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Socio-Economic, Socio-Personal and Demographic Profiling of KVK-Based Vermicompost Training Participants: Evidence from Bihar, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Vermicompost is essentially a varied blend of decomposed farm waste, food waste, and worm castings, organically produced using different species of earthworms. This nutrient-dense organic fertilizer is gaining significant attention amid climate change concerns and the push for organic farming. Agricultural experts are increasingly advising farmers to transition from synthetic fertilizers to organic manures, prompting the need for training programs on vermicomposting to educate farmers about this valuable practice. This research aimed to examine the socioeconomic, demographic, and socio-personal characteristics of farmers who participated in three recent

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vermicomposting training sessions organized by three Krishi Vigyan Kendras (KVKs) in Bihar, India. This study adopted cross sectional survey design. The rationale behind this part of the project is to understand the various attributes of the training participants which could contribute in different ways to the adoption of vermicomposting. It also sought to reveal the status of those variables in relation to the adoption scenario amongst the current farming communities in those three districts. The study was carried out in three districts of Bihar—Samastipur, Muzaffarpur, and Madhubani—with a sample size of 150 farmers. Surveys were conducted in two blocks from each of these districts, selected purposefully. Data analysis was performed using statistical tools in SPSS to calculate the index for each individual farmer. A varied socio-demographic profile of the respondents was revealed who participated in the KVK-based vermicomposting training and it also provided a snapshot of the farming communities of the specific regions. This analysis concludes that the training sessions at three different KVKs attracted a diverse group of farm participants, characterized by varying demographic, socioeconomic, and socio-personal attributes. It is noteworthy that the majority of farmers who attended the vermicomposting training programs were small-scale and marginal farmers, with only a small percentage having high income levels. It is recommended to encourage stakeholder farmers to adopt this technology by providing training and support tailored to their socio-demographic profiles, as this could potentially increase the adoption rate among farmers.

Keywords: Training; demography; vermicomposting; trainees; farmers.

1. INTRODUCTION

Vermicompost is produced through a specialized composting process involving various species of earthworms. This process involves breaking down a diverse mixture of organic materials, such as household waste, food scraps, vegetable residues, casting materials, and bedding materials, resulting in vermicompost. Known for its nutrient richness, vermicompost serves as an organic fertilizer and soil conditioner [1]. Essentially, vermicomposting refers to the creation of vermicompost [2]. This production method relies on the biological decomposition carried out by earthworms and microorganisms. Vermicompost offers numerous benefits for crops and soil by boosting microbial activity and promoting mineralization. It is easy to produce and poses no harm to plants, soil, or the environment. Furthermore, vermicomposting is an economically feasible, socially acceptable, and environmentally sustainable practice that any farmer can implement in their backyard [3]. Vermicompost contains organic carbon, which gradually releases nutrients into the soil, allowing plants to absorb them efficiently. This compost provides crops with additional substances not found in synthetic chemical fertilizers [4]. The use of vermicompost in agriculture is gaining significant attention due to its proven benefits, including soil detoxification and regeneration, waste management, and promoting sustainable farming practices [5]. Additionally, vermicomposting can be used for residential waste management, reducing waste volume and offering a higher economic value compared to traditional composts [6].

Vermicompost is gaining global attention, especially in the realm of ecological and sustainable farming. This trend is also evident in South Asia, including the Indian subcontinent. Besides, vermicomposting is also a significant part of urban framing as the urban farms are in boom these days and getting importance due to growing urban population as an effect of migration [7]. However, farmers, regardless of their farm size, often hesitate to prepare and use vermicompost in their fields. In some cases, farmers are unaware of vermicompost's existence [8]. Therefore, it is essential for both public and private stakeholders to promote sustainable farming practices and educate farmers on how to prepare and use vermicompost. Various extension strategies can raise awareness about vermicompost production, with village-level training sessions being a particularly effective method to enhance farmers' capabilities.

Training programs enhance the knowledge and skills of farmers through hands-on learning experiences [9]. Krishi Vigyan Kendras (KVKs), or Farm Science Centres, serve as beacons for Indian agriculture, organizing various training programs for local farmers. These programs aim to generate employment for rural youth and support various agricultural activities. KVK training offers farmers a clear understanding of vermicomposting, including its preparation and

application in crop fields [9]. Such training empowers farmers with self-employment opportunities, contributing to poverty alleviation at a micro level. Vermicomposting not only creates jobs for rural farmers but also helps improve their financial status [10]. Currently, the farming sector is facing severe challenges due to the adverse effects of climate change. The use of synthetic fertilizers exacerbates these issues, negatively impacting crop production, soil quality, and the quality of farm produce. The Indian Council of Agriculture Research (ICAR), in collaboration with state agricultural departments, is working to mitigate these environmental disasters by supporting stakeholders. A key focus of ICAR's future plans is to promote the use of vermicompost and other organic fertilizers [11-13].

The statement of problem under investigation is that the participants are the main stakeholders of an extension training program and the socio-economic, socio-personal as well as demographic profiles of the participants are relevant in determining the adoption of a particular piece of technology. The extension training programs aim to promote a particular piece of technology and make the users or participants adept to put that technology into use. But it is noteworthy that the socio-economic, socio-persona as well as demographic factors are some important factors which are beyond the control of the extension professionals, but those factors are the determinants of participants' degree of adoption of that innovation. There were 3 vermicomposting training programs organised by KVKs in three districts of Bihar state in India and this paper attempted to depict the demographic, socioeconomic as well as socio-personal attributes of the farm participants in those training programs. It is beneficial to understand the various characteristics of the participant farmers as it helps to drive the extension training programs in a much effective manner by using suitable strategies, techniques, or tools [14]. This article was framed with an objective to determine the socioeconomic and demographic profiling of the respondent farmers who already participated in vermicompost training programs conducted by those KVKs in three districts (i.e., Samastipur, Muzaffarpur, Madhubani) of the state of Bihar.

2. METHODOLOGY

2.1 Research Design and Sources of Data

Data were collected from a group of farmers who participated in three training programs organized by Krishi Vigyan Kendras (KVKs) in Bihar, specifically KVK Birauli, KVK Madhubani, and KVK Saraiya, located in the districts of Samastipur, Madhubani, and Muzaffarpur, respectively. The study was carried out in these three districts. Two blocks from each district were purposively selected: Pusa and Tajpur in Samastipur, Saraiya and Marwan in Muzaffarpur, and Madhwapur and Bisfi in Madhubani. The specific villages involved in the study were Morsand, Karmila, Thahra, and Kothia in Samastipur; Birpur, Anandpur, Dwarikapur Khaie, Bhagwatpur, and Jhakhra Shekh in Muzaffarpur; and Basuki Bihari, Mahua, Pihwara, Sahar, Jagwan, and Lohra in Madhubani.

25 farmers from each of the selected blocks were interviewed in a face-to-face situation using a pre-tested interview schedule and the data were collected from 150 farmers in total who have attended at least a single vermicomposting training conducted by the local KVKs.

Table 1. Selection of respondents (sampling)

Selection of Districts	Selection of Blocks	Selection of Villages	Selection of Respondents
Samastipur	Pusa	Morsand Karmila & Thahra	25
	Tajpur	Kothia	25
Muzaffarpur	Saraiya	Birpur Anandpur	25
	Marwan	Dwarikapur Khaje Bhagwatpur& Jhakhra Shekh	25
Madhubani	Madhwapur	Basuki Bihari, Mahua, Pihwara & Sahar	25
	Bisfi	Jagwan Lohra	25
			N = 150

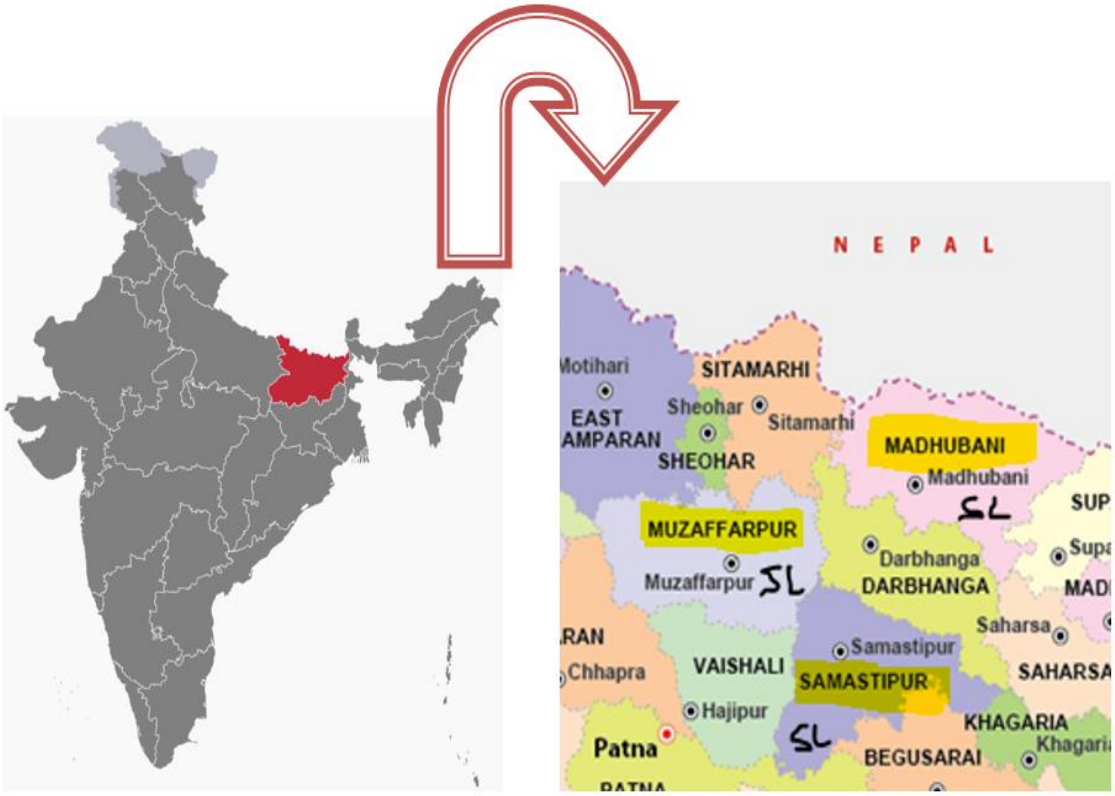

Fig. 1. Districts in state of Bihar under Study (locale)
**SL=Study Locale*

Frequency, percentage, arithmetic mean, standard deviation etc. are the various descriptive statistical tools which were used to analyse the collected data associated with the demographic, socioeconomic and socio-personal attributes of the farm participants. The collected primary data were analysed using some quantitative statistical software like SPSS v.21.

3. RESULTS AND DISCUSSION

Technology and information dissemination are the part of strategic goals of extension [15]. Training is essential for the community members to become skilled in using a specific technology and pushing the process of adoption. *Rural Technology Acceptance Model* (RuTAM) indicates that socio-demographic factor(s) of the stakeholders is imperative in the process of adoption and that explicitly impacts the adoption of any piece of technology [16]. However, social influence, facilitating condition(s), individual factor(s) etc. are also relevant in driving the process of adoption of technology. This study considered exploring 10 necessary socio-economic and socio-demographic variables while collecting the data from the respondents and those are age, caste, occupation, level of education, family type, size of landholding, degree of social participation, annual income level, nature of information sources and nature of mass media usage.

It is notable in Table 2 that 42% of the respondents belong to middle age category followed by 36% young and 11% old age category in Samastipur district. In Muzaffarpur district, 50% of the respondents belong to middle age category followed by 32% young and 18% old age category. In Madhubani district, 44% of the respondents belong to old age category followed by 30% middle and 26% young age category.

In Samastipur district, 46% of the respondents belong to UR category, followed by 34% OBC and 20& belong to SC/ST category. In Muzaffarpur district, 54% of the respondents belong to UR category, followed by 30% OBC and 16% SC/ST category. In Madhubani district, 70% of the respondents belong to UR category, followed by 20% OBC and 10% SC/ST category (Table 3).

Table 2. Classification of respondents based on age

Categories	Districts					
	Samastipur		Muzaffarpur		Madhubani	
	f	%	f	%	f	%
Young (below 35 years)	18	36	16	32	13	26
Middle (between 35-50 years)	21	42	25	50	15	30
Old (above 50 years)	11	22	09	18	22	44
	M = 16.66		M = 16.66		M = 16.66	
	S.D. = 5.13		S.D = 8.02		S.D. = 4.72	

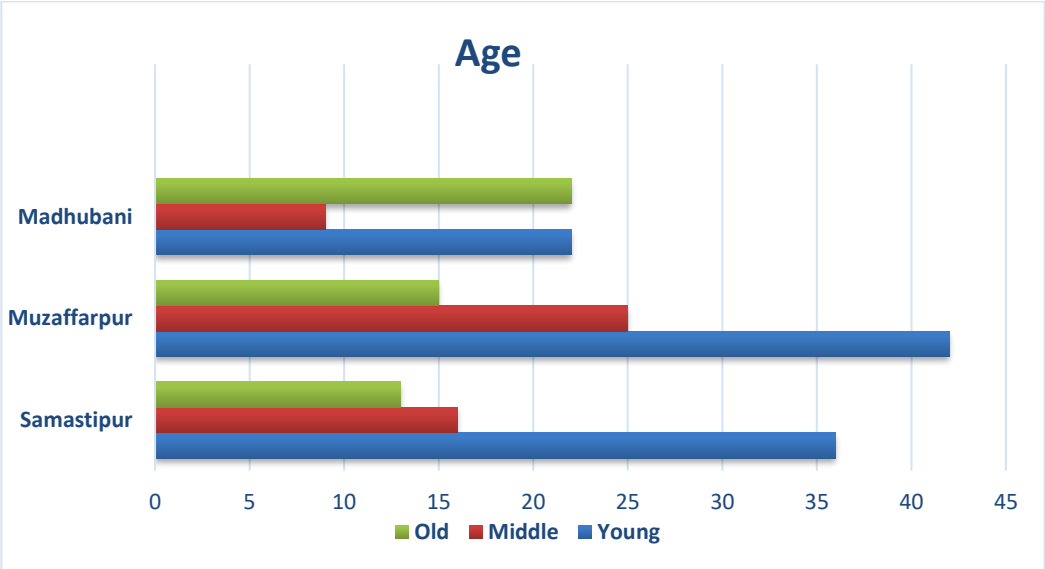

Fig. 2. Classification of respondents based on age

Table 3. Classification of respondents based on caste

Categories	Districts					
	Samastipur		Muzaffarpur		Madhubani	
	f	%	f	%	f	%
SC/ST	10	20	08	16	05	10
OBC	17	34	15	30	10	20
UR	23	46	27	54	35	70
	M = 16.66		M = 16.66		M = 16.66	
	S.D. = 6.50		S.D. = 9.60		S.D. = 16.07	

In Samastipur district, 58% of the respondents were involved in both farming and business, followed by 18% only farming, 14% both farming and services, and 10% as farm labourer. In Muzaffarpur district, 54% of the respondents were involved in both farming and business, followed by 20% only farming, 14% as farm labourer and 12% both farming and services. In Madhubani district, 34% respondents were involved in both farming and services, followed by 26% both farming and business, 22% farm labourer and 18% involved in only farming (Table 4).

In Samastipur district, 24% respondents had studied up to high school, followed by 22% up to graduation or above, 20% up to middle school etc. In Muzaffarpur district, 22% respondents indicated that they studied up to graduation level or above, followed by 20% up to high school, 16% up to primary school etc. Most of the respondents in Madhubani district studied up to high school level followed by middle school (16%) (Table 5).

Most of the respondents (78%) belong to nuclear family in Samastipur district, followed by 22%

joint family. 82% of the respondents in Muzaffarpur district belong to nuclear family, followed by 18% joint family. In Madhubani district, 54% of the respondents belong to nuclear family, followed by 46% joint family (Table 6).

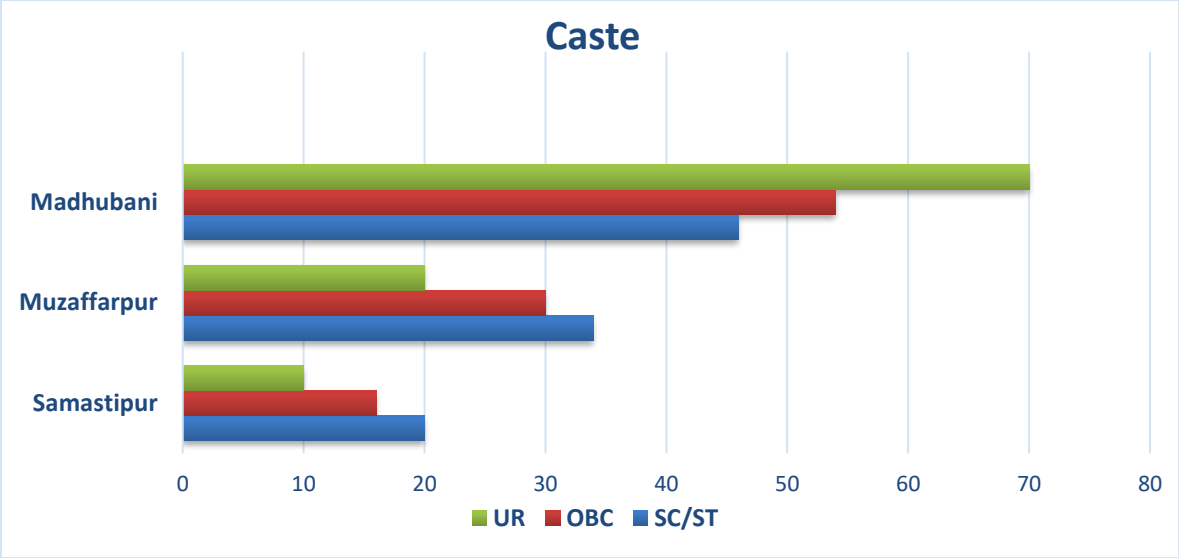

Fig. 3. Classification of respondents based on caste

Table 4. Classification of respondents based on occupation/profession

Categories	Districts					
	Samastipur		Muzaffarpur		Madhubani	
	f	%	f	%	f	%
Farm labourer	05	10	07	14	11	22
Farming (solo)	09	18	10	20	09	18
Farming + Business	29	58	27	54	13	26
Farming + Services	07	14	06	12	17	34
	M = 12.50 S.D. = 11.12		M = 12.50 S.D. = 9.81		M = 12.50 S.D. = 3.41	

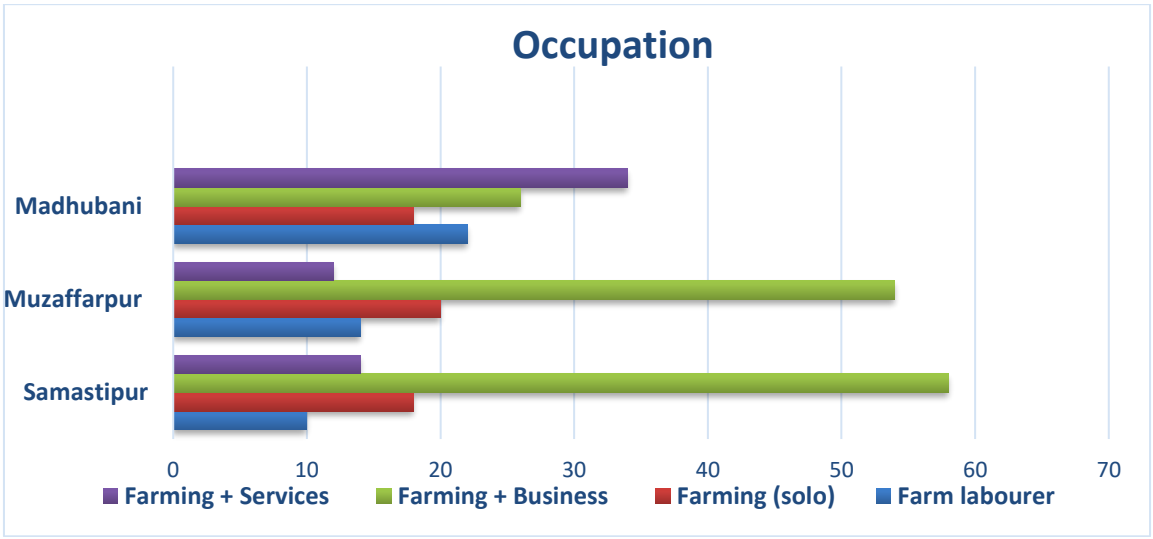

Fig. 4. Classification of respondents based on occupation/profession

Table 5. Classification of respondents based on educational qualification

Categories	Districts					
	Samastipur		Muzaffarpur		Madhubani	
	f	%	f	%	f	%
Illiterate	3	6	4	8	5	10
Can read only	4	8	5	10	6	12
Can read & write	4	8	5	10	7	14
Primary School	6	12	8	16	7	14
Middle School	10	20	7	14	8	16
High school	12	24	10	20	13	26
Graduate & above	11	22	11	22	4	8
	M = 7.14 S.D. = 3.76		M = 7.14 S.D = 2.67		M = 7.14 S.D = 2.91	

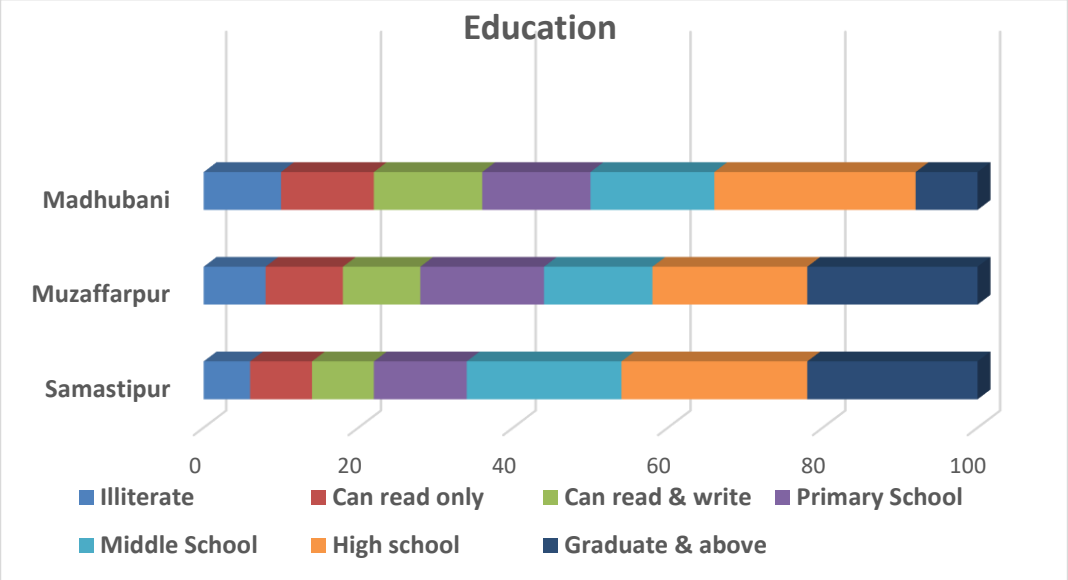

Fig. 5. Classification of respondents based on educational qualification

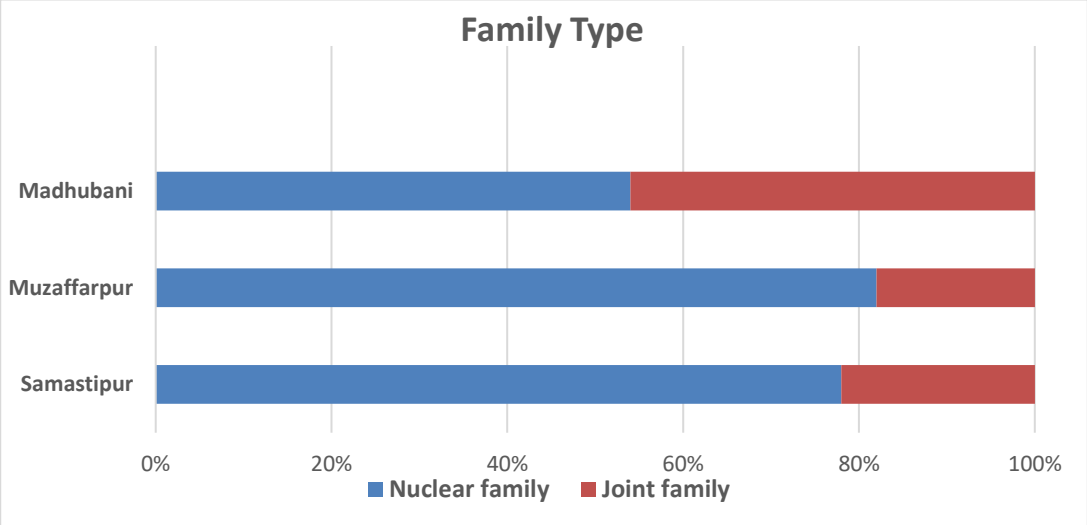

Fig. 6. Classification of respondents based on family type

Table 6. Classification of respondents based on family type

Categories	Districts					
	Samastipur		Muzaffarpur		Madhubani	
	f	%	f	%	f	%
Nuclear family	39	78	41	82	27	54
Joint family	11	22	09	18	23	46
	M = 25.00 S.D. = 19.79		M = 25.00 S.D = 22.62		M = 25.00 S.D. = 2.82	

38% of the respondent farmers had marginal land holding in Samastipur district, followed by 36% small land holding, 10% medium landholding and 6% large land holdings. In Muzaffarpur district, 34% of the respondents possess medium land holding, followed by 30% small, 18% marginal and 18% large land holdings. In Madhubani district, 42% of the respondents had medium land holding, followed by 24% marginal, 20% large and 14% small land holdings (Table 7).

In Samastipur district, 54% of the respondents were not the member of any organization, followed by 36% as ember of one organization, 10% as member of more than one organization. In Muzaffarpur district, 60% of the respondents were not a member of any organization, followed by 28% as member of one organization, 6% as member of more than one organization and 6% as office bearers. In Madhubani district, 70% of the respondents indicated as no member of any organizations, followed by 22% as member of an organization, 4% as member of more than one organization and 4% as office bearers (Table 8).

In Samastipur district, 44% of the respondents have medium level of income (Rs. 50,001-75,000), followed by 26% high (Rs. 75,001-1,00,000), 14% low (Rs. 25,001-50,000), 12% very high (above Rs. 1,00,000) and 4% very low (up to Rs. 25,000). In Muzaffarpur district, 30% of the respondents had a medium level of income, followed by 22% high income, 20% very high income, 16% low income and 12% very low income. Furthermore, in Madhubani district, 52% respondents had medium level of income followed by 18% very low income, 10% low level of income, 10% high income and 10% very high level of income. It is noteworthy that most of the respondents in all the 3 districts had medium level of income (Table 9).

Table 7. Classification of respondents based on their possessed land holding's size

Categories	Districts					
	Samastipur		Muzaffarpur		Madhubani	
	f	%	f	%	f	%
Marginal (up to 1ha)	19	38	09	18	12	24
Small (1.1-2ha)	18	36	15	30	07	14
Medium (2.1-4ha)	10	20	17	34	21	42
Large (>4ha)	03	06	09	18	10	20
	M = 12.50 S.D. = 7.50		M = 12.50 S.D. = 4.12		M = 12.50 S.D. = 6.02	

Table 8. Classification of respondents based on their social participation

Categories	Districts					
	Samastipur		Muzaffarpur		Madhubani	
	f	%	f	%	f	%
Not a member	27	54	30	60	35	70
Member of an organization	18	36	14	28	11	22
Member of more than one organization	05	10	03	06	02	04
Office bearer	0	0	03	06	02	04
	M = 12.50 S.D = 12.28		M = 12.50 S.D. = 12.76		M = 12.50 S.D. = 15.58	

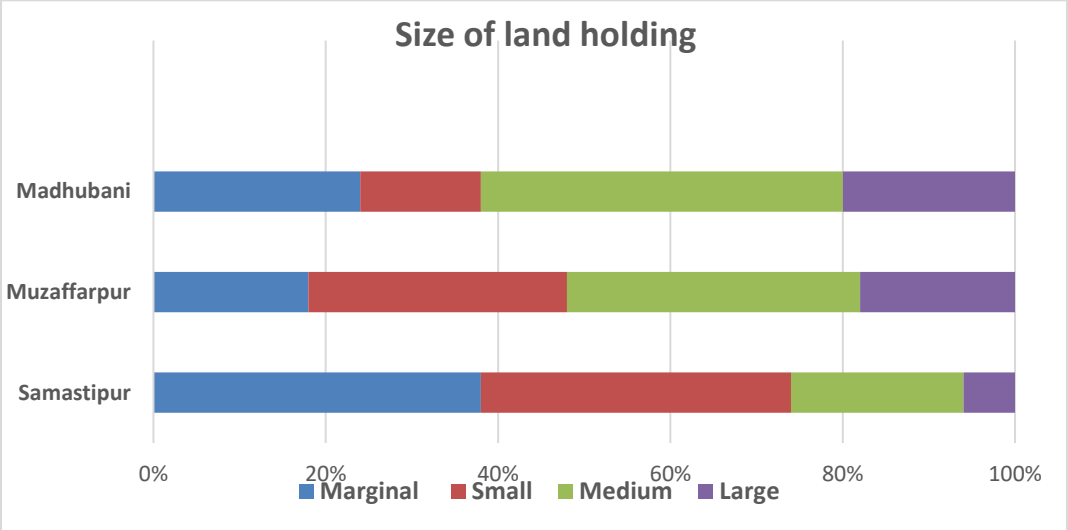

Fig. 7. Classification of respondents based on their possessed land holding's size

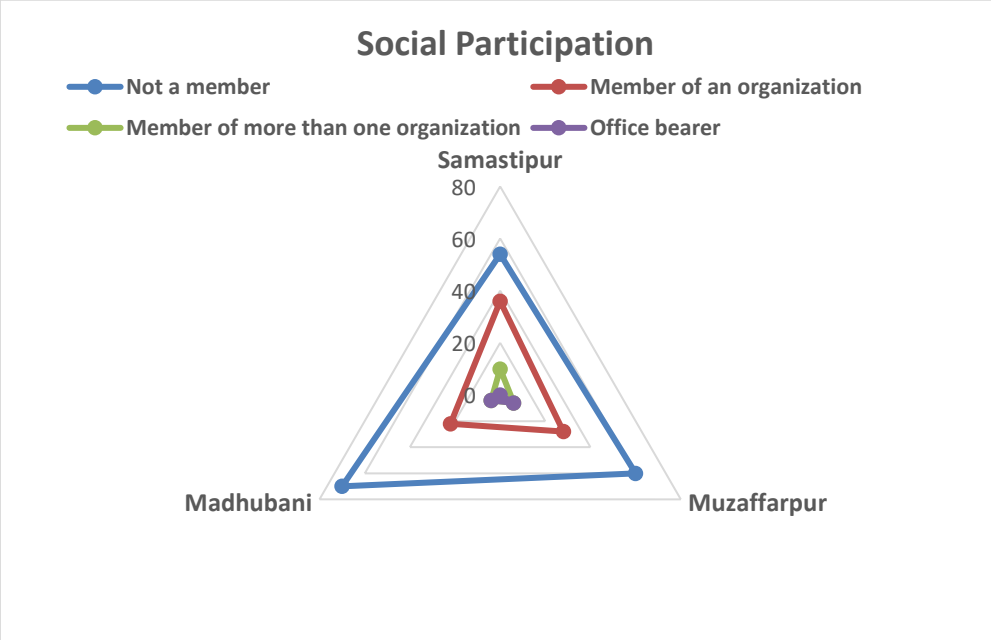

Fig. 8. Classification of respondents based on their social participation

Table 9. Classification of respondents based on their annual income level

Categories	Districts					
	Samastipur		Muzaffarpur		Madhubani	
	f	%	f	%	f	%
Very low (up to Rs. 25,000)	02	04	6	12	9	18
Low (Rs. 25,001 – 50,000)	07	14	8	16	5	10
Medium (Rs. 50,001 – 75,000)	22	44	15	30	26	52
High (Rs. 75,001 – 1,00,000)	13	26	11	22	5	10
Very high (Above Rs. 1,00,000)	06	12	10	20	5	10
	M = 10.00 S.D. = 7.77		M = 10.00 S.D. = 3.39		M = 10.00 S.D. = 9.11	

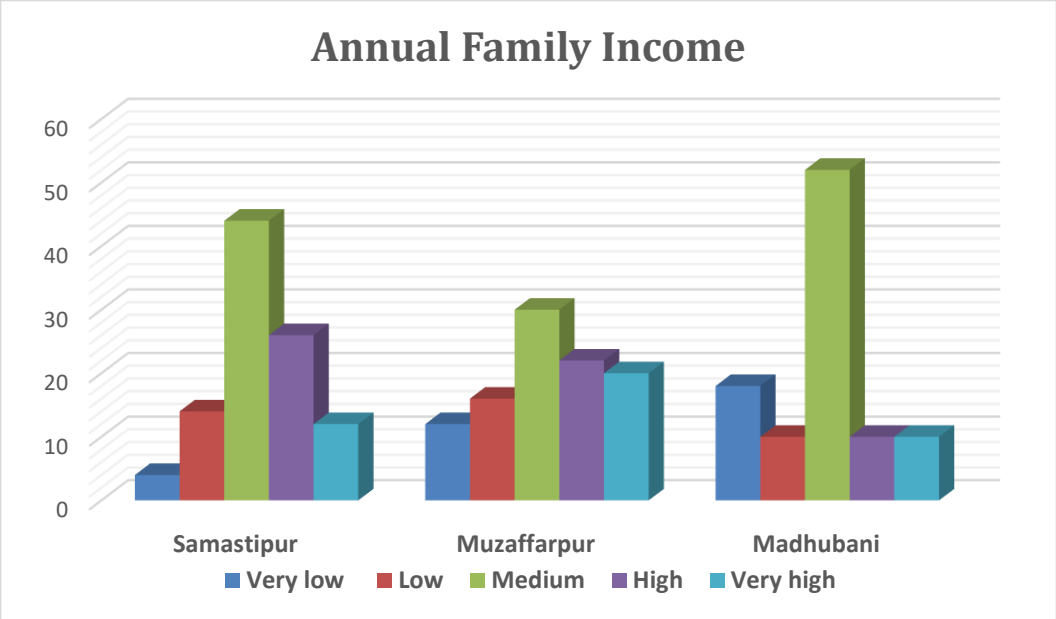

Fig. 9. Classification of respondents based on their annual income level

Table 10. Classification of respondents based on their localite interpersonal information sources

Categories	Districts								
	Samastipur			Muzaffarpur			Madhubani		
	Regular	Occasionally	Never	Regular	Occasionally	Never	Regular	Occasionally	Never
	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)
Friends	11 (22)	14 (28)	25 (50)	13 (26)	17 (34)	20 (40)	14 (28)	17 (34)	19 (38)
Relatives	13 (26)	17 (34)	20 (40)	16 (32)	18 (36)	16 (32)	12 (24)	15 (30)	23 (46)
Neighbours	22 (44)	24 (48)	4 (8)	17 (34)	21 (42)	12 (24)	22 (44)	19 (38)	09 (18)
Local leaders (Panchayat)	07 (14)	23 (46)	20 (40)	09 (18)	27 (54)	14 (28)	07 (14)	23 (46)	20 (40)

Table 11. Classification of respondents based on their cosmopolite interpersonal information sources

Categories	Districts								
	Samastipur			Muzaffarpur			Madhubani		
	Regular	Occasionally	Never	Regular	Occasionally	Never	Regular	Occasionally	Never
	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)
KVK Scientist	20(40)	18(36)	12(24)	18(36)	21(42)	11(22)	36(72)	10(20)	4(8)
D.A.O/ S.D.A.O	7(14)	19(38)	24(48)	5(10)	11(22)	34(68)	2(4)	8(16)	40(80)
B.A.O	13(26)	24(48)	13(26)	10(20)	23(46)	17(34)	4(8)	10(20)	36(72)
S.M.S	21(42)	17(34)	12(24)	12(24)	24(48)	14(28)	5(10)	23(46)	22(44)
K.S./Krishi Sahayak	34(68)	9(18)	7(14)	30(60)	13(26)	7(14)	7(14)	10(20)	33(66)
Demonstration	15(30)	21(42)	14(28)	5(10)	15(30)	30(60)	15(30)	22(44)	13(26)
Kisan Mela/Field day	05(10)	27(54)	18(36)	08(16)	23(46)	19(38)	5(10)	20(40)	25(50)
Bank officer	0(0)	1(2)	49(98)	2(4)	5(10)	43(46)	0	0	50(100)
N.G.O.	0(0)	0(0)	50(100)	3(6)	7(14)	40(80)	0	0	50(100)
Others (Private Company (etc.)	23(46)	14(28)	13(26)	34(68)	10(20)	6(12)	35(69)	10(20)	5(10)

Table 12. Classification of respondents based on their mass media use pattern

Categories	Districts								
	Samastipur			Muzaffarpur			Madhubani		
	Regular	Occasionally	Never	Regular	Occasionally	Never	Regular	Occasionally	Never
	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)
Radio	12(24)	17(34)	21(42)	06(12)	24(48)	20(40)	22(44)	17(34)	11(22)
Television	11(22)	15(30)	24(48)	14(28)	17(34)	19(38)	11(22)	13(26)	26(52)
News paper	07(14)	17(34)	26(52)	11(22)	25(50)	14(28)	09(18)	10(20)	31(62)
Farm magazine	02(4)	25(50)	23(46)	5(10)	20(40)	25(50)	2(4)	7(14)	41(82)
Mobile SMS	0	0	50(100)	0	0	50(100)	0	0	50(100)
Internet	0	0	50(100)	0	0	50(100)	0	0	50(100)
WhatsApp	2(4)	3(6)	45(90)	3(6)	4(8)	43(86)	0	0	50(100)

Table 10 shows that most of the respondents (44%) in Samastipur district indicated their neighbours as regular localite source of information followed by 26% relatives, 22% friends and 14% local leaders. In Muzaffarpur district, 34% of the respondents indicated that they had neighbours as the regular source of information, followed by 32% relatives, 26% friends and 18% local leaders. In Madhubani district, 44% of the respondents indicated that they used neighbours as the localite interpersonal information sources, followed by 28% friends, 24% relatives, 14% local leaders.

Table 11 represents that 40% of the respondents in Samastipur district indicated KVK Scientist as their regular cosmopolite information source followed by 14% DAO/SDAO, 26% BAO, 42% SMS, 68% Krishi Sahayak, 30% demonstration, 10% Kisan Mela/Field day etc. In Muzaffarpur district, 36% of the respondents indicated KVK Scientist as their regular cosmopolite information source followed by 10% DAO/SDAO, 20% BAO, 24% SMS, 60% Krishi Sahayak, 10% demonstration, 16% Kisan Mela/Field day, 4% bank officer, 6% NGOs etc. In Madhubani district, 72% of the respondents indicated KVK Scientist as their regular cosmopolite information source followed by 4% DAO/SDAO, 8% BAO, 10% SMS, 14% Krishi Sahayak, 30% demonstration, 10% Kisan Mela/Field day, 4% bank officer, 6% NGOs etc.

Table 12 explains that in Samastipur district 24% of the training participants use radio on a regular basis, followed by 22% television, 14% newspaper, 4% farm magazine, 4% WhatsApp etc. In Muzaffarpur district, 12% respondents use radio on a regular basis, followed by 28% television, 22% newspaper, 10% farm magazine, 6% WhatsApp etc. In Madhubani district, 44% training participants use radio, followed by 22% television, 18% newspaper, 4% farm magazine etc.

4. CONCLUSION AND RECOMMENDA-TIONS

It can be concluded from this analysis that the trainings conducted at 3 different KVKs were attended by diverse farm participants based on their demographic, socioeconomic and socio-personal attributes. It is noticeable that most of the farmers who participated in those vermicomposting training programs were small and marginal in nature, and low percentage of farmers had high income level. Vermicomposting would be a promising entrepreneurial venture for the rural farming communities in the state of Bihar and the farmers can earn extra income through vermicomposting [17-19]. The farmers will be able to use vermicompost in their own fields for nurturing the crops, and it will be an additional source of income for the farming communities [20-24]. Exploring the socioeconomic, socio personal as well as demographic attributes will implicitly help the extension program planners and administrators in framing the appropriate training programs. The adoption of the vermicomposting technology will get enhanced with the thorough providing post-training support to the farmers. Previous research indicated that the major constraint in successful adoption of vermicomposting is the lack of training and guidance by the experts, and this point needs to be addressed thoroughly by the extension agencies and professionals [25-27]. There is still a gap in the adoption of this beneficial and profitable technology, but the further analysis of the association between different socioeconomic, socio personal as well as demographic attributes and the adoption rate of vermicomposting to be performed. It is suggested to push the stakeholder farmers to adopt this technology through training & support depending on the socio-demographic profiles of the respondent farmers which could possibly enhance the level of adoption amongst the farmers.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that generative AI technology such as ChatGPT (GPT-4 architecture) has been used during editing the manuscripts, including a few paraphrasing.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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