Food Waste And ICT

AG1815 Sustainable Development, ICT and Innovation

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1 Summary

A third of the worlds food supply is wasted each year while a tenth of the population lives under starving conditions. The aim is to discuss why food waste occurs, what its consequences are, how it differs between rich and poor countries, and how it can be remedied by certain ICT solutions. Two specific ICT solutions covered are Karma, an application where restaurants offer customers discounted food items that are past their due date, and Matsmart, a company to which grocers and suppliers sell over-stocked supplies of goods that are also past their due date. Matsmart in turn sells these to its customers through their website. The general idea behind both ICT solutions is that they encourage both enterprises and individuals to engage in sustainable consumption by decreasing food waste. They achieve this by incentivizing the enterprises to discount their wares and thus still realize a small profit, and customers to save money by buying cheaper food.

2 Introduction

According to UNEP [1], approximately one third of the global annual food supply is wasted, circa 1.3 billion tonnes. This amounts to roughly 750 billion dollars a year. This aggregated waste represents four times the emissions of the global airplane industry, equaling 6 percent of all global emissions [2]. A major contributor is the agricultural sector, which throws out "undesirable" food items, e.g those with deformed appearances or discolouring but that otherwise are perfectly edible. Restaurants and wholesalers are also responsible for throwing out food they were unable to sell. This is in part due to overcautious legislation, one obvious example being best before dates that are often no indication that items are no longer edible. Another factor being a lack of communication between retailers and customers where the former holds an over-supply of perishable goods that they are unable to sell. This in turn has up until now been due to insufficient advances in technology and software (ICT). It is the authors personal conviction that there is not enough legislative resources devoted to waste itself, as the implications of throwing away a third of the food supply are not only environmental, but also financial and moral. These are however outside the scope of this essay. Decreasing said food waste is part of the United Nations sustainable development goal number twelve, "responsible consumption and production". Any constructive solution would, besides being a step forward in the aforementioned sustainability goal, also decrease emissions.

[1] Worldwide food waste, UNEP

[2] Hannah Ritchie, March 18, 2020, Food waste is responsible for 6 % of global greenhouse gas emissions, Our World In Data

3 Aim

The aim of the report is to cover why food waste occurs and what the implications of food waste are. This has been briefly discussed in the introduction and problem formulation section. Additionally, the author will cover explicit ICT solutions that contribute towards decreasing food waste, which will be covered in the upcoming sections. These solutions will be discussed in detail. That is, how they function from a technical and practical point of view, as well as if their resulting consequences and effects, which could be direct, systemic or substitutional et cetra. That is, any relevant effect that has been previously covered in lectures and is within the scope of this course. Plenty could be achieved by legislative assemblies in order to decrease waste, this report however will only focus on ICT solutions that for the most part, are the result of innovative enterprises.

4 Description and analysis from a sustainability perspective

In this chapter, various impacts that arise due to food waste will be discussed. These relate to social and environmental sustainability.

4.1 Description Of Direct Impact

Food waste equals 6 percent of all global emissions, meaning that decreasing said waste would lead to a significant positive impact on greenhouse gas emissions (GHG henceforth). Furthermore, throwing out a third of the global food supply does not sit well considering that ten percent [3] of the world population lives under starvation. A third of all the global food supply could and should feed this tenth of the population by a wide margin. Besides the morally deplorable act of allowing this to continue, starving as can be expected, is historically a real cause of environmental and social concern as it leads to societal unrest and political instability in the countries it affects. This instability in turn leads to unsafe conditions to conduct any business, including agriculture. This in turn leads to less agricultural activity which in itself leads to more starvation. Thus, this perpetual downward spiral is not in any way socially sustainable. What may elude the reader is that starvation is not environmentally sustainable either. Starvation and poverty can, when not remedied in time, result in more poverty. When viewed through an eco-friendly lens, impoverishment as well as non-environmentally friendly supply and demand are major contributors to pollution. Pollution simultaneously increases poverty. As the two are correlated, it is necessary to solve them in conjunction [4], thus in this instance, implementing socially- and environmentally sustainable solutions run hand in hand. Furthermore, eliminating poverty and hunger are both first priority goals (one and two

[3] John Holmes, UN website, 2009, Losing 25,000 to Hunger Every Day

[4] Delia Paul, February 12, 2021, International Institute for Sustainable Development, Merging the Poverty and Environment Agendas

respectively) in the United Nations Sustainable Development Goals (UN SDGs).

When access to food is restricted, people tend to engage in the general ruination of the surroundings that they live in. The last thing a starving human thinks about is sustainable production. Thus, the hunter poaches endangered species, and the shepherd allows his sheep to overgraze a vital pasture, resulting in the decaying of a food source that has sustained his community for generations. All in the name of survival, which given the circumstances, the author is very sympathetic to. Thus, wasting food has far more indirect social and environmental consequences than simply being responsible for six percent of global emissions, as is evident when starvation is allowed to run rampant. Starvation as a result of food waste thus drives people towards unsustainable production in order to survive, in direct conflict with UN SDG number twelve (responsible production and consumption). Donating food to where it needs to be, instead of wasting large amounts, is a far more mutually beneficial act than one would believe, as accessible green pastures and non-exterminated species are necessary for the world and the human race as a whole.

One very current and modern example of where food waste and redistribution of food matters is the global pandemic, or the COVID 19 crisis. African swine fever (AFS) erupted in China in 2018 [5] and as such, a considerable amount of swines had to be euthanized to curb the spread of the disease. Unfortunately, pork is the main source of cheap protein in China. As the supply of pigs quickly dwindled, hungry Chinese farmers had to look to alternative sources of protein. These alternatives were unregulated markets were wild animals were being sold. It is strongly suggested that Covid-19 spread to humans in one of these animal markets. Thus, the crisis can be partially blamed on not giving farmers alternative substitutions when pork was taken away. The farmers, when presented with the alternative of either starving or eating animals of dubious origins, chose the latter. If there were appropriate channels to divert food that was being wasted elsewhere to these farmers, perhaps the whole crisis could have been avoided. China is riddled with affluent cities that are free economic zones, where the standard of living matches that of western cities. These cities also match their western counterparts in food waste. Thus, the situation could have been avoided if wasted food from these cities were diverted to the rural inner parts of the country, where due to poverty, people do not tend to waste their food to such an extent as in rich places. Thus when times of privation arrived in the form of AFS, the farmers could not simply waste less and therefore eat more, as someone in the city could. Facilitating the spread of a global pandemic is something that can certainly be counted as counter-productive to social sustainability.

In a study that links food security and sustainability, courtesy of one of the

[5] Natalie Grover, 2021, The Guardian, Deadly pig disease could have led to Covid spillover to humans, analysis suggests

many provided resources in the module section of lecture fourteen, sustainable food production. One of the main conclusions were that "a sustainable food system supports food security, makes optimal use of natural and human resources, is culturally acceptable and accessible... there is an urgent need to design and implement appropriate policies to improve the economic, environmental and social sustainability of the current food consumption patterns". The authors of the study regard decreasing food as an integral part of achieving sustainable food production. They also point out that it is equally important to redistribute food that would have otherwise been wasted. It makes little difference if the author will get to enjoy a meal today that would have otherwise been wasted. For someone that is poverty stricken however, it could mean the difference between starving or prospering. In the provided course literature and resources that have been mentioned above, food security is a terminology that is on par with environmental farming or sustainable intensification. Thus, it is not only necessary to decrease food waste, but also to redistribute what has been saved to where food security is scarce, as this would be a step forward on the path of social and environmental sustainability.

With regards to all the aforementioned instances and effects, the author has hoped to illustrate and establish a link between food waste, restricted food access i.e starvation, and what this means for social and environmental sustainability. The author also hopes to illustrate that wasting food has far greater implications, both direct and indirect, than just being responsible for six percent of global emissions, which in itself is negative.

4.2 Analysis and Discussion Of Impact From A System Perspective

What the author failed to mention above, in that food redistribution, although desirable, is not entirely necessary if food was affordable to an extent where even the most poverty stricken can purchase enough for their daily needs. As of now, food is not cheap enough. In a Utopian scenario, if the entire thirty percent of the wasted food supply was remedied, one obvious consequence would be a drop in demand by a third. A basic understanding of supply and demand would lead one to surmise that it would lead to a significant drop in the prices of food items. In what the author would like to call an enabling effect, slightly differing from the usual ICT context in lecture four, decreasing food waste would enable impoverished individuals to purchase food, by way of a decreased food demand. It also shows how global and local effects are dependent when it comes to food supply. In a highly globalized world that shares the same markets for basic commodities such as wheat, coffee beans, potatoes, meat et cetra, prices in one part of the system have profound effects on prices in other areas, for better or worse. If food waste and thus food demand could be decreased on a local or

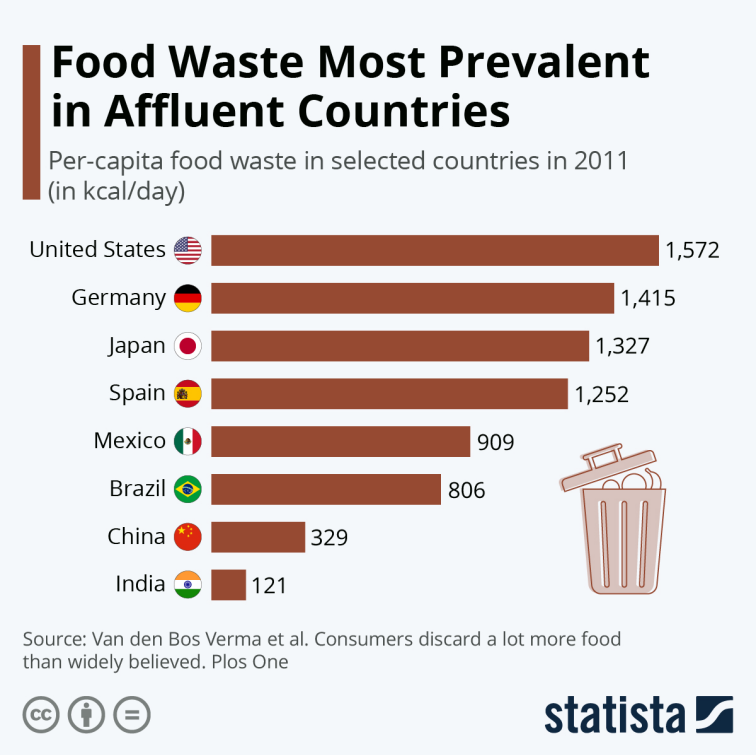


Figure 1: Courtesy of Statista, affiliated with the source contained in the footnote

regional scale in affluent areas, as these areas waste the most [6], it would have a positive global effect where food prices across the globe would decrease and consequently become more affordable for poverty stricken nations. This claim is further supported in the chart above.

5 ICT as a possible solution for sustainable development

This section covers two specific ICT solutions that contribute towards decreasing food waste and encourage sustainable production and consumption.

[6] Monika van den Bos Verma, Linda de Vreede, Thom Achterbosch et al, 2020, PLOS ONE journal, Consumers discard a lot more food than widely believed

5.1 Karma

The notion of food savings in the restaurant industry is nothing new. According to Karma founder Ludvig Berling, long have there been ways to save food wastage by donating food, Karma however is first with creating a user-friendly implementation, where the consumer seeks out the restaurant in question[7]. These operations have in most cases been run by charity organizations like the Swedish Church, and throwing away food has often been more viable than going through hoops of the complicated charity operations. The application incentivizes both users and restaurants to minimize food waste in order to save money, hence the lollapalooza effect from the combined advantages of incentives and user experience, which encourages both parties to participate. In practice, enterprises sign themselves up and register their addresses on the karma webpage. Karma reciprocates by publishing their address and discounted food items in their application on a mobile interactive map, which consumers can browse. Payment is handled digitally, upon which only the uncomplicated matter of collection remains.

By having an app which incentivizes the minimization of food waste for all involved parties, it effectively contributes to decreasing food demand and should therefore in the long term be a net contributor to decreasing food prices. Decreasing prices in turn will make food more affordable for impoverished individuals and thus allow for greater food security for said individuals. This in turn should lead to a situation where the negative consequences of starvation can be avoided, as discussed in section three.

If not obvious until now, the application provides a positive induction effect, where Karma stimulates the consumption of left over food for the purpose of reducing food wastage, thus resulting in sustainable consumption according so UN SDG number twelve. According to Lorenz Hiltys figure provided below, note that inductive effects are otherwise stated as negative, the author however thought the word was fitting in this instance for a positive effect. One potential negative aspect of Karma is a future semi-structural one, albeit a little far-reaching: The app and other similar apps, given a large enough following, can turn into an advertisement enterprise that promotes regular wasteful eating habits (through advertising of undiscounted food items) and thus counteract its positive effects.

Even when looking past the sustainable advantages of Karma, the somewhat revolutionary concept and implementation of the app, coupled with the utility of saving money for both customers and restaurants, makes the author believe that user adoption of this innovative service should explode in the coming years. The diffusion of similar software implementations (Matsmart among other apps and websites) is sure to come, as they essentially boil down to a morally celebrated way of saving money, and who would not support that?

[7]Håkan Soold, 2020, KTH, Karma räddar överbliven mat från att slängas

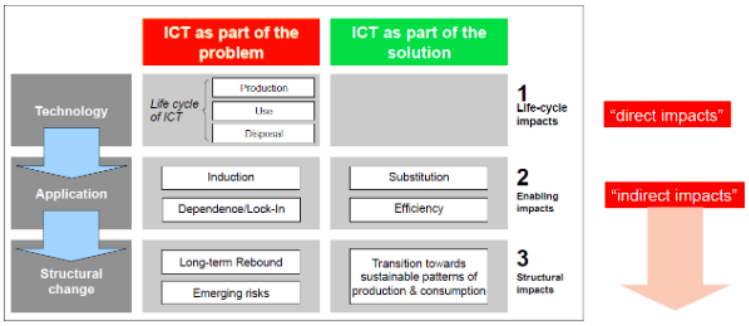


Figure 2: Lorenz Hiltys framework of effects

5.2 Matsmart

Matsmart is a Swedish company that works in a similar fashion to Karma, the difference being that it caters to different market segments. Where Karma focuses on restaurants, Matsmart focuses on grocers, distributors and suppliers. The company purchases goos from said supplier in the event of oversupply, faulty packaging and goods that have expired but are deemed to be edible. In all the above mentioned examples, suppliers deem it to be more cost-effective to throw out food or better yet, sell it to Matsmart at a discount. Matsmart in turn offers said food items to anyone willing to purchase them over their website. According to the karma founders, they have saved an aggregated 25 000 tonnes of food from being wasted[8]. Just as Karma induces people to save money by buying discounted food from restaurants, Matsmart induces people people to save money by buying discounted food from suppliers, where Matsmart, thanks to a user-friendly website acts as an intermediate. The two enterprises work in different areas of the supply chain but have in essence the exact same effects. Matsmart provides grocers with an outlet for selling unwanted goods, thus promoting sustainable production or UNs SDG number twelve, just as Karma.

In order to not make this report too repetitive, Matsmart has more or less the exact same sustainability impacts as Karma. The reader is thus referred back to the Karma subsection. Matsmart, as opposed to Karma however, has the advantage of dealing with distributors instead of restaurants, which is higher up in the supply-chain. As there are a myriad of restaurants with with low output, Karma becomes difficult to scale as there are many market participants with widely differing business models. Some restaurants might not offer take-out food, which is the type of restaurant that attracts Karma. Other high-end restaurateurs might view engaging in food donation and food discounting as dilution of their brand, and might not choose to do business with Karma. The world of grocers and distributors however, in Sweden at least, is dominated by a small group of big corporations. For Matsmart it is easier to do business with a

[8]Akhavan, 2021, SVD newspaper, Idén minskade svinnet – med 25 000 ton

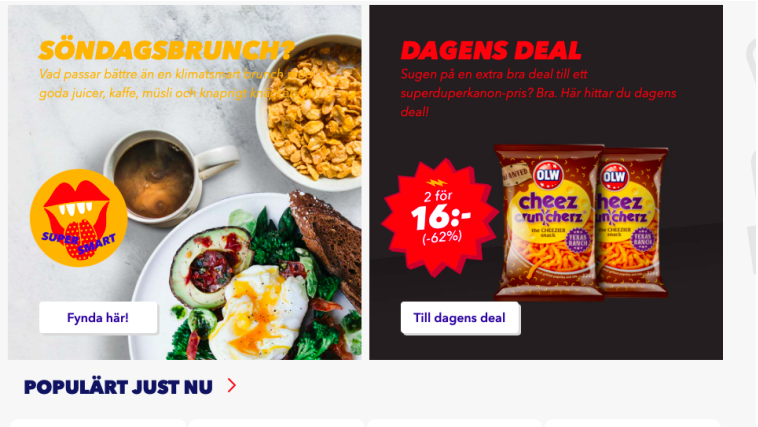


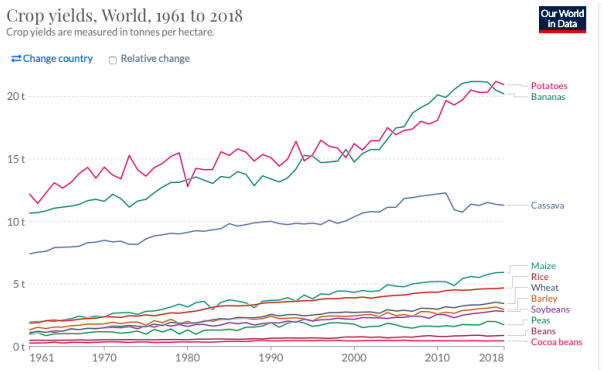
Figure 3: Matsmarts home page

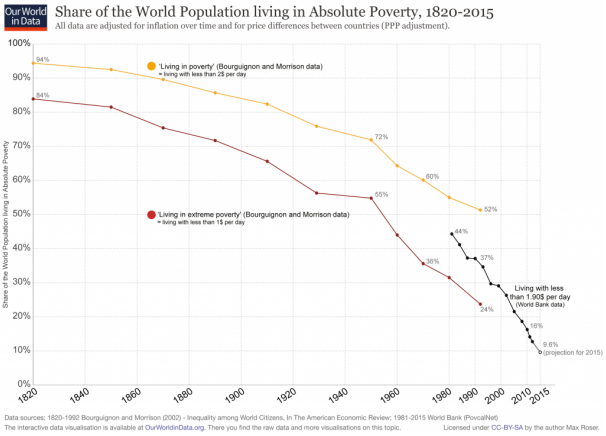
few big actors instead of many small. Thus, their operations are easier to scale. The following is a snapshot of how Matsmart has decided to implement their website.

As is evident from the screenshot of the webpage, it is simply a matter of browsing through articles and then buying what one wishes, at affordable prices. After paying online, the customers receives their article through an intermediate of choice (Postnord, DHL et cetra).

6 Reflection

As an engineer, the author sees a continuing demand for applications and website that continue to connect customers and various retailers, which are not only restricted to restaurants and grocers. Up until now, there has not really been an effective way of clearing over-stocked supplies of perishable goods. With today's technology it is possible, and the above mentioned applications will only increase in number in the future as there is a need for interfaces that connect the aforementioned parties. As an engineer, the author might see themselves as working and contributing to similar solutions in the future, where his skills in programming could readily applied. As an individual, the author is an optimist by nature. Human kind is very resourceful and is sure to solve this problem, through a combination of technical ICT solutions and supplementary legislation. Furthermore, the author would not have such a large objection to food waste if there were no starvation in the world. Throwing out a third of the food supply while a tenth of the population starves however, leaves a bad taste in the mouth. On another note, humans have been incredibly good at increasing the crop yield per hectare throughout history, ostensibly being able to support larger and larger populations and feed more and more people. The whole point of food waste according to the author is that it should be redirected to where it is





needed. The problem of starvation however might take care of itself due to the ever increasing productivity of agriculture, of which one of the consequences is that the share of the world population that lives in extreme poverty has decreased significantly during the last two hundred years. Above are two charts supporting the authors claims, courtesy of the online publication "Our World In Data". Thus, the author frankly believes more in agricultural engineering and progress than ICT solutions when it comes to ending world hunger, which the author personaly regards as more important than food waste, even though the two are somewhat correlated. ICT engineering solutions however might play a larger role in decreasing food waste in wealthy countries.

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