

Vegetarianism & Veganism

By Ellen Potter



Environmental Impact of Animal Agriculture

Focus Within Singapore

Saving the planet is in **Our Hands**

The true meaning of sustainability may be further defined under the wellbeing for all, within the means of nature - in which animal agriculture physically and mentally abuses animals. Furthermore, sustainable development should meet the needs of the present without comorting the needs of future generations to meet their own needs, albeit the issue not only tortures animals and is a leading cause to deforestation, biodiversity loss and water pollution - as well as climate change; but is increasing the health risks for future generations. However, all of this can be changed by individual action. Saving the planet is in our hands.



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FOREWORD

an introduction

The United Nations describes the livestock sector as “one of the most significant contributions to the most serious environmental problems, at every scale from local to global.” And when the UN called for “urgent action” to be taken against these problems in 2006 (under a report named the “livestock’s long shadow”) it led to no policies or initiatives taken, and has since been disregarded. One of the many reasons that may have attempted to justify this neglect is the lack of understanding between individuals - one that under-covers the dark side of such a large and prominent industry. However, in reality, there is a deeper and darker truth behind industry.

#1 PROBLEM: The protection of habitats and endangered species.

One of the unavoidable problems created by animal agriculture is the land exhausted to meet consumer demands, leaving to a web of associated consequences. Since 1970, more than 90% of the entire Amazon rainforest has been cleared only to sustain grazing livestock (PETA). And a large percentage of this does not even account for the living spaces themselves, but even their feed - all of which occupies one-third of the earth’s ice-free land *and* covers 45% of the earth’s total land - meaning that 70% of agricultural land is used for animal farming (theguardian). This leads to many severe consequences:

The World bank states that animal agriculture is responsible of 80% of deforestation globally; with 1-2 acres of rainforest being cleared per second (vegansociety) which doesn’t seem as extreme when compared to the 2-5 acres of land required per cow (cowspiracy). To put it into perspective, this large number takes into account the land space needed to grow feed for these animals - which

reveals a shocking statistic. In the US alone, 56 million acres of land issued to grow food for animals, but only 4 million acres is set to produce the plant-based products feeding humans (PETA). Not only is this up to 20 times more land needed to satisfy a meat-eating diet than a plant-based diet, but leads to air pollution as well as habitat destruction. As a result, the earth is facing a huge extinction; with species of vertebras disappearing 114 times faster due to the felling of forests to provide space for livestock and to grow their food. This also means that every day, we are loosing 137 plant, animal and insect species all due to rainforest destruction - of which the animal agriculture industry plays the largest role. In addition, it is not only the forests and lands being drained by the industry - but our oceans. Beginning with commercial fishing methods, such as bottom trawling and long-lining - the ocean floor is cleared within minutes of all life and coral reefs are destroyed. This results in “by-catch” which is the term referring to species caught by accident alongside the intended fish which typically are, for example, the popular tuna and salmon. With 3/4th of the world’s fisheries being exploited or depleted, 90-100 million tones of fish

are being taken from the ocean every year - coming down to 2.7 trillion animals (PETA). Of these 2.7 trillion, there are approximately 650,000 whales, dolphins and seals, as well as 40-50 million sharks. All of which thrown back into the ocean, dead. To contextualise this into the fish we see on our plates at dinner or at the grocery store - for every 1 pound of fish we purchase or consume - up to 5 pounds of unintended marine species were killed accidentally. This adding up to a shocking 63 billion pounds of fish globally killed and disregarded. This all happens due to the selfish consumerist demand for more product, as these fishing methods, whilst being the most destructive - are the quickest and cheapest. And following the rate in which humans continue to fish - experts estimate that our oceans will be fishes and empty by 2048 (vegansociety). Furthermore, as most farmed fish are carnivores - up to 3 pounds of fish meal are used to produce a single pound of farmed salmon, meaning that large quantities of wild fish caught are not even for our consumption, but for the intended purpose of feeding the species demanded by individuals.

And it doesn't end here.

Livestock operations on land, as will be further mentioned later on, have created over 500 chemically flooded dead zones around the world's oceans; with the added harm from coastal fish farms which "release faces, antibiotics, parasites and non-native fish into sensitive marine ecosystems" (PETA). Therefore, not only is this industry causing mass extinction, but is ruining our earth's lands and oceans - giving us no hope in reversing these tragic destructions as we look towards a dark and unsustainable future.

#2 PROBLEM: Wellbeing of humans and our resources.

As we know, world hunger is a large and pressing issue - and with 800 million people going hungry each day, it's no surprise that there are countless organisations battling to feed hungry mouths (vegansociety). Especially with the world's population estimated to exceed 9 billion by 2050, we need a sustainable way to feed all of these people (united nations, 2013).

However, that brings the question on whether or not we are using our resources effectively. Why? Because "farmed animals consume far more resources than they can ever produce," and considering 40% of the world's harvest goes to livestock instead of hungry people - we could feed around 3.5 billion humans off the food currently being fed to livestock (vegansociety).

This shows that we are wasting valuable crops and land to produce less food and feed less mouths. Consider that 1.5 acres of land can produce 37,000 pounds of plant-based foods, or a maximum 375 pounds of beef. And even whilst sacrificing all of these crops to support livestock, there's requires 10 pounds of grain to produce 1 pound of meat (cowspiracy). Therefore, not only is land being misused to support livestock, but is further depleted to feed them - questioning whether the high demand for meat products from the wealthy and middle-class is justified in being responsible for taking away valuable food that could feed everyone on the planet. This notwithstanding that current statistics stating that the demand for food from animal agriculture is estimated to double by 2050, with a 73% increase in meat and off, and 58% in dairy (FAO).

On the other hand, we look at one of our most valuable and taken-for-granted resources - water. With millions of people being affected year after year by droughts - the animal agriculture industry is responsible for 92% of humanity's water footprint (vegansociety). This considering water is required to grow feed, clean disgusting factory farms and establishments, and to provide drinking water for the animals. As a comparison, here are some of the facts:

683 gallons of water are required for 1 gallon of milk.

Over 2,400 gallons of water are required for 1 pound of beef.

477 gallons of water are required for 1lb of eggs.

Almost 900 gallons of water are required for 1lb of cheese.

This means that the average Californian, whom consumes approximately 1,500 gallons of water a day, holds meat and dairy products responsible for half that number (cowspiracy). With all of this water wastage and misuse, it comes down to the sympathy that considering European farmed animals resonate largely in developing countries - this water is being taken from already water-scarce areas - with little to no regard from the struggling citizens.

Finally, regarding food and water - it is shocking to see how many more resources we waste to produce those we have a desire to process. To summarise and understand the absurdity of the subject, consider; *Humans drink 5.2 billion gallons of water and eat 21 billion pounds of food a day.*

Cows drink 45 billion gallons of water and 135 billion pounds of food a day.

and why is this?

This enters another aspect of the problem - that all of this comes down to consumer demand. *Our demand.* And for what? As put by David Katz whom works at the Yale University Prevention Research Center, "diets optimal for human health vary, but all of the more made up mostly of whole, wholesome plant foods." And under countless findings and scientific research, eating too much meat and dairy "increases risk of heart disease, type 2 diabetes, several major cancers (including breast, liver and prostate) and obesity" (theguardian). Following these understandings and much more, there is nothing that humans can obtain from animal products that they can't find in already-existing plant products. Therefore, settling the truth that we do not require these industries to go through so much labour and waste so much valuable time and resources so we may have optimal health and lives as society may protest. But rather, as humans we are fully capable of living off plant-based diets, as proven by the many individuals now currently turning towards a vegan diet - pushing the fact that the industries drive is truly *anthropocentric*.

#3 PROBLEM: POLLUTION

Global warming is one of, if not the *most* pressing issue our earth faces today. Not only are we seeing the consequences take place rapidly, but as we continue to act thoughtlessly, we are only driving ourselves deeper into an unavoidable grave.

Air Pollution

Animal agriculture is one of the most significant contributing factors to climate change. It are responsible for 14.5% of worldwide greenhouse gas emissions (PETA); this is more than the combined exhaust emissions from all transportation, being 13%. In fact, cattles emit 700 litres of methane a day - which is equivalent to driving a large 4x4 vehicle for 35 miles (vegan society). Therefore, as reported by the guardian - to reduce meat consumption by 50% in the US *alone* would have the safe effects as taking 26 million cars off the road. As shown, the public often overlooks one of the largest factors driving global warming - but who's to blame? Everyone knows that transportation is a major issue surrounding climate change, with high emissions that are constantly being targeted by NGOs to decrease; we see greener transportation and zero emission vehicles. However, the industry hides the fact that instead of spending thousands of dollars extra on a green car, we could simply save our money by avoiding the purchase of animal products.

To further understand the problem, we must understand how truly problematic the consequences of animal agriculture are and how they happen.

First off, factory farming requires large quantities of fossil fuels due to producing, transporting, processing and many more activities (vegan society).

Furthermore, even without the burning of fossil fuels - the raising of animals alone causes huge emissions of harmful gasses. For example, cows produce 150 billion gallons of methane a day (cowspiracy) [which is 250-500 litres per cow per day x 1.5 billion cows globally = 99 - 198.1 billion gallons]. To contextualise this, methane is 20 times more potent than carbon dioxide, and is 25-100 times more destructive within a 20 year time frame; this results in a global warming potential of an 86 fold in 20 years. (cowspiracy).

And this is not the end.

Farming animals and their by products account for 32 million tonnes of CO2 emitted per year and a shocking 51% of all worldwide greenhouse gas emissions (vegan society); this means that even whilst *completely* disregarding fossil fuels burned in the process - we will exceed the 565 gigaton CO2 limit by 2030 (worldwatch.org).

Finally, livestock and the agriculture industry is also to blame for 65% of all human-related emissions of nitrous oxide. Also known as laughing gas, it is 296 times more potent and harmful than carbon dioxide and therefore a huge contributor to global warming - and the gas remains in the atmosphere for an whole 150 years (cowspiracy).

Water Pollution

Water is one of our world's most vital resources, and so it has always been of a high importance for us to protect it at all costs. Therefore, it should be of a global understanding that animal agriculture is the *leading cause* of water pollution. The industry consumes approximately 34-76 trillion gallons of water annually (cowspiracy). Additionally, they are accountable for consuming 80-90% of total US water consumption, with 56% towards growing crops for livestock.

Think about it for a second. Think about the millions of adults and children without access to clean water. Those whom die of dehydration, those who walk miles every day just to bring some home to their family. But here we are, pouring trillions of gallons into an industry providing for the needy middle and upper class - whom are not even aware of the huge environmental impact they are contributing to.

Not only is water being thrown away into the industry, but is even ruining already existing water sources. As we know, water is a non-renewable resource, yet it is being strongly polluted by factory farming:

The US animal farms produce 500 million tons of manure a year, with no sewage processing plant (EPA). This comes down to an appalling 9 million pounds of animal excitement every minute! (vegan society). This is more excretion produced than the *entire* population of the US. This waste is either stored in waste lagoons or sprayed over fields as liquid manure, as to dodge water pollution limits by leaving it for the wind to take away. However, this means that the many people living nearby these factory farms and forced to breathe in toxins and pathogens (EPA). Additionally, "studies have shown that [animal waste] lagoons emit toxic airborne chemicals that can cause inflammatory, immune irritation and neurochemical problems in humans," as mentioned in a report filed by the California State Senate. .

Finally, also results in a runoff from farms and all ends up in water sources. This animal manure contains nitrous oxide, which releases ammonia. This pollutes air and rivers, which both kills fish and depletes water sources (PETA & vegan society). Additionally, this manure contains bacteria and viruses, which contaminate these sources (EPA).

All in all, these are the three largest consequential factors of animal agriculture, all of which are completely disregarded by the public and media as to protect such a large and prestigious industry. From this information, we can see that factory farming negatively affects every aspect of our planet - from our basic food and water, to our health, the rights of animals, our lands, species, resource depletion, and so much more. Especially for those with little background knowledge on the issue, which turns to society to blame, much of this information may come as shocking. Therefore, this informative report will look deeper into how the issue is rooted in Singapore, government affiliations, current measures being taken and will finally suggest both long-term solutions and ways in which you, as an individual, can play your part to *save our planet*.

THE ISSUE IN SINGAPORE

“The world can learn from Singapore’s success stories. Singapore has made efforts particularly, to maximise productivity from very limited land resources. Commercial indoor and rooftop vegetable farms are opening and other urban and peri-urban agricultural initiatives are taking shape.”

Dr Graziano da Silva, Director-General, Food and Agriculture, Organisation of the United Nations, 2014

Animal Agriculture is not a very large industry in Singapore, especially considering the lack of adequate land available. However, throughout the years - Singapore has found ways to innovate and support existing farms, as well as aiming to transform the methods of agriculture itself. Especially considering 90% of food supplies are exported from overseas, Singapore has not let that undermine their efforts - understanding that if these exports were to become unstable, we would need to be self-sufficient.

The major agricultural products produced in Singapore are fruits such as rambutan, mangosteens and durians - indigenous to south-east asian culture; as well as eggs, vegetables, poultry and pork. However, over the years, the industry has dramatically shrunk - especially due to the modernisation of the country, and with technology constantly improving alongside our rapidly growing population - it becomes easier and more efficient to import goods. In fact, only 1% of Singapore’s population are farmers, with farms making up a total 0.87% of the total land (more specifically, in the countryside) and accounting for less than 0.5% of our 2010 reported Gross Domestic Product (GDP) (wikipedia).

The AVA (agri-food & veterinary authority) oversees animal agriculture. They aim to: ensure food in Singapore is safe for consumption, protect the “health and welfare of animals” - such as in regards to avoiding disease, to harness Agrotechnology - especially considering Singapore lacks adequate land-space, and therefore needs to increase productivity and yield, education the public, and much more. They also work alongside farms in Singapore and encourage consumers to support local business (AVA).

The PPD (primary Production Department) is a government agency formed in 1959. They work to “provide a coordinated approach to developing and regulating the local farming and fishing industry.” Since they began, they have followed on extensive work supporting local farms and agriculture in Singapore - with a focus to improve “the livelihood of farmers” - and have enabled Singapore to reach self-sufficiency. All in all, the organisation works to educate farmers, diagnose diseases, and to work alongside the R&D of “production methods, breeding techniques, nutrition and disease control.” (nas.gov.sg)

As collected from multiple sources; the AVA and understood from a speech by the parliamentary secretary of national development within Singapore (during the 15th anniversary of the country’s livestock farmer association, on December 16th, 1978 - by Mr. Ho Cheng School). *Shown on the following page is a timeline of Singapore’s animal agriculture related development over the years:*



Singapore manual farming in the 1960s (AVA)

TIMELINE

of agriculture in Singapore

1950

There is no proper housing, and so pig and poultry and kept in open areas. Compound animal feed is unavailable and therefore causes a lack nutrition for livestock. There is also a lack of disease control, which results in large outbreaks. Finally, breeds are not productive and therefore, farmers must sacrifice a lot of time before being able to put them on market - proving difficult.

1959

The government has launched a line of programs with the aim to support and develop the country's livestock. For examples, these programs cover: teacher farmers modern methods of animal care, proper vaccination and disease control, building veterinary clinics in farm areas, improving breeds for efficiency, and carrying our research into poultry and pig production.

1960

Farming is still being done manually (until 1970) and animals, such as chickens, are kept in bay yards or in grander farms.

1967

Agriculture in Singapore is not maintained and is self-sufficient regarding the production of pig, poultry and eggs. The PPD is currently providing extension services, training and further assistance services to farmers.

1970

The PPD encourages the use of 'cage-net cultivation' (mesh enclosure) of fishes to fishing agricultural farms, whom are at the time using kelongs (offshore platforms, typically wood).

1977

Singapore is aiming for increased production efficiency standards through more genetic improvement programmes, as well as formulating more precise feed for the livestock. They hope to adopt proper waste management into the farms and practice better house-keeping as to be hygienic.

The country earns a total of \$432 million dollars, through the production of 1.2 million pigs, 48 million qual eggs, 514 million hen eggs, 29.7 million chickens and 5140 million hen eggs. Additionally, an extra \$7 million is secured through the export of day-old chicks to neighbouring countries.

1978

The total number of farms in Singapore reduces dramatically since 1969, from 20,357 to 12,000. Currently, 175,400 people (9% of the total population) is "actively engaged in agriculture activities or are indirectly dependant on it for a living."

1988 - 1990

"Agrotechology parks were developed to house modern and productive commercial farms that produce a measure of safe and fresh food."

2000

The DDP is funding farmers and is investing money to support research and development on breeding, disease control, production systems, nutrition and harvesting technology. They have also commissioned an official mandate to secure and establish plant health, animal health and welfare, food resilience and a regard of its safety. Finally, international standards are recognised and the DDP encourages farms to follow "Good Agricultural Practices."

21st Century

Aquaculture "embraces automation and technology to reduce the reliance on manpower." Therefore, agricultural work is now becoming easier, and less reliant on hands-on work - allowing an increased productivity and better quality animal products. Not only is a 'recirculating aquaculture system' introduces - which allows the recycling of water through several treatment techniques - but this protects the fish by being farmed indoors and are no longer exposed to environmental conditions. Furthermore, there are automatic fish feeders, aeration, and water monitors.



Furthermore, the age-net cultivation technique as was previously introduced in 1970 is widespread. The 'moveable pontoon attachments' have been upgraded into a series of improved methods such as the "modular floating high-density polyethylene cube cage. These cages are easier to assemble and maintain, thus reducing manpower needs."

SUSTAINABLE DEVELOPMENT

continuation of the 21st century

Recently in Singapore, the subject of agriculture is increasingly becoming more widespread - and attention is being drawn to the facts. Especially considering Singapore has very little land-space - so in order to be self-sufficient, it requires the use of technology to increase productivity as to sustain self-sufficiency. Examples of this are the adjustments into vertical farming and controlled systems that fight the threat of both "climate change and geopolitical uncertainties".

Furthermore, there are many other approaches starting towards a sustainable development of animal agriculture, although with varying ideas of what it means to reach such sustainability. For example, organisations such as "animal allies" are encouraging the lifestyle

switch to veganism; and working on outreaches to various sectors to include vegan options - making the green lifestyle more accessible (animalallies).

The Singaporean government has also recently, as of March 2017, introduced a new plan focusing on agriculture. It hopes to transform local farms into "high-tech, productive and profitable farms," through various innovative programs. For example, those aimed to overcome "space constraints with technology, using resources more efficiently and developing a generation of 'agri-specialists.'" However, a deeper look into the government's plan and execution of such will be later explored under chapter 2 (channelnewsasia), and minimally under "the relation to environmental impacts."



WHO IS AFFECTED

by the issue?

Despite the fact that less than 1% of Singapore's population are physically involved in the agricultural industry - it is nevertheless an impactful community. Therefore, there are many stakeholders within the industry, with some of the most dominant being as followed...

Local Farmers



As previously mentioned, the number of workers within the agricultural industry, within Singapore, has significantly dropped. Especially as the country has increasingly leaned towards technology and modernisation - most people have turned to work in the city and businesses. However, this development of technology has greatly supported the current farmers - helping them become more efficient and decrease manpower for easier work. Additionally, one of the biggest problems facing farmers is the lack of adequate farming space, especially considering a large sum of land is required to raise animals. Technology is also being used to solve this problem, however that results in less freedom for the animals, and is further and further stepping away from an ethical, free range farm. This will be further discussed later on.

Due to modernisation, consumers often visit supermarkets or order food products online. However, most big food supplier chains, such as cold storage, receive the majority of their products from overseas exports. This results in a decreasing market of those willing to seek out locally grown product - which is hurting their industry. However, by organisation such as ____, Singapore is trying to encourage individuals to support local farms.

Consumers

Apart from a wider range of options, the consumers in Singapore are not widely affected by this industry. However, few groups are benefitted by local farms. One benefit is many locally grown produce is sold in typically



'Singaporean' areas outside the central city, such as near hawker centres and HDBs. This allows the purchase of food products to be very accessibly to locals whom may not visit grocery stores, as well as purchasing the same items for a much cheaper price.

Additionally, those who may attempt to source more ethical foods may turn to local farms. For example, as these products did not have to be shipped overseas - this means less chemicals and additives. And considering the AVA has full control over the regulations that sustain the quality of the goods produced - consumers can expect fresher and safer products. Furthermore, as the industry is smaller an there is less factory farming and cruelty than faced in the majority of overseas exporters - it is overall more ethical. An example is the popularity of some halal farms in Singapore - considering this is a large aspect considering the large population of muslims in Singapore. Finally, as encouraged by the government, NGOS, and the farmers themselves - some people may just want to support the industry.

Government

As the government understands the importance of Singapore being able to support itself in a time of crisis (if overseas supplies become unstable), it is an important industry if not a large one. Therefore, many boards under the government - such as the AVA, National parks board, and ministry of national development - all work hand-in-hand to support and fund local farmers. This is under the "Agriculture productivity fund" (APF) - with an existing \$63 million; with \$10 million towards supporting R&D, and



\$53 towards developing and support (AVA).

Furthermore, as the country exports 90% of its products - a large majority being animal products; the government must spend a lot of time approving and verifying the countries and establishments. They follow a rigorous three step method, which may even include visiting the slaughterhouses overseas themselves. The process of verification is very time-consuming and even expensive - therefore it may not always be efficient, easy or sustainable (AVA).

Furthermore, another difficulty of the industry is not only having to support the productivity of local farms, but encouraging individuals to purchase and support local goods and produce.

Overseas Exporters

Work within the animal agricultural industry in overseas countries is a substantially greater field of work, especially considering their maximised land-space. For example, there are 38 countries whom are verified and approved to export specific animal goods into the country, and few must be derived from AVA-approved establishments (AVA). Some of our biggest importers are meat cuts from Australia predominantly, as well as the USA, New Zealand, Europe, Brazil and many more (Sethloui).

These countries benefit from being able to provide from their own countries as well as boosting their economy through exporting their goods to others. This allows their national economies to grow and expand.



Furthermore, an obvious benefit is that exporting unveils many new opportunities for large businesses to seek gaps in the market and overall ensure a larger sale potential. This increases their own profits dramatically. Firstly, considering the importer becomes reliant on the exporter and will often continue to order from their - creating customer loyalty. And secondly, foreign importers such as Singapore are more likely to place large orders in comparison to that of local buyers. All in all, both sides benefit in this exchange (AACB)

FURTHERMORE,

uncovering a link between Singapore, our future, and our environment

As was discussed in the Foreword, research shows the dramatic tolls that the animal agricultural industry has taken on our planet. However, considering the industry in Singapore locally is very minimal, as well as some use of traditional farming methods - it does not recognisably hurt the environment to a measurable extent. In extent of this, it may even benefit Singaporeans and the environment. Considering, as mentioned before - the expansion of agriculture in Singapore not only supports local farms and their businesses, but Singapore's own economy and security; which is crucial at this point of time, considering climate change in a huge disturbing factor that may shake security on exports globally. Additionally, through not having a reliance on having to import as many goods will reduce Singapore's carbon footprint and therefore benefits the environment.

Extending on the difficulties of climate change, 15 of the 200 fish, egg and vegetable farms in Singapore have been converted to indoor farms through the use of new technology. This is in order to avoid the effects of climate change towards our arising weather problems - and a step taken under "an important national duty to ensure that Singapore has some supply resilience" says Koh Poh Koon, Senior Minister of State for National Development (channelnewsasia).

However, this technological development has sparked controversy in the minds of some Singaporeans; those who claim that we are "losing touch with the natural world." This is under the interpretation that Singapore has already greatly modernised itself from the jungles that used to touch skies before buildings - questioning whether the emphasis of productivity and innovation may replace our history of traditional farming, as well as losing sight of where our food comes from - especially in the eyes of our younger generations.

For example, as was spoken by a new mother and second-generation farmer, Chelsea Wan. She states that Singapore "shouldn't be too engrossed about farms having to go high tech," and holds high hopes that her own son will be aware of "both sides of the industry, the different ends of the spectrum - from the high-tech farms to the productive conventional ones." Ms. Wan's argument is based around the possibility that children may take away the wrong ideas; such as a belief that "everything can be controlled and manipulated." Therefore, losing the traditional concept of "how the environment really does affect the farming community," and "how climate change plays an important role as well." Despite these accusations being appointed to the future of our younger generations, the same ironically holds true for all of us. This showing a special importance that Singapore not only maintains sustainability and works to increase productivity, but also remembers its unique heritage and agricultural background.

Additionally, within a scientifically valued approach to the new technologies and the environment, there brings the uncertainty of long term consequences. One of these under question by Associate Professor Sanjay is the loss of insect species and microbes. This being important considering they support the development of our immunity through life - due to their exposure to our environment. However, as spoken by the professor, "we're getting away from less sterile outdoor conditions to indoor conditions" - we lose these important factors, with long-term effects to yet be perceived.

Overall, as new technological developments are being introduced into Singapore's agricultural farming - we must take precaution. We face the (ARISAL) of both societal issues as well as to-be-discovered long-term environmental problems.

CHAPTER 2

THE

GOVERNMENT

“The world can learn from Singapore’s success stories. Singapore has made efforts particularly, to maximise productivity from very limited land resources. Commercial indoor and rooftop vegetable farms are opening and other urban and peri-urban agricultural initiatives are taking shape.”

Dr Graziano da Silva, Director-General, Food and Agriculture, Organisation of the United Nations, 2014

The AVA Board

Who are They?

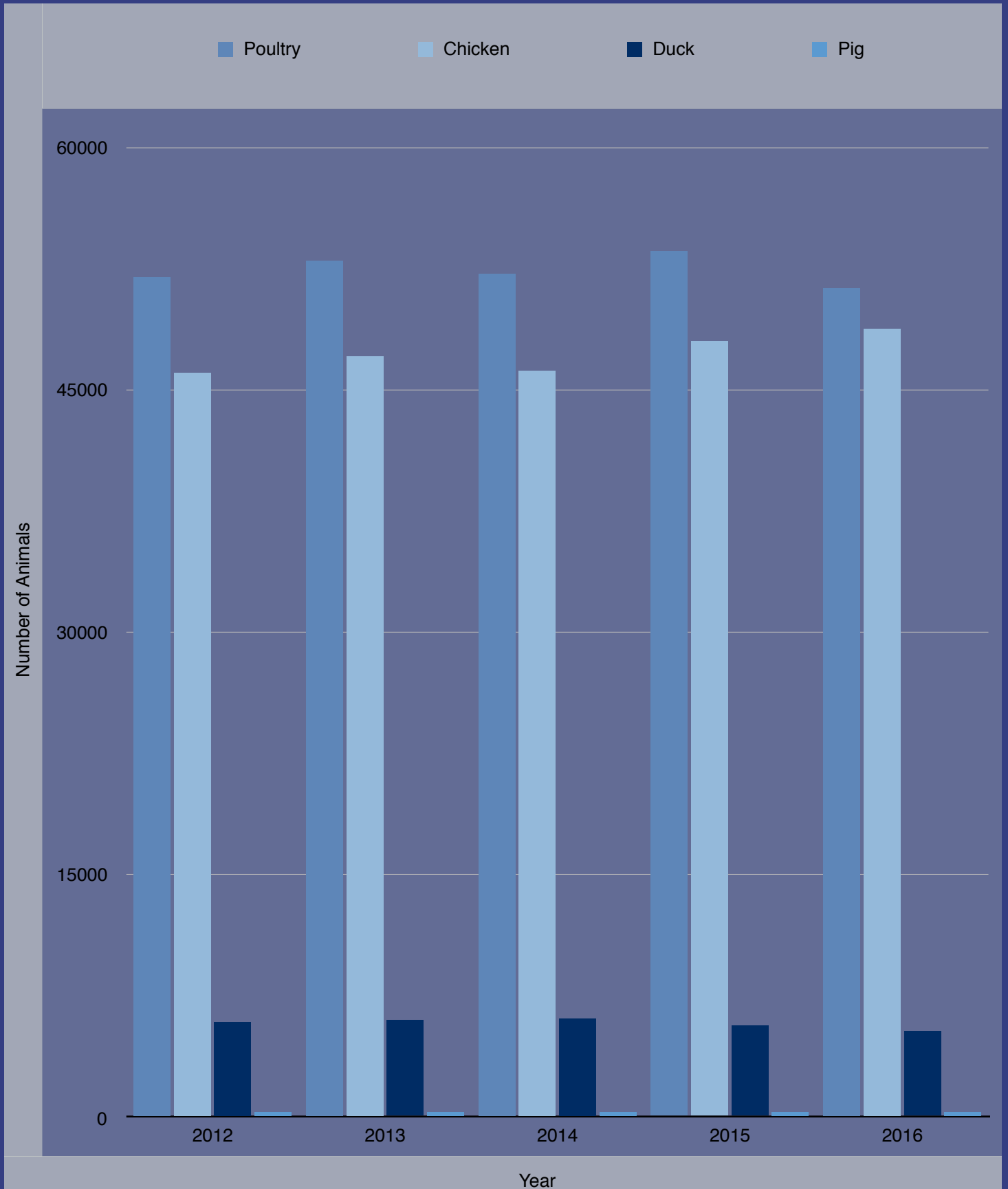
The Singaporean Government plays a large role in supporting animal agriculture in the country. The AVA (agra-food and veterinary association), is a large board built under the government which has the sole focus to provide “safe food, healthy animals and plants for Singapore.”

Within the animal agriculture sector specifically, the AVA works to support the development of Agrotechnology and agri-business to support local farms. One of their main focuses on this development is the Research and Development conducted by the organisation. This is specifically in areas such as: “production methods, breeding techniques, nutrition and disease control,” and improving that of animal husbandry.

All in all, the government and their work in this sector is crucial to its successful and growing efficiency. Without their support, farms in Singapore would still be using the same old traditional methods as in the 1960s, and likely none of these businesses would have survived Singapore’s rapidly growing economy and modernisation.

Livestock Slaughtered in Singapore

Statistics taken from the Agri-Food and Veterinary Authority



THE GOVERNMENT

Actions regarding the issue

How the government supports the development of animal agriculture, whilst taking into account long-term sustainability and environmental welfare,

Main Focuses of the AVA towards supporting Agriculture, and ways in which is supports sustainability and the environment.

Boosting Productivity

The AVA, in hand with the MND (ministry of national development, another government board) work conjointly with the aim to “cultivate [farms] into a high-tech and innovative sector that makes efficient use of land and labour resources.” (straight times) Furthermore, through cultivating technologies and different approach methods to animal agriculture, they can effectively care for and breed the animals - whilst making production of goods more efficient.

In recent years, the AVA has presented a new agriculture productivity fund (APF) - consisting of \$63 million dollars, available to farmers. However, of course, if the farm meets the regulation conditions listed by the AVA; which highlights aspects such as minimum production levels, land usage, and more. Furthermore, the APF largely succeeds the old fund, which was set in 2009. In the past fund, the AVA supported research and development on agro-technology,

as well as developed the production methods within local farms. Furthermore, they held seminars and workshops, available to the public, with the aim of advising local farms on how they can benefit through technology and good agricultural work. The new fund will work with similar aims, but the dramatic increase in funds will surely benefit the community.

Environmental benefits with AquaDecks

One way that this new fund has been put to use is through vertical fish farming, also considered an “aqua deck.” As innovated the the Apollo Aquaculture Group - this is similar to vertical farming, in which fish tanks are stacked indoors, and through the use of unique technologies - they can be designed to suit the climate. Furthermore, this technology is able to recirculate the water with decreases water wastage and therefore is a more sustainable environmental approach. Other added benefits of this technology includes:

1. “automatic underwater sensors” that monitor and change the temperature and pH

2. Barcode tracking which allows farmers to keep track of every individual fish and ensure their health

3. Introduction of Microbes and nanotechnology which replaces the requirement of antibiotics and chemicals, which is substantially more beneficial and sustainable to the environment - as there are no harmful waste products.



4. Compartmentalised systems, which can single out diseases and contain them, which overall reduces the spread of illness and death of fish; which in turn makes it more environmentally friendly due to reduced waste and cruelty.

5. More space, which are cheaper and more energy efficient - which is more sustainable in the long-run.



Lowering Costs

Fighting environmental problems with their circular economy approach, in which recycling is taken into great consideration as the be sustainable and regard the environment.

One example of this is that Singapore has come to notice its abundance in food wastage, which is an obvious disadvantage to the environment, the AVA has found unique ways to fix two problems at once. Through scouring the city for food wastage, then making use of insect farming to convert this into fertilisers - it can be transported and used within their farming methods. This in turn produces food of high quality, which is bought, eaten, and recycled through the same process.

Standard-Setting

Especially with the development of agricultural techniques - many new methods have yet to prove long-term consequences.

Furthermore, with these changes - it is important for standards to be set in order to ensure food safety regulations are met.

An example of these standards are those placed on which animal species may or may not be imported and/or exported. One of these being an act dedicated to endangered species. The act exercises the rights of these animals are that they should be protected - one way this is done is by prohibition of sale of endangered species . This doesn't only recognise their meat for sale of consumption, but other recognisable parts such as horn, claws, teeth and more - such as of all species of Rhinos and Panthera Tigers. These laws set by the government under the sector of agriculture and selling of their goods is a supportive step towards preserving our environment and species.

In addition to this, the AVA regularly visits the animal and coastal fish farms to ensure they comply with regulations. In 2014 alone, they conducted 8,499 investigations, with a concluding total of 45 enforcement actions taking

place against ones that were not meeting standards and laws. Such irregularities, for example, include unauthorised activities taking place, or illegal structures.

Promoting Local Produce

Considering that 200 foods farms in Singapore only produces less than 10% of the country's total food demand, it is very important to promote local farms. Two ways that the AVA supports local demand is by carrying out farmer's markets weekly - to encourage sales; and by developing a logo, which will allow consumers to easily identify and purchase locally grown produce. There are many benefits of doing so, as were previously mentioned - but to highlight: this is beneficial to the consumers due to receiving quality good with less chemicals and antibiotics which are harmful to both health and the environmental.

Furthermore, they are reducing their individual carbon footprint and that of Singapore by cutting out the need to ship goods overseas.

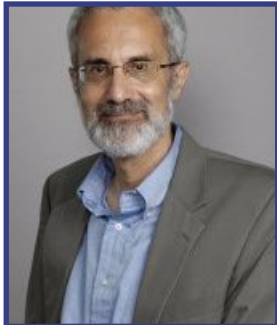
Building capacity

Considering Singapore has very limited land-area, however, one way that the government has attempted to manage this is through developing six parks, of a total 1,465 hectares - allocated to 235 farms as of 2015. (AVA). These Parks are also quite unique in the sense that they are Agrotechnologically based, with modern infrastructure and facilities in a scheme for the government to encourage Agrotechnology usage. This includes "layer farms for egg production, fish farms," goat and cattle farms - with an additional 103 hectares of ocean space dedicated to Singapore's 117 fish farms. The consequences of these actions can be seen in different lights. On one side, deforestation of Singapore's nature took place in order to provide adequate land space for agriculture, which in turn is damaging the environment. On the positive side, considering Singapore does so much work to recover and rehabilitate greenery in the country, as well as legally protected versus indigenous ecosystems to be nature reserves - the government has set a limited amount of space to dedicate to agriculture. This means that the concern of any further land-clearance is absent, and shows the intention of both trying to adequately support agriculture and guarantee no further questions to more land. However, it is not black and white.

OTHER PERSPECTIVES

Dr George Jacobs

President of the Vegetarian Society in Singapore



Jacobs vouches on the importance of reducing climate change - as to address the causes and issues for efficiently. One of the major issues that he has brought attention to is the harmful gases produced by animal agriculture specifically, such as carbon dioxide, methane and nitrous oxide. In fact, these harmful gases derive from the deforestation involved to both house animals and grow crops to feed them, the production and processing of this feed, the decomposition of animal faeces and transportation and processing of animal products (straight times). Therefore, he encourages

Singaporean's to adopt a vegetarian or vegan lifestyle as to reduce climate change and support the environment - being a vegetarian himself since 1980. For example, under his non-profit organisation he supports people looking to change their lifestyle, with a meat-eater on one side of the spectrum as "more harm, unsustainable, promoted lifestyle disease" versus vegan on the right, as "less harm, more sustainable, health promoting" (vegetarian-society).



Kenny Eng

President of the Kanji Countryside Association



Kenny Eng has a large interest in government plans surrounding the development of animal agriculture, as he believes that it is vital for Singapore to take stands to be self-sufficient. However, he has very strong opinions on the policies being addressed and put in place - saying that the government actions have too many flaws. For example, he speaks on how there needs to be more done on the natural and social ecosystem, in order to develop the sector. Furthermore he believes that there is too much focus on developing technology, without the realisation that the majority of farmers will not be

able to adopt such technologies due to "high risks, lack of financing and limited farm tenures." All in all, Eng has brought attention to many, many problems surrounding Singapore's inefficient agricultural production - and believes there are other ways to support farmers and the environment (channelnewsasia).

Animal Allies

Non-profit organisation in Singapore



ANIMAL ALLIES

With a perspective similar to Dr George Jacobs, Animal Allies has spotted animal agriculture as a major cause for climate change - therefore encouraging the reduction of animal-product consumption with the means of protecting our planet. On their website, they illuminate the truth about the agricultural industry and include statistics on how they are harming the environment, as well as including informative videos, a movie, quizzes, E-books and starter kits. With a large group of supporters, they believe that the only way to truly tackle the problem is to avoid eating meat all together (animal allies).



The Good Food Institute

A U.S. non-profit organisation



**T H E
GOOD FOOD
I N S T I T U T E**

The GFI began in 2016, with the vision “of creating a healthy, humans and sustainable food supply” (wikipedia). To provide some brief background information, which will later be discussed as a possible solution to the issue, is

what the GFI does. Unlike the previous perspectives, they don't encourage or work alongside the vegetarian or vegan lifestyle - rather, they target meat-lovers, to provide them “cleaner, safer and cheaper” meat - an replica alternative that doesn't stop them from consuming the foods they love, as they believe that simply trying to put an end to all meat consumption is not plausible.

We work with scientists, investors, and entrepreneurs to make groundbreaking good food a reality.

We focus on clean meat and plant-based alternatives to animal products—foods that are more delicious, safer to eat, and better for the planet than their outdated counterparts.

So how? Through working with all food related industries such as restaurants and grocery stores as to encourage available plant based-options to be offered to consumers. Furthermore, their focus is encouraging and developing clean meat - through the use of synthetic and laboratory grown methods, or creating plant-based meats. Over time, this means that animals will no longer be needed to create authentic meat products, meaning no animal slaughter, no additives and fake flavouring, and more environmental sustainability.

As the market for these products grow, many people are trying to see these products brought to Singapore, such as Anthia Chng, writer of Expat Living Singapore. However, it may be years until these are available.



The International Advisory Committee of Experts (IACE)

“The IACE recognises that there are major international challenges which pose risks to food safety, and human and animal health. These risks, including theorists of food fraud, are increasing and the AVA will have to accommodate to these new challenges.”

- Dr. Gardner Murray, Chairman of the IACE Board

The IACE has conducted many reviews of Singapore’s AVA and agricultural practices - all of which came back with results that kept the AVA a respectable organisation; ranking 5th in the world with “food safety and bio-security standards that are of a world-class level.” Their results identify Singapore as not only being sufficient and nutritional, but sustainable in production (AVA).



The United Nations

Mr Graziano da Silva, Director general of Food and Agriculture Organisation

After conducting visits to Singapore agriculture farms, Silva stated that “The world can learn from Singapore’s success stories.” This being in regards to the country’s high end productivity, even despite the limited land space, as well as their constant development. All in all, in the perspective on the UN, Singapore’s agriculture sector is highly developed and meets all regulations and standards, with no negative comments. However, this doesn’t account much for their environmental impacts.



**Food and Agriculture
Organization of the
United Nations**



CURRENT MEASURES

Although Singapore is already doing a lot of work to support the growth of the agricultural community, there is never a black and white solution; especially against complete efficiency and productivity, versus saving our environment.

ORGANISATIONS

Note: Many of the listed organisations below have been mentioned prior in this briefing, such as the AVA, and therefore will not go into too extensive detail once again.

THE AVA

Agri-food and Veterinary Association

As was previously highlighted, the AVA is a board under the government - whom by far does the most work to support animal agriculture in Singapore. However, to summarise: The AVA works to supply Singapore with safe food supplies, such as through:

- Looking after Animal welfare through protecting endangered species with regulations and laws, avoiding disease and ensuring health through funding research and development.
- Facilitating trade of agricultural products, through regulating import and export of animal species, and managing wholesale distribution from local farms. Additionally, encouraging the sale of local products by promoting the benefits of local produce.
- Raising awareness and working with the Singapore community, to educate on animal welfare and the environment, food safety public education, and the decision between imported versus local produce.
- Furthermore, through many methods as listed previously, they support the development and efficiency of farming. Specifically through technology, such as to make use of the limited land space.



ANIMAL ALLIES

Charital Organisation in Singapore

This registered charity aims to encourage Singaporeans to make healthier and more sustainable choices, in relation to the welfare of animals. One of the main ways they do so is the focus on a vegan lifestyle, by:

- Providing free resources, such as E-books and started packs, for individuals to easily adopt a vegan lifestyle.
- Holding regular vegan events, in order to create a supportive community and link people with similar lifestyle interests or those looking to adopt one.
- Through reaching out to many other influential areas, such as other NGOs, the government, and the public and private sector. They encourage support and incorporation of vegan options into their own actions and choices. For example, with the many restaurants they have been able to work with and gain support of - on the Animal Allies website is free available cards of restaurants with began options.
- Releasing position papers to be signed like a petition, in order to gain recognition once brought to the government or specific large restaurants to offer vegan options. For example, one bringing attention to the “reduction of animal-based food intake for a healthier Singapore” (animal allies).



The GFI

The Good Food Institute, U.S based

The Good Food Institute tackles the problem of environmental harm due to animal agriculture in a unique way. Instead of turning completely against the consumption of meat, they are finding a way to change the industry instead of the people. Through scientifically creating meat-like substitutes, they provide individuals with authentic tasting meat products that require so slaughter or environmental harm.



- Through supporting research to develop clean-meat, which hopefully in the near future will be released at a cheap and affordable price. The science behind this is to take small cell samples from animals and multiplying them in order to increase quantity size - large enough to cook and produce everyday food products. This results in no environmental harm, or animal harm - and is completely sustainable. In fact, after some time, animals can be completely left out of the equation - as cells can be “immortalised” and there will be no requirement for a direct sample.



- Furthermore, the process to produce these synthetic meats is extremely greener than traditional methods, with use of minimal clean energy sources.
- This meat also will have none of the waste matter found in typically meat products, and no risk of any diseases or health issues - such as the common salmonella. This results in better human health, and in the long run - less health problems and along with it the physical, emotional and financial hardships we often do not see (expat living) (GFI).

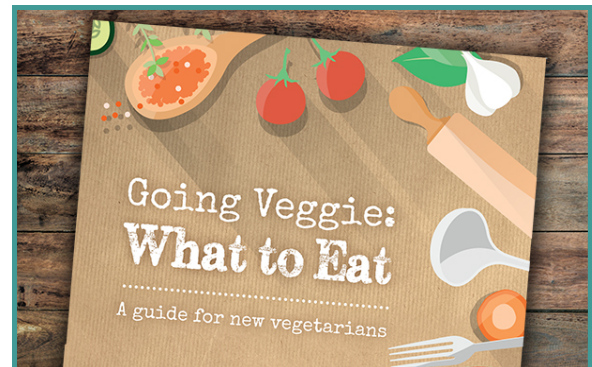
THE VEGETARIAN SOCIETY

A Singapore based, non-profit organisation

A non-profit charity formed in Singapore, 1999; with an aim to “build a more humane and harmonious world for everyone on the planet as well as for our fellow creatures.” And the primal focus behind this goal is their belief that in order to fight environmental issues such as global warming as well as health issues, we must take a step back. Trying to reverse the harmful impacts that humanity has already made on our earth, we should be preventing them in the first place. As states “prevention is the best cure.” Therefore, they direct their efforts into preventing this destruction.

They believe that “Education is the key,” and therefore, it is necessary to dedicate time towards spreading awareness, such as:

- Creating educational materials that can be freely distributed to the public
 - Working alongside public events
 - Holding regular seminars, talks and food demonstrations to the public and often within schools
 - Making it easy for individuals to convert to a vegetarian lifestyle through extensive online information and outlet listings
 - Holding regular events in order to create a community that links individuals and organisations whom hold high morality facing the consumption of eating animals
 - Educational tours both locally and overseas, to understand and work hand-in-hand with organically farms
 - Hosting vegetarian cousin classes to teach individuals that meat-free food doesn't mean bad food
- (vegetarian society)



AND FINALLY...

All in all, there are many organisations and individuals in Singapore who actively work to support the environment and ensure animal welfare. And despite the different methods taken towards addressing the issue, some with completely different perspectives such as the GFI - they all have the same intention; which is a holistic, utilitarianism and biocentric view. Hopefully, with their work and willing involvement from the public, we will be able to achieve the end goal of a sustainable future.

UWCSEA

SUPPORT

United World College of South East Asia is an international school in Singapore. With a large focus on being a role model to both the community and students on environmental sustainability, here is some insight into what they do.

VEGETARIAN WEDNESDAYS

Around once a month, the school serves no meat products to students during break time and lunch. They continue to offer a wide variety of meals for students, even introducing mock meats. As mentioned on the UWCSEA website, the aim is to “start highlighting the ecological implications of our diets” - through encouraging a day of a vegetarian diet.

However, in my own personal opinion - one time a month is a miserable attempt, and in order to draw real attention to the cause - it will need to be more often. (UWCSEA)

Grace Communications Foundation

The school works alongside a foundation that aims to encourage sustainable agriculture - such as animal products that protect their welfare (such as to “treat animals with care and respect, implementing livestock husbandry practices that protect animals’ health and wellbeing.”) and protect biodiversity. It also aims to protect the environment through sustainable farming techniques, such as practices that don't taint natural resources (ex. farmland soil, water sources), and reducing the use of toxic chemicals and fertilisers (with impacts such as eutrophication). The school works with the foundation to support a sustainable future. (sustainable table)

Communications

Another lesser looked at area of the industry is what happens afterwards, after the growth, slaughter, production and ultimate consumption. This is the fact that much of this animal produce is wasted, even at the school campuses. Therefore, the school has done a great deal to ensure environmental sustainability through worm composting and encouraging students to take responsibility in reducing their own food waste. There are many waste and recycling bins, where food waste is taken by primary schoolers to decompose and is used as fertilisers within the school gardens done by volunteer work of high schoolers - in which for example, herbs are grown and picked for lunches. This is extremely environmentally friendly! (perspectives.uwcsea)



A Focus on College Service: Focus on Food

Another way that the school encourages clean eating for the environment is through a small, college service called Focus on Food. I got the chance to interview the two teachers running the service to find out more.



How did it begin?

The service began 3 years ago by a student named Grace Windom, as she had been vegan for a long time and knew that both teachers - *Uzay Ashton and Marion Riasdana*, were committed vegetarians. Therefore, she approached them and shared her own personal thoughts seeming from a place of love for animals. Soon, with research into the idea of bringing together students who shared this compassion - it evolved into a regard for the environmental impact, and the idea that “what we eat and what we consume effects the environment as well” (*Riasdana*).

Aim and Focus

The group started off as a “group for students that were involved with plant based diets and wanted to promote information,” “education people in the school,” and “be a place to celebrate” (*Ashton*). However, recently - students who were not vegan nor vegetarian began joining the group; therefore, creating a thread of promoting healthy eating and overall thinking about ones choices regarding their diet and its impact on the environment. For example, their 3 co-chairs currently (2018) are Hui, Angelina and Tammy, all whom still consume meat and animal-products, yet are interested and open to learning about the vegetarian lifestyle and human liability.

Their three main aims are: *Raising awareness, health, and animal rights.*

What do they do?

The group aims to spread awareness for the impact of mindful eating, such as through:

- Holding a movie screening event every year within the school, showcasing a documentary related to the animal industry and a green lifestyle.
- Working with Luiza Bradford in PSE, in hopes of working a unit surrounding mindful eating and its environmental impact into each grade level to educate students.
- Creating posters and putting them up around the school, such as a controversial poster of a burger - and showing the environmental impact of a single meal.

- Educating students on the importance of Veggie Wednesday. This is a huge controversial issue, because instead of being weekly - it is once a month due to student resistance. Therefore, on these days, students order food from out of school; which completely offsets the aim of saving the environment. This is because students feel that veggie Wednesday is a scheme to press a vegetarian lifestyle on students - without being open to understand the true environmental impacts and means behind the cause.
- Worked with SEASAC weekend to provide athletes and parents with fruit and chocolate smoothies. This being rather than the many unhealthy food choices offered by other stalls. They also received a lot of feedback from customers that they loved the option of having something fresh and healthy.
- Working at the family fest, Holiday fair and CNY lunch yearly to provide environmentally-healthy food choices and encouraging sustainability in mindful eating.
- Creating short PSA's, infographics, eBooks, Dunia articles, training videos, games and more for the community.

What are they working towards?

- De-stigmatising the idea of a vegan and vegetarian lifestyle. As currently there is the idea that those following these lifestyles are trying to rebel against society and are obsessed with forcing their love for animals on others.
- Fight myth surrounding students who complain that they are athletes and need proteins. For example, the service is currently attempting to illuminate the many famous vegan and vegetarian athletes and body builders, and creating posters that show the other plant-based sources of protein.
- Encouraging Sodexo (the schools food provider) to incorporate more vegan and vegetarian choices. Especially within the boarding house, as there are very limited options and the students with these strong dietary constructions face a lot of difficulty within mealtimes.
- Interviewing people who support veggie Wednesday, whom are willing to not eat meat for a day for the environmental benefits. As they believe in order to make students accept the idea, they need to realise that the idea is not strange or unjustified, but *normalising* it.

How are they convincing students?

"It is very difficult to change people's minds, from personal experience, you need to make them more accepting of it - and they become more open minded and will take in the message, and therefore start making the choices on their own. If they think you're trying to make them change, they get defensive and the message gets lost. It's about supporting acceptance."

Therefore, it is not about pressing a vegetarian or vegan lifestyle, but encouraging any mindful eating that could benefit our planet. For example, you can eat meat - but move towards eating leaner cuts and avoiding processed deli meats such as ham and salami

and a huge thanks to Uzay Ashton and Marion Raisdana!

INTO THE FUTURE

So where do we go from here? What possible methods can we take to reduce the environmental harm taking place everyday? And is stopping the consumption of meat all together really the best solution?

Despite many organisations pressing for society to convert to vegetarian or vegan lifestyles, it is simply not feasible. Of course, for those who willingly choose to live such a life, they are dramatically reducing their carbon footprint and taking one of the biggest moves towards stopping global warming. Theoretically, if everyone were to stop consuming meat products - it would be one of the fastest ways to turn our pollution and save our planet. However, despite hope - it is not a realistic goal. It is not that we can blame those who refuse to stop eating such products simply because they love the taste of beef or chicken, but many people may even rely on these animal products for a majority of their diet or income. For example, those living in coastal areas, especially within village areas - may predominately rely on fish. Despite this, it is also simple to say that these smaller populations relying on animal products are not likely to have large industry farms producing tons of toxic gas, but would likely follow traditionally farming which has a low environmental impact. Therefore, it is not easy to accuse anyone on any basis - as it's never easy to see how this change may affect an individual or society.

All in all, the trend of vegetarian and vegan lifestyles is growing, especially within recent years due to high media popularity of bloggers and instagrammers. Additionally, even restaurants within Singapore are running vegan options and supporting the trend. Therefore, having everyone switch diets may not be possible, but those taking into account their dietary choices today are absolutely doing their most to save the planet.

A Replacement by Mock Meat

Another possible reality is the widespread selling of synthetic and plant-based mock meats. Especially as many are beginning to take the environmental toll of the industry into account, through the rise of veganism and through the sudden abundance of related documentaries and books - it is a gap in the market. Those looking to spend money in research and development to produce such products, such as the previously mentioned GFI, are creating a large business and helping the environment. Through creating fake meat, not only will it be much cheaper to produce and purchase - but the environmental difference is huge. As mentioned, no animals will be required or harmed, no antibiotics or chemicals will be used, no possible health risks, no clearing acres of land to grow crops for the animals and house them, no pollution and methane... All in all, this is a feasible and efficient solution], the only trouble being the development and availability globally.

Technological Developments

This is an extremely broad but important topic, considering technology is always finding solutions to new problems - but are they sustainable? For example, carbon capturing, being stored in the ground, could have harmful impacts in the long-term. Additionally, all funds towards technology are being used to make animal agriculture more efficient, to create new chemicals and antibiotics, to genetically modify animals to make the process easier - but rather this technology-funded money should be going towards decreasing the land needed, decreasing the pain of slaughter and developing ways to reduce the toxic gases emitted.

And Finally,

How Can You Play Your Part?

Some other ways to reduce the environmental cost of animal agriculture are much less intensive and difficult. For example:

- *Spreading awareness through word of mouth or social media*
- *Reducing your meat and animal-product intake*
- *Signing an online petition of one of the many relation organisations*
- *Encouraging your local restaurants and grocery stores to incorporate meat-free choices*
- *Limiting your food wastage*
- *Buying your animal products from local farms and markets*
- *Donating to an associated charity*
- *Try a Vegan pledge online*

Why? To save money, to save animals, to protect your health, to save our planet.

In Conclusion,

There are more solution than this, however these are the most predominant and realistic as of the moment. Although, all in all - *prevention is key*. By reducing the physical production of these animal products, such as by decreasing the consumer demand - we are ultimately stopping the problem before it even begins. As we fight for ways to reverse the current harm on the environment we have created, we mindlessly look forward without realising it is still happening at this second. Therefore, maybe it's time to take a few steps back.



BIBLIOGRAPHY

IMAGES

Állatkák." Pinterest, 1 Dec. 2015, www.pinterest.com/pin/347621664967602172/?lp=true.

"Contact Us." Contact Us | AVA, www.ava.gov.sg/contact-us.

"Despite Progress, Food Insecurity Remains Pressing Challenge – UN Official." UN News Center, United Nations, 4 Apr. 2013, www.un.org/apps/news/story.asp?NewsID=44560.

Gazebo Kits, www.alansfactoryoutlet.com/all-about-farms-and-barn-animals.

George Jacobs | James Cook University, Singapore - Academia.edu, jcu-sg.academia.edu/GeorgeJacobs.

"Horse Barn Icon, Outline Style." 123RF Stock Photos, www.123rf.com/photo_85087092_horse-barn-icon-outline-style.html.

Landline. "A Dairy Farmer Walks with His Cows." ABC News, 7 Aug. 2013, www.abc.net.au/news/2013-08-08/a-dairy-farmer-walks-with-his-cows/4873370.

"Money Symbol Hand Drawn Outline." Freepik, www.freepik.com/free-icon/money-symbol-hand-drawn-outline_734718.htm.

Outlet, Alans Factory. "All About Farms and Barn Animals." Alan's Factory Outlet - Carports & Metal Garages -

"Singapore's Food Farms:" Agri-Food & Veterinary Authority of Singapore (AVA), www.ava.gov.sg/files/avavision/issue4_2015/sg50_special.html.

"Singapore Wet Markets: Reminder of Bygone Days." CNN, Cable News Network, 22 June 2015, edition.cnn.com/travel/article/singapore-wet-market/index.html.

sg.linkedin.com/in/kennyeng.

vegetarian-society.org/app/uploads/2017/08/first_goal_aasg-1024x459.jpg.

"Vulgar / Violenta / Mía." Vulgar / Violenta / MÃa, vulgaryviolenta.tumblr.com/.

www.ava.gov.sg/files/avavision/Issue1_2017/img/issue1_2017/fishy_business/marrying_heritage_technology/1.jpg.

www.lifegate.com/app/uploads/mucche.jpg.

RESEARCH

"All Events." Vegetarian Society Singapore, vegetarian-society.org/all-event/.

AVA. "ENDANGERED SPECIES (IMPORT AND EXPORT) ACT 2." 2006.

AVA Vision - Raising the Bar for Local Farm Productivity, www.ava.gov.sg/files/avavision/Issue1_2015/food-bites-raising-the-bar-for-local-farm-productivity.html.

"5 Best Fresh Meat Wholesale Suppliers in Singapore | Food Supplier." SETHLUI.com, 20 Aug. 2017, sethlui.com/best-meat-wholesale-food-suppliers-singapore/.

@bryanrwalsh, Bryan Walsh. "The Triple Whopper Environmental Impact of Global Meat Production." Time, Time, 16 Dec. 2013, science.time.com/2013/12/16/the-triple-whopper-environmental-impact-of-global-meat-production/.

Cameron, James, and Suzy Amis Cameron. "Animal Agriculture Is Choking the Earth and Making Us Sick. We Must Act Now | James Cameron and Suzy Amis Cameron." The Guardian, Guardian News and Media, 4 Dec. 2017,

"Can Clean Meat Really Save the Planet? ." Expat Living Singapore, 2 June 2017, expatliving.sg/clean-meat-sustainable-environment-food/.

Correspondent, Martin Hickman Consumer Affairs. "Study Claims Meat Creates Half of All Greenhouse Gases." The Independent, Independent Digital News and Media, 31 Oct. 2009, www.independent.co.uk/environment/climate-change/study-claims-meat-creates-half-of-all-greenhouse-gases-1812909.html.

Committee on Considerations for the Future of Animal Science Research. "Introduction: Overview of the Challenges Facing the Animal Agriculture Enterprise." Critical Role of Animal Science Research in Food Security and Sustainability., U.S. National Library of Medicine, 31 Mar. 2015, www.ncbi.nlm.nih.gov/books/NBK285726/.

Eng, Kenny. "Commentary: Can Farming Be a Success Story for Singapore?" Channel NewsAsia, 15 June 2017, www.channelnewsasia.com/news/singapore/commentary-can-farming-be-a-success-story-for-singapore-8577514.

"Environment ." Animal Allies , animalallies.sg/environment/.

EPA, Environmental Protection Agency, www.epa.gov/.

"Facts and Sources." COWSPIRACY, www.cowspiracy.com/facts/.

Foundation, GRACE Communications. "Sustainable Agriculture - The Basics." GRACE Communications Foundation, www.sustainabletable.org/246/sustainable-agriculture-the-basics.

Food and Agriculture Organization of the United Nations, www.fao.org/home/en/.

"Food." Commercial Food Imports | AVA, www.ava.gov.sg/explore-by-sections/food/bringing-food-into-singapore-and-exporting/commercial-food-imports.

"Food." *Funding Schemes* | AVA, www.ava.gov.sg/explore-by-sections/food/singapore-food-supply/funding-schemes.

"Food Waste and the UWC Mission." *UWCSEA | International School in Singapore*, 14 Dec. 2016, perspectives.uwcsea.edu.sg/community-news/food-waste-and-uwc-mission.

"Growing Local on Veggie Wednesday." *UWCSEA | International School in Singapore*, www.uwcsea.edu.sg/edunia/growing-local-veggie-wednesday.

"Legislation." *Legislation* | AVA, www.ava.gov.sg/legislation.

"Marrying Heritage and Technology." *Agri-Food & Veterinary Authority of Singapore (AVA)*, www.ava.gov.sg/files/avavision/Issue1_2017/heritage_and_technology.html.

"Meat and the Environment." *PETA*, www.peta.org/issues/animals-used-for-food/meat-environment/.

Pierson, Jimmy. "Animal Agriculture's Environmental Impact Is Still Being Ignored." *HuffPost UK*, *HuffPost UK*, 4 June 2017, www.huffingtonpost.co.uk/jimmy-pierson/animal-agriculture-environmental-impact_b_10276250.html.

"Singapore Success Stories ." *AVA Vision - Food Security: Singapore's Success Stories*, www.ava.gov.sg/files/avavision/Issue1_2015/food-bites-singapores-success-stories.html.

"Singapore's Food Farms:" *Agri-Food & Veterinary Authority of Singapore (AVA)*, www.ava.gov.sg/files/avavision/issue4_2015/sg50_special.html.

Tan, Audrey. "Singapore Farmers Band Together to Boost Sector." *The Straits Times*, 26 Oct. 2017, www.straitstimes.com/singapore/environment/spore-farmers-band-together-to-boost-sector.

"The Good Food Institute." *Wikipedia, Wikimedia Foundation*, 16 Jan. 2018, en.wikipedia.org/wiki/The_Good_Food_Institute.

"The Government's Role." *DEFORESTATION IN SINGAPORE*, blogs.ntu.edu.sg/hp331-2014-37/?page_id=246.

The Vegan Society. "Vegan for the Environment ." *Saving Our Planet with Plant Based Diets* .

The Vegan Society. "Why Vegan?" *Animals. People. Planet* .

United Nations, United Nations, www.un.org/en/.

"What Are the Benefits of Importing and Exporting Products?" *A & A*, 13 Dec. 2016, www.aacb.com/benefits-of-importing-and-exporting/.

"Working Together as One." *AVA*, www.ava.gov.sg/docs/default-source/publication/annual-report/ava-2014-2015-ar.

Worldwatch Institute, worldwatch.org/.

Wong, Wendy. "The Future of Local Farming: Balancing Technology and Nature." *Channel NewsAsia*, 18 July 2017, www.channelnewsasia.com/news/singapore/the-future-of-local-farming-balancing-technology-and-nature-9036832.

www.ava.gov.sg/docs/default-source/tools-and-resources/resources-for-businesses/approved-countries.

"focus on food" *United World College of South East Asia*, webapps.uwcsea.edu.sg/east/actireg/ViewDetails.aspx?ID=23659.

