



A measure of the problem of food waste in grocery shops, Tampere, Finland.

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ABSTRACT

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A measure of the problem of food waste in grocery shops, Tampere, Finland.

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This presentation shows the results of a study based on a questionnaire on food waste in Tampere grocery shops on the amount and possible cost on the consumer, the shop, and community in thirteen (13) Tampere grocery shops. The study data were obtained through casual interviews, observations coupled with a background questionnaire. The influences of customer behavior, and shop policies were measured via descriptive statistics. It was realized almost all the factors correlate with the quantum of food waste in the shops. The constituents of the food waste included customer demands, shop policy, demand and supply, the rate of purchasing discounted food products, and preferences in choosing specific sizes, shapes and weights.

Key words: grocery, discounted, statistics, policy, food, waste

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ABBREVIATIONS AND TERMS

BOGOF	Buy One Get One Free
PTPT	Pick Three Pay Two
SBD	Sell by dates
NGO	Non-governmental Organization
BOGOL	Buy One Get One Later
FSC	Food Supply Chain
FAO	Food and Agriculture Organization
IFAD	International Fund for Agricultural Development
UNICEF	United Nations Children's Emergency Fund
WFP	World Food Program
WHO	World Health Organization

1 INTRODUCTION

The ingestion of food is to make available the nutrients the human body requires for survival and development. This could be of animal or plant source, and other mineral sources. Therefore, the relevance of food as a requirement of life needs no further emphasis. The importance of keeping the supply of food to meet these requirements is everyone's priority, as the food supply is also a security issue. Hence, year in and year out, governments, industries and other stakeholders invest enormous amounts of time, energy, capital and know-how to devise ways to ensure the continuous provision and availability of food and possibly in abundance. The improvements in technologies, transportation systems, storage facilities, and other processing methods have all contributed immensely in this food security in most parts of affluent economies, especially in the western world. But food security is still a great concern to vast other numbers of the world population as well. Several parents hustle to offer their wards the requisite daily nourishment. Although we churn out enough food to satisfy everyone, 11,1% of the world population, thus 815 million still sleep without food. Even more, one in three suffers from some form of malnutrition (WFP, 2017). Though food security is a major headache for a huge number of the world population, it is ironically opposite in other parts too.

Hunger is still very prevalent in lots of countries. According to a 2017 United Nations report, the number of undernourished people in the world increased to an estimated 815 million, up from 777 million in the year 2015. In the same vein, several western and affluent economies are spoilt for choice, even supply made surplus to requirement in such a way that there are varieties and classes of a similar nutritional source. Food thrown away or left unused is a growing problem in every part of the world, especially in more advanced, economically and affluent economies such some parts in Europe, North America and some parts of Asia. FSC (Alex Phil et al, 2015). If the food wasted could be reduced, would it reduce the negative effects the food production has on the ecosystems which supports us

(Åhlander, 2016)? I think so. Food waste accounts for 88 million tons yearly, with accompanying estimated cost of 143 billion euros (EU, 2016). Food wastage results in one-third of the world's food supply lost and wasted throughout the global food supply chain (Alex Phil et al, 2015). And while it's not a new problem, the issue is becoming hard to ignore. In the US alone, the amount of food wasted today is three times more than what we wasted 50 years ago (Wystrach, 2016).

Presently, the issue of food waste is widely pervasive and happens on different levels of society. In our homes, eateries, institutions, shops and others, wasting food has become a routine activity. It is a big contributor to the problem of global food insecurity, both in developed and developing economies (Alex Phil et al, 2015). Every year, more than 3.5 million tons of food is wasted in the Nordic countries. It is an economic, environmental and ethical problem (Nordic Council of Ministers, 2017). In 2008, roughly 43 billion pounds of food was thrown out of grocery stores, that's about 10 per cent of all food purchased in stores (Wystrach, 2016). The EU Commission envisages that the quantum and impact of food waste will go up if adequate curbing and preventive measures are not adopted and practically instituted (Leppänen, 2014). Notwithstanding the high economical and ethical problem associated with food waste, wasting food is a moral crime, and one of the repulsive aspects of consumerism (Andriukaitis, 2016). Hence food waste represents both loss and waste (FAO,2013).

In Finland, an estimate of 65,000 – 75,000 tonnes of food products are discarded annually (Koivupuro, 2011). Though, several studies and measures have been adhered to, and quite broadly studied, not much work has been done at the retailer level of food waste reduction mechanisms although grocery shops are a big factor in that change. In 1916, the first "modern"(Self-service) grocery store opened for business in Memphis, Tennessee, U.S.A. Presently, there are close to 65,000 grocery and drug stores nationwide. Food has become more accessible for people in urban and suburban environments, but shops are now overstocked with more food than we (and they) know what to do with, with an environmental impact that is hard to ignore (Wystrach, 2016). Coop Sweden (1995) indicated its wasted food was about 11,000 tonnes annually, a number which is expected to have gone up as of now since the outfit now deals more in fresh foods. Grocery

stores are worried about what customers might think of empty shelves and barren displays, so they overcompensate with an abundance of food to boost sales (Wystrach, 2016).

This study was conducted in Tampere, a high-income city within the Pirkanmaa Region with an estimated population of 223,200 making up 4,1% of the total population of Finland, with a land area of 4,977km² (Statistics Finland, 2015) has several grocery shops ranging from small through medium to large. These shops deal with the same categories of foodstuffs and other groceries with resultant competition among the respective retailers, and hence a good model for the study. The issue of produced food allowed to go waste runs through the whole process from production to the final consumer, but interest is with the grocery shops in this study since more resources are spent on food considering the harvesting, transportation, preservation, branding and a whole lot before it gets to the shops to be sold to the consumer. Moreover, the cost of food in these shops in Tampere is quite high, furthermore, lots of people can make do with these foods to supplement their already tight budget if something is done about this problem.

2 SCOPE OF THE STUDY

These grocery shops are good avenues to focus on in our quest to reduce food waste in general. The study was aimed at reporting on the issue of food waste among these grocery shops at first hand thereby affording us a good opportunity to have a fair idea of the types, volume, and frequency of this food waste. Also, it will help in highlighting some of the waste management methods used to deal with this food waste generated in the shops. Moreover, the study will find out some opinions as against the environmental impacts of the shop managers on this problem. Subsequently, the study will seek to find out some of the existing policy framework packages, as well as the technical, and socio-economic approaches for sustainable management of the food waste.

3 RESEARCH METHODOLOGY

3.1 Research Design

Descriptive research was used to review food waste management to get a foothold on the problem generally and identify existing or proposed concepts to deal with the challenge. A quantitative study was used in gathering the required data with a questionnaire used to test on a relatively small sample alongside unplanned interviews and observations to check that the questionnaire was valid and reliable for the study. This included the preliminary field investigation, questionnaire survey and face-to-face interviews. The conclusions, and suggestions indicated was arrived from the literature review and the inferences drawn from data collected through questionnaires given out personal visits, interviews and observations.

Tampere known to be probably the most populous inland city within the Nordic region and can be classified as an affluent city at the south of Finland, with inhabitants having good means and access to varying grocery shops which are quite a lot in the city, from small kiosks through medium to supermarkets. You can say we are relatively spoilt for choice as to where and what to consider for our grocery shopping. This relative ease of choice also played a role in influencing some of the reasons why food is wasted by these numerous grocery shops. This study also considered a look at how the city manages this issue of food waste among its shops as well.

The sample group included grocery shops from the various suburbs of the city, kiosks, and supermarkets. This was intentionally for those who deal with the issue

of food waste in the shops. This sampling helped in ensuring enhanced investigation with the reason to obtain in-depth knowledge and understanding of food waste within the shops, coupled with available management methods in helping to reduce the waste.

3.2 Research Methods

Both qualitative and quantitative techniques have been adopted for this study. The reason behind the adoption of the mixed research method was that although the study adopted the use of questionnaires which is typical of quantitative research, it also employed the use of statistical procedures in analysing the data.

3.2.1 Data analysis

Information gathered were thoroughly checked and verified against the test questionnaire to ensure compliance and fulfilment of established goals. Compilation of daily sampled data with responses of similarities was collated later.

3.2.2 Limitations of the study

Intentionally picking respondents could exclude some viable ones who could have offered better responses to the administered questionnaire, and the study topic. This could have resulted in limiting the idea of generalizing the data gathered.

Bias: Time constraints and other factors affected efforts in verifying the questionnaires which were answered to ascertain there were no biased responses. The

possibility of being economical with the truth, or just to give responses to please the questionnaire could not be ruled out.

3.3 Assumptions

- a) It is assumed that seven (7) sample size questionnaire administered to randomly selected respondents were a good representation.
- b) All responses received were deemed to be factual, regardless.
- c) Bias responses, time limitations, and other mitigating factors were assumed not to have any significant impact on the study.

4 ANALYSIS OF RESULTS AND DISCUSSION

4.1 Main categories of Food Waste in the Shops

The import of this categorization is to highlight and try to ascertain the various types of food waste generated by the grocery shops, and as to how the problem can be curbed or reduced significantly. Having an idea of which types of food are frequently sent to the landfill site can help in devising methods as well as reviewing already existing options with due cognizance to available legislations and policies. Food wasted in the shops are normally perishables like vegetables, fresh meat and fruits, but also include significant amounts of other non-perishables such as pastries and cookies.

Aside from the wastage, since the categories vary concerning type, ingredients, as well as packaging, the disposal also pose a lot of challenges with segregation. The available information and as per interviews and observations show that, though the cost of food to the customer and the retailer is quite enormous. Various types and amounts of food end up at the landfill sites daily, weekly and monthly. The financial strain that comes with the disposal of food waste tends to be quite enormous as two (2) of the respondents indicated spending averagely 150,000 euros yearly just for managing the food waste.

Another disturbing aspect is the issue of broken packages. Items like milk and products which are normally packaged in paper or plastic containers tend to break or develop holes in the handling processes, and as such are deemed not appropriate to be sold. Canned food items which get crumbled are also destined for the landfill site. Bread, cake, buns, and doughnuts are the most disposed food items in the shops. These pastries demands are driven by how fresh and scented they appear, and as such, they need to be replaced as often to meet the customer expectations. Fruits and vegetables such as apples, bananas, oranges, banana, carrots, lettuce, tomatoes etc often are thrown away due to appearance, and or shape. It was realized these products also sell for their attractiveness, so even though they may be wholesome, they may end up in the refuse container due to some of the afore-stated reasons.

5 RESULTS AND DISCUSSION

5.1 Results of the survey

All the respondents seem to approach matters similarly concerning the ordering of new food products, food storage, and food waste management. In most of the stores, orders are placed in two ways, either manually or automatically as per the amount left in stock, as well as the policy of the shop. Some categories of food products like fruits and vegetables are normally ordered manually to afford the management the benefit of assessing the state personally before stocking them. However, are few of the shops relied exclusively on an automatic system, and the system orders as soon as the amount in stock reached a certain threshold.

The respective personnel had no problem in handling the food products and are well trained on how to identify problems with the foods as per the shop's requirement. From the study, it became clear although food waste cuts across all the categories, raw meat, fruits and vegetables, pastries, milk and milk products are often thrown away due to reasons of best before dates, deformed shapes, reduced weight, and or demand for fresh-looking products as seen Figure 1 and 2 below.

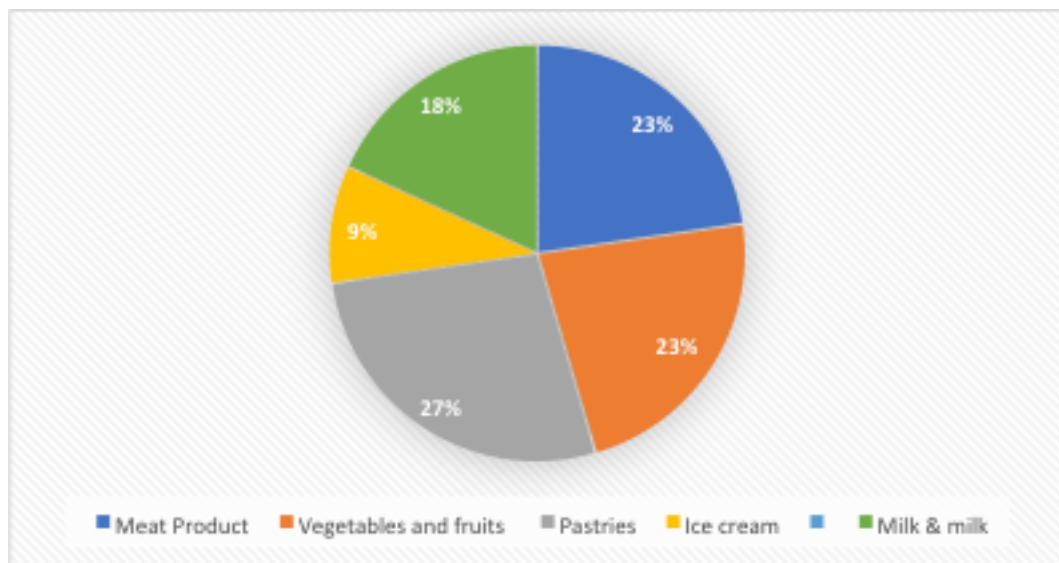


Figure 1. Food waste per category

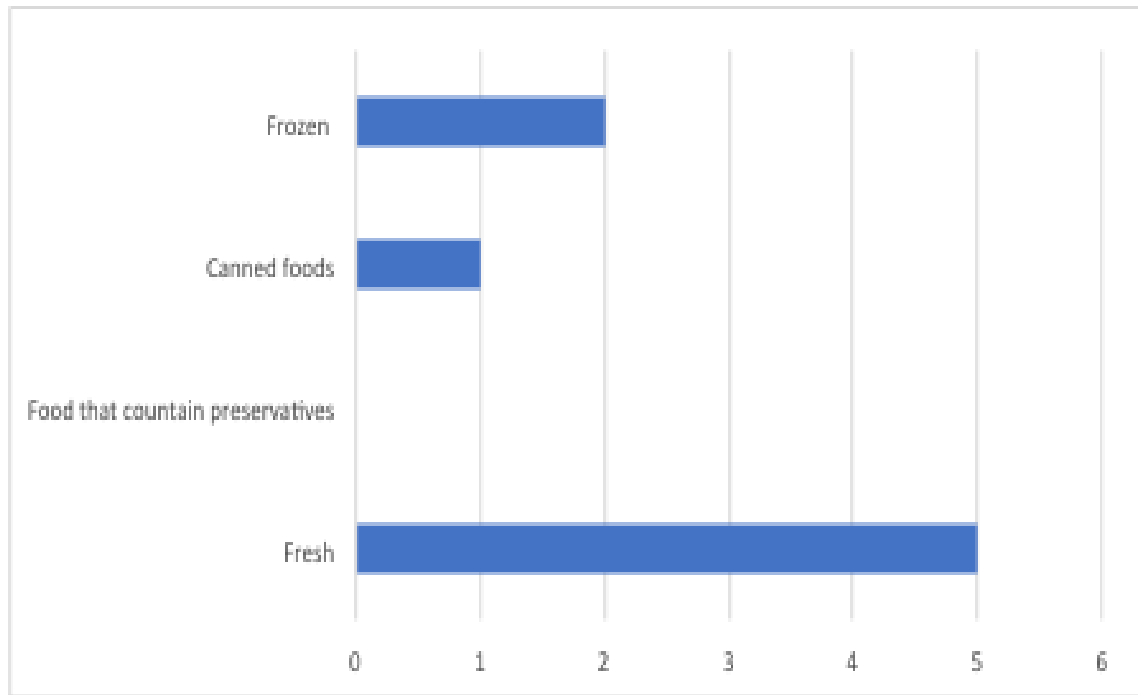


Figure 2. Different types of food waste discarded

It was established that food is discarded quite often shown in table 1 below. With a 100 per cent disposal daily and 34 percent disposal twice a week.

Table 1. Frequency of disposing waste

Everyday	Two times a week
100%	34%

Most of the shops throw away food daily in large quantities illustrated in figure 3 below, coming with it lost hours of manpower, and cost for disposing of them aside from the enormous environmental burden these results in.

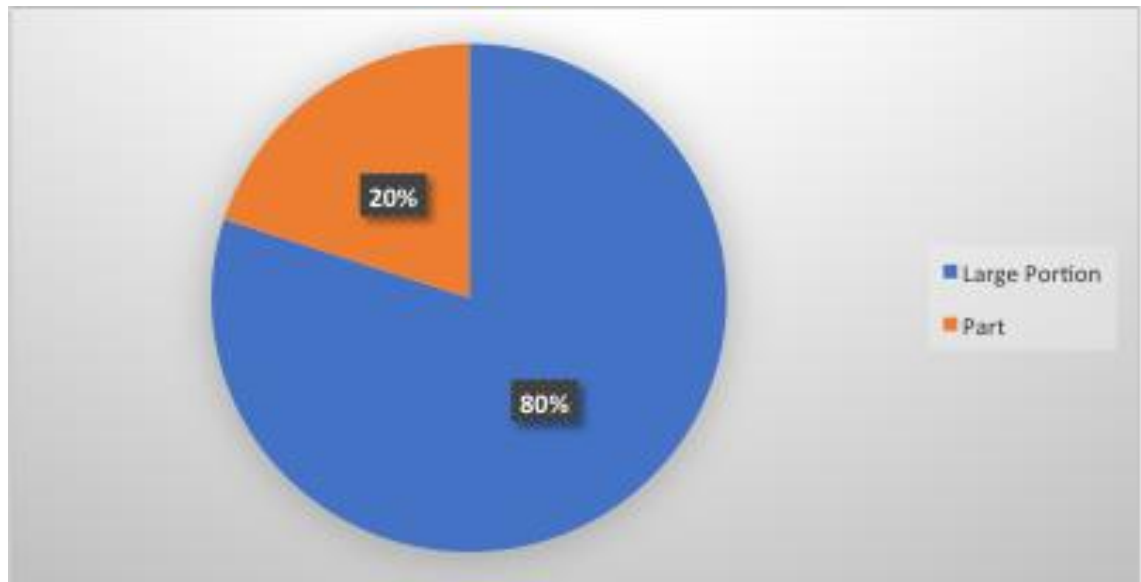


Figure 3. Edible portions of food wasted

One other unfortunate aspect is that, although some these bio-products are sent to composting sites, and biofuel making companies, a large chunk end up at the landfills. Consequently, most of the respondents are bothered by the huge losses as a result of the discarded foods. Some of the stores registered losses of €30 per day, and €120,000 to €150,000 a year of food waste value. Therefore, have sought to adopt measures that go some way in saving some of the food. They offer 30 per cent discount sales on otherwise wholesome food but are almost or due for disposal as per the best-before or shelf lives. But they went on to indicate that, customers are not swayed by these offers, and they normally prefer fresh and long expiry dates, and or shelf life for reasons of health security, and individual preferences. But other reasons could be with the low discount percentage (%) of the offers.

Although some respective shops, local authorities, agencies, and existing legislations have measures in place to further minimize this wastefulness, there also exist evidence of these measures not being enough, and negligible compared to the ever-increasing spate of this problem depicted in table 2 below.

Table 2. Measures taken by Shops

Measures	Frequency (%)
Reduce prices	20
Donating food before expiration	30
Reducing the amount bought	10
Giving discounts	30
Giving food to employees	10
Better storage of food	0

For instance, some of these shops have opted to work with some local NGO's, Churches, Welfare unions and companies to at least make good use of this food they deem waste and not good for continuous retailing by donating them to soup kitchens, food banks, the socio-economically vulnerable like the unemployed, the aged and immigration reception centres.

The opinion of the respondents, these wastage impacts mainly on the following as shown in the figure 4 below.

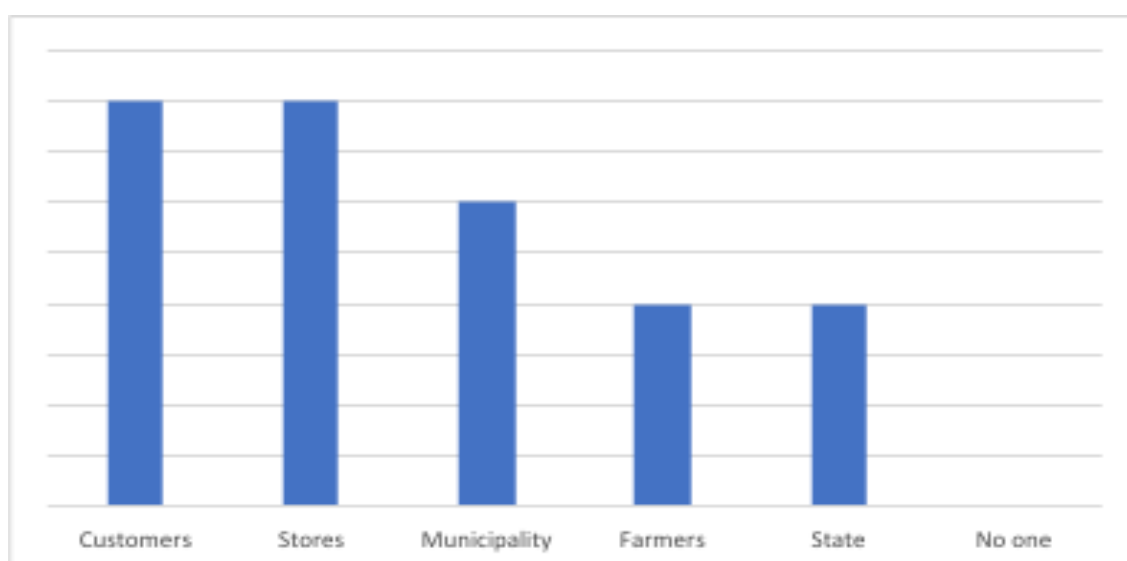


Figure 4. Opinions of respondents

Actions taken before throwing the food by stores are such as discounts. Mostly reduced product prices by 30 per cent, as well as others, as well as their fit for purpose percentages of discount. Despite the in-house waste management, a contractor for each case handled the disposal of the final waste generated by the stores. The study showed that half of the stores asked, did not know the resultant cost of the waste disposal.

Most of the products are ordered locally and from abroad. About 50 per cent of the stores questioned throw both local and imported products, meanwhile one claimed that imported products are rather discarded. Most of the respondents didn't seem to be involved in hunger prevention projects or interventions, locally or abroad.

5.2 Suggestions and for further actions

This section presents the following, suggestions and for further actions of the study.

One of the most important actions that could be made is to frequently review the existing laws and regulations drawn to manage the issue of food waste in the shops to meet up to the ever-changing trend in the industry. The shops are constantly finding new ways to satisfy their existing customers, attract new customers and be able to stand up to competition from others. In the same vein, customers are always changing their shopping trends due to several factors which include economic advancement, change of environment, health demands and even social or religious beliefs. And all these in one way or the other impact on the supplies to the shops which are normally intended to whip up demand and sales. But these as well can impact on the waste as supply may not necessarily meet up with demand.

Establishing and maintaining food banks and kitchens would also help the countless number of people who go to bed hungry due to socio-economic restraints. It

is also a known fact that with the ever-upward adjustments to our utility bills, family needs and many life support systems, we all make conscious efforts to make sacrifices on our budget on nutrition. So, we all stand in one way or the other to benefit if adequate attention is given to institutions which are making voluntary efforts to support those who are in dire need of food by serving them warm soups, and food supplies which go far enough to supplement the budget of many in need, as well as enhancing their balanced nutritional needs. It is, therefore, imperative as people, politicians, and religious groups to face up and help contribute to the maintenance of existing agencies such as "Jeesus Cafe Oy", and support the establishment of new and easily accessible ones. The funds spent on benefits to the needy can be stable if the little given out can meet up the various high cost of utilities as people will spend less on food, and in effect be able to live basic comfortable lives.

It may be of help if policymakers could increase the tax percentage on food waste management at the landfill sites so that the waste collectors will, in turn, pass it on to the shops. A situation where the shops are made to pay higher fees can force them to reduce the volume food waste they generate.

Improved methods and practices used in preserving food for ample time can make a positive contribution to reducing the amount of food that ends up in the landfill. Good storage practices like better segregation is an example. Enhanced ventilation, proper handling by staff, and less movement of fresh foods in the shops before they are finally sold out to the customer.

Efficient planning to correspond with demand and supply in order not to exceed the shop's orders beyond an estimated demand for a time period. The adoption of sustainable system by using technology to routinely track customers behaviour with respect to their choices, demands, and needs will go a long way in controlling superfluous stocking. The shops will only order what can be sold.

Frequently trainings, seminars and workshops on food waste management would adequately raise awareness and prepare the shops in reducing food waste, as it has been realized a good number of the shop managers are not well in-tune with existing management methods for reducing the waste in their shops, or are less resourced with means of adopting improved practices. Therefore, continuously encouraging training on new management methods will assist in meeting up with the dynamic nature of the challenge of food waste.

In the light of the foregoing conclusions, the following recommendations have been made to help resolve the menace of food waste by the grocery stores in Tampere, as listed in the table 3 below.

Table 3. Recommended actions and expected effects

No.	Recommended action	Expected effect(s)
1.	Authorities should constitute a committee to review the existing legislation and policies on food waste and ensure full compliance by all grocery stores.	This legislature will ensure stores comply with the policies that will prevent them from wasting food. It will further help to control the generation of food waste in Tampere.
2.	In order to manage effect of food waste on sanitation, Tampere city authorities should establish more food banks and kitchens across the city and should promote accessibility by the needy in the community.	This will go a long way to help meet some of the nutritional needs of the poor and vulnerable in the society.
3.	The shops should be encouraged and motivated to adopt the use of adverts in the form of posters at vantage points in the shops highlighting the problem of food waste, and the importance of responsible shopping.	These adverts will provide constant reminders and information to customers on the need for food waste prevention.
4.	City authorities should take it as a duty to educate and inform the populace of the need to do their bits to reduce food waste in the shops through public seminars, lectures, radio/television adverts, banners, and role-plays.	This will motivate consumers to be sustainably sensitive and responsible in their shopping behaviours.
5.	Technologies for saving food need to be supported to expand and promote the adoption and use of systems like ResQ, and Karma. which are food	This will alert the grocery shops and respective consumers of any leftovers so that remedial actions

	surplus apps which alert their users restaurants with leftover food at heavily reduced prices. More grocery shops should be permitted and encouraged to enrol on these platform (i.e. digital solutions).	can be taken immediately to eliminate potential food wastages.
6.	Laws should be made and enforced to make it mandatory to shops to keep records which must be reported to appropriate authorities on their monthly food waste.	This will serve as a link or early warning system between the stores and the food banks to ensure early pick-up of surplus foods for the food banks.
7.	It will be recommendable if authorities offer some incentives like tax cuts, certificates of recognition etc to shops which are actively implementing measures to save food from ending up in the trash bins.	This will serve as motivation for respective shops to continue with these measures, as well as be an incentive for other shops to follow in their footsteps.

5.3 Scope for Further Research

For further research, there is the need to investigate into ways that will help to enhance the effectiveness of the sustainability aspects of policies, and legislation fit for purpose in curbing the wastage that occurs in the shops. For instance, laws can be made to make it mandatory to avoid food waste as much as possible.

6 CONCLUSION

Given the results shown earlier, we see that stores do generate eventually a tremendous amount of food waste. Especially, food waste that can still be consumed before disposal. Throughout the questioner, shops do take initiatives in tackling the issues, as well as a willingness to further their actions to limit the physical and economic impact of throwing away food. The most common action undertaken for combating food waste discarded by grocery shops is to reduce prices from 30 to 50 per cent.

Moreover, some new initiatives have been observed and believed to contribute more in the fight against the disposal of usable food products by shops. K- Market for instance in Finland reduces the prices of cooked food like grilled chicken, salad, fried pork and many others at their food service joints by 50% - 70% from 20:30 Finnish time.

Some other initiatives gaining popularity is this digital measure of using a mobile phone application, Res-Q in some cities like Finland and Helsinki in alerting would-be customers of shops and restaurants about discounts before closing times.

Crucial impacts can be made if laws are made or reviewed to allow persons referred to as dumpster divers to freely to pick reusable foods from food chains before the food end up at the landfill sites.

With all the afore-stated measures, methane gas emission into the environment will be reduced, as less organic matter will end up at the landfill sites in Tampere and its environs.

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APPENDICES

1(2)

Appendix 1. Questionnaire

Job position..... Sex: Male Female

1. What is your family size?

 1 2 3 4 5 or more

2. What is your highest level of education?

 Tertiary education / Professional qualification Secondary School (middle school, O/A-level) Primary school No schooling

3. What type of food waste do you normally dispose

 Meat Vegetables Pastries Ice cream Drinks Milk Other (specify).....

4. What form are these food waste normally in?

 Fresh Preserved Canned Refrigerated/Frozen Other (specify)

5. How often do you dispose of these food wastes?

 Daily Twice in a week Weekly Every Two Weeks Three times a month

6. What amount in total of food waste is thrown away? [] []

[] [] []

7. Who dumps the dumps the food waste? Self /organization Waste collectors

Other.....

8. Do you have any plans for the food before throwing away? Yes

No

9. Where do you dump the waste? Community dumping site Burn Waste collection agency.
10. Do you know how the food waste is finally taken care of?
 Yes Burned Buried Refuse site/landfill) No
11. Any idea of how much this cost per collection? Yes, how much?..... No
12. Who dumps the dumps the food waste? Self /organization Waste collectors Other.....
13. Who dumps the dumps the food waste? Self /organization Waste collectors Other.....
14. What portion of the foods thrown away are usually in a good condition for consumption? Large portion Part Small portion No idea None of the above
15. Where does the greatest portion of your products come from?
 Finland Abroad Both
16. Which Foods do you usually throw out?
 Imported products Finnish Products Both
17. Is your company involved in any food or famine prevention projects locally or abroad? Yes No No idea.