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Importance and Effectiveness of Waste Decomposer in Biodegradable and Agro-waste Management in Nepal

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Abstract

Background: Agro-waste management in Nepal remains a critical concern due to existing policy gaps and weak implementation mechanisms. Although Kathmandu Metropolitan City highlighted bio-waste management in its annual policy and program (2075/76), clear and effective management approaches for the management are still lacking. Furthermore, the limited understanding of how bio-decomposers are promoted and adopted by stakeholders across the value chain still remained a concern of research.

Objective: It aimed towards validifying the waste decomposers as a rapid solution for managing organic waste, while recognizing the risks associated with immature or incomplete compost, which can negatively affect soil health, plant growth, and ecosystem function

Method: A qualitative case study approach was employed, using stratified purposive sampling for the selection of respondents both sellers and consumers. Since Kathmandu serves as the major hub for such products, the peripheral area of Bhaktapur and Lalitpur was included to

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capture the dynamics of market nodes and sub-nodes, as well as the spillover effects within the compost value chain.

Results: The findings reveal gaps in awareness, quality assurance, and coordination among stakeholders involved in agro-waste management.

Conclusion: By linking empirical insights with existing policy frameworks, the study identifies key areas where policy intervention is needed, particularly in promoting effective use, ensuring product quality, and strengthening institutional mechanisms. The paper concludes that improved policy alignment, enhanced stakeholder engagement, and stronger institutional support are essential for advancing sustainable and efficient bio-waste management practices in Nepal.

Keywords: Waste, compost, policy, organic fertilizer

Introduction

The increasing trend of urbanization in city areas has led to an increase in the waste quantity and its management problem adding to the serious environmental concerns health and pollution and other problems such as problems with its reuse and decomposition. The health and environmental impacts of municipal solid waste (MSW) disposal vary based on the types of waste and the management methods employed (Eriksson et al., 2005). Waste is specifically classified as biodegradable and non -biodegradable. With rapid population growth and increasing consuming practices and usage of technology the increase of non-biodegradable waste in the upcoming future will be of major challenge. (Khajuria et.al 2008) The non-biodegradable waste requires more resources and effective management considering different aspects associated with it. The report by ADB 2013, highlights the present major problems faced by municipalities in Nepal time consuming legal procedure of decision making and approval for land acquisition of proposed landfill sites, lack of technical support, financial constraints, problems in area selection, and strong opposition from nearby communities.

The highly visible practice that citizens practice in Nepal for waste disposal is that they dispose of waste within their compound either by unscientific composting, open burning, or throwing the waste in the surrounding open space (Karak et al., 2012). In city areas, local government collection for waste management exists. However, the waste is still not categorized into different types by the citizens themselves. Though, some residents who undertake roof top gardening utilize the bio-degradable waste for the gardening purpose and kitchen garden purpose this is so minimal. The role of the government in managing the non-biodegradable inclusive of biodegradable waste will be large and challenging. However, if properly dealt the citizens can also play an important role in the waste management problem that can help to minimize the problem of waste. The biodegradable waste which tends to include kitchen waste and agri waste can be used as compost if decomposed at the household level or at farm level. In this context, it becomes necessary to promote effectively the awareness of the role of the waste decomposer for decomposition particularly the agrowaste and other biodegradable waste. The low cost associated with management of biodegradable waste if managed effectively can

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be highly beneficial to the economy as well. The issue of biodegradable waste management can be well managed if populations across city and rural areas are made aware of the process of decomposition using quality, proper methods and techniques for the waste decomposer.

The waste, mainly the kitchen waste, agriculture waste and other biodegradable waste are useful to make compost. Furthermore, if not disposed properly waste may cause several human health issues and environment issues and therefore it is important to adopt a very safe disposal method (Sud et al,2008) This agro waste compost contains sufficient amounts of plant nutrients inclusive of micro-elements which can be substituted in terms of chemical fertilizers which are needed to be imported from other countries since Nepal does not produce any kinds of fertilizers. People usually are unaware of how to effectively manage the agri waste, kitchen and other biodegradable waste in Nepal. The role of compost becomes vital for the biodegradable, particularly agro and kitchen waste for the production of fertilizer. The benefits associated with biodegradable kitchen and agro waste decomposition are high in terms of ecological and sustainability as well. (Mariangela et al.2011)

The waste decomposer which is a consortium of beneficial microorganisms and could help in the reduction of a huge volume of organic waste by converting them into compost (in-situ composting of crop residues and quick composting of bio wastes) quicker than the conventional composting methods. There are many studies and reports which indicate that the waste decomposers can play an important role to solve the ecological problems in the long term but equally it is a sustainable source for fertility inducers for the farmers both small holders and large holders. Since this type of compost contains the living organism it enhances the soil nutrients and minerals necessary for the development and growth of the plant. The conventional compost making practices used by the population is time consuming and output takes time to be reused. There are waste decomposer products available in the market which speeds up the process of decomposing in comparison to traditional methods.

In the context of Nepal the government has focused on promotion of organic farming and also the good agriculture practices. The compost from the degradable waste both kitchen and agro waste can be a good solution not only in terms of addressing the waste problems but also the agriculture sustainable and safe practices. Linking this to the main issue is of the type of compost that is available in the market in Nepal and understanding how this decomposer information is available to users. The availability of types of compost in the market thus becomes fundamental to understand the quality and effectiveness of such decomposers in waste management and producing good quality compost. The study is guided by key research questions that examine the types of waste decomposers available in the Nepalese market, the preferred compositions and characteristics of these decomposers among farmers and households, the level of user satisfaction regarding their effectiveness, their comparative efficiency in managing agro and biodegradable waste relative to conventional methods, and the existing policy and institutional gaps affecting their promotion, regulation, and adoption in Nepal.

Objective and Methodology

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The objective of this research paper is to examine the types of waste decomposers available in the local market of Nepal and to assess user satisfaction with these products. The study was conducted during the period of 2021–2022. A qualitative case study approach was employed, using stratified purposive sampling for the selection of respondents. Since Kathmandu serves as the major hub for such products, the peripheral area of Bhaktapur and Lalitpur was included to capture the dynamics of market nodes and sub-nodes, as well as the spillover effects within the compost value chain. In Nepal, Agrovet enterprises are the primary actors responsible for selling waste decomposers to farmers and local users. For this study, a total of 46 Agrovets from Province Three were selected, representing the districts of Kathmandu, Lalitpur, and Bhaktapur. These sites were chosen because waste management is a critical concern in urban areas of the valley, making them particularly relevant for analyzing the availability and adoption of waste decomposers. Furthermore, in Lalitpur and Bhaktapur, farming activities are still widely practiced, reflecting the rural–urban dynamics of these areas. Data were collected using a combination of closed- and open-ended checklists designed for the survey. Twenty six agrovets were surveyed in Kathmandu District, Eleven agrovets were surveyed in Bhaktapur District and ten Agrovets were surveyed in Lalitpur district. Total number of 48 farmers were interviewed to find their satisfaction rate towards the waste decomposer in terms of their effectiveness. The table presented below presents the data of agrovets in terms of location and name of the agrovet used for the survey purpose for this research study.

Table 1: Profile of the respondents in terms of name and address of the Agrovets surveyed

S.N.	Name of the surveyed Agro-vet of Bhaktapur	Address	S. N	Name of the surveyed Agro-vet of Kathmandu	Address	S. N	Name of the surveyed Agro-vet of Lalipur	Address
1	Nirajan Biu Bhandar	Purano Thimi	1	Agro Seed Bhandar	Mahakal	1	Everest Seed	Dhapakhel
2	Dadhikot Biu-Bijan Bhandar	Kamalbinayak	2	Mahakal Agro Seed Shop	Mahakal	2	Nesma Seed Centre	Lagankhel
3	Bhimsen Biu Bhandar	Thimi	3	Annupurna Beej Bhandar	Asan	3	Kathmandu Agro Concern	Lagankhel
4	Gagati Agro Concern	Gagati	4	Khanal Agro Trading	Mahakal	4	A.T.C. Sceintific Business Conservation Centre	Khumaltar
5	Gagati Agriculture Centre	Adarsha	5	Shree Khanal Agro Trade	Mahakal	5	A.T.C. Sceintific Business	Khumaltar

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							Conservation Centre	
6	Churna Ganesh Agro Centre	Byasi-2	6	Nepal Kristi Beej Bhandar	Balkhu , Tarkari Bajar	6	Sagar weed	Lagankhel
7	Machhindra Agro Flower	Bhaktapur	7	Agro Seed Bhandar	Mahakal	7	Kathmandu Agro Concern Pvt. Ltd.	Lagankhel
8	Bhaktapur Biu Bhandar	Bhaktapur	8	Agro Top Traders	Balkhu , Tarkari Bajar	8	Sakkal Agro & Seed Traders	Lagankhel
9	Aadhunik Krishi Sahakari Sanstha Ltd.	Barahisthan, Suryabinayak	9	Shree Durga Agro & Beej Bhandar	Balkhu Kumari club	9	National Agro Centre	Lagankhel
10	Bhaktapur Biu Bhandar	Suryabinayak	10	Shree Durga Agro & Beej Bhandar	Balkhu Kumari club	10	Joshi Agro Suppliers	Lagankhel
11	Bhaktapur Biu Bhandar	Suryabinayak	11	S.M. Agro-vet	Mahakal			
			12	S.K. Agro-vet	Mahakal			
			13	Khanal Agro Trade	Mahakal			
			14	Agro Seed Concern	Mahakal			
			15	S.N. Seeds Pvt. Ltd	Bhadrakali			
			16	Dakshinkali Agro-vet	Kalimati			
			17	Agro Top Traders	Kalimati			
			18	Kako Agro	Kalimati			
			19	New Seed Suppliers	Kalimati			
			20	Kalika Agro-vet	Kalimati			
			21	Everest Agro-vet	Kalimati			
			22	Nepal Bahuuddeshiya Agro-vet	Kalimati			
			23	Mount Everest Agro Seed Centre	Kalimati			

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			24	Himalayan Agro Enterprises	Kalimati			
			25	Grosma Beej Bhandar	Kalimati			
			26	Jay Guru Beej Bhandar	Kalimati			

Thus, 11 from Bhaktapur, 26 from Kathmandu and 10 agro vets from Lalitpur respectively around Kathmandu Valley were surveyed.

Findings and Results

The following table presents the findings in terms of the waste decomposers manufacturers , the usable period of waste decomposer, legal , form of the waste decomposer, price range and application process that were available in the market and sold by agro vet.

Table 2 : List of waste decomposers found in different agro-vets of Kathmandu Lalitpur and Bhaktapur.

S.N.	Waste decomposers	Manufacturer Company	Usable period	Legality	Form of product	Application rate	Price
1	Balaju EM	Balaju Biotech	1 year	Registered	Liquid	10-15 ml/liter of water	125/liter
2	Prarambha EM Plus	Prarambha Biotech	2 years	Registered	Liquid	10-15 ml/liter of water	105/liter
3	EM-1	EMCO Nepal	1 year	Registered	Liquid	15-20 ml/liter of water	110/liter
4	Sathi EM	Asian Seeds Chemical Trading	1 year	Registered	Liquid	10-15 ml/liter of water	150/liter
5	Speed Compost	Kan Biasos	1 year	Non-Registered	Liquid	10-15 ml/liter of water	120/liter
6	Sanjeevani EM	ASSP Centre		Registered	Liquid	10-15 ml/liter of water	150/liter
7	Jeevantu	Nepalese Natural Bio Product Pvt. Ltd	2 years	Registered	Liquid	10-15 ml/liter of water	120/liter
8	Jaivik I.P.Agro Liquid	Aayumi Himalayan Agro Ltd.	1 year	Registered	Liquid	10-15 ml/liter of water	120/liter
9	Active EM	Maitri Krishi Farming	1 year	Registered	Liquid	10-15 ml/liter of water	100/liter
10	Prarambha dhulo	Prarambha Biotech	2 years	Registered	Powder	100 gm/10 kg of waste	250/ kg

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11	EM	Global IME	1 year	Registered	Liquid	10-15 ml/litre of water	120/litre
12	Praramva EM Plus	Prarambha Biotech	2 years	Registered	Liquid	10-15 ml/litre of water	120/litre
13	Sanjeevani B	ASSP Centre	1 year	Registered	Liquid	10-15 ml/litre of water	120/litre

Availability, Types, Usability of Waste Decomposers in Market

During the survey, thirteen different types of waste decomposers were identified across 47 Agrovet enterprises. The majority of these products were manufactured in Nepal, with approximately 95% of the 46 Agrovets surveyed selling locally produced decomposers. Imported products from India included Saathi EM and Sanjeevani EM, while Nepalese producers and manufacturers comprised companies such as Prarambha Biotech, S.N. Seeds Chemical Trading Pvt. Ltd., Global IME, Asian Seeds Chemical Trading, Kan Biasos, Aayumi Himalayan Agro Ltd., ASSP Centre, Nepalese Natural Bioproduct Pvt. Ltd., Balaju, EMCO Nepal, Maitri Krishi Farming, and Agricultural Sanjeevani Seed Production. Most of the decomposers were available in liquid form packaged in plastic bottles, with only one Agrovet offering a powdered version. The liquid form was particularly notable because it could be multiplied for reuse, allowing users to extend its application for subsequent composting cycles. All products were registered with their respective manufacturers. The shelf life of these decomposers ranged between one and two years, though the majority were usable for only one year.

Selling frequency of Waste Decomposers

The survey results indicate that the quantity of waste decomposers sold by Agrovets ranged from 300 to 4,200 liters per year. The highest reported annual sale was 4,200 liters, while the average sales volume was approximately 1,000 liters. The peak sales period for waste decomposers was observed from January to mid-July.

Types of consumers

The survey found that the primary and major users and consumers of waste decomposers were farmers, including small-scale farmers, rooftop gardeners, and retail shopkeepers.

Response of consumers towards Waste Decomposer

A total of 48 consumers, including rooftop gardeners and farmers, were surveyed to assess their satisfaction with waste decomposers and their usage. Respondents were selected through a stratified purposive sampling approach, focusing on commercial consumers with prior experience using waste decomposers from Kathmandu, Lalitpur, and Bhaktapur, while ensuring variation in farming practices and representation of peri-urban and semi-rural contexts. The sample included 15 consumers from Bhaktapur, 16 from Lalitpur, and 17 from Kathmandu. The study revealed that commercial farmers in all three districts were actively using compost products, with most reporting usage over the past two years. Rooftop gardeners, who previously relied on vermicomposting, had shifted to waste decomposers due to challenges with vermicompost, particularly the death of earthworms that hindered the process and reduced

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effectiveness. Farmers also noted that crop residues and agricultural waste were often left undecomposed or burned in the past. After becoming aware of the decomposition process, they began using waste decomposers to manage agro-waste more effectively. In addition to composting, farmers reported using these products for pesticide purposes and seed treatment, highlighting their multifunctional role in agricultural practices.

Policies in Nepal

The waste management policy of year 1996 is the major policy document that provides the broader framework for the waste management for government and other actors in Nepal. The policy emphasizes on the effective management of the solid waste considering the roles of government institution at all level, public actors and private actors. The policy aims to minimize the environmental pollution and the adverse effect on the public health equally. The Solid Waste Management act enacted in 2011 is the guiding document that defines the explicit roles and responsibilities of the different institutions to manage the solid waste management in the country. After the new federal structure in Nepal the Local Government Operation Act, 2074 (2018) is the important act that enables and specifies the clear roles of the local government in managing the solid waste effectively. The principle of 3 R s is promoted, need to raise awareness is being iterated, public private partnership, collection process and management process is promoted, biodegradable waste and organic waste are also being highlighted and tariff and regulation are being informed by this act. The Government of Nepal is highly committed to efficiently managing the solid waste thereby controlling pollution and addressing its health impacts.

On agriculture side, the National Fertilizer Policy 2002 specifies and focuses particularly on the chemical fertilizer management and availability. This policy also focuses on the integrated crop nutrient, and the promotion of organic farming and biofertilizers will be upscaled though the major focus is on chemical fertilizers and inputs. The directives for incentives program on organic fertilizers was developed by the Department of Agriculture in year 2020 to promote the usage of organic fertilizers with the objective to maintain sustainable soil management and to seek the alternatives to chemical fertilizers. The directives mainly talks about the organic fertilizers (granular, powder and vermicomposting). The Agro-biodiversity promotion Policy 2006 was developed with the main objective to promote the application, usage and awareness of the organic fertilizers and improve the efficiency of the ecological agricultural production inputs using local natural resources. The agri-business promotion policy 2006 advocates for the agribusiness certification businesses mainly organic agriculture and organic products. Despite government of Nepal focuses on the organic fertilizer promotion, it is important to note here the waste from kitchens and agrowaste needs to be promoted equally as well, not only for waste management but also for organic farming. The gap remains in the policy in terms of agriculture where it does not speak about the waste particularly the agri waste and kitchen waste. The integration and synergy of two sectors in terms of policy for agriwaste remains which is necessary to address the SDG goals of 2, 11, 12, 13, 15 as well. However, at this point the local act of agriculture can speak on the waste of both agriculture and kitchen.

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Discussion

The study found that waste decomposers are easily available in the Nepalese market, with most products manufactured by national and local producers. Supply is consistent throughout the year, and there is no reported deficit and shortage of these products. The role of waste decomposers was observed to be highly effective, as their use not only accelerates the composting process compared to conventional methods but also significantly reduces organic waste by converting it into compost which is validated and evidenced by other studies. Biodegradable materials such as agricultural residues, animal waste, kitchen waste, and city waste, all rich in organic carbon and plant nutrients, can be efficiently processed using waste decomposers. While traditional composting is time-consuming, often taking several months, the use of liquid waste decomposers shortens the process to approximately 40 to 45 days. Both commercial farmers and small-scale rooftop gardeners were found to be using these products, with additional reported benefits including seed treatment and biopesticide applications.

The policy review further highlighted that the Government of Nepal has recently prioritized organic farming and the promotion of organic fertilizers. Waste management policies emphasize the handling of biodegradable waste, including agricultural and kitchen waste. However, the study noted a lack of synergy and integration between the agricultural and waste management sectors. Given Nepal's reliance on agriculture, effective management of agro-waste holds particular importance. Therefore, agricultural policies should place equal emphasis on kitchen food waste management to create a more holistic and integrated approach to sustainable waste utilization.

Conclusion and Policy recommendations

The study highlights that waste decomposers can serve as an effective solution to waste management while simultaneously functioning as valuable agricultural inputs. Since compost production using decomposers is relatively low-cost, there is strong potential to promote agri-entrepreneurship and upscale compost production, aligning with Nepal's agricultural policy goals of encouraging organic farming. The availability of organic products in the Nepalese market further supports this transition.

The findings recommend stronger synergy between the waste management and agricultural sectors to ensure effective handling of agro-waste and other biodegradable materials at all federal levels. A strategic framework and action plan for degradable products should be formulated promptly to integrate these sectors and maximize benefits, thereby addressing the growing waste management challenge. For large-scale production, the government could encourage public-private sector partnership participation and entrepreneurship in compost production. Additionally, surplus compost from small-scale producers could be integrated into the market through linkages with market actors, or the government could establish mechanisms to purchase a portion of this output, promoting its use as an alternative to chemical fertilizers.

Awareness and promotional campaigns through media and social platforms could further enhance adoption and encourage compost production at multiple levels. Such measures would

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not only strengthen waste management practices but also contribute to sustainable agriculture and the broader goal of organic farming in Nepal.

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