



Global
Green Growth
Institute

Promoting the Use of Organic Fertilizer Made from Fecal Sludge in Nepal

Summary of proposed intervention

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Version 1.0

1. Context and Rationale:

Nepal has made good progress in the sanitation sector, especially with the announcement of open defecation free (ODF) status in 2019, but the long-term viability of the sector remains an issue.¹ Due to current low tipping fees and high operational costs, the operation and maintenance of fecal sludge treatment plants is at present unattractive for the private sector without substantial subsidies.

Waste valorization as part of a complete service from treatment to reuse could increase the viability of sanitation services, yet it is still limited.

Treated fecal waste applied in the agriculture sector provides a lower cost and effective alternative to chemical fertilizers. Currently the agriculture sector of Nepal is declining. A report from Nepal Rastra Bank suggests that the contribution of agriculture to the Gross Domestic Product (GDP) has decreased by approximately 3% over a 10-year period.² The primary reason is the drop in agricultural productivity due to degraded soil fertility.^{3,4}

Fecal sludge compost could be a solution increasing agricultural production and improving the nutrient content of soils.⁵ It could also help to reduce pollution of soils and aquifers by chemical fertilizers. But its use is still largely ignored, and the private sector has given little interest to date in producing and selling organic fertilizer made of fecal sludge. The private sector interest could play critical role in sustaining the faecal sludge management. According to the private sector three major issues (as highlighted below) need to be addressed to promote fecal sludge as an organic fertilizer in commercial farming.

1. Social acceptance of the agriculture produces made of using fecal sludge as an organic fertilizer,
2. Continuous supply of such fertilizer. The requirement of organic fertilizer per hectare is approximately 15 tons.⁶
3. Clear policies on the use of fecal sludge as organic fertilizer need to be endorsed by the government. Policy could include prospective definition of organic fertilizer made of fecal sludge to the safe application procedure and acceptable nutrient contents of such fertilizer.

Regarding the framework, the Government of Nepal (GoN) is currently reviewing the organic compost regulations. As per the new regulation, the standard requirement of nutrient contents (nitrogen, potassium, phosphorous, and heavy

¹ Budhathoki, C. B. (2019). Water Supply, Sanitation and Hygiene Situation in Nepal: A Review. Kathmandu: Journal of Health Promotion <https://www.nepjol.info/index.php/jhp/article/view/25513/21323>

² Central Bureau of Statistics (CBS), Nepal. (2020). Annual Growth Rate of GDP by Economic Activities. Kathmandu: CBS . <https://cbs.gov.np/annual-growth-rate-of-gdp-by-economic-activities-table/>

³ SASEC. (2021, 04 12). Improving Farm Productivity. Retrieved from Improving Farm Productivity: <http://www.sasecrtn.edu.np/index.php/en/resources/usefulinfo/how-to-grow-harvest-food-cash-crops/improving-farm-productivity>

⁴ As per the report of department of custom, Nepal imported approximately 3,300 tons of organic fertilizer (made of vegetable and animal waste) at an average import price of 84/kg in FY 2075/76.

<https://archive.customs.gov.np/en/monthlystatistics.html>

⁵ According to expert opinion from Nepal Agriculture Research Center (NARC), co-composting is required to maintain the quality of fertilizer.

⁶ According to the private entrepreneur currently working in commercial and noncommercial agriculture and officials of Department of Agriculture (DoA) and Nepal Agriculture Research Center (NARC), 15 tons of organic fertiliser is required per hectare.

metal components) will be revised. However, even with the increasing effort of the government, the demand of organic fertilizer made of fecal sludge will likely remain subdued due to consumer acceptance issues.⁷

2. Intervention and Summary of Cost Benefit Analysis

Consultations with the private sector show that prospective entrepreneurs would be willing to invest in fecal sludge treatment businesses with compost production if there is demand for the byproducts. Further exploration with the private sector, officials from Department of Agriculture (DoA) and National Agriculture Research Center (NARC) concluded that an introduction of a flat subsidy of Nepali Rupee (NPR) 10 per kg (on the market price) could be useful to stimulate the demand of organic fertilizer made of fecal sludge. This proposal suggests a flat subsidy of NPR 10 per kg be provided to all categories of organic fertilizers.

Even if the flat subsidy of NPR 10 per kg would apply to all organic fertilizer categories, farmers could be incentivized to choose organic fertilizer made of fecal sludge because of its low market price (thereby increasing the demand of such fertilizer). To compare, the price of organic compost from vermicompost starts at NPR 30 per kg, while the maximum market price of organic fertilizer from fecal sludge is NPR 18 per kg.⁸

A cost-benefit analysis (CBA) was prepared for one agricultural product, namely the Srijana tomato variety that is seen as a cash crop with high growth potential by experts in Nepal. The following assumptions were used in the analysis:

1. A flat subsidy of NPR 10 per kg is provided to the organic fertilizer in general.
2. Tomato (Srijana variety) tomato as a produce.
3. The tomato is cultivated in the tunnel⁹.
4. Farmers are well informed about the benefits of fertilizer produced from fecal sludge and will choose the same for their cultivation because of its cost advantage and (large) quantity required per hectare¹⁰.
5. Surplus production of tomato will be exported with an export tax of NPR 1 per kg.
6. Consumers are well informed and will likely choose the cheaper (organic) produce.
7. Market price of organic fertilizer made of fecal sludge is NPR 18 per kg.
8. Continuous supply of fecal sludge exists; and
9. Promotional campaigns and program to educate the farmers are in place.

Following are the key components of the CBA.

⁷ As per the official from NARC, Government can be the initial purchaser of such fertilizer as it will help to increase the confidence among consumer as well.

⁸ As per the DoA and NARC officials, market cost of organic fertilizer made of fecal sludge should not exceed NPR 15 per kg.

⁹ Tomato cultivation done by trenching tunnel is called tunnel cultivation. Usually 5meter*20meter tunnel is used for the cultivation of tomato. http://www.doanepal.gov.np/downloadfile/crop%20book%202073%20setup_1613545895.pdf

¹⁰ Farmers need to use 15 tons of the organic fertilizer per hectare so they will choose the cheapest available alternative (which is organic fertilizer made of fecal sludge) assuming that the quality of all available organic fertilizer is same.

I. Benefit of the Proposed Interventions Compared to Business as Usual

a. Economic Benefits

Economic benefit includes benefit to the government and actors involved across the value chain of tomato production in Nepal. Economic benefits to the government would be from the export tax revenue from the export of surplus tomatoes and reduction in subsidy for the chemical fertilizer that is currently in place. Likewise, the use of organic fertilizer made of fecal sludge and simultaneous introduction of subsidy, will increase the volume of production while reducing the cost of production. This will increase the income of the economic actors including farmers, middle agents, and consumers (Table 1).

Table 1: Benefits from the intervention

Part A: Benefits associated across value chain of tomato		Part B: Benefit to the government	
		Potential tax revenue to the government from export of tomato	
Savings to the farmers due to reduction in cost of production (with the use of organic fertilizer made of fecal sludge) and introduction of subsidy	NPR 295.68 million	Tax benefit from the export of the tomato (to India)	NPR 192 million
Increment in income of farmer due to high sale volumes	NPR 1120.35 million	Savings from not having to import chemical fertilizer	NPR 111.57 million
Increment in income of other stakeholders (like middlemen, wholesaler and retailer) due to high sales volume	NPR 69.66 million		
Savings to consumer due to reduction in cost of tomato	NPR 1580.41 million		
Total economic benefit: 3,369.67 million			

b. Health Improvements

There are three kinds of health-related benefits resulting from fecal sludge management considered in the CBA including reduction in diarrheal cases, days lost from work avoided, and savings due to reduction in emission of different types of harmful chemicals.

In the case of diarrheal incidences studies indicate that diarrheal cases can be reduced by 60% with the proper management of sanitation.¹¹ Likewise, as the diarrheal patients need to spend NPR 569 per episode to cure the diarrhea, this is a considerable burden for some households.¹² Furthermore, good health will reduce absenteeism. As estimated by WHO, a diarrheal patient will need to take 2 days of leave each time.¹³ Finally, the treatment of fecal sludge will reduce the emission of harmful gases like carbon dioxide, methane, carbon monoxide, nitric oxide, sulfur dioxide, hydrocarbon, hydrogen chloride, hydrogen sulfide, and hydrogen fluoride. The release of such gases has its own cost to human health. As per the calculation the cost to human health of per tons of dry sludge is NPR 1000.¹⁴

¹¹ National Library of Medicine. (2010, 08 10). Pubmed. Retrieved from Pubmed.gov: <https://pubmed.ncbi.nlm.nih.gov/20620115/>

¹² Marina Vaidya Shrestha, S. R. (2019). Household Expenditure on Diarrhea Treatment among Under Five Children in Godawari Municipality of Nepal. *JNHRC*.
[https://www.jnhrc.com.np/index.php/jnhrc/article/view/2181#:~:text=The%20average%20out%2Dof%2Dpocket,NRs%20114.15%20\(US%20%241.01\)w](https://www.jnhrc.com.np/index.php/jnhrc/article/view/2181#:~:text=The%20average%20out%2Dof%2Dpocket,NRs%20114.15%20(US%20%241.01)w)

¹³ WHO. (2004). *Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Level*. WHO.
https://www.who.int/water_sanitation_health/publications/wash-improvements-costs-benefits/en/

¹⁴ RPA, Milieu Ltd and WRc for the European Commission. (2008). *Environmental, economic and social impacts of the use of sewage sludge on land*. https://ec.europa.eu/environment/archives/waste/sludge/pdf/part_ii_report.pdf.

Table 2: Environment and health benefits from the proposed intervention

Benefits	
Savings from reduction in diarrheal cases	NPR 345.84 million
Income gained due to days lost in work avoided	NPR 891.44 million
Savings from reduction in emission of chemical gases	NPR 73.18 million
Total environment and health benefit	NPR 1310.46 million

c. Achievement of target to increase the nutrient content of soil to 5%

As the government has set a target to increase the nutrient content of the soil from the current level of 2% to 5% by 2030, the annual requirement of organic fertilizer is 60 million tons.¹⁵ In this context, the use of fecal sludge seems to be an ideal option to produce the mandated quantity of organic fertilizer.

d. Mobilization of private investment to take up the service provision of fecal sludge management

With the presence of a lucrative demand, private investors can have a greater interest in producing organic fertilizer made from fecal sludge as part of a complete treatment and reuse installation. As a result, the private sector could provide services in operating and managing fecal sludge treatment sludge with little or no subsidies from the government.

e. Increase social acceptance of the Agri-products using fecal sludge as a compost

The norms to be established with the government and a decreasing price of the organic produces (as shown in the above case study) will ultimately encourage consumers to start accepting the products made of using fecal sludge as a compost.

II. Cost to the government if the proposed interventions is implemented

The cost is calculated considering a flat subsidy of NPR 10 per kg to the farmers cultivating the (*Srijana variety*) tomato. The total fertilizer required is 15 tons per hectare, as per the agriculture expert and government officials. With this data, the total subsidy required is computed to be NPR 1,200 million.

III. Calculation of benefit to cost ratio:

Based on the above economic and environmental analysis, the benefit-to-cost ratio has been calculated to be 4.41 (Table 3)

Table 3: Computation of benefit-to-cost ratio

Total cost to the government	NPR 1200 million
Total benefit to the government	NPR 4680.13 million (economic plus environment and health)
Benefit-to-Cost Ratio: 3.90	

¹⁵ The information was provided by the official of DoA.

3. Next Steps

Joint consultations with experts from the agriculture sector and the sanitation sector in which the CBA and the proposal will be presented for their inputs. The consultations will also focus on the discussion on the draft implementation plan to get their inputs for their refinement.

The proposal will subsequently be submitted formally to the Ministry of Water Supply (MoWS) with following documentations:

- a. The report on cost benefit assessment.
- b. Excel sheet with detail assessment.
- c. The proposed intervention implementation plan with communication strategy.

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