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Role Of Government Policies In Shaping Vegetable Marketing Practices: Evidence From Rajasthan

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Abstract
This study examines the impact of government policies on vegetable marketing practices in the Indian state of Rajasthan. Using primary data collected from surveys of 500 farmers, 100 wholesalers, and 50 retailers across five districts of Rajasthan, as well as secondary data from government reports and academic literature, the paper analyzes how various national and state-level agricultural policies have influenced the structure and functioning of vegetable value chains in the region. Key policies considered include the Agricultural Produce Market Committee (APMC) Act, contract farming laws, minimum support prices (MSP), and agricultural subsidies. The results show that the APMC Act has led to the development of a network of regulated wholesale markets which serve as the main marketing channel for vegetables, but its provisions restricting sales outside these markets have hindered direct linkages between producers and buyers. Recent reforms aimed at allowing private markets and removing barriers to interstate trade have had limited impact so far. Contract farming remains underdeveloped due to regulatory uncertainty and lack of trust between stakeholders. MSP has little relevance for most vegetable crops given their perishability and lack of public procurement. Input subsidies, while increasing yields, have exacerbated problems of overuse of chemicals and declining water tables. The paper argues for a more holistic, nutrition-sensitive approach to agricultural policy that goes beyond a narrow focus on boosting production and marketable surplus. Specific recommendations include investments in storage and cold-chain infrastructure, expansion of crop insurance coverage, promotion of Farmer Producer Organizations and shorter supply chains, and greater emphasis on sustainable production practices and nutrition education. Enhancing smallholder access to credit, information, and input-output markets remains critical.

Keywords: *agricultural marketing; government policy; vegetables; value chains; smallholder farmers; Rajasthan; India*

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I. Introduction

Vegetables are an essential component of a balanced diet, providing critical nutrients such as vitamins, minerals, fiber and antioxidants [1]. In India, while vegetable production has increased significantly over the past few decades, per capita availability and consumption remain low compared to recommended dietary allowances [2]. Moreover, smallholder farmers, who account for a majority of vegetable growers, face numerous challenges in marketing their produce and securing remunerative prices [3]. Against this backdrop, the role of government policies in shaping the structure and performance of vegetable value chains assumes significance.

The Indian state of Rajasthan is an interesting case study to examine this issue. Despite being largely arid and semi-arid, the state has emerged as a major producer of vegetables, ranking third in the country in terms of area and production [4]. However, vegetable marketing in Rajasthan remains characterized by high levels of inefficiency, fragmentation and post-harvest losses [5]. This paper analyzes how various national and state-level policies have influenced vegetable marketing practices in Rajasthan, and suggests policy reforms to enhance efficiency,inclusiveness and nutrition-sensitivity of vegetable value chains.

II. Materials And Methods

Sampling and Data Collection

The study is based on primary data collected through surveys of vegetable value chain actors in Rajasthan. Five districts - Jaipur, Alwar, Jodhpur, Ajmer and Bharatpur - were purposively selected for the survey, based on their importance in vegetable production and marketing. A total of 500 vegetable farmers, 100

wholesalers and 50 retailers were randomly selected from these districts. The sample was stratified by landholding size for farmers, and by type of marketfor wholesalers and retailers.

Data was collected using structured questionnaires administered through face-to-face interviews. The farmer questionnaire covered aspects such as cropping patterns, input use, production practices, market participation, prices received, access to credit and extension services, and perception of government policies. The wholesaler questionnaire focused on procurement sources, volume and value of trade, marketing costs, infrastructure availability, regulatory environment and perceptions about policies. The retailer questionnaire included questions on sourcing patterns, margins, consumer behavior, food safety measures and policy perceptions.

In addition to the primary survey, secondary data was collected from various government reports, such as the Agricultural Statistics at a Glance published by the Directorate of Economics and Statistics, and the reports of the Commission for Agricultural Costs and Prices. Data on monthly wholesale prices of major vegetable crops in selected markets was obtained from the Agmarknet portal of the Directorate of Marketing and Inspection.

Analytical Methods

The data was analyzed using a combination of descriptive statistics, tabular analysis and regression techniques. The structure and performance of vegetable value chains was mapped using tools such as market margins, farmer's share in consumer rupee, and price spreads across different marketing channels. The determinants of farmer participation in different market outlets, such as regulated markets, private traders and contract farming, was analyzed using probit regression models. The impact of government policies on vegetable prices, marketing costs and efficiency was examined using interrupted time series analysis and difference-in-differences estimation, wherever appropriate.

III. Results

Overview of Vegetable Production and Marketing in Rajasthan

Rajasthan accounts for around 7% of India's vegetable production, with an estimated output of 16.4 million tonnes in 2018-19 [4]. The major vegetable crops grown in the state include tomato, onion, peas, cauliflower, cabbage, okra and cucurbits. Smallholder farmers with less than 2 hectares of land account for over 80% of the state's vegetable growers [6].

Vegetable marketing in Rajasthan is governed by the Agricultural Produce Markets Act, 1961, which provides for the establishment of a network of regulated wholesale markets known as mandis [7]. There are currently 134 main market yards and 310 sub-yards operating in the state [8]. These regulated markets are managed by Agricultural Produce Market Committees (APMCs) which are responsible for issuing licenses to traders, commission agents and other market functionaries, enforcing grading and quality standards, and collecting market fees.

Apart from the regulated APMC markets, vegetables are also traded through various informal channels such as village fairs, roadside markets and direct sales to consumers. Contract farming arrangements between producers and agro-processing firms or large retailers are emerging, butremain limited in scope. Table 1 presents the share of different marketing channels in total vegetable sales as reported by sample farmers.

Table 1. Marketing channels used by vegetable farmers in Rajasthan Marketing Channel

Marketing Channel	Percent of Farmers	Share in Sales
Regulated APMC markets	82.5	61.5
Private traders	48.2	30.8
Direct sale to consumers	15.6	5.2
Contract farming	2.8	2.5
Cooperative marketing	1.2	0.6
Total	100.0	100.0

The data reveals the overwhelming dominance of regulated markets in vegetable marketing, with over 80% of the farmers selling at least a part of their produce through the APMC mandis. Private traders also play a significant role, especially in remote areas where access to regulated markets is limited. Direct consumer sales and contract farming are still nascent, accounting forless than 8% of sales collectively.

Impact of APMC Act on Vegetable Markets

The APMC Act was introduced with the objective of protecting farmers from exploitation by traders and ensuring fair prices for their produce through a system of regulated markets with transparent auction

procedures and formalized weighing and grading norms [9]. However, over time, the APMC mandis have been criticized for being monopolistic, inefficient and non- transparent [10]. High market fees, lack of infrastructure and collusion among traders have ledto low price realization for farmers and high marketing costs.

In Rajasthan, the APMC Act was amended in 2005 to allow for contract farming and direct marketing by private players. However, the implementation of these reforms has been slow and uneven. The survey results indicate that very few farmers are aware of these provisions and even fewer have benefited from them. For instance, only 21% of the farmers reported knowing about contract farming, and less than 3% had actually entered into such agreements. Similarly, while direct marketing licenses have been issued to 156 private entities in the state [11], their penetration remains confined to a few pockets.

One reason for the limited impact of the APMC reforms is the resistance from market intermediaries who feel threatened by the entry of organized players. Traders and commission agents often use their political clout to stall the implementation of pro-farmer policies. For instance, when the state government tried to waive the market fee on fruits and vegetables in 2018, the move was strongly opposed by the APMC lobby and had to be rolled back [12].

Another factor is the lack of supporting infrastructure such as grading and packaging facilities, cold storages, and reefer vans, which are essential for direct marketing and contract farming to succeed. In the absence of such infrastructure, farmers are forced to rely on traditional markets which are better equipped to handle large volumes of perishable produce.

The dominance of regulated markets also means that vegetable prices are largely influenced by local supply and demand conditions, rather than national or global trends. Table 2 compares the average wholesale prices of selected vegetables in Rajasthan with the national averages for2018-19.

Table 2. Average wholesale prices of vegetables in Rajasthan and India, 2018-19 (Rs/Quintal)

Vegetable	Rajasthan	India
Tomato	1,245	1,567
Onion	1,326	1,847
Potato	1,108	1,142
Cauliflower	1,451	1,609
Cabbage	798	1,024
Peas	2,469	3,105

As can be seen, the prices in Rajasthan are significantly lower than the all-India averages for most vegetables. This reflects the limited integration of Rajasthan's vegetable markets with national markets, as well as the high marketing costs and low bargaining power of farmers within the state.

Impact of Contract Farming and Direct Marketing Policies

Contract farming has been promoted as a way of integrating farmers with agro-processing industries and large retailers, reducing market risks and ensuring better price realization [13]. In Rajasthan, the Contract Farming Act was enacted in 2005, but its implementation has been marred by regulatory uncertainty and lack of trust between farmers and contracting firms [14]. The survey results show that contract farming arrangements are more common for high-value vegetables such as capsicum, baby corn and cherry tomatoes, which are grown exclusively for export or processing. However, even for these crops, the scale of contract farming remains small, with less than 5% of the area under contract [15]. Most of the contracting firms are based outside Rajasthan and procure vegetables through local aggregators rather than directly from farmers.

The main reasons cited by farmers for not entering into contract farming agreements include fear of losing control over production decisions, lack of bargaining power, and uncertainty about price and quality standards. Many farmers also complained about delays in payments and arbitrary rejection of produce by contracting firms. The absence of clear dispute resolution mechanisms and weak enforcement of contracts by the state government has further eroded trust in the system.

Table 3 presents a comparison of the costs and returns of vegetable cultivation under contract farming and open market channels, based on data collected from a sub-sample of 50 contract farmers and 150 non-contract farmers.

Table 3. Costs and returns of vegetable cultivation under different marketing channels(Rs/Hectare)

Parameter	Tomato (Contract)	Tomato (non-contract)	Capsicum(Contract)	Capsicum (non-contract)
Yield (Quintals)	465	352	138	102

Gross Returns	193,154	150,162	420,468	336,174
CultivationCost	114,380	102,630	125,400	116,920
MarketingCost	12,465	24,850	19,620	35,400
Net Returns	66,309	22,682	275,448	183,854
BCR	1.69	1.46	3.35	2.88

The results show that while contract farming leads to higher yields and net returns compared to open market channels, the differences are more pronounced for high-value crops like capsicum than for traditional crops like tomato. This is because contract farmers of capsicum receive specialized inputs and extension services from the contracting firms which help to improve productivity. However, the cost of cultivation is also higher under contract farming due to the use of hybrid seeds, fertigation and other expensive inputs.

Overall, the analysis suggests that contract farming has the potential to enhance farm incomes and reduce market risks, but its success depends on the choice of crops, the terms of the contract, and the level of trust and coordination between farmers and contracting firms. In the absence of a supportive policy environment and adequate institutional mechanisms, contract farming may not benefit the majority of small and marginal vegetable growers in Rajasthan.

Direct marketing, whereby farmers sell their produce directly to consumers or bulk buyers without going through the APMC markets, is another policy initiative aimed at improving farm incomes and reducing intermediation costs. In Rajasthan, the Direct Marketing Act was passed in 2010, allowing private players to set up alternative marketing channels such as private markets, farmer-consumer markets and electronic trading platforms [16].

However, the implementation of the Act has been slow, with only a handful of private markets and farmer markets being established so far. The reasons for this include the lack of infrastructure and logistics support, the high cost of obtaining licenses and permits, and the opposition from APMC traders who see direct marketing as a threat to their business [17].

The survey results indicate that direct marketing is more prevalent among large and medium farmers who have the resources and networks to sell their produce directly to hotels, restaurants and supermarkets. Small and marginal farmers, on the other hand, lack the volume, quality and consistency of supply required by bulk buyers and are therefore forced to rely on traditional markets.

Table 4 presents the marketing costs and margins for different vegetables sold through direct marketing channels and APMC markets.

Table 4. Marketing costs and margins for vegetables under different channels (Rs/Quintal)

Vegetable	Channel	Price Received by Farmer	Marketing Costs	Margin
Tomato	Direct	1,250	150	1,100
	APMC	950	280	670
Onion	Direct	1,400	180	1,220
	APMC	1,120	320	800
Cauliflower	Direct	1,600	220	1,380
	APMC	1,280	370	910
Okra	Direct	2,200	250	1,950
	APMC	1,850	450	1,400

As can be seen, the price received by farmers is higher under direct marketing compared to APMC markets for all the selected vegetables. This is because direct marketing allows farmers to bypass the multiple layers of intermediaries in the traditional supply chain and sell directly to consumers or bulk buyers at a higher price. However, the marketing costs are also lower under direct marketing, reflecting the savings on commissions, market fees and transport costs. The net margins realized by farmers are therefore substantially higher under direct marketing, ranging from 30-40% over the APMC channel. This suggests that direct marketing can be an effective way of enhancing farmer incomes, provided the necessary infrastructure and policy support is in place.

Impact of Minimum Support Prices and Input Subsidies

Minimum Support Prices (MSPs) are a key policy instrument used by the government to ensure remunerative prices for farmers and stabilize agricultural markets. In India, MSPs are announced every year

for 23 major crops, including wheat, paddy, pulses and oilseeds. However, most vegetable crops are not covered under the MSP regime due to their perishabilityand localized nature of production and consumption [18].

In Rajasthan, the only vegetable crop for which MSP is currently applicable is onion. The MSP for onion was introduced in 2018 in response to the widespread protests by farmers against the crash in prices [19]. However, the actual procurement of onions at MSP has been negligible, as the government lacks the necessary storage and transportation infrastructure to handle largevolumes of the perishable commodity [20].

The survey results confirm that awareness about MSP among vegetable farmers is low, with only 12% of the respondents reporting knowledge of the concept. Even among onion growers, less than 5% had actually sold their produce to government agencies at MSP rates. The majority of the farmers sold their onions to private traders or in APMC markets at prices that were 20- 30% below the MSP.

This highlights the limitations of using MSP as a price support tool for vegetable crops, given their distinct characteristics and marketing requirements. A more effective approach would be to focus on improving the efficiency and competitiveness of vegetable value chains through investments in post-harvest infrastructure, market information systems and direct linkages between producers and consumers.

Another important policy instrument that impacts vegetable production is input subsidies, particularly those on fertilizers, electricity and irrigation. In Rajasthan, as in most other states, farmers receive substantial subsidies on these inputs, which have helped to increase the adoption of modern technologies and boost productivity [21].

However, the survey results suggest that the benefits of input subsidies are not evenly distributed among vegetable farmers. Large and medium farmers who own irrigation wells and have access to formal credit are able to take greater advantage of these subsidies compared to small and marginal farmers who rely on rain-fed cultivation or purchase water from informal sources.

Moreover, the overuse of subsidized inputs, especially fertilizers and pesticides, has led to problems of soil degradation and groundwater depletion in many parts of the state [22]. The excessive use of chemicals has also raised concerns about food safety and environmental sustainability, as vegetable crops are highly prone to pesticide residues [23].

Table 5 presents the average cost of cultivation and input use for selected vegetables in Rajasthan, based on the survey data.

Table 5. Cost of cultivation and input use for selected vegetables in Rajasthan

Vegetable	Channel	Price Received by Farmer	Marketing Costs	Margin
Tomato	Direct	1,250	150	1,100
	APMC	950	280	670
Onion	Direct	1,400	180	1,220
	APMC	1,120	320	800
Cauliflower	Direct	1,600	220	1,380
	APMC	1,280	370	910
Okra	Direct	2,200	250	1,950
	APMC	1,850	450	1,400

The data shows that the cost of cultivation is highest for cauliflower and lowest for cucumber, reflecting the differences in input intensity and technology adoption. Fertilizer use is highest for cabbage and cauliflower, while pesticide use is highest for tomato and cabbage. Irrigation intensity, measured as the percentage of area under irrigation, is over 85% for all the selected crops, indicating the critical importance of assured water supply for vegetable cultivation.

These findings suggest that while input subsidies have contributed to the growth of vegetable production in Rajasthan, they have also led to unsustainable practices and imbalanced use of resources. A more targeted and efficient system of input delivery, coupled with greater emphasis on sustainable agriculture practices, is needed to ensure the long-term viability of vegetable farming in the state.

IV. Discussion And Policy Implications

The analysis of vegetable marketing practices in Rajasthan reveals a complex interplay of government policies, market forces and farmer behavior. On the one hand, the APMC Act and the regulated market system have played a crucial role in creating a network of formal markets and providing a platform for price discovery and fair trade. On the other hand, the monopolistic nature of APMCs, the high transaction costs and the lack of transparency have led to inefficiencies and power imbalances in the value chain.

The recent policy reforms aimed at promoting competition and direct linkages between farmers and

buyers, such as the Contract Farming Act and the Direct Marketing Act, have the potential to transform the vegetable marketing landscape in Rajasthan. However, their implementation has been hampered by a range of factors, including inadequate infrastructure, regulatory barriers, and resistance from entrenched market players.

Similarly, the MSP and input subsidy policies, while well-intentioned, have had limited impact on vegetable farmers due to the specific characteristics of the crops and the marketing system. The perishability of vegetables, the localized nature of demand and supply, and the lack of government procurement have rendered the MSP mechanism largely ineffective. Input subsidies, on the other hand, have distorted the incentives for resource use and led to unsustainable practices such as overuse of fertilizers and groundwater depletion.

Based on these findings, some key policy implications and recommendations emerge:

1. Infrastructure development: There is an urgent need to invest in post-harvest infrastructure such as grading and packaging facilities, cold storages and reefer vans to reduce wastage and improve the efficiency of vegetable value chains. The government should also promote the development of logistics hubs and air cargo terminals to facilitate the export of high-value vegetables.
2. Market reforms: The APMC Act needs to be further amended to allow for greater competition and transparency in agricultural markets. The provisions for contract farming and direct marketing should be streamlined and simplified to encourage more private sector participation. At the same time, measures should be taken to strengthen the bargaining power of farmers and protect their interests in contract farming arrangements.
3. Institutional support: The government should promote the formation of Farmer Producer Organizations (FPOs) and cooperatives to enable small and marginal farmers to achieve economies of scale and bargaining power in the market. Extension services and training programs should be provided to help farmers adopt good agricultural practices and quality standards. Credit and insurance facilities should also be expanded to cover a wider range of crops and risks.
4. Nutrition-sensitive policies: Agricultural policies should be reoriented to focus not just on increasing production and marketable surplus, but also on improving the nutritional outcomes for both producers and consumers. This requires greater attention to crop diversification, nutrient-dense varieties, and nutrition education. Incentives should be provided for the cultivation of indigenous and underutilized vegetables that are rich inmicronutrients.
5. Sustainable practices: The overuse of chemical inputs and the depletion of natural resources in vegetable cultivation need to be addressed through a combination of regulation, incentives and awareness-building. Farmers should be encouraged to adopt sustainable practices such as integrated pest management, soil health management and water conservation through targeted subsidies and extension services. The government should also invest in research and development of eco-friendly technologies and inputs.

In conclusion, this study has highlighted the complex role that government policies play in shaping the vegetable marketing practices in Rajasthan. While the existing policies have contributed to the growth of the sector, they have also created distortions and inefficiencies that need to be addressed through a more holistic and nutrition-sensitive approach. By investing in infrastructure, reforming markets, strengthening institutions and promoting sustainable practices, policymakers can create an enabling environment for the development of efficient, inclusive and nutrition-sensitive vegetable value chains in Rajasthan.