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## **A Multi-tiered Approach to Address Food Waste in Australia**

7.3 million tons. 298 kilograms per person (Rabobank, 2019). Enough to fill the largest stadium in the Southern Hemisphere, the Melbourne Cricket Grounds, six times (Rabobank, 2020). These are all statistics used to describe the amount of food wasted on an annual basis in Australia. While food spoilage and waste may not always come to the forefront in discussions surrounding food insecurity, it is undoubtedly a major contributor that must be addressed in the search for solutions to this global issue. In developed countries in particular, food wastage is proving to be a growing problem that involves not just losses of food among farmers, manufacturers, and retailers, but also waste created by households and individuals. Among such countries, the small continent of Australia rises close to the top in per capita food waste. In order to address the concerns raised by spoilage and waste in Australia, one must first examine its root causes and then consider solutions involving all sectors of the food supply chain to create effective, meaningful, and lasting change.

A large contributor to Australia's food waste issue is its agricultural sector. Currently approximately 51% of Australian land is being cultivated (Australian Bureau of Statistics [ABS], 2018), yet 28% of global agricultural land produces food that will ultimately be wasted (Food and Agriculture Organization of the United Nations [FAO], n.d.). Since the average farm size is 4,331 hectares which is equivalent to about 8,093 football fields in size, this agricultural land is divided into large areas rather than small family farms, as is the case with much of the United States (ABS, 2017). However, while it may appear as though Australia is abundant in agricultural resources given the amount of space devoted to it, in reality, Australia's climate in many areas is not conducive to crop cultivation. Desert is prevalent in Australia, making up almost 20% of its overall geography (Digital Transformation Agency, n.d.). This also means that freshwater is much more scarce, and the preservation of resources is key to continued food production. However, when food is discarded, all of the significant land and water resources that contributed to its growth are wasted right alongside it. In addition, much of what is grown for food in Australia is sold in local supermarkets and purchased by Australian consumers (Department of Agriculture, Water, and the Environment [DAWE], 2020). As a result, when food is wasted along the supply chain, it impacts not only the environment, but also the economy. This occurs to such an extent that the Australian government estimates that food waste costs \$20 billion per year (DAWE, n.d.). Evidently, food waste poses very serious consequences for Australia's residents and the country as a whole.

On a deeper level, individuals also contribute significantly to the food waste problem in Australia. Although a country of just under 26 million people, Australia ranks fourth in the world for the largest amount of food waste produced per capita (Rabobank, 2019). The issue comes down not simply to losses from crop yields due to pests or to food lost during transportation, but to the choices and attitudes of families and individuals. The reality is that a typical Australian family is able to support themselves financially, being that the average weekly income is \$1,711.80 AUD which translates to approximately \$67,841.80 USD per year (ABS, 2021). This income would be to support an average household size of only around 2.6 (Australian Institute of Family Studies, 2018). This is not to say that many Australian families are without challenges. For example, according to the 2013-2014 General Social Survey by ABS, "20% of people said either themselves, a friend or family member had been affected by mental illness, alcohol or drugs, or abuse or violence in the past year" (Baxter, 2016). However, most families do live in metropolitan areas with strong infrastructure, electricity, appliances, clean water, and indoor plumbing (ABS, 2010). Thus, a typical family has both access and the means to obtain sufficient food to sustain

themselves. It becomes clear, then, that the majority of food waste occurring in households is a result of completely avoidable pitfalls when cooking at home. These may include such actions as buying or cooking too much food, throwing out food before the use-by date or throwing away leftovers, and unintentionally allowing food to rot or spoil before it can be used (often a consequence of buying too much). In order to change the course of this growing problem, one first needs to change the way consumers perceive the food in front of them.

One way to alter these wasteful tendencies may be in helping individuals to recognize the impact of their actions not simply on the economy or the environment, but on the 1 in 5 Australians who are affected by food insecurity (DAWE, n.d.). Although it's true that many Australian families are able to support themselves financially, this does not mean all are saved from poverty, or, hence, from food insecurity. Historically marginalized populations such as the indigenous Aboriginal and Torres Strait Islander people in Australia, tend to be those who are also disproportionately affected by poverty, and a lack of food security (Bowden, 2020). Many of these groups live in remote and isolated areas that sometimes even struggle to meet the clean water standards, with water being contaminated with nitrates, uranium, and fecal matter (Lansbury Hall et al., 2016). For these people, food waste poses a huge threat to the already unstable food security they experience. While many food banks don't have sufficient resources to meet the needs of all those affected by food insecurity, unspoiled food is being thrown away from supermarkets and households. According to the *Foodbank Hunger Report 2020*, this issue has only grown as a result of the COVID-19 pandemic. With food insecurity on the rise, more and more Australians have been turning to food banks for relief (Foodbank, n.d., p. 8). However, during lockdowns, with more families cooking at home more frequently, food waste trends have only increased. There is a direct correlation between these two incidences. In fact, the UN estimates that if food waste could be reduced by just 25%, it would be able to feed all the malnourished people in the world (Lyons, 2015, par. 1).

Food waste poses significant economic and environmental consequences not just in Australia, but globally. For instance, as food decomposes, it releases the potent greenhouse gas, methane, which is many times more powerful than carbon dioxide. As a result, in Australia, food waste accounts for over 5% of their total greenhouse gas emissions, in addition to comprising 8% of global greenhouse gas emissions (DAWE, n.d.). To put this in perspective, according to the World Food Program USA, "If wasted food were a country, it would be the third largest producer of carbon dioxide in the world" (World Food Program USA, 2021, par. 9). Not only this, but all of the resources, from water to land, used to produce food that is discarded is also wasted (FAO, n.d.). The loss of these resources and the loss or wastage of food all bears an economic cost. Farmers, manufacturers, and stores all lose either income or revenue when they throw away food, which, in turn, impacts the larger economy. This begs the question, though, if food waste is such a global issue, what can be done to reduce it and how can these solutions be put into place?

To address these questions, it is important to first determine what solutions are currently being used to combat the issue both in Australia and abroad. To begin with, since Australia is considered a developed country, examining working solutions in countries with similar developmental levels is vital. One such case is France, which is now considered one of the leading pioneers in reducing food spoilage and waste. In 2016, they passed a law requiring supermarkets larger than 400 square meters to donate any unused food (that they could no longer sell, but had not yet expired) to food rescue charities (Gore-Langton, 2017). This venture has proved very successful, with 46,000 tonnes of food being saved per year, while at the same time donations to food banks have increased 20% (Livesay, 2019). Not only has this provided environmental and social benefits, making strides towards great food security, but it has also benefited many stores and the economy. Whilst supermarkets that did not comply faced hefty fines, acting as a negative incentive, stores that did are rewarded with an up to 60% tax break (Livesay, 2019). Even though this solution focuses on just one aspect of food waste, it still presents a step towards tackling the problem.

While France's new law focuses on food lost in the retail sector, Japan's solution focuses on the largest sector creating food waste, that of households. In recent years, many local and even national governmental organizations in Japan have partnered with the United Nations's Food and Agriculture Organization (FAO) to sponsor campaigns educating the public about the consequences of food waste. Advocacy campaigns such as "Save Food" have made a special effort to make youth more aware of the problem using lectures and training sessions in schools (from elementary schoolers up to university students). In 2017, Japan's food waste figures were significantly lower than many other industrialized countries, with households only wasting 2.8 million tons despite the population of approximately 127 million (FAO, 2017). Evidently, education and advocacy initiatives can play a huge role in shaping the mindset of consumers and working towards reducing the amount of waste produced on a daily basis.

One solution that has not yet been broadly explored, is the potential for implementing changes to the packaging of food in order to extend their shelf lives, and thus eliminate some of the wastage that stems from spoiled food. For instance, in the past few years, edible packaging has been brought to the forefront of research by serving a dual purpose function. Not only can it reduce food waste by utilizing leftovers generated during production processes, but it can also help eliminate plastic pollution and the introduction of microplastics into packaged foods. Such packaging can come from a variety of sources, from citrus peel waste created during the production of juices and other products, to whey protein and corn starch. Many of these edible packaging materials have also proven successful in extending the shelf life of foods like fruits and vegetables and even adding antimicrobial and antioxidant properties to the packaged food (Mohamed et al., 2020). Since waste can be diverted from production processes to create such packaging, costs to obtain primary materials would often be kept to a minimum, adding to the viability of this solution. While significant research still needs to be done in order to assess the broader applications of edible packaging, it offers significant benefits that should not be ignored when developing a solution to combat food waste in Australia and around the world.

In addition to food waste solutions abroad though, it is also crucial to consider what work is already being done in Australia to resolve this issue. One such solution is "Stop Food Waste Australia," a government-funded initiative designed to cut Australia's food waste in half by 2030. This bold proposal involves bringing together the government, businesses, farmers, and consumers in order to reduce food loss and waste across every sector. One way they plan to do so involves the Australian Food Pact, a voluntary agreement that organizations can sign up for. Once they commit to the agreement, they can work with Stop Food Waste Australia to identify ways to optimize their supply chain in order to minimize food waste ("Australian Food Pact", n.d.). This may involve steps like donating more usable food to food rescue charities, which is one of the main goals of the Australian government. These efforts would strive to meet the needs of food insecure populations by redirecting food that would normally go to waste. Thus far, the Australian government has devoted \$4 million to fund this project which launched in June of 2021 (DAWE, n.d.). Since this solution has only recently been implemented, there is a very limited amount of information available as to its success thus far, and its long term effects can not yet be measured. However, it is promising in that it addresses not just one cause of food loss and waste, but rather endeavors to tackle wastage all along the supply chain. This multi-tiered approach is needed in order to curb the growth of this problem and provide the most benefits to the environment, economy, and society in general.

In order to make a lasting impact in reducing food waste and progressing towards a more food secure world, any solution will need to address changes to the agricultural, manufacturing, retail, and consumer sectors. While the Stop Food Waste Australia initiative is a start, one major drawback of this proposal is that it is voluntary. This means that organizations that are already taking steps to stop food waste might be more willing to sign up than those who are not. To enact real change, all parties must be involved. An approach similar to France's law could quite feasibly be implemented in Australia to create such necessary forward movement. By using government policy to apply both the positive incentives of tax

deductions for food donations, and the negative incentive of fines for noncompliance, stores could begin to cut down on food waste. These actions would need to be put into place by Australia's Parliament in order to launch change on a national level.

Second, since households are the biggest contributors, a similar solution to that of Japan could be adapted to Australia. The FAO could begin by partnering with local governments to initiate a similarly-structured advocacy campaign surrounding food waste. This would aid in boosting awareness of the consequences of food waste among individuals. To reach the widest audience, though, it would be useful to partner not just with schools, but also with local businesses, non-profits, and communities, to educate all about this issue. In addition to the face-to-face components of the campaign, such as FAO representatives giving presentations to students and other community members, it may be helpful to utilize social media to bolster understanding of the food waste issue. Since social media platforms boast millions of Australian users, it is a convenient way to engage the public, and has the added benefit of being free of charge (thus requiring no funding). Alongside these campaigns it would be beneficial to emphasize the tax write-offs available for donating food to registered charities, stressing how this can be done with any unused food at home. Spreading this message may motivate individuals to donate to food banks, thus further aiding in reducing food insecurity in Australia. Social media could again be utilized to aid in disseminating this information. Since the Australian government has already demonstrated a significant desire to reduce food waste in their country, it is possible that they could supply much of the funding for such a campaign.

In combination with these proposed solutions, a final recommendation would be to begin to implement closed-loop processes in both the agricultural and manufacturing fields. Since most fruits and vegetables grown in Australia are subsequently sold in local grocery stores (DAWE, 2020), using the waste of such crops to generate edible packaging can create a zero-waste cycle that would also benefit farmers. Rather than having to throw away food that cannot be sold to stores, it can instead be sold to manufacturers for use in packaging generation. This solution would begin with further research into commercial production of edible packaging before it can be widely used. Research organizations such as the Australian Research Council often supply grants for such projects, but funding could also be obtained in partnerships with manufacturers and farmers, once they were educated on the advantages of such a system. If edible packaging were made available on a commercial level, it would then likely require a cultural adjustment in the way consumers view and dispose of packaging, since these innovations are not what most Australians are accustomed to. This shift may be eased, though, if edible packaging manufacturers were to highlight the benefits of this solution, both in terms of their ability to reduce food waste, and, more specifically, to reduce plastic usage. The Australian government recently announced the National Plastics Plan 2021, which aims to reduce plastic waste by banning or phasing-out many single-use plastics by 2025, among other things (Buchanan, 2021). Since more attention has been directed in recent years to the environmental consequences of plastic, Australian consumers may already be more poised and willing to accept alternate options to traditional plastic packaging. Such inventions could be a huge step forward in eliminating the wasteful mindset in many sectors of society.

Australia, like many countries today, is faced with growing concerns about food waste and its connections to food insecurity. Whether this wastage occurs in agriculture, processing and manufacturing, transportation of goods, retail stores, or households, the fact remains that food spoilage and waste is, and will remain an issue until all groups come together to combat it. By utilizing the plans already in place with the Stop Food Waste Australia initiative and combining them with restrictions on food waste in stores, education for individuals, and the creation of closed-loop processes for farmers and manufacturers, Australia can work towards reducing food waste and improving food security for everyone.

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