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SOCIO-DEMOGRAPHIC ANALYSIS OF FARMING AND USE OF BIOPESTICIDES AMONG FARMERS OF GAJAPATI DISTRICT IN ODISHA, INDIA

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ABSTRACT

Large portion of country like India, which is heavily dependent on agriculture and related sectors, should be aware of the potentiality of biopesticides to promote sustainable agriculture with zero hunger. But it has not yet adopted in the manner in which it should be. The current study was carried out in five villages of Gajapati district of Odisha, India to know about farmers' approach and usage of biopesticides. The majority of farmers were found to be men, ranging in age from 23 to 65 and having been in farming for 3 to 50 years. A very few among them were qualified higher secondary education, nearly half of the farmers were illiterate. Additionally, it was observed that farmers used a less land and made less money from it. Biopesticides are unknown to the majority of farmers, and even most of the farmers have never heard of it. It was noted that farmers seldom ever used biopesticides.

Keywords: Biopesticides, Farmers, Gajapati, Sustainable, Zero hunger.

Introduction

In recent years, institutional and policy initiatives as well as productivity at the national and sub-national levels have undergone major changes in India's agricultural sector. More than 83% of the country's people are rural residents who rely completely on agriculture for their livelihood. Although the necessity to provide the population with an adequate supply of food of a decent quality has been met, the accompanying need for sustainable and equitable agricultural growth still exists. There is a pressure on agriculture and related industries to supply food needs, as the world's population is expected to reach 9.7 billion by 2050 (UNDES, 2015) as a result of the exponential growth of the population. In terms of Indian states, Odisha's economy depends heavily on agriculture and significant progress has been made in this area over the past several years. According to the study by Tripathy *et al*. (2011), there are differences in performance between the districts, with the coastal districts and the western Sambalpur district performing better than others. Between the years 1980 and 2000, Pattanayak and Nayak (2004) examined the regional differences in agricultural development in different zones of Odisha. The ecological, institutional, and technological qualities of a region, as well as current research that primarily focuses at the state level and the development of bottom up and micro level planning, all have a substantial impact on that region's agricultural performance.

The productivity and sustainability of agricultural methods should be increased in order to meet the demand for food and supplies to the rising population. Increasing crop production by applying manure and organic based treatments, such as biopesticides, or reducing yield loss as a result of harsh environmental conditions are two examples of how to increase agricultural productivity (Pathak *et al*., 2018; Gonclaves, 2021). Biopesticides, which are pest management tools based on living organisms or organic materials, hold out great potential for reducing production loss without sacrificing the quality of the final product. Biopesticidescome in a wide variety of forms and they are categorised based on the sources from which they are extracted and the molecules or compounds they are made of (Ruiu, 2018). Biopesticides have several merits as they are environment friendly, target specific, not deleterious to non-target organisms, highly effective in small amounts and decompose quickly without leaving problematic residues (Saberi *et al*., 2020). In recent years, the use of biopesticides is gaining momentum because they can be efficiently used in sustainable agricultural practices (Gonclaves, 2021). Present dissertation of work is framed with the objective to know about the knowledge, attitude and practices of farming as well as use of biopesticides among farmers of Gajapati District in Odisha, India.

Materials and Methods

Between April-May, 2022, farmers were interviewed using a questionnaire as part of a cross-sectional study to fulfill the objective of present study. Face-to-face interviews with farmers were conducted as a part of this survey. First, the purpose of the study was explained in the local language i.e. Odia and Telugu. Later, when they had shown their readiness, verbal questions were posed, and their responses were recorded on a questionnaire, which was earlier prepared.

***Area of study*:** Gajapati district of Odisha, located at the south-east of Odisha on a hilly terrain of Eastern Ghats between longitude 84° 32'E, 83° 47'E and latitude 18° 44'N, 19° 39'N. The district borders with Andhra Pradesh in the south, District of Rayagada to west, District of Ganjam to East and District of Kandhamala to the North. The climate is subtropical with high humidity. Five villages of Gajapati district of Odisha (Fig. 1) namely, Routhpur, Barlanda, Totagumuda, Parusurampur and Jhampiguda were selected for the information and data collection.

***Collection of Data*:** The data were gathered utilizing the personal interview approach. A good relationship and cordial environment was established with each farmer prior to the interview in order to acquire their trust in the ability to gather accurate and reliable information. The interview took place at their resident place and field.

***Statistical analysis*:** The data recorded in the present work was analyzed by one-way analysis of variation (one-way ANOVA). Correlation study was performed by Pearson Correlation and Sig. (2-tailed) at 0.01 level and 0.05 level of significance using SPSS 12.0 for Windows (SPSS Inc., USA).

Results and Discussion

Farmers from the five Villages of Gajapati district of Odisha were respondents for this survey. In this area, the majority of respondents worked in the rice, cotton, groundnut and few were involved in vegetable farming.

Demographic appearances of respondents

The majority of respondents were male (97.66%), only 2.34% women were involved in farming. Age group of the respondents ranged from 23–65 years with an average of 42 years, having the experience of 3–50 years with an average of 22 years in farming (Fig. 2). Education is a very important variable for the assessment of farmer's knowledge and practices. It was found that 40% respondents were illiterate, 20% had primary level, 26.66% had middle level education and 13.34% of respondents had education level up to higher secondary (Fig. 3).

All of the farmers were men, according to the study by Oztas *et al*. (2018) concerning knowledge level, attitude and behavior of farmers regarding the usage of pesticides. Lekei *et al*. (2014) described the profile of farmers' pesticide exposure, their knowledge of pesticide dangers, their prior experiences with poisoning, and their exposure to risky activities, documented the same pattern. The average age of farmers was found to be between 18 and 51 years old, according to a study by Tuna *et al*. (2012) on Turkish farmers' knowledge, attitudes, and behavior concerning pesticides. Learning new skills requires experience, especially for farmers. This component alone has the ability to increase yield and reduce farming costs. In the study of farmers' health through targeted extension programmes, to ascertain the farmers' level of awareness on the safe usage of pesticides and biosafety, 37.9% of the people polled had experience of farming between five and ten years, while 41 percent of respondents were between the ages of 11 and 15. The adoption of modern agricultural practises has been proven to be significantly influenced by a farmer's sociodemographic factors, such as gender, age, education level, and farming experience, according to studies.

Depiction of respondents

The total area of farming was noted between 0.5–4 hectare with an average of 1.9 acre, and most of the farmers have 1-acre area for the cultivation of crops (Fig. 3). This data indicate that the farmers had small farming units. The annual incomes claimed by the farmers was in the range of 16,000-60,000 with an average of 31,200 (Fig. 2).

The link between farm size and income is a topic of discussion. There are so many literature linking income with farm size. One theory holds that the size of a farm and productivity are inversely related (Gaurav and Mishra, 2015). Another viewpoint emphasizes the contextual nature of the link between farm size and productivity (Chattopadhyay and Sengupta, 1997). Inverse relationships may not always be the result of diminishing returns, as Assunçaoa and Ghatak (2003) shown. It might be caused by unrecognized farmer skill heterogeneity. According to Monchuk *et al*. (2010), land fragmentation may even have a negative impact on agricultural production and consequently, the income generated.

Information regarding biopesticides

Disease infections in different crops was reported by the farmers including rust, root rot, wilt, smuts and pest infestations include aphids, whiteflies, jassids, mealybugs and termites in this area. Majority of the farmers deals with plant diseases by Thiophenate methyl, Bavistin, Carbendazime, Copper, Sulphur and Pest infestations by Acetamprid, Cypermethrim, Lambda Cyhalothrin and Dimethoate. Cultural control refers to the manipulation of old practices like date management with respect to pest outbreak etc. Regarding the knowledge and use of biopesticides, out of a random 15 farmers, 5 farmers ever heard about biopesticides, 4 having a bit knowledge and only 1 claimed to using the biopesticides (Fig. 4), that only in few parts of his farming.

Correlation study

Table 1 shows that, at 5% level of significance ($p< 0.005$), the experience of farmers was found to be negatively correlated with educational qualifications (0.565), while farming area was noted to be positively correlated with annual income (0.531). At 1% level of significance ($p< 0.001$), experience of farming in years was positively correlated with the age of farmers (0.886), while educational qualifications of the farmers were found to be negatively correlated with age of farmers (0.685).

In the present study, almost none of the farmer was noticed who had ever used biopesticides efficiently, and most of them were not even aware about it. It was clearly found that there is lack of awareness, lack of skill, less faith in biopesticides and the farmers considered it as difficult and clumsy. As the biopesticides and bio-control agents are important components of Integrated Pest Management (IPM), the IPM programmes should be conducted by various agencies to aware the farmers regarding benefits of biopesticides.

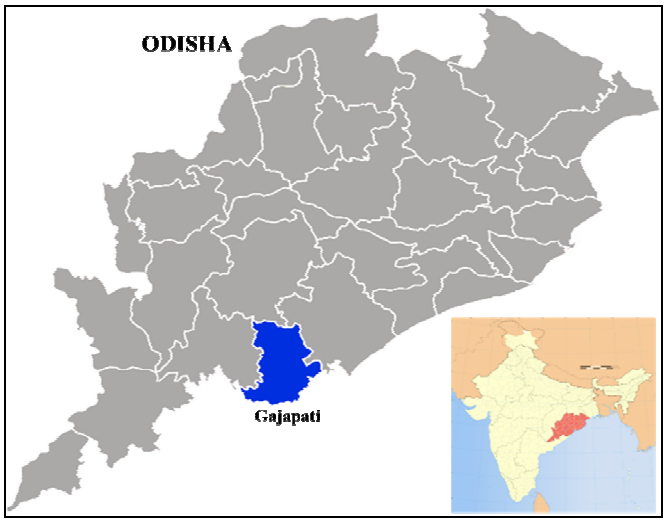

Fig. 1 : Map of Odisha, India showing the area of Gajapati district (Source: shorturl.at/BCLX7)

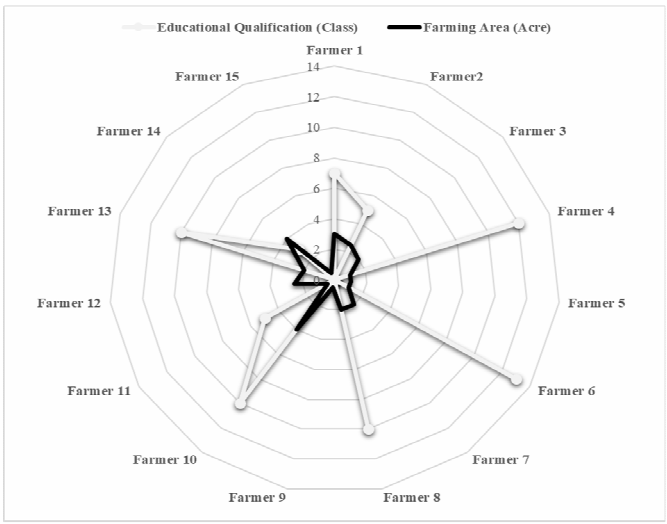

Fig. 3: Educational qualifications (class 0 to 13) and Farming area (Acre) of 15 random farmers used in the study

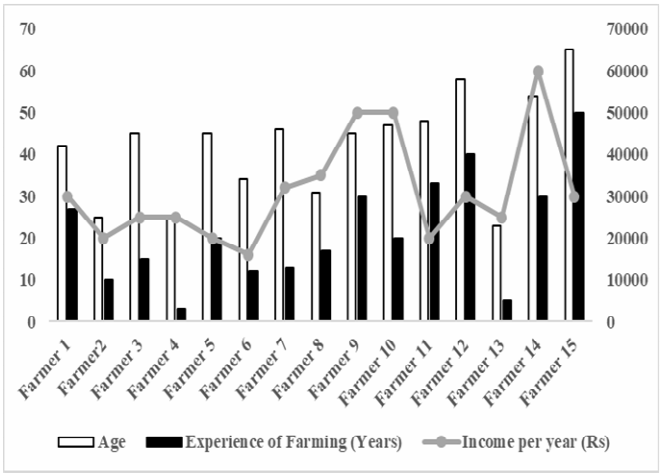

Fig. 2 : Age (years), Experience (years) and Income per years (□) of 15 random farmers used in the study

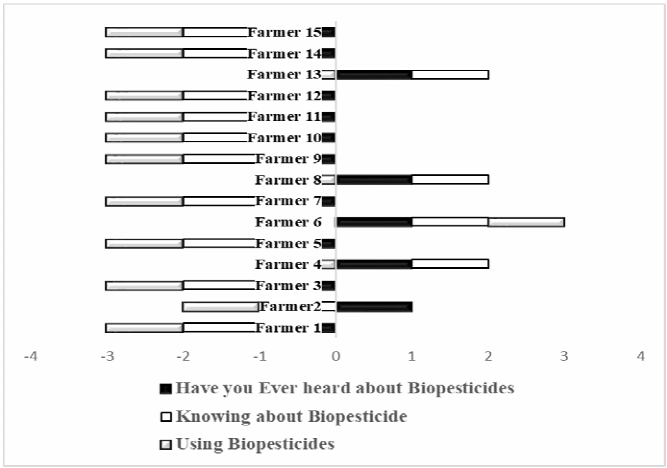

Fig. 4: Knowledge of farmers about biopesticides (positive and negative responses)

Table 1 : Correlation study of various parameters used in the study

		Age	Experience of Farming (Years)	Income per year (Rs)	Educational Qualification (Class)	Farming Area (Acre)
Age	PC	1	.886**	0.373	-.685**	0.038
	ST		0	0.171	0.005	0.892
Experience of Farming (Years)	PC	.886**	1	0.3	-.565*	-0.093
	ST	0		0.277	0.028	0.742
Income per year (Rs)	PC	0.373	0.3	1	-0.16	.531*
	ST	0.171	0.277		0.569	0.042
Educational Qualification (Class)	PC	-.685**	-.565*	-0.16	1	0.129
	ST	0.005	0.028	0.569		0.646
Farming Area (Acre)	PC	0.038	-0.093	.531*	0.129	1
	ST	0.892	0.742	0.042	0.646	

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)
PC: Pearson Correlation
ST: Sig. (2-tailed)

Conclusion

Analysis showed that farmers with less education are more at risk than the farmers, having above primary education, who are aware of biopesticides. The amount of land used for farming and yearly income were strongly correlated. Additionally, there was a significant correlation between educational attainment and the usage of biopesticides and novel farming methods. However, insufficient understanding of the biological control strategy was discovered, indicating the necessity of an education effort among farmers.

Acknowledgment

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