Economics of Production and Marketing of Vermicompost in Chitwan, Nepal

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Abstract

The information on production and marketing of vermicompost was collected from all the 32 vermicompost producers within the study area and 32 adjacent non-producers were selected through snowball sampling making the total respondents' size of 64. The non-producers were farmers with few of them vermicompost users. The total cost of production was Rs. 15.68 per kg compost and was Rs. 0.40 per earthworm. The net profit was Rs. 9.32 per kg. Undiscounted benefit cost ratio for vermicompost considering total variable cost and gross cost was 4.30 and 2.55 respectively. Financial viability of average size vermicomposting firm for the economic life of five years was found feasible with respect to Net Present Value (NPV) Rs. 73997.92, discounted Benefit Cost Ratio (B: C) 1.55, Internal Rate of Return (IRR) 65 % and Payback period 1.72 years. Direct selling of the vermicompost by producers to the local consumers was observed as the strongest marketing channel. However there were few instances of marketing through cooperatives and traders as well. Producers' share for vermicompost marketing through cooperatives was higher i.e. 88 % as compared to marketing through traders i.e. 71 %. The study revealed that vermicompost production is a highly feasible enterprise from which the producer can enjoy economic benefits.

Keywords: Vermicompost economics, Vermicompost production, Vermicompost marketing.

INTRODUCTION

Vermicomposting is a simple technology for converting half decomposed organic wastes into organic compost with the help of earthworms. On the one hand organic farming is gaining its popularity and on the other hand organic waste management is becoming a burning issue. The best option to merge these is through vermicomposting. According to Practical Action Nepal (2008) organic wastes account for 50 % to 70 % of total solid wastes which can be managed through vermicomposting to produce organic manure. Vermicomposting is an effective method of converting "garbage to gold" (Vermi Co, 2001; Tara Crescent, 2003). Different species of earthworms are used in vermicomposting such as Eisenia fetida, Eisenia anderi, Lumbricus rebellus, Epiges, Endoges etc. In Nepal, Eisenia fetida is the commonly used earthworm species for vermicomposting.

Vermicompost is one of the best alternatives among organic manures as a soil amendment input. Vermicompost production is a viable option to increase farm income but inadequate research and problem analysis activities have been carried out to date in the production, processing and marketing aspects of vermicompost. At present, vermicompost marketing is unorganized with ill-defined marketing channels. Though the sale of this organic input to the fellow farmers and between some organizations is occasionally evident, its marketing on a commercial scale is rare. There are no adequate policy guidelines regarding vermicompost production, processing and marketing from the perspective of commercialization. Both producers and
consumers will benefit through better identification of marketing system with low marketing margin and higher producer's share. Thus, identification of appropriate marketing channels with lower marketing margin and higher producer's share would let the producers obtain higher benefits from vermicompost production. Hence, this research was carried out to meet following objective:

- To study the economics of production and marketing of vermicompost in Chitwan, Nepal.
- To assess financial viability of average size vermicomposting firm.
- To determine the appropriate marketing channel of vermicompost.

MATERIALS AND METHODS

An interview schedule was prepared for collecting primary information from both vermicompost producers and adjacent non producers. Census survey was done that included all the vermicompost producers within the district. Altogether, there were 32 vermicompost producers within the district at the time of survey. Similarly 32 adjacent non producers were selected by snow ball sampling. Snow ball sampling is non probability sampling technique in which a respondent gives information about other respondents in his or contact. Thus, the total respondent size was 64. The primary and secondary information obtained from the survey was coded, tabulated and analyzed by using Statistical Package for Social Science (SPSS 16.0), Stata 12 and Microsoft Excel.

The total cost of production was calculated by adding total variable cost and total fixed cost. Total variable cost included cost of organic wastes, cost of water, labor cost, packaging cost, transportation cost and maintenance cost. Likewise, total fixed cost included interest on capital and depreciation cost. Tax payment was not observed among the producers in the study area. So it was not included as fixed cost item.

According to Dillon and Hardaker (1993) gross margin is the difference between gross return and variable cost incurred. Gross margin was calculated as:

\[
\text{Gross margin (Rs.)} = \text{Gross return (Rs.)} - \text{Total variable cost (Rs.)}
\]

Where,

- Gross return = Price (Rs.) × Total quantity produced (Kg)
- Total variable cost = Summation of cost incurred in all the variable items

Similarly, net profit was calculated as:

\[
\text{Net profit (Rs.)} = \text{Gross return (Rs.)} - \text{Gross cost (Rs.)}
\]

Where,

- Gross cost = Total fixed cost (Rs.) + Total variable cost (Rs.)

The benefit cost analysis was carried out by using following formulas:

\[
\text{Benefit cost ratio (B: C)} = \frac{\text{Gross return (Rs.)}}{\text{Total variable cost (Rs.)}}
\]

Benefit cost ratio (B: C) = Gross return (Rs.) / Gross cost (Rs.)

To determine the financial viability net present value, discounted benefit cost ratio, internal rate of return and payback period were calculated for the economic life of five years. For calculating present value of benefit and cost the discount rate of 12 % was considered as it is the interest rate for agricultural loan by Nepalese government.

Marketing margin is the difference between retailer's price and farm gate price which was calculated as:

\[
\text{Marketing margin = Retailer price (P)} - \text{Farm gate price (P)}
\]

Similarly, producer's share is the ratio of price received by producer to price paid by consumer expressed in percentage which was calculated using the formula:

\[
\text{Producer's share = (P/F) × 100%}
\]

Where,

- \( P \) = Price received by producer or farm gate price (Rs.)
- \( F \) = Price received by retailer or price paid by consumer (Rs.)

The marketing efficiency was measured empirically with the help of Acharya's Modified Approach for Marketing Efficiency (Acharya and Agrawal, 1999).

\[
\text{MME = FP/ (MC + MM)}
\]

Where, \( MME \) = Modified measure of marketing efficiency

\[
\text{FP = Price received by the producer (Rs.)}
\]

\[
\text{MC = Marketing cost (Rs.)}
\]

\[
\text{MM = Marketing margin (Rs.)}
\]

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The average age of respondents for producers was about 45 years and for non-producers it was about 48 years. In case of producers, 50 % of the respondents were male and 50 % of them were female whereas for non-producers 75 % of them were male and 25 % were female. Most of the respondents had their qualification above School Leaving Certificate (SLC) in both cases. The average years of schooling of producers were slightly more i.e. 8 years than that of non-producers i.e. 7.81 years. Most of the producers were Brahmin (78 %) followed by Chhetri (19 %) and Indigenous/Ethnic (3 %).

Similarly, most of the non-producers were also Brahmin (75 %) followed by Indigenous/Ethnic (19 %). In both cases, most of them followed Hinduism followed by Buddhism. About 88 % of the producers and 75 % of the non-producers had agriculture as their primary occupation. Out of total respondents, about 69 % of the producers and only about 6 % of the non-producers had received training on vermicompost production. The study revealed that economically active members were about 71 % in case of producers and 80 % in case of non-producers which was higher than district average of 61.91 % (DDC, 2013) in both cases. The average land
holding of producers was more than that of non-producers which was 0.48 ha in case of producers and 0.45 ha in case of non-producers. The average livestock standard unit for producers was 13.42 whereas average livestock standard unit for non-producers was 11.02.

**Economics of vermicompost production and marketing**

**Cost of vermicompost production**

The total cost of vermicompost production was derived by adding variable cost and fixed cost. Most of the vermicompost producers used the variable inputs available at home for vermicompost production. The average variable cost per kg compost was about Rs. 11 and per earthworm was Rs. 0.25. Likewise, the average fixed cost per kg compost was about Rs. 5 and per earthworm was Rs. 0.15. The variable cost and fixed cost comprised about 68 % and 32 % of the total cost of production respectively (Table 1).

**Gross margin and Net profit**

Gross margin shows the clear picture on whether or not the variable cost incurred in the production process is covered by the value of the product. While calculating net profit both variable and fixed costs are considered. The gross margin of vermicompost was around 21 thousand rupees and the net profit was around 16 thousand rupees (Table 2).

**Undiscounted benefit cost ratio**

Any enterprise is considered feasible when benefit cost ratio is greater than 1. The undiscounted benefit cost ratio for vermicompost was calculated by two ways: one by considering total variable cost (B:C₁) and next by considering gross cost (B:C₂). The study revealed that B:C₁ was 4.30 and B:C₂ was 2.55 (Table 3). This indicates that vermicompost production is feasible enterprise.

The undiscounted benefit cost ratio considering total variable cost appeared higher as compared to the benefit cost ratio obtained by Reddy et al., (2009) in a study carried out on economics of vermicompost production in Coorg district of Southern Karnataka, India which was 1.78 and 1.52 for the vat method and heap method, respectively.

**Financial viability of vermicompost producing firm with average earthworms in the study area**

From the study it was observed that the average number of earthworm reared was about 98 thousand. Thus financial viability for vermicompost production was determined for a firm with average earthworm numbers for economic life of five years. Cash inflow, outflow and incremental net benefit with their present values for the economic life of five years are shown in Table 4.

The variable costs and the benefit were kept constant for each year. The net present value calculated at 12 % discount rate was around Rs. 74000. Similarly, discounted benefit cost ratio was 1.55 which means that every single rupee of initial investment yields a net benefit of Rs. 1.55 from vermicompost producing firm with average number of earthworm. The internal rate of return was 65 % which was very high as compared to required rate of return i.e. 12 %. Higher internal rate of return was due to the use of home available organic wastes and other resources; due to short duration of the enterprise to produce final output i.e. vermicompost gets ready within 40 to 45 days (Bajracharya and Lakhe, 2013) and due to low initial investment. The payback period appeared to be 1.72 years (Table 5). The values of these all parameters indicated that vermicompost production is financially viable. But for vermicompost production at commercial scale all these indicators should be studied accordingly.

Shivakumara (2008) in his study about production and marketing of vermicompost in Karnataka, India have done the financial feasibility analysis for vermicompost production units which revealed that the net present value (NPV) was around Rs. 99800 at 12 % discount rate. The benefit cost ratio was 3.44 and the internal rate of return (IRR) was 38 %. Furthermore, payback period (PBP) for vermicompost production appeared to be 1.71 years. The net present value and benefit cost ratio for this study appeared lower as compared to findings made by Shivakumara (2008) but the internal rate of return appeared much higher for this study. The payback period was nearly equal for both the studies.

**Marketing channels and marketed volume of vermicompost and earthworm**

Marketing channel refers to the route through which a commodity passes from the site of production to the site of consumption. Specialized market for vermicompost was not observed in the study area. The major portion of vermicompost i.e. 85 % was found to be marketed directly from producers to the local consumers. The local consumers were farmers, researchers, government agencies and NGO/INGOs. Maximum volume was marketed to the farmers i.e. 70%. Some consumers were found to buy vermicompost from cooperatives. Out of total producers in the study area, only a single producer was found to sell some portion of produced vermicompost to the trader from another district. No vermicompost trader was found to be involved in the process of marketing within the district.
produced vermicompost was consumed within the district and only a very small amount was found to be disposed to Kathmandu valley market and other districts.

Marketing Cost, Marketing Margin, Producer's Share and Marketing Efficiency

Marketing margin and producer's share are the major components that determine marketing efficiency. Lower marketing margin and higher producer's share indicates efficient marketing. Three marketing channels were observed for vermicompost marketing in the study area. They were:

Producer-seller (Rs.1/kg) → Consumers (Channel – I)
Producers (Re.1/kg) → Cooperatives (Rs.1/kg) → Consumers (Channel – II)
Producer (Rs.0.5/kg) → Trader (Rs.2.5/kg) → Consumers

Table 1. Cost of vermicompost production (Rs.) in the study area

<table>
<thead>
<tr>
<th>Cost items</th>
<th>Per kg compost</th>
<th></th>
<th></th>
<th>Per earthworm</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Average</td>
<td>Min</td>
<td>Max</td>
<td>Average</td>
<td>Min</td>
<td>Max</td>
</tr>
<tr>
<td>Variable cost</td>
<td>10.73</td>
<td>(68.43)</td>
<td>1.94</td>
<td>27.66</td>
<td>0.25</td>
<td>(62.50)</td>
</tr>
<tr>
<td>Fixed cost</td>
<td>4.95</td>
<td>(31.57)</td>
<td>0.08</td>
<td>16.01</td>
<td>0.15</td>
<td>(37.50)</td>
</tr>
<tr>
<td>Total</td>
<td>15.68</td>
<td>(100)</td>
<td>2.02</td>
<td>43.67</td>
<td>0.40</td>
<td>(100)</td>
</tr>
</tbody>
</table>

Figures in parentheses indicate percentage of cost
Source: Field Survey, 2013

Table 2. Gross margin and net profit analysis of vermicompost production in the study area

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Gross Return (Rs.)</th>
<th>Total Variable Cost (Rs.)</th>
<th>Gross Margin (Rs.)</th>
<th>Total Fixed Cost (Rs.)</th>
<th>Net Profit (Rs.)</th>
<th>Net Profit (Rs/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vermicompost</td>
<td>26816.41</td>
<td>6246.63</td>
<td>20569.78</td>
<td>4290.23</td>
<td>16279.55</td>
<td>9.32</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2013

Table 3. Undiscounted benefit cost ratio of vermicompost production in the study area

<table>
<thead>
<tr>
<th>Commodity</th>
<th>Gross return (Rs.)</th>
<th>Total variable cost (Rs.)</th>
<th>Gross cost (Rs.)</th>
<th>B:C</th>
<th>B:C2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vermicompost</td>
<td>26816.41</td>
<td>6246.63</td>
<td>10536.86</td>
<td>4.30</td>
<td>2.55</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2013

Table 4. Cash flows in vermicompost production

<table>
<thead>
<tr>
<th>Year</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost (Rs.)</td>
<td>47078.43</td>
<td>24135.86</td>
<td>24135.86</td>
<td>24135.86</td>
<td>24135.86</td>
<td>24135.86</td>
<td>-</td>
</tr>
<tr>
<td>Benefit (Rs.)</td>
<td>0</td>
<td>57675.02</td>
<td>57675.02</td>
<td>57675.02</td>
<td>57675.02</td>
<td>57675.02</td>
<td>-</td>
</tr>
<tr>
<td>INB (Rs.)</td>
<td>-47078.43</td>
<td>33539.15</td>
<td>33539.15</td>
<td>33539.15</td>
<td>33539.15</td>
<td>33539.15</td>
<td>-</td>
</tr>
<tr>
<td>Discount factor (%)</td>
<td>1</td>
<td>0.89</td>
<td>0.80</td>
<td>0.71</td>
<td>0.64</td>
<td>0.57</td>
<td>-</td>
</tr>
<tr>
<td>PV of benefit (Rs.)</td>
<td>0</td>
<td>51330.77</td>
<td>46140.01</td>
<td>40949.26</td>
<td>36912.01</td>
<td>32874.76</td>
<td>208206.8</td>
</tr>
<tr>
<td>PV of cost (Rs.)</td>
<td>47078.43</td>
<td>21480.92</td>
<td>19308.69</td>
<td>17136.46</td>
<td>15446.95</td>
<td>13757.44</td>
<td>134208.9</td>
</tr>
<tr>
<td>PV of INB (Rs.)</td>
<td>-47078.43</td>
<td>29849.85</td>
<td>26831.32</td>
<td>23812.8</td>
<td>21465.06</td>
<td>19117.32</td>
<td>73997.92</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2013

INB = Incremental Net Benefit
PV = Present Value

Table 5. Financial viability of vermicompost production unit with average earthworm number in the study area

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Particulars</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Net present value (Rs.) (@ 12 % discount rate)</td>
<td>73997.92</td>
</tr>
<tr>
<td>2.</td>
<td>Benefit cost ratio (@ 12 % discount rate)</td>
<td>1.55</td>
</tr>
<tr>
<td>3.</td>
<td>Internal rate of return (%)</td>
<td>65</td>
</tr>
<tr>
<td>4.</td>
<td>Payback period (Yrs.)</td>
<td>1.72</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2013
Figure 1. Marketing channels and marketing volume of vermicompost within the study area

Table 6. Marketing cost, marketing margin, producer’s share and marketing efficiency for vermicompost

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Marketing channels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Price received by producer (Rs/kg)</td>
<td>25</td>
</tr>
<tr>
<td>Total marketing costs (Rs/kg)</td>
<td>1.5</td>
</tr>
<tr>
<td>Retailer’s price (Rs/kg)</td>
<td>-</td>
</tr>
<tr>
<td>Total marketing margins (Rs/kg)</td>
<td>-</td>
</tr>
<tr>
<td>Producer's share (%)</td>
<td>-</td>
</tr>
<tr>
<td>Index of marketing efficiency (MME)</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Field Survey, 2013

CONCLUSIONS

The study on economics of vermicompost production and marketing indicated that it is profitable enterprise with better net profits and benefit cost ratio. Direct marketing of vermicompost from producer to consumer was found to be the strongest marketing channel however marketing through cooperatives and trader was also found in few instances. Marketing through cooperatives was found to be more efficient as compared to marketing through trader because both producers’ share and marketing efficiency index was higher for former as compared to later. From the financial viability study we can conclude that vermicompost production is feasible enterprise. Appropriate supply chain of organic waste and cow dung can attract people to produce vermicompost on a large scale. At present context demand for vermicompost is increasing and government is also giving subsidy which is appreciative. Based on the findings of the study, the following suggestions are made:

- Cooperative marketing should be promoted.
- There should be provision for better market information.
• Organized marketing channel should be established.

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