and semi-medium categories. In Chhotaudepur, small farmers dominate (45%), while in Tapi, semi-medium farmers form the largest group (35%). Dahod shows a concentration of marginal (34%) and small farmers (31%). This confirms that natural farming in the study area is predominantly practised by resource-poor farmers with limited landholdings.

Table 4: Land holding distribution of sample farmers

Sr. No.	Category	Chhotaudepur (%)	Tapi (%)	Dahod (%)	Average (%)
1	Marginal (<1 ha)	14.00	10.00	34.00	19.33
2	Small (1.01-2 ha)	45.00	19.00	31.00	31.67
3	Semi-Medium (2.01-4 ha)	27.00	35.00	21.00	27.67
4	Medium (4.01-10 ha)	12.00	31.00	7.00	16.67
5	Large (>10 ha)	2.00	5.00	7.00	4.67
Total		100.00	100.00	100.00	100.00

Source: Field survey

4.4 Natural Farming Experience and Training

In terms of natural farming experience, Chhotaudepur shows the most mature adoption, with 81 per cent of farmers having 2-3 years of experience. Tapi reflects recent adoption, as 67 per cent of farmers have only 0-1 year of experience. Dahod shows moderate progress, with 59 per cent having 1-2 years of experience. Regarding training exposure, Chhotaudepur demonstrates better capacity building, with 55 per cent of farmers receiving 4 or more days of training, whereas in Tapi and Dahod, 85 percent and 89 percent of farmers, respectively, received only 2-day training programs. A small proportion of farmers across all districts reported no training. These variations in experience and training are consistent with patterns reported by Kumari and Rana (2025) [12], who found that training and extension contact significantly influence natural farming adoption.

4.5 Animal Husbandry

Animal husbandry is widely practised by farmers across all three districts: 98 per cent in Chhotaudepur, 83 per cent in Dahod, and 68 per cent in Tapi. Cow ownership is highest in Chhotaudepur (98%), followed by Dahod (59%) and Tapi (42%), while buffalo ownership is significant across all districts. This integration of livestock with farming is critical in natural farming systems, as cow dung and cow urine form the basis of bio-inputs such as Jeevamrut and Beejamrut (National Mission on Natural Farming [NMNF], 2025) [14]. Farmers without livestock face higher dependency on external inputs, which may increase cultivation costs and reduce self-reliance.

4.6 Crop Production

As shown in Table 5, cereal crops dominate natural farming production across all three districts. In Chhotaudepur, maize is the leading crop with 39.80 ha under cultivation and a production of 65.16 MT, followed by tur (23.38 MT) and paddy (11.03 MT). In Tapi, paddy dominates with 63.42 ha and production of 182.97 MT, reflecting the district's agro-climatic suitability for rice cultivation. Dahod shows the highest overall production, with maize leading at 187.40 MT across 107.47 ha, followed by wheat (160.26 MT) and paddy (38.92 MT).

Table 5: Crop-wise production across districts

Rank	District	Top Crop (MT)	2nd Crop (MT)	3rd Crop (MT)
1	Chhotaudepur	Maize - 65.16	Tur - 23.38	Paddy - 11.03
2	Tapi	Paddy - 182.97	Gram - 55.21	Wheat - 52.29
3	Dahod	Maize - 187.40	Wheat - 160.26	Paddy - 38.92

Source: Field survey

Taluka-wise analysis further identifies high-production zones. In Chhotaudepur, Naswadi (24.44 MT), Jetpur Pavi (21.83 MT), and Chhotaudepur taluka (21.35 MT) are the leading contributors. In Tapi, Dolvan (56.66 MT), Songadh (53.29 MT), and Valod (46.16 MT) dominate. In Dahod, Dhanpur stands out with the highest production (160.31 MT), followed by Dahod taluka (60.90 MT) and Zalod (42.83 MT). These talukas represent the most strategic locations for procurement activities due to their higher produce availability.

4.7 Crop Calendar and Procurement Planning

The crop calendar analysis (Table 6) reveals that most Kharif crops maize, paddy, bajra, soybean, groundnut, cotton, and tur are sown between mid-June and July, with harvesting extending from mid-September to January. Procurement of Kharif produce should therefore be planned from October to January, with the specific window varying by crop. Rabi crops (wheat, gram, rabi maize) are harvested from February to April, defining the Rabi procurement window. Perennial crops like guava produce fruit twice a year (August-October and February-April), requiring two separate procurement cycles annually.

Table 6: Procurement timeline based on crop calendar

Sr.	Season	Crop	Harvesting Period	Sowing Period
1	Kharif	Paddy	Mid-Sep to Mid-Oct	Jun-Jul
2	Kharif	Maize, Bajra, Groundnut	Oct-Nov	Jun-Jul
3	Kharif	Soybean	Nov-Dec	Jun-Jul
4	Kharif	Cotton, Tur	Oct-Jan	Jun-Jul
5	Kharif	Castor	Dec-Jan	Jun-Aug
6	Rabi	Gram	Feb-Mid Mar	Oct-Nov
7	Rabi	Wheat, Rabi Maize	Mar-Apr	Oct-Nov
8	Perennial	Guava	Aug-Oct & Feb-Apr	Feb-Mar or Aug-Sept

Source: Field survey

4.8 Road Connectivity and Procurement Infrastructure

Road condition and connectivity are fundamental prerequisites for efficient agricultural procurement. The study found that the majority of farmers report good road conditions 74 per cent in Chhotaudepur and 81 per cent in both Tapi and Dahod. A moderate proportion reported medium road conditions (15%, 10%, and 15% respectively), while poor road conditions were reported by 11 per cent, 9 per cent, and 4 per cent. Better road connectivity in Tapi and Dahod facilitates smoother transportation of farm produce from fields to procurement centres, reducing post-harvest losses and transportation costs compared to Chhotaudepur.

4.9 Proposed Procurement Centre Locations and Storage Capacity

Using a cluster-based approach with a 10 km service radius (Mogale *et al.,* 2019; Sharma, 2021) [13, 17], a total of 24 procurement centre locations were identified across the three districts (Table 7). In Chhotaudepur, six centres were proposed: Sodhliya, Suskal, Tejgadh, Kherka, Dhokaliya, and Pipaliya, covering all six talukas with a combined production of 124.40 MT and a required storage capacity of 62.21 MT. In Tapi, nine centres, including Dhanturi, Kharsi, Singpur, Vedchhi, Babarghat, Magarkui, Unchamala, Nizar, and Fulvadi, cover a combined production of 290.47 MT, with a required storage capacity of 145.24 MT. In Dahod, nine centres, including Dhanpur, Nimnalia, Limdi, Kaliya Kuva, Pratappura, Sukhasar, Fatepura, Matana Palla, and Gangardi, address a combined production of 424.28 MT, with a required storage capacity of 212.14 MT. Dhanpur in Dahod district stands out as the single most critical procurement hub, contributing 160.32 MT of production.

Table 7: Proposed procurement centres and required storage capacity

District	Procurement Centre Locations	Total Production (MT)	Req. Storage Capacity (MT)
Chhotaudepur	Sodhliya, Suskal, Tejgadh, Kherka, Dhokaliya, Pipaliya	124.40	62.21
Tapi	Dhanturi, Kharsi, Singpur, Vedchhi, Babarghat, Magarkui, Unchamala, Nizar, Fulvadi	290.47	145.24
Dahod	Dhanpur, Nimnalia, Limdi, Kaliya Kuva, Pratappura, Sukhasar, Fatepura, Matana Palla, Gangardi	424.28	212.14

Source: Field survey

The required storage capacity was calculated at 50 per cent of total production, following FAO & CWC recommended methodology, as farmers typically retain a portion of their harvest for household consumption and seed purposes (FAO, 2011; CWC, 2018) [10]. This ensures realistic infrastructure planning without overestimating available procurement volume.

5. Conclusion

The study concludes that the agricultural and procurement scenario in Chhotaudepur, Tapi, and Dahod districts is dominated by small and marginal farmers, with moderate crop diversity and a gradual shift toward natural farming practices. The socio-economic profile indicates that most farmers belong to older age groups, with limited youth participation, and farming is largely male-dominated, though female participation is relatively higher in Tapi. Families are medium to large, relying on family labour, while educational levels remain low to moderate, creating challenges in understanding formal procurement systems. Land ownership is entirely farmer-based, with small and semi-medium holdings reflecting subsistence-oriented agriculture. Natural farming adoption and training exposure vary, with Chhotaudepur performing better than Tapi and Dahod. Livestock integration is common, supporting sustainable agriculture through organic inputs. Crop

production is dominated by cereals like maize, paddy, and wheat, with regional variation across districts. Based on production concentration and accessibility, key procurement centres identified include Sodhliya, Tejgadh, and Kherka in Chhotaudepur; Vedchhi, Babarghat, and Nizar in Tapi; and Dhanpur, Limdi, and Fatepura in Dahod. The crop calendar shows Kharif harvests from September to January and Rabi from February to April, aiding efficient procurement planning. Road connectivity is generally good, especially in Tapi and Dahod, though some parts of Chhotaudepur which helps with transportation.

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