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Research Article

ASSESSMENT OF KNOWLEDGE GAP REGARDING ORGANIC WASTE MANAGEMENT AMONG DAIRY FARMERS OF PUNJAB

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ABSTRACT

Knowledge is one of the fundamental attributes which discerns the course of action in bringing a positive change in one's behaviour. In the context of present study, qualitative gap in knowledge of the dairy farmers for organic (agriculture, household and livestock) waste management was investigated using *ex-post facto* research design. Multistage random sampling was used to select 80 small and large dairy farmers (40 each) from District Ludhiana of Punjab and the knowledge level was assessed by using a pre-developed and standardized knowledge test. Results revealed that maximum gap in knowledge exists among the dairy farmers regarding utilization of livestock waste followed by household waste and agriculture waste. Relational analysis showed that the farmers' knowledge was significantly ($p<0.01$) influenced by education, total income, the use of information sources and organic waste utilization score. The study was concluded with an impression that by raising farmers' educational levels, helping them make better use of information sources and developing their capacity for the sustainable use of organic waste, the farmers' knowledge of organic waste management may be improved.

Keywords: Dairy, Education, Farmers, Knowledge, Organic Waste

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Agriculture and livestock are the two major components of our food chain from where we derive our daily food needs and serves to be the major source of waste production in rural areas of the country. Agricultural waste has the potential to be a massive source of biomass, which could meet about 33 percent of the energy needs of developing nations. In India, around 75 percent of the rural energy needs are met by agricultural waste. The wastes generated in rural areas are largely organic and biodegradable but their in-situ segregation at the point of generation poses a constraint for their management. The volume of rural wastes generated stood around 0.3 to 0.4 million metric tonnes per day, which if managed properly can prove to be a good source of income for the villagers. Given the enormous potential for waste generation in rural regions, it is imperative that appropriate interventions be made to turn this waste into a resource. Moreover, the practices followed by the farmers for waste management reflects their knowledge level of their knowledge (Singh *et al.*, 2023). Assessing farmers' knowledge gaps is essential for developing a clear image of waste disposal at the field level and for creating the necessary policy framework for sustainable waste management which was done within the framework of the current study.

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MATERIAL AND METHOD

An *ex-post facto* research design was followed for investigating the knowledge gap regarding organic waste management practices being undertaken by the respondents. For the present study, organic waste is defined as the waste generated due to activities related to agriculture (crop residues), household (kitchen waste and degradable waste) and livestock (dung) waste. Purposively the state of Punjab was selected because of the colossal productivity in terms of agriculture and livestock, high cropping intensity, net biomass surplus and high human and livestock population densities (Singh *et al.*, 2020b). Small dairy farmers and large dairy farmers, with herd sizes of 5 to 25 dairy animals and more than 25 animals, respectively, were the two categories into which respondents were divided. Multistage random sampling was done to select a total of 80 dairy farmers. A total of 40 small and 40 large dairy farmers were selected from eight villages belonging to two blocks of District Ludhiana of Punjab. The data regarding knowledge gap was collected using pre-developed and standardized knowledge test on organic waste management developed by Singh *et al.* (2019). Further, percent knowledge gap was

calculated by the following formula given in Equation 1.

$$\text{Knowledge Gap \%} = \frac{\text{Total number of responses} - \text{No. of correct responses}}{\text{Total number of responses}} \times 100 \quad (1)$$

The correlation coefficient, coefficient of determination and regression estimates were used to compute the relational analysis between the knowledge level of organic waste management and other independent variables.

RESULTS AND DISCUSSION

Knowledge gap

It is inducible from the results given in Table 1 that under agriculture waste management the knowledge gap ranged from 7.50 to 95 percent with highest gap (95.00%) in the aspect of knowledge about process used for production of electricity from the straws and stubbles whereas lowest gap of 7.50 per cent was found in the aspect of knowledge on machine used to mulch stubbles in soil.

Under household waste management category, the knowledge gap ranged from 45 to 95 percent with highest gap (95.00%) in case of knowledge about waste composting machine to prepare compost while minimum gap (45.00%) was found in the aspect of knowledge on the best method for disposing human excreta.

Under livestock waste management, three sub-components were included *viz*., composting, vermi-composting, biogas production. In case of composting, the knowledge gap ranged between 63.75 to 100 percent. Cent percent gap was found in two aspects i.e. knowledge on best time for filling the full tank in NADEP composting and knowledge on method of composting in which roof/shed necessarily required while lowest gap (63.75%) was seen in the aspect of knowledge on depth of compost pit.

In case of vermicomposting sub-head, knowledge gap ranged between 52.50 and 93.75 percent and maximum gap (93.75%) was seen in the aspect of knowledge about optimum temperature range for earthworms whereas lowest gap (52.50) was found regarding knowledge on time required for vermicompost to get ready.

Under biogas production sub-head, the knowledge gap ranged between 6.25 to 91.25 percent. Maximum gap (91.25%) was perceived in case of knowledge about the minimal separation required to avoid pollution when building a biogas plant close to water bodies while minimum (6.25%) gap was seen in case of knowledge about use of biogas.

Results given in Table 2 shows the category-wise overall knowledge gap from which it is inducible that maximum gap in knowledge (75.47%) was found in case of livestock waste management which is ranked first whereas minimum gap (53.75%) was seen in case of agriculture waste management which is ranked third.

The findings of the current investigation are partial to complete consonance with the studies discussed in this section. Agarwal *et al.* (2015) reported the lack of awareness among people regarding waste management practices, especially the rural people practicing agriculture and animal husbandry did not have knowledge regarding the modern waste management practices. A study conducted by Jat and Bochalya (2017) in Rajasthan revealed that majority of the farmers (65%) were having medium level knowledge for vermicomposting. Dhaka *et al.* (2017) reported the overall low level of knowledge among the women farmers and high training needs in the area of livestock waste management in Rajasthan. In the State of Karnataka, Veeresh *et al.* (2011) investigated the waste management practices. It was observed that 62.78 percent farmers utilized paddy straw foe livestock feed, 54.44 percent practiced composting and only 2.22 percent went for vermicomposting. The paddy straw was also used for thatching, packaging, etc.

But in the State of Punjab, the condition is somewhat different as majority of the famers burn the agriculture and livestock waste. Burning of paddy and other crop residues are causing serious environmental problems in Punjab. About 18 million tons of paddy straw is estimated to be burnt every year (Agriculture Policy for Punjab, 2013). The dry fodder availability for livestock is short to the tune of around 40 percent and burning of paddy straw aggravate this situation. Singh *et al.* (2020a) reported that majority of the farmers tend to burn organic waste and knowledge was a major limiting factor responsible for the same.

The studies have reported that development of information sources like mobile apps and other information and communication technologies can increase the knowledge level of the farmers pertaining to management of organic waste in particular and other livestock practices in general (Panda *et al.*, 2018; Sood *et al.*, 2020; Panda *et al.*, 2021; Singh *et al.*, 2021a; Singh *et al.*, 2022a). The information sources handy for the use by the farmers had the potential application for ascertaining optimal utilization of rural waste and their utility must be enhanced (Singh *et al.*, 2022b). Further, it has been observed that print material and ICT enabled communique can facilitate waste management practices (Kumar and Singh, 2017; Ginwal and Sharma, 2022; Jadoun *et al.*, 2023; Singh *et al.*, 2024).

Relational analysis between knowledge level in organic waste management and other variables

The results presented in Table 3 shows the relationship

Table 1. Statement-wise knowledge gap regarding organic waste management among dairy farmers

S.No.	Knowledge Item	KSS (n=40)	KS (%)	KGS (%)	KSL (n=40)	KL (%)	KGL (%)	KSP (N=80)	KP (%)	KGP (%)
Agriculture waste management										
1.	Machine used to mulch stubbles in soil	37	92.50	7.50	37	92.50	7.50	74	92.50	7.50
2.	Days required to compost straws in field	14	35.00	65.00	19	47.50	52.50	33	41.25	58.75
3.	Type of bio-product to be cultivated using straw, stubbles and animal manure	9	22.50	77.50	11	27.50	72.50	20	25.00	75.00
4.	Process used to generate electricity from straws and stubbles	2	5.00	95.00	2	5.00	95.00	4	5.00	95.00
5.	Amount of fine per acre for illegal burning of crop residues	26	65.00	35.00	28	70.00	30.00	54	67.50	32.50
Household waste management										
6.	Waste recycling	22	55.00	45.00	18	45.00	55.00	40	50.00	50.00
7.	Difference between organic and inorganic waste	9	22.50	77.50	9	22.50	77.50	18	22.50	77.50
8.	Time taken by kitchen waste composting machine to prepare compost	1	2.50	97.50	3	7.50	92.50	4	5.00	95.00
9.	Method best suited for disposing human excreta	19	47.50	52.50	25	62.50	37.50	44	55.00	45.00
10.	Managing used tea leaves	2	5.00	95.00	9	22.50	77.50	11	13.75	86.25
Livestock waste management										
	Composting									
11.	Ideal time for filling the whole tank in NADEP composting	0	0.00	100.00	0	0.00	100.00	0	0.00	100.00
12.	Composting method in which roof/shed is necessarily required	0	0.00	100.00	0	0.00	100.00	0	0.00	100.00
13.	Ideal particle size for composting organic waste	5	12.50	87.50	5	12.50	87.50	10	12.50	87.50
14.	Depth of compost pit	17	42.50	57.50	12	30.00	70.00	29	36.25	63.75
15.	Ideal size of heap for composting organic waste	0	0.00	100.00	1	2.50	97.50	1	1.25	98.75
	Vermicomposting									
16.	Time required for vermicompost to get ready	19	47.50	52.50	19	47.50	52.50	38	47.50	52.50
17.	Optimal temperature range for earthworms	1	2.50	97.50	4	10.00	90.00	5	6.25	93.75
18.	Capacity of a standard vermicomposting bed	4	10.00	90.00	4	10.00	90.00	8	10.00	90.00
19.	Items required along with livestock waste to make vermicompost	15	37.50	62.50	8	20.00	80.00	23	28.75	71.25
20.	Vermiwash	12	30.00	70.00	10	25.00	75.00	22	27.50	72.50
21.	Major use of vermiwash	1	2.50	97.50	6	15.00	85.00	7	8.75	91.25
	Biogas Production									
22.	Biogas can be used for	38	95.00	5.00	37	92.50	7.50	75	93.75	6.25
23.	Waste materials required for production of biogas	22	55.00	45.00	25	62.50	37.50	47	58.75	41.25
24.	Starter culture used in biogas production	15	37.50	62.50	13	32.50	67.50	28	35.00	65.00
25.	Minimum distance to be maintained while constructing biogas plant near water bodies to prevent contamination	0	0.00	100.00	7	17.50	82.50	7	8.75	91.25
26.	Machine used to convert biogas into electricity	5	12.50	87.50	9	22.50	77.50	14	17.50	82.50

KSS: Small farmers' knowledge score; KS (%): Small farmers' knowledge (in percentage); KGS: Small farmers' knowledge gap; KSL: Large farmers' knowledge score; KL (%): Large farmers' knowledge (in percentage); KGL: Large farmers' knowledge gap; KSP: Pooled knowledge score; KP (%): Pooled knowledge (in percentage); KGP: Pooled knowledge gap

Table 2. Category-wise knowledge gap among dairy farmers

Category	KSS (n=40)	KS (%)	KGS (%)	KSL (n=40)	KL (%)	KGL (%)	KSP (N=80)	KP (%)	KGP (%)	Rank
Agriculture waste	88	44.00	56.00	97	48.50	51.50	185	46.25	53.75	III
Household waste	53	26.50	73.50	64	32.00	68.00	117	29.25	70.75	II
Livestock waste	154	24.06	75.94	160	25.00	75.00	314	24.53	75.47	I

KSS: Small farmers' knowledge score; KS (%): Small farmers' knowledge (in percentage); KGS: Small farmers' knowledge gap; KSL: Large farmers' knowledge score; KL (%): Large farmers' knowledge (in percentage); KGL: Large farmers' knowledge gap; KSP: Pooled knowledge score; KP (%): Pooled knowledge (in percentage); KGP: Pooled knowledge gap

Table 3. Relational analysis between knowledge level on organic waste management and other variables

Independent Variables	Knowledge Level on Organic Waste Management			
	r	r^2	B	Sig.
Age	-0.087	0.001	0.012	0.814
Education	0.413**	0.171	1.956	0.000**
Land holding	0.238*	0.057	1.095	0.831
Experience in dairy farming	0.118	0.014	0.045	0.296
Herd size	0.206	0.042	0.059	0.047*
Total income	0.347**	0.121	0.000	0.000**
Information source utilization	0.407**	0.167	0.264	0.000**
Social participation	0.088	0.008	0.436	0.438
Organic waste utilization score	0.343**	0.118	0.947	0.002**

r: Coefficient of Correlation; r^2: Coefficient of Determination; B: Regression coefficient; Sig.: Probability value; ** significant at P<0.01; * significant at P<0.05

between knowledge level of farmers for organic waste management and dependent variables. It can be seen that education, total income, information source utilization and organic waste utilization score were having highly significant ($p<0.01$) and positive correlation with knowledge level which means that with increase in all such variables, there will be a highly significant increase in knowledge level of dairy farmers. The coefficient of determination for highly significant variables was 0.171, 0.121, 0.167 and 0.118, respectively. Further, land holding was also found to have a significant and positive correlation with knowledge of the farmers. Only age was found to have negative correlation with the dependent variable. It can be inferred from the table that an increase of 0.947 units of organic waste utilization score will increase the knowledge level by 1 unit with 11.80 percent correct predictor variance. All the dependent variables were found to have positive regression on knowledge level with education, total income, information source utilization and organic waste management score being highly significant ($p<0.01$). The results of the current investigation comply with the observations reported by Mukherji *et al.* (2016) in which there was positive and significant correlation between the knowledge and waste management. The same study reported that respondents belonging to high socio-economic group were having more knowledge regarding waste management and were found to be more willing towards waste management. Previous findings by Singh *et al.* (2018), Mishra *et al.* (2020) and Singh *et al.* (2020c) reported that knowledge plays a significant role in adoption of agricultural practices by the farmers which signifies that improving knowledge of farmers is crucial for increasing the overall adoption rate.

CONCLUSION

The results of the study were conclusive of the facts that a huge knowledge gap existed among the dairy farmers regarding sustainable utilization of livestock waste followed by household and agriculture waste. Wide gaps were evident for the knowledge items in various categories generation of electricity from straws and stubbles, kitchen waste composting machine, NADEP composting, use of vermiwash, installation of biogas plant near water bodies, etc. Relational analysis suggested that the farmers must be educated and trained for sustainable waste management techniques. Moreover, the development of information sources like mobile apps and other ICTs can help in timely dissemination of knowledge, thus management of organic waste in eco-friendly way.

REFERENCES

Agarwal, R., Chaudhary, M. and Singh, J. (2015). Waste Management Initiatives in India for Human Wellbeing. *Eur. Sci. J.* **(S.E.)**: 105-27.

Agriculture Policy for Punjab. (2013). Committee for Formulation of

Agriculture Policy for Punjab State.

Dhaka, B.L., Bairwa, R.K., Meena, N.L., Chayal, K. and Nagar, B.L. (2017). Training needs assessment of women farmers on livestock production management in Bundi District of Rajasthan, India. *Int. J. Curr. Microbiol. Appl. Sci.* **6(6)**: 796-803.

Ginwal, P. and Sharma, P. (2022). Effectiveness of personal versus online extension methods in disseminating knowledge on household waste management. *Indian J. Ext. Edu.* **58(2)**: 120-123.

Jadoun, Y.S., Mukhopadhyay, C.S., Singh, A. and Kaur, N. (2023). E-agriculture diaspora: heralding a new era of animal farming and agricultural practices. In biotechnological interventions augmenting livestock health and production (pp. 435-451). Singapore: Springer Nature Singapore.

Jat, M.K. and Bochalya, B.C. (2017). Knowledge of vermiculture technology among the rural women: A case of Rajasthan. *Agric. Update.* **12(3)**: 371-375. DOI: 10.15740/HAS/AU/12.3/371-375.

Kumar, P. and Singh, A. (2017). Use of mobile phone and its apps in extension services. *J. Agric. Ext. Manag.* **18(1)**: 37-51.

Mishra, B.P., Kanwat, M., Gupta, B.K., Meena, N.R., Mishra, N.K. and Kumar, P.S. (2020). Correlates of adoption of improved apiculture practices in Arunachal Pradesh. *Indian J. Ext. Edu.* **56(2)**: 51-54.

Mukherji, S.B., Sekiyama, M., Mino, T. and Chaturvedi, B. (2016). Resident knowledge and willingness to engage in waste management in Delhi, India. *Sustainability.* **8(10)**: 1065. doi:10.3390/su8101065.

Panda, P., Tiwari, R., Sood, H., Singh, A. and Dutt, T. (2021). Development of need based IVRI-artificial insemination app and its perceived utility. *Indian J. Ext. Edu.* **57(1)**: 142-147.

Panda, P., Tiwari, R., Joshi, P. and Singh, A. (2018). Awareness and use of ICT tools by veterinarians and para-vets with special reference to mobile apps in Gujarat. *Multilog. Sci.* **8**: 270-73.

Singh, A. and Rashid, M. (2017). Impact of animal waste on environment, its managemental strategies and treatment protocols to reduce environmental contamination. *Vet. Sci. Res. J.* **8**: 1-12. doi: 10.15740/HAS/VSRJ/8.1 and 2/1-12.

Singh, A., Jadoun, Y.S., Brar, P.S. and Kour, G. (2022a). Smart technologies in livestock farming. In Smart and sustainable food technologies (pp. 25-57). Singapore: Springer Nature Singapore.

Singh, A., Kumar, P. and Kour, H. (2016). A case report on cow dung composting: Traditional practice followed by women in rural areas of Jammu and Kashmir for maintaining agroecology. *J. Rur. Agric. Res.* **16(2)**: 79-80.

Singh, A., Tiwari, R. and Dutt, T. (2021a). An ICT driven intervention for transforming waste to wealth: Methodic development and assessment of IVRI-waste management Guide App. *J. Mater. Cycles Waste Manag.* **23(4)**: 1544-1562. doi: https://doi.org/10.1007/s10163-021-01236-1.

Singh, A., Tiwari, R. and Dutt, T. (2021b). Augmentation of farmers' income in India through sustainable waste management techniques. *Waste Manag. Res.* **39(6)**: 849-859. doi: https://doi.org/10.1177/ 0734242X20953892.

Singh, A., Tiwari, R., Joshi, P. and Dutt, T. (2020a). Insights into organic waste management practices followed by dairy farmers of Ludhiana District, Punjab: Policy challenges and solutions. *Waste Manag. Res.* **38(3)**: 291-299. DOI: 10.1177/0734242X19886632.

Singh, A., Tiwari, R., Nagra, P. S., Panda, P., Kour, G., Singh, B., Kumar, P. and Dutt, T. (2023). Predicting opinion using deep learning: from burning to sustainable management of organic waste in Indian state of Punjab. *Waste Manag. Res.* 0734242X231219627.

Singh, A., Tiwari, R., Panda, P. and Dutt, T. (2020b). Organic waste production and utilization by dairy farmers in district Ludhiana of Punjab, India. *Indian J. Ext. Edu.* **56(1)**: 20-27.

Singh, A., Tiwari, R., Panda, P., Joshi, P. and Dutt, T. (2019). Development and standardization of knowledge test for organic waste management. *Int. J. Curr. Microbiol. Appl. Sci.* **8(08)**: 1443-1449. doi: https://doi.org/10.20546/ijcmas.2019.808.168

Singh, A., Tiwari, R., Panda, P., Kour, G. and Dutt, T. (2022b). Information source utilization for organic waste management with special reference to digital technologies: A qualitative study on dairy farmers of district Ludhiana, Punjab. *Cogent Edu.* **9(1)**: 2062093.

Singh, B., Singh, A., Jadoun, Y. S., Bhadauria, P. and Kour, G. (2024). Strategies for sustainable climate smart livestock farming. In adapting to climate change in agriculture-theories and practices: approaches for adapting to climate change in agriculture in India (pp. 341-359). Cham: Springer Nature Switzerland.

Singh, J., Kumar, P. and Singh, A. (2018). Constraint analysis of traditional methods of extension communication in adoption of scientific dairy practices. *Int. J. Curr. Microbiol. Appl. Sci.* **7(08)**: 4522-4532.

Singh, J., Kumar, P. and Singh, A. (2020c). Dissemination of information to dairy farmers in Jammu and Kashmir: Developing a web module. *Info. Dev.* **36(4)**: 546-558.

Sood, H., Tiwari, R., Singh, A. and Dutt, T. (2020). Development of a need based IVRI-dairy manager app and its perceived utility. *Int. J. Curr. Microbiol. Appl. Sci.* **9(12)**: 3003-3009.

Veeresh, S.J., Narayana, J. and da Silva J.A.T. (2011). Agricultural bio-waste management in the Bhadrawathi Taluk of Karnataka state, India. *Bioremed. Biodivers. Bioavailab.* **5(1)**: 77-80.