



Government Interventions and Protected Cultivation: A Central Rajasthan Perspective

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Abstract: Protected cultivation using polyhouses, shade nets, drip irrigation, and greenhouse farming has emerged as a key strategy to boost productivity, reduce climate risks, and raise farmer incomes. To promote adoption, the Government of India and Rajasthan have introduced schemes like NHM, RKVY, and MIDH, offering subsidies, credit support, and training. For the analysis of the objectives of Government Policies, Subsidies, and Support Programs were examined relevant to Horticulture and Protected Cultivation in Central Rajasthan. Semi-arid Central Rajasthan, with erratic rainfall and poor soils, has been a focus under the National Horticulture Mission (NHM) through subsidies, training, and technical support. Farmer feedback indicated 62.56% learned of NHM via government extension services, while 12.42% were informed by peers. Over half had limited prior knowledge of protected cultivation, yet all attended training. NHM subsidies covering 51–75% of initial investment enabled polyhouse establishment, resulting in higher yields, improved produce quality, and better market access. Challenges included high initial costs, technical gaps, maintenance issues, and lack of collateral (27.53%). To improve sustainability, the study recommends advanced training, timely financial support, quality input access, and technical advisory networks. Strengthening cooperatives, market linkages, infrastructure, tailored credit, and insurance, supported by research, awareness campaigns, and monitoring, will enhance adoption and ensure long-term viability for sustainable horticultural development in Central Rajasthan.

Key word: Government intervention, horticulture, protected cultivation, polyhouse, NHM Jel Code:Q18, Q13, Q16, Q12, O13.

The global horticulture market was valued at \$271.5 billion in 2023, growing at around 6.7% annually. The Asia-Pacific region dominates due to high population and consumption. In India, horticulture production reaches 32.48 million tonnes, exceeding food grain output despite a smaller cultivation area. Contributing about 33% to agricultural value addition, horticulture is also a key source of rural employment and

consumer demand. Protected cultivation—including polyhouses, shade nets, drip irrigation, and greenhouse farming—has become vital in India's horticulture sector. It reduces climatic risks, saves water, and supports off-season production, boosting productivity and farmer incomes. Nationally, horticultural crops cover 28 million hectares, producing 342 million tonnes, while vegetables occupy 11.3 million hectares with 204.8 million tonnes output. In Rajasthan, vegetable cultivation rose sharply in 2022–23 to 1.93 million hectares with 2.33 million tonnes production. Selected districts of Central Rajasthan accounted for 80,578 hectares and 428,776 MT of vegetables in the same year. The potential for expanding the area under vegetable cultivation is very limited. Therefore, the viable approach is vertical expansion, achieved by enhancing productivity and cropping intensity through protected farming, supported by environmental control measures and protection practices. Government interventions, such as subsidies, training programs, and support under schemes like the National Horticulture Mission, play a crucial role in promoting protected cultivation and facilitating the adoption of modern technologies (Paroda, 2013; Gowda, 2009; NAAS, 2001; GOH, 2013; Singh, 2012; Raj *et al.*, 2016; Kumar *et al.*, 2017; Kumar *et al.*, 2020). Given semi-arid conditions and challenges such as erratic rainfall and poor soils, protected cultivation has strategic importance in Central Rajasthan. To promote adoption, the Government of India and Rajasthan have introduced schemes like NHM, RKVY, and MIDH, offering subsidies, credit support, and training. Yet, sustainability concerns persist as farmers face maintenance issues, input access problems, and uncertain subsidies. This study assesses the impact of government interventions on investment decisions, project viability, and adoption of protected cultivation in Central Rajasthan.

Materials and Methods

Data and methodology

The present research study has taken a descriptive-analytical research methodology considering primary and secondary data to see the impact of government intervention- National Horticulture Mission (NHM) in particular- on the protected cultivation in Central Rajasthan. The region under study includes four districts-

Ajmer, Alwar, Jaipur, and Nagaur- which were carefully chosen for their big share in NHM supported protected cultivation and semi-arid agro-climatic conditions. A multi-stage purposive sampling technique was used, where beneficiary lists were acquired from the Directorate of Horticulture, Government of Rajasthan, and a total of 50 NHM beneficiary farmers actively doing protected cultivation were chosen to represent all the districts adequately. Primary data were gathered in 2023-24 *via* personal interviews with a structured and pre-tested questionnaire composed of both closed-ended and semi-structured questions. The questionnaire included various aspects such as socio-economic characteristics of households, awareness and sources of information regarding NHM, training exposure and prior knowledge of protected cultivation, nature and extent of financial assistance received, utilization of subsidies, outcomes in terms of yield, income, produce quality and market access, constraints faced in adoption, and farmers' perceptions and suggestions for sustainability. The secondary data were obtained from the official records of the Directorate of Horticulture, NHM guidelines, policy documents, and published literature related to the topic. The data thus collected were analyzed through the application of descriptive statistical techniques like percentages, averages, cross-tabulations, and comparative before-after analysis to ascertain the changes that took place after the adoption of protected cultivation. This methodological framework ensures transparency, empirical rigor, and reliability of the findings.

Results and Discussion

Demographic profile of the selected farmer households

The demographic profile of the selected beneficiary farmer households presented in Table 1 highlights that the respondents across the selected districts of Rajasthan are predominantly middle-aged, male farmers belonging largely to the General social category, with a strong prevalence of joint family systems and substantial farming experience. The dominance of male respondents and joint families is consistent with earlier studies that emphasize the traditional patriarchal structure and collective household decision-making in Indian agriculture (Singh *et al.*, 2019; GOI,

Table 1. General information of responded

Sr. No.	Particulars	Nagaur	Ajmer	Alwar	Jaipur	Grand Total
1	Number Sample	13	14	13	10	50
2	Gender (%)					
	Female	23.08	21.43	7.69	70.00	28.00
	Male	76.92	78.57	92.31	30.00	72.00
3	Average of age (years)					
	Female	56.3	48.7	59.0	56.9	55.1
	Male	50.2	51.4	47.5	56.7	50.2
	Grand Total	51.6	50.8	48.4	56.8	51.6
4	Social Group					
	GEN	100.00	78.57	76.92	100.00	88.00
	SC	0.00	14.29	0.00	0.00	4.00
	ST	0.00	7.14	23.08	0.00	8.00
5	Family type					
	Joint	76.92	78.57	69.23	90.00	78.00
	Nuclear	23.08	21.43	30.77	10.00	22.00
6	Average literate					
	Literate	69.23	78.57	92.31	50.00	74.00
	Illiterate	30.77	21.43	7.69	50.00	26.00
7	Average of education (years)	9.00	9.73	12.92	7.80	10.32
8	Average of experience in Farming (years)	37.69	31.43	26.00	43.50	34.06
9	Average annual income					
	Income from Agri (Rs.) before PC	330769	382142.9	369231	340000	357000
	Income from Agri (Rs.) with PC	1069231	1735714	124231	1080000	1303000

Note: Agri.: Agriculture, GEN - General, SC- Schedule Cast, ST- Schedule Tribes, PC- Protected Cultivation

2022). The average age was 52 years across the gender and the district which suggests an ageing farming population, a concern frequently noted in Indian agriculture due to the limited participation of rural youth (BIRTHAL *et al.*, 2014). The relatively high literacy rate (74%) and average schooling of more than 10 years indicate improving educational attainment among farmers, which is crucial for technology adoption and farm management efficiency (Rogers, 2003). The respondents' long farming experience (34 years on average) reflects deep practical knowledge, which, when combined with education, can enhance productivity and income outcomes. The substantial increase in average annual agricultural income during 2023–24 compared to the pre-PC (Protected cultivation) period indicates improved economic performance, possibly due to better access to technologies, markets, and institutional support, as highlighted in recent policy assessments (NITI Aayog, 2021; GOI, 2023). The average annual agricultural income increased from Rs. 3.57 lakh before protected cultivation to Rs. 13.03

lakh during 2023–24. These findings indicate that the selected beneficiaries had considerable farming experience and educational exposure, along with a substantial increase in agricultural income following the adoption of protected cultivation. However, the available data do not provide sufficient evidence to establish a direct relationship between these socio-economic characteristics and farmers' resilience or income improvement.

Table 2 reveals that government extension services were the primary source of information about the National Horticulture Mission (NHM) and its support for protected cultivation across all districts (62.56%), underscoring the critical role of public extension systems in disseminating information on government schemes, as also reported in earlier studies on horticultural technology diffusion in India (Singh *et al.*, 2019; GOI, 2022). Information exchange among farmers also emerged as an important channel (21.46%), highlighting the significance of peer learning and social networks in technology

Table 2. How did you first hear about NHM and its support for protected cultivation

Sr. No.	Particulars	Nagaur	Ajmer	Alwar	Jaipur	Overall
1	How did you come to about NHM and its support for establishing protected cultivation?					
a)	Government Extension Services	69.23	57.14	53.85	70.00	62.56
b)	Farmers' Associations	-	14.29	-	-	3.57
c)	Media (TV, Radio, Newspapers)	7.69	14.29	7.69	20.00	12.42
d)	Other Farmer	23.08	14.29	38.46	10.00	21.46
2	Have you attended any training or awareness programs related to NHM and protected cultivation?					
a)	Yes	100.00	-	-	100.00	100.00
b)	No	0.00	-	-	0.00	0.00
	If yes, how many training programs have you attended?					
a)	1 to 2	100.00	-	-	100.00	100.00
b)	More than 3	0.00	-	-	0.00	0.00
3	Rate your knowledge about protected cultivation techniques before NHM Support					
a)	Very Low	84.62	-	-	0.00	54.40
b)	Low	7.69	-	-	50.00	25.69
c)	High	7.69	-	-	50.00	19.92
d)	Very High	-	-	-	-	-

awareness, consistent with the diffusion of innovations theory (Rogers, 2003). Media sources played a relatively limited role, while farmers' associations had minimal influence, indicating scope for strengthening collective institutions and mass communication strategies. Notably, all respondents had attended training or awareness programs related to NHM and protected cultivation, though participation was limited to one or two trainings, suggesting basic exposure rather than advanced capacity building. Despite universal training attendance, the pre-NHM knowledge levels of protected cultivation were largely low to very low (about 80% combined), indicating that beneficiaries initially lacked technical understanding and were highly dependent on institutional support. This finding aligns with earlier evidence that structured training and extension interventions are essential for improving farmers' knowledge and adoption of capital-intensive technologies such as protected cultivation (BIRTHAL *et al.*, 2014; NITI Aayog, 2021). Overall, the table emphasizes the pivotal role of extension-led awareness and training under NHM in bridging initial knowledge gaps and facilitating technology adoption among farmers. Similarly, Rajesh and Shivalingaiah (2022) highlighted that farmers' adoption of protected cultivation technology was hindered mainly by a lack of scientific expertise in modern cultivation practices and the timely availability of planting material.

Table 3 shows the responses of the beneficiaries about the financial side of the NHM support for protected cultivation in the Rajasthan districts of Nagaur, Ajmer, Alwar, and Jaipur. The data illustrate that all (100%) of the respondents had the NHM financial support in the form of subsidies only, and none mentioned receiving loans or grants. In addition, the subsidies received were similarly between 51% and 75%, which indicates that NHM guidelines were uniformly applied in all districts. The beneficiaries mainly spent the financial support on greenhouses/polyhouses construction and irrigation systems installation, while the amounts spent on seeds, pest control, or training were very small. The results point out that NHM assistance is mainly capital-based, which favors physical infrastructure development rather than operational inputs or capacity-building programs. However, there is still the possibility of increasing the investment in human capital to guarantee the sustainability of productivity in protected cultivation (Kumar *et al.*, 2020; Singh and Sharma, 2018).

The adoption of protected cultivation among the beneficiaries across the districts of Nagaur, Ajmer, Alwar, and Jaipur in Rajasthan resulted in the impacts and outcomes shown in Table 4. The data reveal a similar and extremely good impact on the yield and quality of the produce, with 100% of the respondents indicating a considerable increase in the yield and a great

Table 3. Beneficiary responses on financial aspects

Sr. No	Particulars	Nagaur	Ajmer	Alwar	Jaipur	Overall
1	Did you receive financial assistance from NHM for protected cultivation?					
a)	Yes	100.00	100.00	100.00	100.00	100.00
b)	No	0.00	0.00	0.00	0.00	0.00
2	If yes, what type of financial assistance did you receive?					
a)	Subsidy	100.00	100.00	100.00	100.00	100.00
b)	Loan	0.00	0.00	0.00	0.00	0.00
c)	Grant	0.00	0.00	0.00	0.00	0.00
3	What was the percentage of subsidy/financial assistance received?					
a)	0-25%	0.00	0.00	0.00	0.00	0.00
b)	26-50%	0.00	0.00	0.00	0.00	0.00
c)	*51-75%	100.00	100.00	100.00	100.00	100.00
d)	76-100%	0.00	0.00	0.00	0.00	0.00
4	How was the financial assistance utilized?					
a)	Construction of Greenhouses/Polyhouses	100.00	100.00	100.00	100.00	100.00
b)	Purchase of Seeds/Plants	0.00	0.00	0.00	0.00	0.00
c)	Irrigation Systems	100.00	100.00	100.00	100.00	100.00
d)	Pest Management	0.00	0.00	0.00	0.00	0.00
e)	Training and Capacity Building	0.00	0.00	0.00	0.00	0.00

Note: *Identical values arise due to the uniform subsidy pattern and beneficiary-based sample selection under the scheme.

improvement in the quality of the produce after the introduction of protected cultivation techniques. The same way, the respondents also hailed the technology as a commercial benefit by unanimously stating better market access and higher prices for their products. While these benefits were up there, the beneficiaries had to deal with some drawbacks – the major constraint being high initial investment (57.36% of the total respondents), then lack of technical knowledge (22.80%) and maintenance problems (19.84%), whereas market access and pest/disease control were not referred to as significant limitations. When it came to the support given by NHM for the establishment of protected cultivation, most of the participants said they were satisfied, with 80.17% being satisfied and 19.83% being very satisfied; thus, there is an overall positive view of government support. The implication of these results is that the protected cultivation practice under NHM greatly increases the quantity, quality, and salability of the horticultural products, but at the same time, financial and technical barriers remain to be important (Prakash *et al.*, 2021, Singh and Sharma, 2018).

Table 5 presents the experiences and ideas of the beneficiaries about the management support of protected cultivation in Nagaur, Ajmer,

Alwar, and Jaipur districts. The results indicate that access to high-quality seeds and inputs (40.08%) and better pest and disease management (35.80%) were the two most important forms of additional support identified by beneficiaries for better management of protected cultivation. In comparison, 16.84% of respondents preferred more training programs, while only 7.28% reported marketing and distribution support as an additional requirement. With respect to training, the vast majority of the respondents (76.18%) pointed out the importance of advanced cultivation techniques, while the smaller part (23.82%) considered integrated pest management as necessary, and post-harvest handling and processing were not mentioned. With regard to financial access, more than one-fourth of the respondents (27.53%) reported facing difficulties, primarily due to the lack of collateral, which was identified by all affected respondents (100%). In contrast, high interest rates, complex application procedures, and the limited availability of tailored financial products were not reported as barriers. All respondents (100%) showed their willingness to become members of farmers' cooperatives or associations for better access to resources and markets. These findings highlight the necessity of targeted measures that bring together quality

Table 4. Outcomes and impact of protected cultivation

Sr. No	Particulars	Nagaur	Ajmer	Alwar	Jaipur	Overall
1	Have you noticed any changes in yield after adopting protected cultivation?					
a)	Decreased	0.0	0.0	0.0	0.0	0.0
b)	No Change	0.0	0.0	0.0	0.0	0.0
c)	Increased	0.0	0.0	0.0	0.0	0.0
d)	Significantly Increased*	100	100	100	100	100
2	Have you noticed any changes in the quality of produce after adopting protected cultivation?					
a)	Decreased	0.0	0.0	0.0	0.0	0.0
b)	No Change	0.0	0.0	0.0	0.0	0.0
c)	Improved	0.0	0.0	0.0	0.0	0.0
d)	Significantly Improved	100	100	100	100	100
3	Have there been any changes in market access and selling price after adopting protected cultivation?					
a)	Yes, better access and higher prices	100	100	100	100	100
b)	Yes, better access but same prices	0.0	0.0	0.0	0.0	0.0
c)	No change in access but higher prices	0.0	0.0	0.0	0.0	0.0
d)	No change in access and prices	0.0	0.0	0.0	0.0	0.0
4	Have you faced any challenges in adopting protected cultivation?					
a)	High Initial Investment	46.15	57.14	46.15	80.00	57.36
b)	Lack of Technical Knowledge	38.46	14.29	38.46	-	22.80
c)	Maintenance Issues	15.39	28.57	15.38	20.00	19.84
d)	Market Access	0.00	0.00	0.00	0.00	0.00
e)	Pest and Disease Management	0.00	0.00	0.00	0.00	0.00
5	Are you satisfied with the support of NHM for establishing protected cultivation?					
a)	Very Dissatisfied	0.00	0.00	0.00	0.00	0.00
b)	Dissatisfied	0.00	0.00	0.00	0.00	0.00
c)	Neutral	0.00	0.00	0.00	0.00	0.00
d)	Satisfied	84.62	71.43	84.62	80.00	80.17
e)	Very Satisfied	15.38	28.57	15.38	20.00	19.83

Note: *The 100% reported/significant perceived yield increase reflects results from the beneficiary sample with complete pre- and post-intervention data.

inputs, technical training, and organized collective action to build the sustainability and profitability of protected cultivation (Sharma and Singh, 2018; Jadhav and Rosentrater, 2017).

Table 6 displays the recommendations made by the beneficiaries for the policymakers to facilitate the adoption and effectiveness of protected cultivation under National Horticulture Mission (NHM) through the districts of Nagaur, Ajmer, Alwar, and Jaipur. Increasing subsidy amounts was the recommendation of the vast majority (88.88%), while a small portion (11.12%) advised setting up of more localized support centers; none of the participants pointed out simpler application procedures or better monitoring mechanisms. As for informing the public about the NHM programs, the beneficiaries wanted the holding

of more frequent workshops and seminars (55.36%) as the topmost means followed by the improved use of digital platforms and social media (25.88%) and collaboration with local agricultural institutions (18.76%), which shows that they prefer direct, accessible, and locally relevant communication channels. Support is already there, but more than half of the participants (71.26%) think that the current NHM aid is not enough for maintaining there for a long time the protected cultivation, which indicates the need for the adoption of financial, technical, and institutional measures that will keep the productivity and profitability going on. The insights gather thus portray the scenario where there is a need for policy adjustments that are specific, financial incentives that are more generous, and knowledge dissemination

Table 5. Perception and suggestion for stakeholders

Sr. No	Particulars	Nagaur	Ajmer	Alwar	Jaipur	Overall
1	What additional support or resources would help you better manage your protected cultivation?					
a)	More training programs	15.38	14.29	7.69	30.00	16.84
b)	Access to high-quality seeds and inputs	38.46	35.71	46.15	40.00	40.08
c)	Better pest and disease management	38.46	28.57	46.15	30.00	35.80
d)	Marketing and distribution support	7.69	21.43	-	-	7.28
2	What type of training would be most beneficial for you?					
a)	Advanced cultivation techniques	92.31	78.57	53.85	80.00	76.18
b)	Integrated pest management	7.69	21.43	46.15	20.00	23.82
c)	Post-harvest handling and processing	0.00	0.00	0.00	0.00	0.00
3	Do you face any challenges in accessing credit or financial services for protected cultivation?					
a)	Yes	38.46	28.57	23.08	20.00	27.53
b)	No	61.54	71.43	76.92	80.00	72.47
4	If yes, what are the main challenges?					
a)	High-interest rates	0.00	0.00	0.00	0.00	0.00
b)	Lack of collateral	100.00	100.00	100.00	100.00	100.00
c)	Complex application procedures	0.00	0.00	0.00	0.00	0.00
d)	Limited availability of tailored financial Products	0.00	0.00	0.00	0.00	0.00
e)	High-interest rates	0.00	0.00	0.00	0.00	0.00
5	Do you have any interest in joining a farmers' cooperative or association for better access to resources and markets?					
a)	Yes	100.00	100.00	100.00	100.00	100.00
b)	No	0.00	0.00	0.00	0.00	0.00
c)	Maybe	0.00	0.00	0.00	0.00	0.00

that is stronger in order to keep the protected cultivation (Kumar *et al.*, 2020; Prakash *et al.*, 2021; Singh and Sharma, 2018) environmentally sustainable in the long run.

Table 7 gives priority recommendations made by the beneficiaries to the financial institutions focused on supporting protected cultivation practices in Ajmer, Alwar, Jaipur,

and Nagaur districts. A significant proportion of the population (73.19%) stressed the requirement for low-interest rates combined with flexible repayment terms (13.05%) and grants/subsidies (13.76%), while the demand for crop or structure insurance remains insignificant. Focusing on the needs of small and marginal farmers, the recommendations

Table 6. Recommendation for policymakers

Sr.No	Particulars	Nagaur	Ajmer	Alwar	Jaipur	Overall
1	What changes would you recommend in NHM policies to enhance the adoption and success of protected cultivation?					
a)	Increased subsidy amounts	84.62	78.57	92.31	100.00	88.88
b)	Simplified application processes	0.00	0.00	0.00	0.00	0.00
c)	More localized support centers	15.38	21.43	7.69	0.00	11.12
d)	Enhanced monitoring and evaluation mechanisms	0.00	0.00	0.00	0.00	0.00
2	How can government agencies improve the dissemination of information about NHM support programs?					
a)	More frequent workshops and seminars	38.46	71.42	61.54	50.00	55.36
b)	Improved use of digital platforms and social media	38.46	14.29	30.77	20.00	25.88
c)	Collaboration with local agril. institutions	23.08	14.29	7.69	30.00	18.76
3	Do you think the current NHM support is sufficient for long-term sustainability of protected cultivation?					
a)	Yes	30.77	35.72	38.46	10.00	28.74
b)	No	69.23	64.28	61.54	90.00	71.26

Table 7. Suggestions for financial institutions

Sr. No	Particulars	Ajmer	Alwar	Jaipur	Nagaur	Overall
1	What financial products or services would be most helpful for farmers practicing protected cultivation?					
a)	Low-interest loans	76.92	64.29	61.54	90.00	73.19
b)	Flexible repayment options	15.38	21.43	15.38	0.00	13.05
c)	Insurance products for crops and structures	0.00	0.00	0.00	0.00	0.00
d)	Grants and subsidies	7.69	14.29	23.08	10.00	13.76
2	How can financial institutions better cater to the needs of small and marginal farmers involved in protected cultivation?					
a)	Tailored financial products	84.62	78.57	84.62	90.00	84.45
b)	Simplified application processes	15.38	21.43	15.38	10.00	15.55
c)	Partnerships with government and NGOs	-	-	-	-	-

of the stakeholders are strongly in favor of financial product design (84.45%) and to some extent, simplified processing requirements (15.55%). These findings clearly establish that to improve the acceptability and sustainability of protected cultivation practices among farmers; financial institutions are required to modify their offerings in terms of capital and operational requirements specific to greenhouse farming (Prakash *et al.*, 2021).

In Ajmer, Alwar, Jaipur and Nagaur the perceived perspective of beneficiaries of support for protected cultivation through collaboration among stakeholders is presented in Table 8. Stakeholders highlighted regular meetings/forums (46.73%) as the main way to increase collaboration between farmers/government and financial institutions, followed by joint training/capacity building (31.95%) and shared information platforms (13.19%), while integrated support schemes (8.13%) were less often mentioned. When asked about how the private sector would best contribute to support protected cultivation, the majority

(74.26%) indicated that providing high quality agricultural inputs was most important, followed by technical support and consultancy (25.74%), with the facilitation of market access and investing in R&D being less important. Overall, these results show that regular engagement, combined with technical training and the availability of quality inputs, are essential for sustaining and expanding identified initiatives to develop protected cultivation through the collaboration of multiple stakeholders (Panancheri, 2025)

Table 9 depicts the viewpoints of the beneficiaries regarding the long-term vision and sustainability of protected cultivation in Nagaur, Ajmer, Alwar, and Jaipur districts. The majority of the respondents (58.27%) showed their willingness to extend the area under protected cultivation, while others gave priority to diversifying crops (20.55%), introducing more sustainability practices (7.99%), and improving market linkages and getting more out of the products (13.19%).

Table 8. Stakeholder collaboration and support

Sr. No	Particulars	Ajmer	Alwar	Jaipur	Nagaur	Overall
1	How can collaboration between farmers, government agencies, and financial institutions be improved to support protected cultivation?					
a)	Regular stakeholder meetings and forums	46.15	50.00	30.77	60.00	46.73
b)	Joint training and capacity-building programs	23.08	28.57	46.15	30.00	31.95
c)	Shared platforms for information exchange	23.08	14.29	15.38	0.00	13.19
d)	Development of integrated support schemes	7.69	7.14	7.69	10.00	8.13
2	What role do you think private sector players (like agribusiness companies) can play in supporting protected cultivation?					
a)	Providing high-quality inputs	69.23	78.57	69.23	80.00	74.26
b)	Offering technical support and consultancy	30.77	21.43	30.77	20.00	25.74
c)	Facilitating market access	-	-	-	-	-
d)	Investing in R&D for better technologies	-	-	-	-	-

Table 9. Long-term vision and sustainability

Sr. No	Particulars	Nagaur	Ajmer	Alwar	Jaipur	Overall
1	What is your long-term vision for your farm with respect to protected cultivation?					
a)	Expanding the area under protected cultivation	53.85	50.00	69.23	60.00	58.27
b)	Diversifying crops grown under protected structures	15.38	21.43	15.38	30.00	20.55
c)	Improving sustainability practices (e.g., water conservation, renewable energy)	0.00	14.29	7.69	10.00	7.99
d)	Enhancing market linkages and value addition	30.77	14.29	7.69	0.00	13.19
2	What measures would you suggest to ensure the long-term sustainability of protected cultivation practices?					
a)	Increased research and development	38.46	50.00	30.77	50.00	42.31
b)	Continuous training and capacity building	30.77	21.43	38.46	30.00	30.16
c)	Better infrastructure (e.g., storage, transportation)	0.00	0.00	0.00	0.00	0.00
d)	Stronger farmer networks and cooperatives	30.77	28.57	30.77	20.00	27.53
3	How can NHM support evolve to better address future challenges in horticulture and protected cultivation?					
a)	More adaptive and responsive policies	15.38	14.29	15.38	20.00	16.26
b)	Greater emphasis on climate resilience	0.00	0.00	0.00	0.00	0.00
c)	Enhanced support for technological innovation	53.85	64.29	84.62	80.00	70.69
d)	Strengthened focus on market development	30.77	21.43	0.00	0.00	13.05

To make sure that the practice lasts for a long time, the beneficiaries have pointed out that the research and development should be increased (42.31%), continuous training and capacity building should be done (30.16%), and farmer networks and cooperatives should be made stronger (27.53%), while there was no mention of infrastructure improvements. The improvement of NHM support, the respondents gave priority to technological innovation enhancement (70.69%), next was the focus on marketing development strengthening (13.05%) and policy-making that is more adaptive and responsive (16.26%); climate resilience was not stated specifically among the priority areas. The findings interpret that the farmers foresee the sustainable growth to be realizable through expansion, innovation, and cooperation, acknowledging the necessity of targeted R&D, training, and technology-driven support to ensure long-term productivity and resilience in protected cultivation (Kumar *et al.*, 2017).

Conclusions

On analyzing various aspects related to demographic structure, rate of adoption, financial support, outcomes, suggestions from stakeholders, and long-term vision from the farm community involved in protected cultivation in Nagaur, Ajmer, Alwar, and Jaipur districts in the state of Rajasthan, it has been found that there has been a major improvement in productivity and quality as well as accessibility

in farm output because all beneficiaries have registered a marked increase in their output in terms of quantity and improvement in overall quality. Although there has been optimal usage of support in terms of capital subsidies related to greenhouses and irrigation systems in their protected cultivation practices among beneficiaries, there has been negligible emphasis on operational inputs and capacity-building activities. Greater emphasis was placed by beneficiaries on government support in terms of higher subsidies in their protected cultivation practices under scrutiny in this study; operating costs in terms of low-interest loans in protected cultivation; further improvement in training and extension support in this horticulture practice; better coalescence among various stakeholders in this context; and R&D support related to technology in this particular practice related to horticulture practices in this state in India under this study review.

References

- Birthal, P.S., Negi, D.S., Jha, A.K. and Singh, D. 2014. Income sources of farm households in India: Determinants, distributional consequences and policy implications. *Agricultural Economics Research Review* 27(1): 37-48.
doi:10.5958/j.0974-0279.27.1.003.
- GOH 2013. Working Group Report on Development of Protected Cultivation in Haryana. Haryana Kisan Ayog, Government of Haryana, pp. 1-66.

- Government of India (GOI) 2022. *Agricultural Statistics at a Glance*. Ministry of Agriculture and Farmers' Welfare, New Delhi.
- Government of India (GOI). 2023. *Economic Survey of India 2022-23*. Ministry of Finance, New Delhi.
- Gowda, S.M.V. 2009. Hi-Tech Floriculture in Karnataka, Occasional Paper-49, The National Bank for Agriculture and Rural Development Department of Economic Analysis and Research Karnataka Orion Press, Fort, Mumbai, pp 1-95.
- Jadhav, H.T. and Rosentrate, R.K.A. 2017. Economic and environmental analysis of greenhouse crop production with special reference to low cost greenhouses: A Review. An ASABE Meeting Presentation, pp. 1-6.
doi:10.13031/aim.201701178.
- Kumar, R., Meena, R. and Singh, P. 2020. Financial support mechanisms under the national horticulture mission: Impact on protected cultivation. *Journal of Horticultural Economics* 12(2): 45-58.
- Kumar, V., Singh, S. and Meena, H. 2017. Role of government subsidies in promoting protected cultivation: An empirical study. *International Journal of Agricultural Policy and Research* 5(2): 89-98.
- NAAS 2001. Hi-Tech Horticulture in India, Policy Paper, National Academy for Agricultural Sciences, pp 1-9.
- NITI Aayog 2021. *Doubling Farmers' Income: Progress and Way Forward*. Government of India, New Delhi.
- Panancheri, Ashraf 2025. Fueling the Future: Government Push for High-tech Greenhouse Farming in Kerala. *International Journal for Multidisciplinary Research*. 7(4): 1-10
- Paroda, R.S. 2013. Strategies for protected cultivation. Inaugural Address, delivered at the first National Seminar on Advances in Protected Cultivation, at NASC Complex, Pusa Campus, New Delhi
- Prakash, P., Kumar, Pramod, Kar, Amit, Prabhat Kishore, Singh, Awani Kumar and Immanuel, Sheela 2021. Protected cultivation in Maharashtra: determinants of adoption, constraints, and impact. *Agricultural Economics Research Review* 34(2): 217-228.
doi:10.5958/0974-0279.2021.00031.8.
- Prakash P, Kumar, Pramod, Kishore, Prabhat, Jaganathan, D., Immanuel, Sheela and Varadha Raj., S.2021. Determinant of Access to Credit and Availing Subsidies for Protected Cultivation in Maharashtra. *Indian Journal of Extension Education* 58(2): 167-172.
doi:10.48165/IJEE.2022.58240.
- Raj, A., Gupta, P. and Sharma, M. 2016. Access to credit and its impact on protected cultivation adoption: A case study from India. *Agricultural Finance Review* 76(4): 511-525.
- Rajesh, C.M. and Shivalingaiah, Y.N. 2022. An analysis of constraints in adoption and strategies to promote the protected cultivation among the horticulture crop growers. *Biological Forum* 14(4a):343-349.
- Rogers, E.M. 2003. *Diffusion of Innovations* (5th ed.). Free Press, New York.
- Singh, Brahma. 2012. Protected cultivation of vegetables and flowers-potentials and success stories in India and Abroad. (In) Working group report on Development of Protected Cultivation in Haryana. Stakeholders meeting on Protected Cultivation for Haryana, held at Haryana Kisan Ayog. <https://www.scribd.com/document/566869933/Dev-Protected-Cultivation>
- Sharma, A. and Singh, R. 2018. Enhancing the adoption of protected cultivation through technical training and extension services. *Journal of Agricultural Extension Management* 52(3): 345-362.
- Singh, A. and Sharma, H. 2018. Adoption and Utilization of NHM Subsidies for Greenhouse Cultivation in Rajasthan. *Indian Journal of Agricultural Economics* 73(4): 312-325.
- Singh, R., Meena, M.S. and Swanson, B.E. 2019. Extension Strategies for Agricultural Development in India. *Journal of Agricultural Extension* 23(2): 1-12.

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