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Assessment of Farm waste management practices and perceived changes in agro- ecosystem attributes among farmers of Haryana, India

Elizabeth Jose[1], K. Ponnusamy[2] and Vani Chandran[3]

Dairy Extension Division, ICAR-NDRI, Karnal 132 001, Haryana, India

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ABSTRACT

Present study was conducted to know the perceived changes in agro- ecosystem among farmers of Haryana. Three districts namely, Kaithal, Hisar and Bhiwani were selected randomly from first, second and third agro ecological zones of Haryana, respectively. The data were collected using structured interview schedule with the sample size of 180 farmers, with 60 farmers from each district. Frequency and percentage were used for analysis of the data. Study implies that understanding the environmental consequences of new agriculture techniques helps to implement appropriate management actions to address problems emerging out of it.

Key words: *Farm waste management, Haryana, Agro-ecosystem, Perceived changes*

Introduction

Continuous mono cropping system threatens the sustainability of future agricultural production in terms of soil, water, climate, and market parameters which warrants farmers to use their resources efficiently. Recent trends in crop farming witnessed a multifold shift towards paddy and wheat specialization in Haryana (CRRID, 2017). The reduction of poverty and sustainability of economic growth in India are directly correlated with crop and related farm operations. About 65 per cent of ground water in Haryana is of poor quality. The second-generation problems of green revolution in the state have caused a steep decline in resource base, soil degradation (soil compaction, soil salinity, sodicity, water logging, and pesticide residue), reduction in soil organic carbon content and hydrological imbalance resulting in an increase of the overall cost of cultivation. There has been a remarkable increase in pollution of soil, water and environment in the state (Haryana Kisan Ayog Report, 2014).

The objective of the Green Revolution was to address India's food scarcity issues by enhancing agricultural output through the use of improved irrigation systems, pesticides, fertilizers, agricultural machinery, and similar means. This primarily involved intensifying crop production by focusing on more robust, high-yielding crop varieties. Nevertheless, there are apprehensions regarding the increased chemical usage in cultivating high-yielding crop strains and its associated health consequences. Furthermore, the shift from traditional agriculture to large-scale cultivation of high-yielding crop varieties may have additional environmental impacts beyond the use of potentially harmful substances like pesticides and herbicides.

A study related to the aftermaths of the green

([1,3]Research Scholar, [2]Principal Scientist)

revolution in Punjab shows that farmers are burning their land in Punjab, the center of the green revolution, in order to plant crops for the upcoming cycle rather than following the natural cycle as is customary. Next harvest will be coming shortly because the hybrid crops have short crop cycles. There is significant degree of pollution in Punjab as a result of burning of crop residues in some places (Davis *et al*., 2018). This kind of farming has the potential to generate a variety of greenhouse gases, such as carbon dioxide, nitrogen oxide, etc. (de Miranda *et al*., 2015). Inadequate water supply and soil toxicity made subsurface water more polluted. The green revolution's sole objective was to boost food production and ensure that there was enough to feed everyone. The effects on the environment weren't considered (Taylor, 2020).

Effective waste management helps to reduce pollution, facilitate waste reduction and promote its reutilization. Converting crop residue from a waste product to a resource can have significant advantages for the environment, farmer income, and rural economies in Punjab, Haryana, and other regions where crop burning occurs. In addition, the effects of climate change on agriculture have significant social and economic consequences for human well-being. To derive better strategies in agriculture, it is essential to understand farmer's perceptions about agro-ecosystem changes. Keeping the above facts in mind, the present study on farm waste management practices and perceived changes in agro-ecosystem attributes was undertaken.

Materials and Methods

The present study was undertaken to explore the pattern of farm waste management and perceived agro ecosystem changes in the state of Haryana. The study was carried out during 2020-2022 in three agro ecological zones of Haryana state. One district from each agro-ecological zone was chosen followed by two blocks each in every district and two villages of selected blocks. Three districts namely, Kaithal, Hisar and Bhiwani were selected randomly from first, second, third agro ecological zones of Haryana, respectively. Two blocks namely Kaithal and Siwan blocks from Kaithal district, Hisar I and Hisar II from Hisar district and Bhiwani and Bhawanikhera blocks from Bhiwani district were selected. With the help of expert opinion and progressive farmers, 15 farmers from each village were selected. The data was collected using structured interview schedule with the sample size of 180 farmers with 60 farmers from each district. Data was analyzed by frequency and percentage.

Farm waste management

It was operationalized as the practices followed by the farmers to manage or dispose the waste products of their farm. It includes methods such as preparation of manure, discharging as waste, preparation of dung cake and bio fertilizers, production of biogas etc. It was ascertained by the schedule and gathered responses were analyzed by frequency and percentage.

Perceived changes in agro -ecosystem

It was operationalized as perceived changes in the attributes which reflect agro eco system changes such as soil fertility status, amount of rain fall etc. It was ascertained by the schedule and gathered responses using nominal level of measurement. Responses were analyzed by frequency and percentage.

Changes	Score
Increased/Improved	2
Decreased/Degraded	1
No change	0

Results and Discussion

Vast majority of the respondents (93.89%) were using cow dung as manure. About 41.67 per cent of them were using cow dung for dung cake preparation and 10.00 per cent of farmers utilized cow dung for preparing bio fertilizers. Only few farmers resorted to selling (1.67%) and biogas making (0.56%).

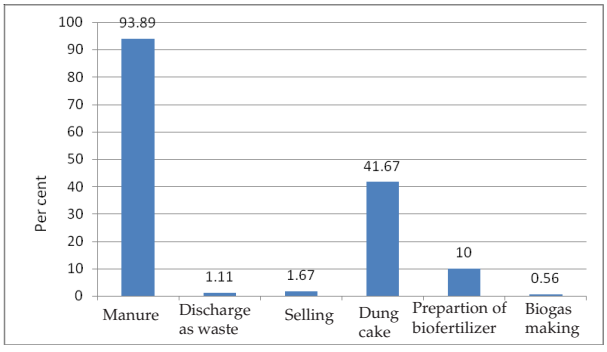

Fig. 1. Distribution of respondents according to cow dung waste management

High proportion of respondents (95.56%) had buried the carcasses. About 3.89 per cent of farmers had sold carcasses for leather making. Only 2.22 per cent of farmers prepared manure from crop residues (Table 1). The government plans to promote agriculture waste-based biomass to address the issue of crop residue burning and scientific agricultural waste disposal. Because compressed biogas is chemically comparable to commercially available CNG, it could be used as green automobile fuel.

Attributes reflecting perceived change in agro-ecosystem in the study area

Table 2 provides information on perception of respondents about changes in agro ecosystem. Considering the past ten years, cent percent of the farmers opined that their economic status has improved. Majority of the farmers (96.7%) opined that soil fertility status has degraded to a greater extent because of the indiscriminate use of fertilizers and pesticides. Majority of the farmers (96.1 %) reported that the crop yield had improved considerably during the past ten years. Cent per cent of the farmers perceived that ground water level had decreased than that of previous years. Most of the farmers (98.9%) perceived that water quality has decreased. Around 95 per cent of farmers perceived that fertilizer use has increased. A large number of farmers (97.8 %) opined that pesticide use has increased. Majority of the farmers (96.7%) revealed that upper and lower limit of temperature has increased due to climatic changes.

About 98.9 per cent pointed out that rainfall quantity has decreased over the past few years. There are varying opinions among the farmers regarding rainfall distribution; one group (60%) of farmers opined that rainfall distribution has decreased whereas the other group (40%) opined that rainfall distribution has increased. Around 98.3 per cent farmers opined that there was decrease in forest cover. About 98.9 per cent farmers reported that number of village ponds have decreased.

About 98 per cent farmers opined that wild animals and wild birds have decreased. A large number of farmers (99.40%) opined that air quality has decreased. Cent per cent farmers opined that usage of ITK practices has reduced.

India has attained food self-sufficiency due to the Green Revolution. In Haryana, this has resulted in

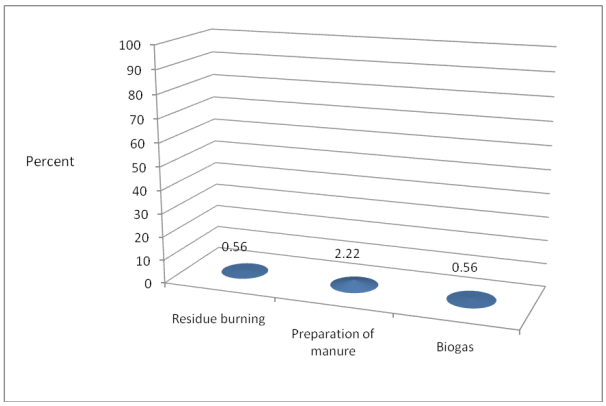

Fig. 2. Distribution of respondents according to crop residue waste management

Table 1. Distribution of respondents according to their waste management pattern

S. No.	Farm waste management	Kaithal f	Kaithal %	Hisar f	Hisar %	Bhiwani f	Bhiwani %	Total(n=180) f	Total(n=180) %
	Cow dung								
1.	Used as manure for agriculture	60.00	100.00	55.00	91.67	54.00	90.00	169.00	93.89
2.	Discharge as waste	0.00	0.00	2.00	3.33	0.00	0.00	2.00	1.11
3.	Direct sale to others	0.00	0.00	1.00	1.67	2.00	3.33	3.00	1.67
4.	Preparation of dung cake	26.00	43.33	28.00	46.67	21.00	35.00	75.00	41.67
5.	Preparation of bio fertilizers	15.00	25.00	2.00	3.33	1.00	1.67	18.00	10.00
6.	Bio gas plant	1.00	1.67	0.00	0.00	0.00	0.00	1.00	0.56
	Disposal of carcass								
1.	Burial	60.00	100.00	52.00	86.67	60.00	100.00	172.00	95.56
2.	Incineration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3.	Leather industry	0.00	0.00	7.00	11.67	0.00	0.00	7.00	3.89
	Crop residue management								
1.	Residue burning	1.00	1.67	0.00	0.00	0.00	0.00	1.00	0.56
2	Preparation of manure	2.00	3.33	0.00	0.00	2.00	3.33	4.00	2.22
3	Biogas	1.00	1.67	0.00	0.00	0.00	0.00	1.00	0.56

Table 2. Farmer's perception about different parameters of agro-ecosystem during last 10 years

S. No.	Attributes	Response categories (n=180) (Perception about agro ecosystem)		
		Increased/ Improved (%)	Decreased/ Degraded (%)	No change (%)
1	Economic status	100.00	0.00	0.00
2	Soil fertility status	3.30	96.70	0.00
3	Crop yield	96.10	3.90	0.00
4	Ground water level	0.00	100.00	0.00
5	Water quality	1.10	98.90	0.00
6	Fertilizer use	95.00	3.90	1.10
7	Pesticide use	97.80	1.70	0.60
8	Use of bio-fertilizer/pesticide	5.00	95.00	0.00
9	Burning of crop residues	96.70	3.30	0.00
11	Temperature (Min-Max)	96.70	3.30	0.00
12	Rainfall amount	0.60	98.90	0.60
13	Rainfall distribution	40.00	60.00	0.00
14	Forest cover	1.70	98.30	0.00
16	No. of village water ponds	1.10	98.90	0.00
17	No. of water harvesting structures	100.00	0.00	0.00
18	Wild animals	1.10	98.90	0.00
19	Wild birds	0.60	98.30	1.10
20	Air quality	0.00	99.40	0.60
21	Wild plants	0.00	87.20	12.80
22	ITK practices	0.00	100.00	0.00

persistent environmental degradation, particularly of soil, vegetation, and water resources. Organic matter levels in soil are declining, and the usage of chemical inputs is increasing. Newly introduced crop varieties have been reactive to inputs, but this has needed both higher fertilizer application and only irrigation, leading to nitrate and phosphate contamination of water and changes in the ground water table. Haryana has the greatest usage of agrochemicals in India. In the last 30 years, fertilizer consumption has risen from 3 to 130 kg/ha in the state (Nehra, 2019).

The integrated and sustainable monitoring and management of agriculture and forestry necessitates a focus on issues such as effective land and water utilisation, nutrient management, biomass productivity, re-enrichment of inherent fertility, moisture conservation, water harvesting, and ground water recharging. Understanding the environmental consequences of agricultural development helps to implement appropriate management actions to address problems that emerge as a result of it.

Conclusion

Study shows that there is a large scope for effective waste management techniques in Haryana, such as the preparation of dung cake, bio fertilizer, and biogas. Waste management techniques help to reduce pollution, facilitate waste reduction, and promote its reutilization. Study related to perception of agro-ecosystem changes shows that farmers have good awareness about agro-ecosystem changes. The study implies that these agro-ecosystem changes can reflect on farming system activities and yields. So it is advisable to adopt climate-smart approaches to cope with changing environmental conditions.

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