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Constraints and suggestions for effective use of agrochemicals in north Gujarat

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Abstract

The present study entitled “Constraints and suggestions for effective use of agrochemicals in North Gujarat” was undertaken to identify the constraints faced by vegetable growers and to obtain their suggestions for improving the effective use of agrochemicals. The study was conducted in Banaskantha and Sabarkantha districts of North Gujarat. An ex-post facto research design was employed and a multistage sampling technique was used to select 300 vegetable growers from 30 villages. The findings revealed that the major constraints faced by the vegetable growers were high prices of agrochemicals (72.91%), lack of timely information regarding recommended dosages (68.33%) and lack of awareness about prohibited agrochemicals (66.66%), which ranked first, second and third respectively. The major suggestions offered by the respondents were the need for timely, clear and accurate information on recommended application methods and safe use (75.83%), organization of regular training programmes (66.66%) and provision of technical guidance (62.00%). The study concludes that economic and information-related constraints are the major barriers to effective agrochemical use and addressing these through extension interventions and institutional support can improve safe and efficient utilization.

Keywords: Agrochemicals, constraints, suggestions, vegetable growers

Introduction

Agriculture provides livelihood to most of the Indian people. Agricultural work is one of the most prevalent types of employment in the world. Nearly 50.00 per cent of the world labour is employed in agriculture. Although, its intensification has reduced the economic capacity and sustainability of small farming systems by causing a remarkable growth in the use of production inputs. The use of modified seeds or high yielding varieties, fertilizers and pesticides led to bumper produce. The use of these inputs is no doubt important for producing agricultural crops, but the so-called green revolution was ally with unforeseen consequences from chemical pollution. An overwhelming number of researches had provided convincing evidences that consumption of more fruits and vegetables trim down the risk of certain chronic maladies like coronary artery disease, diabetes and several cancers (Van and Pivonka, 2000 and Stan *et al.*, 2008) ^[10, 9] and probably leads to prolonged life expectancy, provided other health conditions are met.

More than half (51.00%) of India's food products were found to have pesticide residues with 20.00 per cent exceeding the allowed levels (The Hindu, 2013) ^[11]. India experiences the highest rate of rejection for horticultural export consignments, along with the most notifications from the USA and EU for failing to meet their food safety

standards. The commodities most affected by non-compliance include spices, as well as fresh and processed fruits and vegetables (Idris *et al.*, 2015) ^[3]. Agrochemicals violations are the leading cause of these rejections (European Commission, 2012 and Neff *et al.*, 2012) ^[4, 5].

In the context of North Gujarat, where agriculture forms the backbone of rural livelihoods, the indiscriminate and imbalanced use of agrochemicals has emerged as a critical concern affecting both farm productivity and environmental sustainability. Farmers often face multiple constraints such as inadequate technical knowledge, improper dosage and timing of application, lack of access to reliable extension services and economic limitations, which hinder the effective and safe use of agrochemicals. These challenges not only reduce input-use efficiency but also contribute to soil degradation, health hazards and residue-related market rejections. Despite the availability of recommended practices, there exists a significant gap between knowledge and adoption among farmers. Therefore, it becomes imperative to systematically identify the constraints faced by farmers and to document their practical suggestions for improving agrochemical use. Such an analysis will help in formulating need-based extension strategies and policy interventions aimed at promoting judicious, safe and sustainable use of agrochemicals in the region, thereby ensuring both agricultural productivity and environmental

health. In view of these concerns, the study entitled “Constraints and suggestions for effective use of agrochemicals in North Gujarat” was undertaken.

Methodology

The present investigation was carried out in the North Gujarat region, which falls under the jurisdiction of Sardarkrushinagar Dantiwada Agricultural University (SDAU). Initially, two districts of North Gujarat, namely Banaskantha and Sabarkantha were selected purposively based on their highest area and production of vegetable crops. Subsequently, three talukas from each district (Palanpur, Deesa and Dantiwada from Banaskantha; Himmatnagar, Talod and Idar from Sabarkantha) were selected using simple random sampling. Further, five vegetable-growing villages from each selected taluka were randomly chosen, constituting a total of 30 villages. Finally, ten vegetable growers from each village were selected through simple random sampling, resulting in a total sample size of 300 respondents. This multistage approach, combining purposive and random sampling methods, ensured both relevance and representativeness of the sample, thereby enhancing the reliability and validity of the study findings. An ex-post facto research design was employed, as the study aimed to analyze the existing conditions without manipulating any variables.

Results and Discussion

Constraints and Suggestions for Effective use of Agrochemicals

A) Constraints Faced by Vegetable Growers in Effective Use of Agrochemicals

In this research, constraints were identified as the challenges encountered by farmers in the effective use of various agrochemicals. Throughout the study, farmers were asked to share the technological, economic, service and supply-related and information transfer challenges they face when utilizing agrochemicals. For each type of constraint, the Per cent and rank were determined and both overall and category-specific rankings were assigned based on these Per cents, arranged from highest to lowest. The calculated Per cent and both overall and category-specific rankings for each constraint are presented in Table 1.

The data in Table 1 showed that the most important constraints faced by vegetable growers were; expensive prices of agrochemicals (72.91%) got first ranked, followed by lack of timely information regarding the recommended dosage of agrochemicals (68.33%) which ranked second and not aware of agrochemicals that are prohibited ranked third (66.66%).

Whereas, insufficient understanding of the recommended dosage for applying agrochemicals (63.75%), followed by insufficient knowledge about the harmful effects resulting from the improper use of agrochemicals (58.75%), limited connections with extension workers (57.08%) and difficulty in reading the labels on containers, bottles or packets (53.75%) with fourth, fifth, sixth and seventh ranked, respectively.

The less important constraint faced by vegetable growers were; expressed excessive labour costs (46.66%), unavailability of trained laborers during the application of agrochemicals (40.83%), insufficient funds to buy plant

protection equipment (35.00%), lack of availability of agrochemicals in the village (32.08%) and insufficient availability of publications on agrochemicals (25.41%) with eighth, ninth, tenth, eleventh and twelfth ranked respectively.

The results indicate that the most critical constraints perceived by vegetable growers pertain to the economic burden and information-related gaps concerning agrochemical use. The high cost of agrochemicals emerged as the primary barrier, suggesting an urgent need for financial support mechanisms such as subsidies, group procurement models, or cooperative-based input supply systems. Additionally, the lack of timely and adequate information on recommended dosages and unawareness of banned agrochemicals point to serious deficiencies in the knowledge dissemination process. This highlights the need to strengthen agricultural extension services, enhance the reach of advisories through ICT tools and ensure regular farmer training. The inability to understand agrochemical labels and limited contact with extension personnel further emphasize literacy and communication barriers that must be addressed through user-friendly labeling (e.g., pictorial instructions), multilingual content and intensified outreach. Constraints related to labor, equipment and availability of agrochemicals, though ranked lower, still underscore the structural limitations in input access and workforce readiness. Collectively, these implications call for a comprehensive strategy that integrates financial, informational and institutional interventions to ensure safe and effective agrochemical usage among vegetable growers. This finding is consistent with the findings of Prajapati *et al.* (2016)^[6], Jangwad (2018)^[7] and Satasiya (2023)^[8].

B) Suggestions Given by the Vegetable Growers to Overcome the Constraints about Effective Use of Agrochemicals

An attempt was made to ascertain suggestions from vegetable growers to overcome various constraints faced by them in the use of agrochemicals. The vegetable growers were requested to offer their valuable suggestions on difficulties faced by them in the effective use of agrochemicals. The data were collected and summarized in Table 2.

The result in Table 2 indicates major suggestions given by the farmers in descending order of rank. The suggestions offered by majority of the vegetable growers were; effective utilize agrochemicals, farmers should be need timely, clear and accurate information about recommended application methods and dosage along with instructions for safe handling & use (75.83%), regular training sessions should be organized on the proper use, handling, repair and maintenance of plant protection equipment (66.66%), proper use of agrochemicals should be supported with technical guidance (62.00%), farmers should be provided knowledge about safety measure, usage, repair and maintenance of plant protection equipment's (53.33%) and plant protection chemicals should be made available at village place (50.83%).

Least suggestions offered by the growers were; financial assistance or subsidies should be offer to make agrochemicals and plant protection equipment more affordable (48.33%), there should be consistent availability

of quality agrochemicals in local markets, especially in remote areas (37.91%), the role of extension workers should be enhanced by improving their skills and expanding their outreach to deliver effective on-ground technical support (35.00%), agrochemical container labeling should be

improved to make instructions easier to read and understand, especially for individuals with limited literacy (32.50%) and publication and literature related to hazardous effects of agrochemicals should be provided (20.41%). Similar findings were reported by Gajera (2022).

Table 1: Distribution of the vegetable growers according to constraints faced in the effective use of agrochemicals (n = 300)

Sr. No.	Constraints	Frequency	%	Aspects-wise rank	Overall rank
I. Economic constraints					
1	Insufficient funds to buy plant protection equipment	84	35.00	III	X
2	High prices of agrochemicals	175	72.91	I	I
3	High labour costs	112	46.66	II	VIII
II. Technological constraints					
4	Lack of knowledge regarding the appropriate dosage for applying agrochemicals	153	63.75	II	IV
5	Lack of awareness regarding the negative impacts caused by the incorrect use of agrochemicals	141	58.75	III	V
6	Challenges in reading the labels on containers, bottles, or packages	129	53.75	IV	VII
7	I am not aware of which agrochemicals are prohibited	160	66.66	I	III
III. Service-related constraints					
8	The lack of trained laborers during the application of agrochemicals	98	40.83	I	IX
9	Lack of availability of agrochemicals in the village	77	32.08	II	XI
IV. Constraints in information transfer					
10	Insufficient availability of publications on agrochemicals	61	25.41	III	XII
11	There are limited connections with extension workers	137	57.08	II	VI
12	There is a lack of timely information regarding the recommended dosages of agrochemicals	164	68.33	I	II

Table 2: Suggestions given by the vegetable growers to overcome the constraints

Sr. No.	Suggestions	Frequency	Per cent	Rank
1	To effectively utilize agrochemicals, farmers need timely, clear and accurate information about recommended application methods and dosage, along with instructions for safe handling & use.	182	75.83	I
2	Regular training sessions should be organized on the proper use, handling, repair and maintenance of plant protection equipment.	160	66.66	II
3	Proper use of agrochemicals should be supported with technical guidance.	149	62.00	III
4	Farmers should be provided with knowledge about safety measures, usage, repair and maintenance of plant protection equipment.	128	53.33	IV
5	Plant protection chemicals should be made available at the village.	122	50.83	V
6	Financial assistance or subsidies should be offered to make agrochemicals and plant protection equipment more affordable.	116	48.33	VI
7	There should be consistent availability of quality agrochemicals in local markets, especially in remote areas.	91	37.91	VII
8	The role of extension workers should be enhanced by improving their skills and expanding their outreach to deliver effective on-ground technical support.	84	35.00	VIII
9	Agrochemical container labelling should be improved to make instructions easier to read and understand, especially for individuals with limited literacy.	78	32.50	IX
10	Publication and literature related to the hazardous effects of agrochemicals should be provided.	49	20.41	X

Conclusion

The present study clearly indicates that vegetable growers in North Gujarat face a combination of economic, technological, service-related and information transfer constraints in the effective use of agrochemicals. Among these, economic constraints, particularly the high cost of agrochemicals, emerged as the most severe barrier. Simultaneously, gaps in timely and accurate information, lack of awareness regarding recommended dosages and prohibited chemicals and limited interaction with extension personnel were identified as major informational constraints affecting proper agrochemical usage.

The findings further reveal that although farmers are aware of the importance of agrochemicals in crop production, their improper and imbalanced use is largely attributed to inadequate knowledge, poor access to advisory services and

structural limitations in input availability. These issues not only affect crop productivity but also pose serious risks to environmental sustainability, human health and market acceptability of produce.

The suggestions put forth by the respondents strongly emphasize the need for strengthening extension services through regular training programmes, timely dissemination of location-specific recommendations and enhanced technical guidance. Ensuring the availability of quality agrochemicals at the village level, improving affordability through financial support mechanisms and developing user-friendly instructional materials can further facilitate effective agrochemical use.

In conclusion, a comprehensive and integrated approach involving extension agencies, policymakers and input supply systems is essential to address the identified

constraints. Such efforts will help in promoting the judicious, safe and sustainable use of agrochemicals, thereby enhancing the productivity and livelihood security of vegetable growers in North Gujarat.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this research paper. The research was conducted independently and no financial, personal or professional affiliations influenced the outcomes or interpretations of the study. All findings and conclusions are solely based on the data collected and analyzed in the Banaskantha and Sabarkantha districts, Gujarat.

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