SOLID WASTE MANAGEMENT

A Case Study of Kopu Village

TOURISM DEVELOPMENT ENDEAVORS -2016

PROJECT ADVISOR: NIRAJ TAMRAKAR
PROJECT COORDINATOR: SAGARIKA BHATTA
INTERNS: AASHUTOSH BHANDARI, BIPIN KARKI, MEGHA BAJAJ, RUBINA KARKI, SAMIDHA SHAKYA, SANJAY KURMI
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Abstract

This paper deals with the practices applied for solid waste management in Kopu Village. In addition, farming system is also discussed and knowledge of community people regarding effective management of solid wastes practices. Data and information were collected through survey by preparing questionnaires. During interaction with local community members we found most of the people followed traditional method of farming and the bio-degradable wastes generated through it were utilized by making compost manure following traditional methods. Modern technologies were not quite developed and there wasn’t direct involvement of any government and private organization in implementing 3R approach. This paper shows the methods/approaches applied for solid waste management in Kopu Village, Kathmandu, Nepal.
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Abbreviations

**UNEP**  United Nations Development Program

**SWM**  Solid Waste Management

**3R**  Reduce, Reuse, Recycle

**MSW**  Municipal Solid Waste

**ADB**  Asian development Bank
1. Introduction
The rapid increase in the population and economic development has led to severe environmental degradation that environmental resources base upon which sustainable developments depends. With growing population, urbanization and demand for consumer goods, both quantity and quality of urban solid waste has changed significantly. Urban solid waste is one of the major contributor to global warming. Solid waste collection and disposal are an important part of environmental hygiene and need to be integrated with environmental planning and policies. Solid waste management is the proper management of unwanted solid wastes generated from municipality, households, hospitals and industries. The wastes generated can be degradable as well as non-degradable wastes. The best way of managing solid waste is by following 3R (Reduce, Reuse and Recycle) principal. Reducing the production of waste is the best way of solid waste management. Reusing the waste to increase its life cycle is second best way of managing solid waste. For reuse creative handmade products can be made from waste papers, plastics, and clothes and marketed. For recycling of degradable solid waste, composting can be done (Global Development Research Centre).

Kopu village is located 23 km south of Kathmandu valley and lies in Dakshinkali Municipality. It is bordered by Lalitpur in the east and Makwanpur district in the south. Pharping is a historical city with rich culture, also a tourist destination. Buddhist Monasteries and Dakshinkali Temple are major religious destinations. The spatial extend of the Dakshinkali municipality is between Latitude: 27°36'8.03" and Longitude: 85°17'4.64". Farming and Cattle rearing as a major source of livelihood, the village is backward because of less literacy rate and less development works. With increase in population, the solid waste has also been increased and which is to be monitored and controlled in time for the proper conservation and maintenance of the environment and for a healthy sustainable living.
1.1 Objective
- To realize and analyze solid waste management policy and practices in Nepal

Intermediate Objective
- To enhance capacity building in the young people and community beneficiaries of the project about solid waste management focused on in creative recycling methods and recycling potentialities.
- To disseminate the knowledge via different media and medium.

1.2 Outcome
- To develop it as part of non-formal education to youth and community.
- To create cooperation among different associations and partner organizations that work with young people in creative recycling methods and recycling potentialities.
1.3 Limitations:
1) Limited time period.
2) The location site/target area is farther from the organization.
3) Communication gap.
4) Different level of 'priority'.
5) Problems of solid waste management could not be effectively addressed.

1.4 Significance:
1) Capacity-building, youth empowerment.
2) Practical learning experience for the interns.
3) Directional flow of the waste materials to reusable items.
4) Awareness about clean energy along with the concept of re-use, reduce and recycle.

2. Literature Review

Introduction
The Kopu village has potentials of making model village by leading whole area in proper solid waste management and promoting organic farming. The literature review provides some glimpse of previous research, their findings, scope and some input which we will be using and upgrading in our implementation. The following research paper and articles have been reviewed for study. Stumpy soil fertility is caused by continue crop and using chemical fertilizer. The organic amendments able to boost soil fertility. The reason of this research was to investigate the effect of organic amendments in comparison with chemical fertilizer on cowpea plants growth parameters under pot culture experiments. Results indicated that all the organic amendments showed better plant growth and nutrient uptake when compared to chemical fertilizer and control. Obtained results highlight the prospects and potentials of using organic fertilizers as renewable natural fertilizers for cowpea growth. Several studies indicated that the applications of organic fertilizers in adequate quantities improves soil condition and growth parameters in field crops. The study suggested that application of organic fertilizer improve growth of plants.
Summary: This article explains about difference in yield by soil fertility. The main idea is to differentiate change in production by use of organic and chemical fertilizers. The result showed that use of organic fertilizers proved to show better plant growth and nutrient uptake. The article suggests use of organic fertilizers as renewable natural fertilizer having environmental values, improving soil quality and increasing production. The use of organic fertilizer came much more beneficial in long term improvements of soil quality. (Rabia Badar et al, 2015)

The information in this guide to making and using compost has been developed from working with Ethiopian smallholder farmers since 1996, particularly in the dry and degraded highlands of northern Ethiopia. It is based on the Tigrinya booklet by Arefayne Asmelash (1994 EC/2002 GC), the ISD Project Officer based in Mekele, Tigray. It is hoped that smallholder farmers and local agricultural experts in many parts of the world, and particularly in Sub-Saharan Africa, will be able to identify and use the most appropriate and applicable method for making compost in their own areas.

Summary: The paper provides insights about various constituents of making natural manures. The paper discusses about two types of manure: natural or compost and human made chemical. There is discussion about types of soil, the kind of insects, microbes and vermicides require for making proper manure, uses of compost manures and its return output. The needs for making manure likes plants both dry and green, water, animal materials, air, heat, balance of carbon and nitrogen. And their right proportion and significance are highlighted. The various methods of making manures like The Nadep Method, Trench composting, Bangalore Pit Method, Bangalore Piling Method, Indore Pit Method, Indore Piling Method. (Sue Edwards et al, 2011).

Organic farming uses almost exclusively biological and natural materials and processes to produce food. The practice aims to protect human health and conserve, maintain or enhance natural resources, with the goal to preserve the quality of the environment for future generations while being economically sustainable. Organic farming has grown rapidly throughout the world in recent years. Currently, Australia (Oceania) has the largest land areas under organic farming, Liechtenstein (Europe) the highest percentage of organic area, and Mexico (Latin America) the greatest number of organic farms worldwide. One of the most valuable benefits of organic farming is the improvement in soil quality, which can be expressed in terms of chemical,
physical and biological properties and their interactions. In this article, we will discuss the properties, regulations and impacts of organic farming on human livelihood and the environment.

Summary: The paper discusses about benefits of organic farming over chemical based agricultural system. The paper also points out various challenges for implementation of organic farming like labor cost and challenges faced by mechanized farmers to adopt it. The paper provides details about importance of organic farming. The production requirements like crop and livestock are emphasized. The paper makes comparative study of soil by use of organic vs chemical based agricultural system. The various soil improvement quality like biological, physical, chemical properties are highlighted. The worldwide distribution and development of organic farming are provided with supportive data's. The impacts of organic farming are discussed: Long-term productivity of the land, Food security and stability, Environmental impact and Social impact. (M.E. Ortiz Escobar & et al, 2007)

3. Methodology
One day visit was taken to the Kopu Village to know about the situation of the solid waste in the village and analyze the possible solutions to reduce the waste. Questions were already prepared and then the Questionnaire survey was conducted. First of all, Mr. Sashi Sharma Aryal familiarized the locals about the goal of our visit to the locals. There were 6 members who were divided into 3 groups for the data collection and each group was guided by a local resource person. Then the information were collected from 25 household in different corners of the village. Then the information was collected on basis of the survey conducted. Key informant interview was taken with local stakeholders to recognize the present situation and know the future possibilities in terms of solid waste management in the village.

After that the data was analyzed and we came to know that they were interested in making organic manure as the majority of people were dependent on Agriculture for livelihood. Secondary information was also collected on the basis of Literature review and information were collected from relevant websites and reports.
3.1 Research Design:

- Selection of Area
- Problem
- Preparation of questionnaire
- Data
- Primary data
  - Questionnaire
  - Key Informant Interview
- Secondary data
  - Literature Review
  - Reports and Articles
- Data analysis
- Report
4. Result

**Figure 2: Types of crops in kopu Village**

Most of the farmers of Kopu Village are planting paddy and maize as major crop. Wheat is planted by less number of people compared with paddy and maize.

**Figure 3: Quality of soil in Percentage**

In Kopu Village, the soil is semi fertile in nature. According to the 92% of the local people, the soil is semi fertile.
Figure 4: Types of fertilizer used in Percentage

People of Kopu Village use both types of fertilizers (bio fertilizer and chemical fertilizer). High percentage of people use mixture of bio fertilizer and chemical fertilizer.

Figure 5: Types of waste generated

The waste generated by the locals of Kopu Village is mostly in biodegradable in nature. 71.4% of the total waste generated is biodegradable followed by non-biodegradable which is 21.4%
Figure 6: Knowledge about Reduce, Reuse, and Recycle

About 57.14% people of Kopu Village have no knowledge about the 3R principle.

Figure 7: Involvement of private or governmental sector on 3R approach

The people of Kopu Village informed us that there is no involvement of private or governmental sector for teaching or informing the locals about the 3R approach of solid waste management.
5. Discussion
As per the information provided by the locals of the Kopu Gaun, majority of the houses in the area had family members of around 5-10 people. Kopu gaun is a village which is located 23 km south of Kathmandu valley in Dakshinkali Municipality and where the majority of people depend for livelihood is Agriculture. Major source of income for the locals also includes Cattle rearing such as Cow, goat, hens, etc. along with agricultural activities and few involved in jobs and foreign employment.

The village is economically backward because of the less literacy rate among the working groups and other such facilities. But there are few schools available these days which provide primary education. One such school named “Shikrapur Community School” is actively involved in the awareness and community activities for the betterment of the village.

Farmers are using different farming techniques since ancient times. Traditional techniques are the base of all developing phase of farming methods. Since ancient times to present, there are many test done to develop the new techniques and technology of farming. In the past, the locals used to follow the Traditional method of Farming but now they prefer combine method of both traditional and modern methods. Farmers are using different farming techniques since ancient times.

During the traditional period, people collected the seed of crops in jungle then started to cultivate but there are lot of problem they have to face like hard work, low production, loose grains from wild animals and birds etc. During this period farmer had a mixed farm of livestock, fruit and crops still some places practice same methods on farming like crop rotation, with pasture making use of animal dung for fertilizer. Modern farming is the best way to grow more foods utilizing the modern farming technology. Increasing popularity of modern farming is not only the boon but also going to damage the ecological cycle as a curse because of the use of chemical fertilizer, pesticides, gas on machine polluting water, decreasing production capacity of soil etc. There are many negative impacts bring Modern farming on environment and human health effects. Whereas, Organic farming is very similar to traditional farming that produces crops ecologically that play the vital role to minimize the negative impact on environment and human beings. Farmers of Developed and developing countries were started to practice organic farming with the
slogans of go green or return back to the nature. Organic farming techniques avoid the use of synthetic and harmful pesticides, fertilizers, growth regulators and livestock feed additives.

Organic farming is the fusion of ancient farming and modern farming techniques, which is the most appropriate method for farming. The major crops grown in the area was maize, paddy, etc. because of the semi fertile soil quality available in the region.

Bio fertilizer are the substance which make the soil rich with nutrients by using microorganism. They are of many types and each type takes care of the mount of nitrogen and phosphorus level in the soil. They increase the plant productivity. (Adnan, A, 2010). Bio fertilizers have various benefits. They have lower manufacturing costs, especially regarding nitrogen and phosphorus use. They are better survival on seeds and soil. It’s very easy to use by the farmers. It does not cause contamination and environmental pollution. Chemical fertilizers are fertilizers that have been artificially manufactured to contain nutrients in specific quantities. Commercial chemical fertilizers are more expensive than natural fertilizers. When chemical fertilizers are used for prolonged duration, the soil gets damaged. Use of chemical fertilizer gives higher production for 2-3 years, but production declines with its usage sand also causes soil infertility. Almost all the household we surveyed in Kopu Village, people have general concept about bio fertilizer and compost manure. Along with bio fertilizer they also used chemical fertilizers like urea, DAP, to increase productivity. It was found that the use of chemical fertilizers had cause rise in production for 1-2 years and later the production rate declined.

PREPARATION OF ORANIC MANURE

The conventional agriculture focused merely on yield rise to meet growing food needs of increasing population, and paid little concerns to sustainable use of locally available both natural and human resources. This resulted in mere intensive use of agro-chemical inputs but a wide productivity gap between the best possible and the farm practice; agricultural lands continued to shrink, and farming system led to environmental degradation such as depletion of soil and soil fertility, decline in water availability and increase in different forms of pollution. At the same time, such practice upset both environmental resources and indigenous knowledge system rendering the agriculture system unsustainable (Scialabba, 2000). People prepare farmyard and
manure from cattle dung, remains of vegetables, leftover of grass and feeds of animals, leaves and small shrubs which is then collected in a pit. It is piled up in the pit for 3/4 months to make a good fertilizers and then used in the farmland. Traditional method is followed for the preparation of organic manure in Kopu gaun. Around 40- 50 kg of manure is produced approximately.

Due to the lack of proper guidance on organic technologies and insufficient services by the local service centers, many farmers are facing problems in this regard. (Deepak et al, 2009) The farmers know the procedure but are hesitant on implementation phase. They have limited their manure making to very rudimentary and obsolete form, taking granted for organic manure and quickly shifting for chemical one.

There is need to document the innovations from the local level to national level. Research and studies can generate certain findings and evidence based knowledge which can be shared with the likeminded working agencies and directly to the farmers. The publications and media can play important role in bringing its agenda into village and then household’s levels for implementation.

The recent introduction and use of agro-chemicals such as fertilizers and pesticides is becoming important only to the commercial agriculture pockets recently being developed in the accessible areas. With introduction of improved agronomic and composting practices, bio fertilizers and bio-pesticides, there is greater possibility of converting the systems to organic types with little effort. Farmers in the Terai are producing crops in combination of both indigenous and conventional knowledge system. Organic farming with low productivity is adopted in a few areas (Pant, 2006).

**Solid Waste Management in Kopu Village**

The characteristics and quantity of the solid waste generated in a region is not only a function of the living standard and lifestyle of the region's inhabitants, but also of the abundance and type of the region's natural resources. An economically developing nation may fail to pay adequate attention to solid waste management. Such a failure incurs a severe penalty at a later time in the form of resources needlessly lost and a staggering adverse impact on the environment and on public health and safety.

Special attention is given to organic (biodegradable) residues since, in the majority of developing
countries, these residues constitute at least 50% of the waste (by weight). The resource recovery aspect regarding the organic component is as follows:

1. The component can be used in agriculture as a soil amendment through composting.
2. Its energy content can be recovered either biologically or thermally. Biological energy recovery is by way of methane production through anaerobic digestion. Thermal recovery is by way of combustion to produce heat. (UNEP: Solid waste management Volume1)

Rapid and uncontrolled urbanization, lack of public awareness, and poor management by municipalities have intensified environmental problems in towns in Nepal, including unsanitary waste management and disposal. While solid waste management (SWM) has become a major concern for municipalities and the country as a whole, the status of SWM is not fully understood due to the lack of SWM baseline data, which are also essential for effective planning.

The Government of Nepal enacted the Solid Waste Management Act of 2011 effective from 15 June 2011. The objectives of the act include maintaining a clean and healthy environment by minimizing the adverse effects of solid waste on public health and the environment. The local bodies, such as municipalities, have been made responsible for the construction, operation, and management of infrastructure for collection, treatment, and final disposal of MSW. The act mandates local bodies to take the necessary steps to promote reduce, reuse, and recycle (3R), including segregation of MSW at source. (ADB Solid waste management in Nepal: Current status and policy recommendations)

In Kopu Village, both bio-degradable and non-biodegradable wastes are produced, but biodegradable wastes are produced in greater quantity. These include animal dung, vegetable remains, feeds of animals etc. Most of the villagers use bio-degradable wastes to make compost manure which is later used as bio fertilizer whereas the non-biodegradable wastes such as plastics are either burned down or thrown away. Some of them reuse plastic bottles to fill up water. About 1-2kg of solid waste is produced every day from each household. Although wastes are produced in smaller quantities and reusing is practiced in some households, the villagers do not have knowledge on recycling. They do not have proper knowledge about disposal of non-biodegradable wastes and the concept of 3R. In addition to it, there isn’t any involvement of governmental or private bodies to address the issues of solid waste management in Kopu Village.
Summary of Solid Waste Management Act 2011

According to Solid waste management act, there are provisions relating to production, collection, minimization and disposal of solid waste. It states that the responsibility to make arrangement for the solid waste shall rest with the local body. This includes construction and operation of the infrastructures required for the collection, final disposal and processing of solid waste including construction of any transfer station, landfill site, processing plant, compost plant and bio gas plant for the management of solid waste. The responsibility to manage or cause to manage solid waste shall also rest with the local body. But the responsibility for the processing and management of hazardous waste, medical waste, chemical waste or industrial waste under the prescribed standards shall rest with the person or institution that has generated the solid waste.

There is also a provision which states reduction in production of solid waste. Any individual, organization or institution shall have to reduce the amount of generated waste as much as possible while carrying out any work or business. It shall be the duty of every person, institution to reduce the quantum of the solid waste by making arrangements to dispose the disposable (biodegradable, organic) solid waste within their own area by making arrangement for the reuse thereof and discharging the remaining solid waste thereafter.

The act also has provision of segregation of solid waste at source by dividing the solid waste into different categories including at least organic and inorganic. The time, location and method for discharge of solid waste shall be prescribed by the local body. The local body may also arrange for the location of container by designating the collection point in each street or colony to collect waste systematically.

The local body shall take necessary steps for the promotion of reduction, reuse and recycling of solid waste and may frame and enforce necessary directives for effective implementation. There is also a provision regarding transfer station and sanitary landfill site, involvement of the private sector regarding solid waste management. Also there is provision regarding solid waste management service fee from the concerned person, institution or body for the management of solid waste.

Provision regarding pollution control and the monitoring of solid waste management work, provision regarding solid waste management technical support center, offence and punishment is
also included in the Solid Waste Management Act, 2011. Under the topic miscellaneous, there is a provision regarding chemical pesticides which states that while importing the chemical pesticides, it shall be imported under the prescribed standards and the concerned person or institution shall have the responsibility to dispose the date-expired chemical pesticides under the prescribed standards.

6. Conclusion
The overall objective of this community visit was to know about the status of solid waste management in Kopu Village. Most of the community people were illiterate and their main source of income is farming. They have been using both organic as well as chemical manure for the production. They prefer organic manure if it will be sufficient for their farming activities. The major crops grown in the village was maize, paddy, etc. People have reduced waste by making compost. There is more scope of composting in the village, if they are properly equipped and if they have some technical knowledge about solid waste management. The non-biodegradable waste needs to be managed properly instead of burning. The government should concentrate on the management of the solid waste in this area.

Annex 1
Questionnaire

Name:                                     Address:
Age:

Education:

1. What is the size of your family (List number of members)?

2. What is the main source of income of your family?

3. What is the total coverage area of your land and how much of it is cultivatable?

4. What are the types of crops cultivated in your land?

5. What is the quality of soil?
   - Fertile
   - Semi-Fertile
   - Infertile

6. How much manure is used for cultivation?

7. Do you use chemical fertilizers or generate Bio-fertilizer by yourself?

8. What difference do you find in yield yearly (Chemical or Bio)?
9. If you produce your own manure, how much do you produce approximately?

10. Do you rear cattle? How many? (if you do)

11. How much waste is generated from your household per day?

12. What type of waste is generally generated from your house bio-degradable or non-bio degradable?

13. How do you manage, your household wastes?

14. How much land coverage is required for manure production (if manure is produced)?

15. Do you know anything about reduce, reuse, recycle?

16. Has any private sector or government sector giving training on 3R approach? Has any groups been converting it into self-sustaining business?
17. What are the process and material used for preparation of manure? How productive has it been?

18. Is there any private or government sector that is responsible for caring or managing solid waste in community? If yes list the names and process of collection and management?
Annex II

Picture 1 Discussion with community members

Picture 2 group photo with community members
Picture 3 Doing questionnaire survey

Picture 4 Interacting with community members
6. References


*Solid Waste Management.* (2005). UNEP.