

Design and Development of Online Portal for Food Waste Management

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ABSTRACT

The drive for reduction of food waste at high level requires effective management techniques of disposal and to reduce the excess production of food at source. This project aims to connect the management of hostel authority and the students to convey the information by means of a portal. To begin with the existing system at the institution was analyzed, investigative study was conducted in RV institution with a total number of 1300 of residential students and 3000 day scholars, and it was found that the food wasted on a daily count was 186 kg. Online portal helps at greater extent to find the exact number of food required on a day. Redistribution of surplus food in the form of coupons to day scholars will benefit both the management and students. The coding is done using Laravel PHP Web Framework for creating web application, MySQL for managing database, and LAMP for web development. Website provides the whole information on food wasted and coupon that can serve hunger at minimum cost; thus it creates awareness in students. By the test conducted for a week, it was found that using online portal, food wasted can be reduced.

Keywords: LAMP, Laravel, MySQL, redistribution

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INTRODUCTION

Food waste is a global concern for all mankind. The existing food systems and food disposal techniques are extremely inefficient. As per the United Nations Food and Agriculture Organization (FAO), one-third of the food produced is lost before it can reach humans for consumption [1, 2]. Between 2014 and 2016, the FAO recorded that, out of the 7.3 billion people, approximately 795 million were undernourished, wherein 780 million belonged to developing countries and 11 million to developed countries [3]. Figure

1 shows the extent of food waste accumulated globally. In spite of these large number of hungry people everywhere, such large amounts of food are wasted. The amount of food waste generated by Indians is equivalent to the amount of food consumed by the United Kingdom as a whole; a static that doesn't give us much to be proud of. India is amongst one of the countries with the largest number of hungry people. Approximately 190.7 million in this country are undernourished which accounts for 10.2% of the population [4]. The problem of food

wastage only increases at different stages of the supply chain. There is a high amount of food wastage at various stages before it reaches the consumer's plate, but the amount of waste accumulated at consumption level can't be ignored.

FOOD WASTE – RVCE SCENARIO

Sustainable food waste management is a critical research area growing rapidly over the years. Most research works have always been inclined to explore solutions in only one dimension, i.e., environmental, economic or social [5]. The need of the hour is to come up with solutions that are considerate of all the implications. RV College of Engineering (RVCE) has three boys' hostels at campus accommodating around 1200 students. A large amount of food waste is generated in these hostels [6]. Additionally, the food court at campus also generates some amount of food wastes. Renewable energy sources are being harnessed everywhere and anaerobic digestion can enable RVCE become self-sufficient in managing food wastes while generating energy [7]. This project report describes a system for measuring, analyzing, improving and regulating food wastes at RVCE and conceptualization of a system to harness the benefits of a circular economy [8–10].

OBJECTIVES OF THE STUDY

To conceptualize and design an online portal for information tracking and data management which helps to reduce the waste produced.

Defining and categorizing food wastes for the purpose of this study.

A) To study existing food waste management systems through literature scan and to carry out an on-site study at the RVCE campus.

B) Assessment and collection of data on food wastes generated in the college.

C) To engage the stakeholders in the area of food waste management.

D) To carry out a questionnaire-based survey to understand the inherent contributing factors.

E) To create an online web portal to help easy information flow.

To evolve a system for measuring, analyzing, improving and regulating food wastes at campus and cost–benefit analysis of the proposed alternatives

PROBLEM IDENTIFICATION

The hostels at RVCE accommodate 1200 students. As approximately 30 and 60 kg/day of food wastes are generated during preparation and post-consumption of the meals for these students, respectively. The current system of management of these wastes involves either giving away the waste to pig-feeders or dumping of the waste. Hence, the requirement of a sustainable system for management of these food wastes is lucid.

PROJECT METHODOLOGY

This project focuses on evolving a sustainable and feasible method for the management of the large amounts of food wastes accumulated from hostel kitchens of the institution. The main goal is to develop a responsive system for the FWM with the involvement of the various stakeholders of the system. Figure 2 highlights the stakeholders in the system of the institution.

The steps to follow on creating online portal are as follows:

- 1) Carry out a test run by installing XAMP software.
- 2) Set up a word press multisite as shown in Figure 3.
- 3) This is an effective way to test the plug-ins.
- 4) Create a network setup.
- 5) Ensure Apache and MySql are running in parallel window.
- 6) Configure the window with wp-config.php and ht access files.

- 7) Run the system for a bug.
- 8) Attach the voting panel to the MySQL.
- 9) Now open the local server on browser.

Wamp local server setup

Literature review on various methods of modeling waste management.

Questionnaire survey based on the SWOT analysis to identify threat and weaknesses by understanding the inherent contributing factors of consumer behavior.

Data collection and analysis of data.

Determining and designing the best possible solution for disposal of wastes to achieve a circular economy.

Model Formulation:

Phase 1: Framing the zones of area to study, collect the primary data.

Phase 2: Analysis of data suggesting a best model to reduce the waste.

Model Validation: Comparison of the methods used to solve models to give the best output by validation of data.

Food waste management involves the following steps:

- 1) Literature scan to understand the research gap and gains a better understanding of the existing system.
- 2) Analyzing the consumption patterns and assessing level of food waste by studying the existing system.
- 3) Carrying out a questionnaire survey based on the online information sourcing to understand the inherent contributing factors of consumer behavior.
- 4) Data collection and structuring of data.
- 5) Determining and designing the best possible solution for disposal of food wastes to achieve a circular economy.

AMOUNT WASTE GENERATED IN THE CAMPUS

It is a never-ending phenomenon as long as there are people visiting the campus. Waste

generated in the campus may not be more prominent in the carbon footprint portfolio of the institution, but its impact on the environment cannot be neglected. Waste generation is also considered in the category of Scope 3 emissions just because it is not fully under the control of the institution. The data keepers of waste generated in the campus were identified and the maximum amount of data was extracted out of what was available in the records of the institution and the missing data was estimated based on the sample population that was available. It was observed that waste generated in the campus can be categorized into three types, namely dry waste, vegetable waste and food waste. Table 1 shows the amount of waste generated in the campus.

Human populace in the campus can be classified into two categories based on the hours of stay of individuals in the campus. The categories are day scholars/general shift staff and resident employees/resident students. The day scholars/employees are assumed to stay in the campus for only 1 shift per day, i.e., 8 hours/day. The resident students and staff stay in the campus for a full day, i.e., 24 hours. The conversion factor used for calculations is 1.14 for 24 hours/day and 0.38 for 8 hours/day. A sample calculation of emissions as a result of human activity in the campus for the month of January 2012 is shown below. Table 1 shows the total amount of carbon emissions occurring due to the people visiting campus.

∴ Amount of CO₂ emitted = 12.80 mt

Waste generated in the campus is divided into three categories, namely dry waste, vegetable waste and food waste. For the sake of simplicity in calculations in Figure 4, types of wastes are summed up to obtain the total amount of waste generated in the campus of the institution before applying the conversion factor to obtain the carbon

dioxide equivalents of waste generated. A sample calculation of the amount of carbon emissions due to the waste generated in the campus is shown below. Table 1 shows the total amount of carbon emissions occurring due to the amount of solid waste generated in the campus.

$$\begin{aligned} \text{CO}_2 \text{ emitted} &= \text{Solid waste generated} \times 0.125 \\ &= 6060 \times 0.125 = 0.76 \text{ mt CO}_2\text{e} \end{aligned}$$

The highest carbon footprint of wastage is present during the consumption phase (38% of total), whereas consumption accounts for 21% of total food wastage. Thus it impacts every one of the stages that the item experiences, from preparing to transportation. This is then added to the underlying horticultural effect and the last

end-of-life effect. This demonstrates the carbon impression of the wastage happening at the utilization stage originated from both – vitality utilized for cooking and the vitality utilized when the sustenance was developed, put away, prepared and dispersed, and afterward the finish of-life of the disposed of nourishment, for example, landfill.

Greenhouse gas emissions from the agricultural phase are major contributors to carbon footprint of each food supply chain. During consumption phase, the greenhouse gas emissions coming from consumption itself – energy consumed for the preparation process – play an important role.

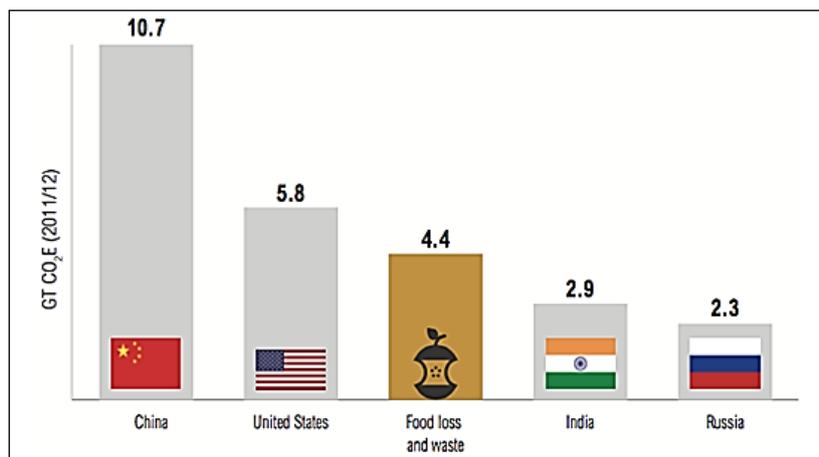


Fig. 1. Global hunger index [4].

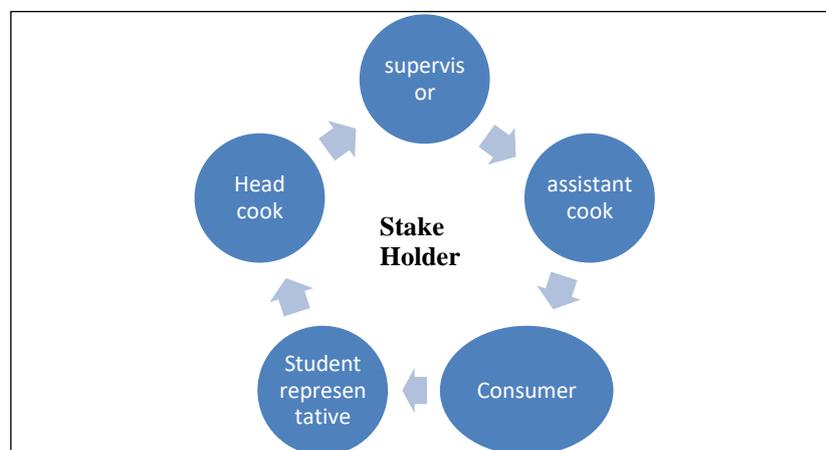


Fig. 2. Stakeholder system.

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File Edit View Navigate Code Refactor Run Tools VCS Window Help
voter.php >
Project
voter.php
External Libraries
1 <?php
2 if(!isset($_SESSION)) {
3     session_start();
4 }
5 include "auth.php";
6 include "header_voter.php";
7 >?
8 <?php include "date_check.php"; ?>
9
10 <h4> Welcome <?php echo $_SESSION['SESS_NAME']; ?> </h4>
11 <h3>Make a Vote </h3>
12 <form action="submit_vote.php" name="vote" method="post" id="myform" >
13 <center><font size=16'> Hi, student from hostel, when will you NOT have food in the hostel mess?? <br><br>
14 <input type="radio" name="lan" value="Morning"> Morning<br>
15 <input type="radio" name="lan" value="Afternoon"> Afternoon<br>
16 <input type="radio" name="lan" value="Night"> night<br>
17 <input type="radio" name="lan" value="All"> all 3 times<br>
18
19 </font></center><br>
20 <?php global $msg; echo $msg; ?>
21 <?php global $error; echo $error; ?>
22 <center><input type="submit" value="Submit Vote" name="submit" style="..." /></center>
23 </form>
24

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Fig. 3. Server setup.

Table 1. Academic waste generated.

to have samples of all the food items available for a week's menu before they can choose a meal plan to their liking and serves their requirements. However, such a model requires considerable investment in world class storage facilities. Harvard University's "Food for Free" concept encourages cooking leftover ingredients and their distribution for local causes.

MIT makes use of cameras to show any leftover food in their cafeteria which can be claimed by any student at minimal costs or free of cost on a first-come-first-serve basis. These models can be tweaked to meet the requirements of the students in our college. Integration with ID cards, vending machines for packaged foods and drinks are some of the things that can be started on a trial basis.

Meal plans can be an effective mechanism to combat food waste as they provide for flexibility. Not all students will prefer to eat in the hostel mess for all three meals and snacks on all the days they are living on campus.

Options that can be provided to students include the following:

- 1) Unlimited (21 meals/week)
- 2) 14 meals/week
- 3) 7 meals/week

ONLINE PORTAL IN REDISTRIBUTION

Online portal helps in redistribution of food shown in Figure 7, where this will be an intimation for the day scholars in college who will be very much in need of the food rather than bringing from home. This way hunger within the college can easily be solved.

Thus coupons here reflect the plate meals for that day, which can be availed from the website whoever is in need of food at much lesser rate.

CONCLUSION

The amount of food waste is rapidly increasing and more people are going hungry every day. Although giving away the food waste to pig-feeders might seem like a hassle-free option to the management; in reality, it is both economically and environmentally less useful. Landfills or dumping of these wastes is also less preferable.

Due to this initiative at campus, there exists now a structured and recorded data-set monthly for the food wastes from the hostel mess. Various stakeholders have realized their roles and are coming forward with their grievances and ideas. Students are constantly giving suggestions and willing to contribute to this cause. After exploration of various options, based on the type of food waste, alternatives were explored and the best solution suggested. The highest amount of food waste was found to be the surplus waste in the kitchen, i.e., the unconsumed cooked food. This accounts to around 120–140 kg of waste daily and is edible.

Through the course of this study, various conclusions can be drawn. Online portal helps in redistribution of food where this will be an intimation for the day scholars in college who will be very much in need of the food. This way hunger within the college can easily be solved. Thus coupons here reflect the plate meals for that day, which can be availed from the website whoever is in need of food at much lesser rate. Our college has nearly total of 100 kg of food which is left out and unconsumed where this online portal model helps in reducing and redistributing in an efficient way. Only 20% of food with vegetable waste can be used as manure or biogas digester. Therefore, this study has helped realize the importance and benefits of self-sufficient waste management. The various benefits of a circular economy have been realized.

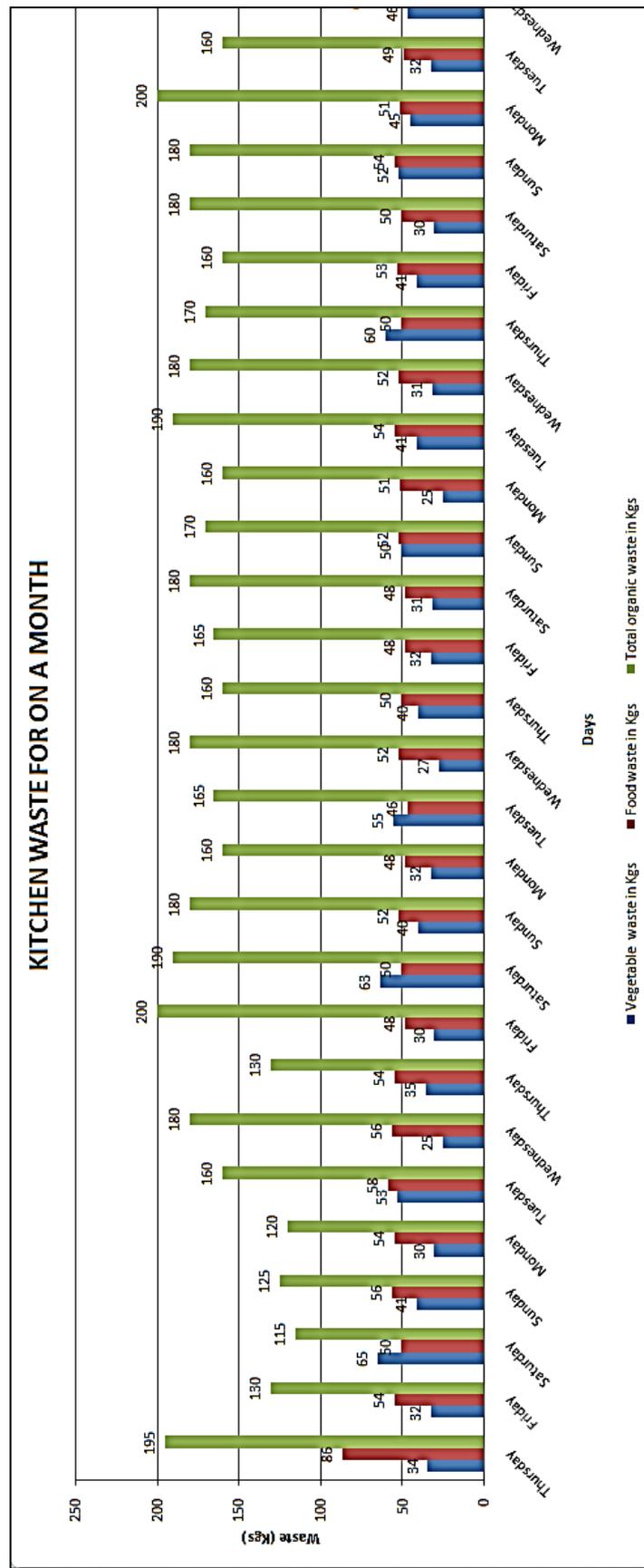


Fig. 4. Food kitchen waste.

- Assembly on 25 September 2015. IFPRI, United Nations; 2015.
- [2] Garcia-Garcia G, Woolley E, Rahimifard S, Colwill J. *A Methodology for Sustainable Management of Food Waste*. Springer; 2016, pp. 2210–2227.
- [3] Flores RA, Shanklin CW, Loza-Garay M, Wie SH. Quantification and characterization of food processing wastes/ residues. *Compost Sci Util*. 1999; 7(1): 63–71p.
- [4] Lebersorger S, Schneider F. Discussion on the methodology for determining food waste in household waste composition studies. *Int J Integr Waste Manag Sci Technol*. 2011; 31(9–10): 1924–1933p.
- [5] Garcia-Garcia G, Woolley E, Rahimifard S. A framework for a more efficient approach to food waste management. *Int J Food Eng*. 2015; 1: 65–72p.
- [6] Kosseva MR. Introduction: causes and challenges of food wastage. *Int J Integr Waste Manag Sci Technol*. 2011.
- [7] Gupta A. Environment & PEST analysis: an approach to external business environment. *Int J Mod Soc Sci*. 2013; 2(1): 33–43p.
- [8] Iacovidou E, Busch J, Hahladakis JN, Baxter H, Siew K, Ben MJ. A parameter selection framework for sustainability assessment. *Sustainability*. 2017; 9(9).
- [9] Misra S, Chadah S, Pathania M, Center of Consumer Studies, IIPA. Assessment of Wastage of Food and Ostentatious Behaviour During Social Gatherings (Marriages/Parties/Meetings, etc.) in National Capital Region, Delhi. 2011.
- [10] Curry N. *Modeling and Design of a Food Waste to Energy System for an Urban Building*, Thesis. Department of Electrical and Computer Engineering, Concordia University, 2010.

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