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Socio-economic influences on integrated pest management: A comprehensive analysis of soybean growers' profiles and adoption patterns for sustainable crop protection

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Abstract

The research investigates the intricate interplay between the socio-economic profiles of soybean growers and their adoption of recommended Integrated Pest Management (IPM) practices, aiming to identify factors influencing sustainable agricultural practices. The diverse socio-economic landscape of the respondents, considering age, education, annual income, land holding size, farm power, and social participation. Notably, the majority falls within the "Middle" age group (65.83%) and exhibits varying levels of education and income. The extent of adoption, with 65.83% in the "Medium" category, 20% in the "High" category, and 14.17% in the "Low" category. The findings suggest a baseline acceptance of sustainable practices, with targeted interventions needed for the "Low" adoption group. Correlation analysis revealed significant positive correlations for education, annual income, landholding size, and farm power, indicating their influence on IPM adoption. Conversely, age and social participation show non-significant correlations. This research lays the groundwork for tailored strategies, interventions, and policies to enhance widespread adoption, fostering sustainable agriculture among soybean growers.

Keywords: Socio-economic profile, recommended IPM practices, and soybean growers

Introduction

Sustainable agriculture, marked by the judicious use of resources and environmentally conscious practices, is integral to ensuring global food security. In this context, the adoption of Integrated Pest Management (IPM) practices plays a pivotal role in promoting resilient and sustainable crop protection strategies. Soybean, a crucial leguminous crop with wide economic significance, stands at the intersection of agricultural innovation and socioeconomic dynamics. This study aims to comprehensively explore the intricate relationship between the socioeconomic profiles of soybean growers and the extent of adoption of IPM practices. By delving into the multifaceted factors influencing decision-making in agricultural practices, we seek to unravel the nuances that shape the adoption patterns of IPM among soybean growers. Understanding the socioeconomic context is paramount for designing targeted interventions, policies, and educational programs that can effectively bridge gaps, promote sustainable farming practices, and enhance the overall resilience of soybean cultivation systems. This research endeavors to contribute valuable insights to the ongoing discourse on sustainable agriculture, offering a nuanced understanding of the interplay between socioeconomic factors and the adoption of IPM practices in the context of soybean farming.

The adoption of Integrated Pest Management (IPM) practices is critical for mitigating the challenges posed by pests in soybean cultivation, aligning with broader goals of sustainable and eco-friendly agriculture. However, the extent to which soybean growers adopt these practices is not only influenced by agronomic considerations but also intricately linked to their socioeconomic profiles. The socioeconomic landscape of soybean growers encompasses factors such as education, income, access to resources, and landholding size, all of which can significantly shape decision-making processes in agricultural practices.

Soybean, as a versatile and economically vital crop, holds a strategic position in the global agricultural scenario. Its cultivation is often embedded in complex social and economic contexts, ranging from smallholder farmers in developing regions to large-scale commercial operations.

The adoption of IPM practices becomes a dynamic interplay between traditional farming practices, economic constraints, and the awareness and accessibility of modern, sustainable agricultural techniques.

This study aims to conduct a comprehensive analysis of the socioeconomic influences on the adoption patterns of IPM practices among soybean growers. This aims to explore the multifaceted relationships between the socio-economic profiles of growers and their choices in pest management strategies. Insights derived from this research not only contribute to the academic understanding of the topic but also provide actionable information for policymakers, agricultural extension services, and stakeholders in designing targeted interventions.

As we embark on this investigation, the overarching goal is to inform evidence-based strategies that foster a more widespread and effective adoption of IPM practices among soybean growers, thereby promoting agricultural sustainability and resilience in the face of evolving environmental and economic challenges.

Material and Methods

Selection of Blocks

In the Bhopal district, encompassing two subdivisions, the Berasia block was purposively chosen due to its extensive soybean cultivation and the researcher's familiarity with the area and local nuances.

Selection of Villages

Within the Berasia block, comprising 304 villages, six villages—Damila, Chanpura, Dolatpura, Hamid Khedi, Gorla, and Netapura—were selected randomly for inclusion in the present study.

Selection of Respondents

To ensure a representative sample, 20% of soybean growers from each selected village were randomly chosen. This methodology resulted in the selection of 120 farmers for the research study. This sampling strategy is designed to provide a diverse and comprehensive understanding of the socio-economic profiles and the adoption patterns of integrated pest management practices in soybean cultivation.

Result and Discussion

Socio-economic profile:

Table 1 provides a comprehensive overview of the socio-economic profiles of the respondents, offering insights into various demographic and economic factors influencing soybean growers in the study area.

Age

The distribution based on age reveals a diverse representation of respondents. While 10% fall into the "Young" category, a significant majority (65.83%) comprises individuals in the "Middle" age group. The "Old" category constitutes 24.17% of the respondents. This distribution suggests a balanced representation across different age groups, allowing for a nuanced exploration of how age influences the adoption of integrated pest management practices.

Education

Educational backgrounds vary among respondents, with the majority being literate to some extent. Notably, 37.50% of respondents are "Illiterate," while 25.00% attended "Primary

School" and 20.83% attended "Middle School." The distribution indicates the need to consider varying levels of education in designing and delivering educational interventions related to integrated pest management.

Annual Income

The distribution of respondents according to annual income highlights diverse economic backgrounds. A substantial proportion (32.50%) falls in the "Rs. 35,001-60,000" income bracket, followed by "Up to Rs. 35,000" (30.00%). This distribution underscores the economic diversity among soybean growers in the study area, which may influence their capacity to invest in sustainable farming practices.

Size of Land Holding

The distribution based on land holding size reflects the varied scale of agricultural operations. "Marginal" landholders (up to 1 ha) constitute 39.16%, followed by "Small" landholders (1.1 to 2 ha) at 31.66%. This diversity in landholding size provides a valuable context for understanding the scalability and resource availability for implementing integrated pest management.

Farm Power

The distribution based on farm power reveals variations in mechanization levels. A majority (60.83%) falls under the "Low Farm Power" category, indicating a reliance on traditional or less mechanized farming methods. Understanding farm power distribution is crucial for tailoring pest management strategies that align with the existing agricultural practices.

Social Participation:

Social participation among respondents is diverse, with 50.00% indicating "No Membership" in any organization. However, a significant proportion is engaged, with 20.83% in "Membership in One Organization" and 15.83% holding roles as "Executive/Office Bearer." This social participation data sheds light on the potential influence of community networks on the dissemination and adoption of integrated pest management practices.

Extent of Adoption

In table 2 the distribution of respondents based on the overall extent of adoption reveals a notable majority falling into the "Medium" category, constituting 65.83% of the total respondents. This suggests a substantial inclination toward incorporating recommended IPM practices among soybean growers. Furthermore, 20.00% of respondents exhibit a "High" extent of adoption, emphasizing a commendable proportion actively engaging in sustainable pest management strategies. The "Low" adoption category, representing 14.17%, indicates a portion of respondents requiring targeted interventions or awareness programs to enhance the integration of recommended IPM practices.

This distribution pattern is crucial for understanding the current landscape of IPM adoption among soybean growers. The dominance of the "Medium" category signals a baseline acceptance and integration of sustainable practices, while the presence of a significant number in the "High" category underscores a positive trend toward comprehensive adoption. The relatively smaller percentage in the "Low" category provides an opportunity for targeted interventions and educational initiatives to bridge knowledge gaps and enhance

the overall adoption of recommended IPM practices. This data lays the foundation for further exploration into the factors influencing adoption patterns, particularly in relation to the socio-economic profiles discussed earlier, thereby

contributing to the development of tailored strategies for promoting sustainable agriculture in the soybean cultivation domain.

Table 1: Distribution of the respondents according to their socio-economic profile

S. No.	Socio-economic profile	Frequency	Per cent
1.	Age		
	Young	12	10.00
	Meddle	79	65.83
	Old	29	24.17
	Total	120	100
2.	Education		
	Illiterate	45	37.50
	Primary school	30	25.00
	Middle school	25	20.83
	High school	10	8.33
	Higher secondary	06	5.00
	College and above	04	3.33
	Total	120	100.00
3.	Annual income		
	Up to Rs. 35,000	36	30.00
	Rs. 35,001-60,000	39	32.50
	Rs. 60,001-1,00,000	11	9.17
	More than Rs. 1,00,00	34	28.33
	Total	120	100.00
4.	Size of land holding		
1.	Marginal (up to 1 ha)	47	39.16
2.	Small (1.1 to 2 ha)	38	31.66
3.	Medium(2.1 to 4 ha)	09	7.50
4.	Large (above 4 ha)	26	21.26
	Total	120	100.00
5.	Farm power		
1.	Low farm power	73	60.83
2.	Medium farm power	33	27.50
3.	High farm power	14	11.67
	Total	120	100.00
6.	Social participation		
	No membership	60	50.00
	Membership in one organization	25	20.83
	Membership in two and more than two organizations	16	13.33
	Executive/office bearer	19	15.83
	Total	120	100.00

Table 2: Distribution of respondents according to over all extent of adoption regarding recommended IPM practices of soyabean

S. No.	Extent of adoption	Frequency	Percent
1.	Low (up to 17 scores)	17	14.17
2.	Medium (18-24 scores)	79	65.83
3.	High (25 and above scores)	24	20.00
	Total	120	100.00

Correlation analysis of socio-economic profile with the adoption of recommended IPM practices of soybean

The correlation analysis presented in Table 3 unveils intriguing insights into the interplay between various socio-economic factors and the adoption of recommended Integrated Pest Management (IPM) practices in soybean cultivation. Among these factors, education emerges as a significant positive correlate ($r = 0.2356, p < 0.05$), suggesting that higher educational levels among soybean growers are linked to a heightened propensity for embracing recommended IPM practices. This finding underscores the pivotal role of education in shaping sustainable farming attitudes and practices. Likewise, the positive correlation observed between annual income and IPM adoption ($r =$

$0.2346, p < 0.01$) implies that as growers' annual income increases, there is a corresponding elevation in the adoption of sustainable pest management practices. This aligns with the notion that financial stability enables farmers to invest in and implement advanced agricultural practices. The size of landholding exhibits a similar trend, displaying a significant positive correlation ($r = 0.1867, p < 0.05$), indicating that larger landholdings are associated with a higher likelihood of adopting recommended IPM practices. Farm power, representing mechanization levels, also shows a noteworthy positive correlation ($r = 0.1837, p < 0.05$), reinforcing the idea that increased mechanization aligns with a greater adoption of sustainable pest management strategies. Conversely, age and social participation do not display significant correlations with IPM adoption, as denoted by non-significant (NS) correlation coefficients. This nuanced exploration of socio-economic correlates provides a foundation for targeted interventions, policy development, and educational initiatives aimed at bolstering the widespread adoption of recommended IPM practices among soybean growers.

Table 3: Correlation analysis of socio-economic profile with the adoption of recommended IPM practices of soybean

S. No.	Independent variables	Coefficient of correlation "r" value
01.	Age	-0.03045 ^{NS}
02.	Education	0.2356*
03.	Annual income	0.2346**
04.	Size of land holding	0.1867*
05.	Farm power	0.1837*
06.	Social participation	0.1465 ^{NS}

NS = Non significant, *Significant at 5% level, **Significant at 1% level

Conclusion

In conclusion, the comprehensive analysis of socio-economic profiles and the adoption of Integrated Pest Management (IPM) practices among soybean growers reveals a nuanced landscape that can inform targeted interventions for sustainable agriculture. The socio-economic profiles indicate a diverse representation across age groups, educational backgrounds, annual incomes, landholding sizes, farm power levels, and social participation. The majority falls into the "Medium" category of IPM adoption, reflecting a baseline acceptance of sustainable practices, while a commendable proportion exhibits a "High" extent of adoption. The correlation analysis underscores the significant influence of education, annual income, landholding size, and farm power on the adoption of recommended IPM practices. Education and higher income levels correlate positively with adoption, emphasizing the role of knowledge and financial stability. Larger landholdings and increased farm power also show positive correlations, suggesting scalability and mechanization contribute to enhanced IPM adoption. This holistic understanding provides a foundation for tailored strategies, interventions, and policy development to promote sustainable agriculture and bridge existing gaps in knowledge and adoption practices among soybean growers.

Application of research

The application insights by identifying significant correlations between IPM adoption and education, annual income, landholding size, and farm power. These correlations suggest that tailored interventions focusing on education, financial support, and mechanization can positively influence the widespread adoption of sustainable pest management practices among soybean growers. The research outcomes, thus, pave the way for targeted extension programs, policy formulations, and capacity-building initiatives to enhance the overall sustainability of soybean cultivation through effective IPM practices.

Research Category: Agricultural Extension and Communication

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