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Introduction

Regardless of the countless conferences, summits and policies addressing food insecurity in hopes of establishing food collective security, world hunger and the question on the role and extent of technology are still a major issue. Regarding the relationship between food security and scientific technology/ advancements, two major fields characterize the issue. World hunger, even if throughout decades has largely improved, remains to be a predominant issue that must be addressed in order to globally develop. The United Nation's list of Sustainable Development Goals includes the "Zero Hunger" plan by 2030 as their second goal, however its implementation needs collaboration and rigidity for it to be viable. The limits and restrictions on technology in the food industry are also to be determined due to the rapid development of new methods on improving the efficiency of production, transportations and distribution. The extent and limits of these new technologies is a highly polarized topic as different nations and non state actors have different progress on methodology in the food industry.

Food security is a process, as well as an international goal that all nations should strive for. This condition calls for the utmost holistic perspective to consider all cases and aspects of this necessary goal, guided with the four pillars of availability, access, utilization and stability. Aiming towards this state encompasses balancing nutrition, welcoming new technologies, have a complete view on agriculture, stopping the spread of invasive agricultural plagues and creating

established careers and jobs in agriculture. In other words, contrary to popular belief, food security does not simply involve having food or solely having the problem of hunger; it implies managing food, having nutritious food, looking at agriculture in general and the human work put into it. In addition, it is imperative to consider the fact that agriculture is the largest employer in the world, as its industry provides an income and job for approximately 40% of the global population, most of which come from poor rural households. Various factors such as the increase of human population (population is expected to be 9 billion by 2050), climate change, unpredictable food prices, difficulty for food access and unstable supply are some of the difficulties that have shaped current food insecurity. Yet, it is agreed that these factors all fall into the three categories, and are related: the factual concept of food scarcity in the world, national and international governmental or non governmental involvement, and independent research conducted about advances.

The preponderant issue of food security, is the lack of it; namely in regards to hunger. Currently, there are 795 million people that are deemed undernourished in the world. Hunger affects peoples of every age, no matter if they live in an urban or rural environment. The root of the issue can be narrowed down to three areas that are interrelated: production, access and income deficiency. The problem with production is the state of the world, as all resources are scarce, therefore production is a challenge itself. Access encompasses where the production goes to and the distribution of nutrients; while there could be a surplus of a certain type of food, that food may not be what the body requires and needs to sustain itself. However, income touches upon the greater issue of poverty, which as an effect causes hunger.

A complimentary consideration are the technological advances made in the agricultural industry. These may either be affecting food security in a positive or negative way. Agricultural technology nowadays determines productivity rate and jobs that are going to be aligned with these. Such advances as irrigation technology, soil fertilization management, breeding, genetic engineering/ modifications, water management and organic materials are innovations that are shaping this industry today. Yet, it is imperative to consider larger bodies that have the ability to limit advances made. Government intervention, private industries, laws, and poor infrastructure

may, in many cases either confine or maximize development in the industry, either way, these determine the fate of the opportunity of these advances.

Thus, food security is an issue that affects underdeveloped countries, as well as developed ones in some way or another. Considering all factors and effects of food industry and policy changes, these should be taken into consideration immediately. Contemporarily, many ideas and goals are being published, yet with no concrete action being taken. Policies should reflect the compromise between state and non state actors regarding the key aspects of the food industry: hunger and technology. As food is considered a human right in many levels, it is the government's duty to grant proper food access to their citizens; yet it is independent research organization's job to develop newer and more effective methods; as it is the United Nation's role to oversee the relationship to benefit both parties without backtracking the other.

Definition of Key Terms

Food Security

The official term that refers to jobs and employment opportunities lost due to the introduction of certain technological innovations and machinery.

Food Availability

The determined quantity of available food with appropriate quality, that may be produced by the own domestic means of a country or imported; imported food may or may not include external food aid.

Utilization

The usage and consumption of food paired with other factors of sanitizing, potable water, adequate health care and a healthy diet. It incorporates a physical and psychological well being holistically, as opposed to only considering food.

Food Access

A term that describes and measures the individual access to adequate food for an

appropriate and nutritious diet.

Food Aid

Food items that are the product of external aid from another country or non state actor. Usually the recipient of it is under crisis and suffering from a lack of resources and in times of scarcity.

Food Engineering

Refers to sub field in Agricultural Engineering focused on applying engineering practices in the production and distribution of food in the industry. It is the merging of microbiology, chemistry and physical sciences in an engineering context.

General Overview

Taking into account the various uncontrollable factors and influencers in the issue of current insecurity in the world, it is debated what is the correct approach to this issue. The matter begins with the question of hunger, and to another extreme considers technological advances to make the food industry more productive and sustainable. These two, very different fields summarize the two areas of work in establishing food security. World hunger has been an issue for centuries now, due to not being an established formula in the allocation of resources in the world, and larger issues of poverty. Also, it is important to consider new technologies that surge every day, as these intend to change the agricultural industry. Although the intentions are to make this business more profitable, productive and sustainable, new discoveries made every day constantly change what is the “ideal state”. In addition, as these three areas are maximized, they are for the sake of the supplier; therefore, food becomes simply a product of the industry, not a human right. For the reasons above, it is crucial to understand these both fields of food security, to comprehend how different factors alter the status of these; and how these can be managed and shaped to established the desired stability in the short and long term.

The brief history on food security, world hunger and associations with technology

Food Security became a “real” worldly concern post World War I, as it was addressed first by the League of Nations at a global scale, rather than addressing a certain country, city or village. The report issued by the League was titled “Nutrition and Public Health”, in which it acknowledged food shortage in poor countries, and alarming rates of malnourishment. These discussions and talks brought up other issues such as the production, processing and trade of food in different areas of the world. Yet, the focus of these talks was the relationship and differentiation of nutrition and food, and the issue of food surpluses and deficiencies. As a result of these talks, the only relevant action taken was the agreement on the increase of food production to meet human needs, that supposedly as a result would boost the agriculture industry. Therefore the starts of food security come from the concern of the unequal relationship between nutrition (health) and food in various parts in the world and how it affects the population and the economy.

Post World War II and the creation of the United Nations and the Food and Agriculture Organization (FAO) brought other questions regarding the distribution and management of food in the field of Food Security. Early research proposed the idea that with current food production and access, only two thirds of the world was being fed. There was a survey that calculated calories (energy) being produced compared to the current population and the average amount of calories a human being should consume, and simply one third of the world could not be fed. Therefore, European countries and North America started to increase their food production exponentially. However, this backfired tremendously due to now food surpluses existing, that were not needed, that were most likely going to end up as food waste. Consequently, another topic in food security came up, which is allocation and management. From this problem, food aid was utilized as a solution, as food that was not needed in North America was transported to Europe under the Marshall Plan.

By the 1970’s, food production increased by more than 50 percent, and production per capita increased by 20 percent. However, this was only in western regions. Research conducted on famines in sub-saharan African countries revealed two issues that were the cause of their high rates of hunger and malnourishment: production and accessibility. Land in these countries is

incredibly infertile due to the extreme climate changes that occur, droughts and floods for example, and the unpredictability of these. In addition, due to corrupt government and lack of food governance, accessibility is an issue as these commodities are not always available. Yet, in these times, food security was established as a concern mostly due to the predictions of population growth, not the deaths and illnesses related to malnourishment and lack of food available in some places. Regardless, in these times no real progress was made, as the same tools, such as food aid were utilized and the approach was still the same.

After 1990, throughout 2015, these are often called the Golden Years of Food Security, in diplomatic terms. During 1992 the first Conference on Nutrition took place in Rome, which can be seen as a major milestone in the fight for complete food security. This is because it branched out the differentiation between nutrition and food, and the relationship of health and agriculture that has to culminate in sustainability for the future. In addition, the 2000 Millennium conference dictated “Eradicating extreme poverty and hunger” as their first goal. Following on 2015, to achieve Zero World Hunger was declared the second of Sustainable Development Goals, that should be accomplished by 2030 in collaboration with the international community. In addition, these new approaches opened up the possibility of collaboration with other organizations and institutions that take into consideration health and new technological aids to the food industry and systems.

Short-term effects of food insecurity and speedy development

Immediate effects of food insecurity are incredibly grave, as they are occurring right now. As an effect of hunger, one out of every nine people in the world suffer from malnourishment. The common result of malnourishment is often death due to the lack of access and availability of nutritious food (or food at all) in some areas of the world. The effects of food insecurity are quite literally fatal and are the source of suffering in people inhabiting every single continent, especially Africa and Asia. However even if general scarcity is not yet a problem, the allocation of food is. If food is continued to be thought of as a product and commodity in a holistic sense, instead of something vital for the human being; millions of people will continue to die each year due to a necessity that is badly distributed and supplied to those who need it the

most. Regardless of multiple awareness campaigns and attempts to solve this issue, organizations and sovereign nations are unable to tackle this problem due to a lack of cooperation that leads to the deaths of helpless individuals.

Yet, there are positive outcomes for the incredibly fast paced technological advancements in the agricultural industry. The approaches and goals for the advancements align with those for those tackling food insecurity: enabling availability, access, utility and stability. However, from a private supplier's perspective, sustainability and a strong profit are also some of the guiding pillars. Overall, it is considered ideal that so many independent research companies are competing to make the industry more sustainable and prosperous in every sense; nonetheless, as long as food is still thought of as something essential to human life instead of a source of money. Which is why, currently, the impacts of these developments are not at all harmful to society nor the industry, as modern techniques are being aligned with today's methods.

Long- term effects on food insecurity and technological advancements

Surely, the long term effects of World Hunger are incredibly impactful, and shape the future of the globe demographically as well as politically and socially. Inevitably unresolved world hunger is directly related with death, epidemics and illnesses. However, another issue disregarded is what hunger does to the world in terms of development. Whatever growth is in plan for the next five, ten, fifteen or twenty years, it is all going to be stuttered. The inability of the international community to resolve this paramount problem plaguing major areas and a grand fraction of the human population further displays pure incompetence. If the world is unable to provide a basic human right to all of its inhabitants, then it begs the question of how is development meant to take place while ignoring such key flaws of the system. Innovation might take place every single day, but as long as one out of every nine people suffer from malnourishment, it clearly showcases an error in the priorities and incorrect collective food security.

Nevertheless, technological advances do bring out positive long term outcomes to matters of food security. As new technologies develop, this paths out food industries to have a more

sustainable future. Even Though it is hard to speculate what specific developments will be carried out, it is evident that these will contribute the scene of food production, transportation and consumption in a more modernized way that will benefit the contemporary society. Technology is making food more nutritious, available, less wasteful and helping the working people in the industry. However, if regulations and laws are not imposed in countries, independent researchers and companies, potentially technology could pose as a threat. Prioritizing profit over the quality of the food (quantity) may leave the consumer as a secondary priority. In addition, maximizing technology could lead to a loss of jobs and complete reform even in countries that do not have the access or the means to newer technologies. Therefore, it is imperative to regulate and oversee this process and development so that it can be carried out organically so it does not have negative impacts.

Major Parties Involved

United States

The United States is currently ranked first in Food Security around the globe. This is due to the fact that the nation is first in the categories of availability, and third in affordability, quality and safety. In addition to this, the United States is home to multiple headquarters of independent scientific research companies of agriculture. Therefore, given these two the United States should lead as a model and a prime figure in outlining guidelines and goals for the food industry to accomplish collective food security, given that they already do in their own country.

Burundi

In contrast, Burundi is ranked last, with a position of #113 in food security. As a result, it is the country with the largest food insecurity, therefore is a country that is completely dependent in food aid as they lack specialization in producing and transporting their own food, given that they are unable to access food. Burundi should serve as an example of a failed nation in terms of food security and should be one of the countries that is aided the most into reaching the goals.

United Kingdom

The United Kingdom is currently #8 in food security, but what is most interesting is the fact that it is ranked third in improvement. This displays how even an European developed nation can find room for change, and how the quality of their food security has largely increased.

Yemen

However, Yemen is in the other side of the spectrum with the highest ranking in deterioration of Food Security. Yemen is ranked #100 in food security, therefore it serves as an example that even countries that are down low in the ranking are still decreasing their food security, while the world should only be progressing currently and collectively. There is always going to be a ranking, but it should be a clear goal that countries should only be improving, not decreasing even more in their own standards.

China

China has the largest population of people, and worryingly it is ranked #42 in food security. By this number it is evident that food in China is not accessible, of quality or affordable enough by the standards of its current population. Its population numbers do not correlate with the food production or access it is receiving, therefore causing large food instability. As China has the largest population, it handles larger numbers than the rest of the world is used to, as a result causing hunger at a larger scale.

India

As it is considered to have the estimated largest growth of population, it should be India's prime concerns to acknowledge their plan to sustain its inhabitants. Currently, it is #75; therefore this number gives away that India is not prepared for such growth in population in regards to sustaining that future population with proper access and consumption of food, while it cannot even sustain its current. As predictions regarding its growth are well established and researched, it is best to aid India for its preparation and development in means to become a nation with stable

food security.

Timeline of Events

Date	Description of event
1943	UN Conference on Food and Agriculture in Hot Springs, Virginia in the United States. It was convened by US president Franklin D. Roosevelt, and had the participation of 44 different governments. There, it was talked of a future establishment of an organization within the UN specialized in food and agriculture.
1945	Creation of the United Nations Food and Agriculture Organization (FAO). The FAO was established as a specialized organization, and it first met in Quebec, Canada.
1960	Resolution XV declared the provision of food surpluses to countries with severe food deficiencies in their systems. Supposedly, this aid would come from the United Nations, to countries within the United Nations. Food surpluses were to be distributed and managed to incentivize the economic development of underdeveloped nations.
1961	World Food Programme is created through resolution number XVI. It is initially created as a multilateral food aid program that worked in collaboration with the General Assembly.
1974	The First World Food Conference is held in Rome. The conference discussed the issues on food production and consumption as an examination on a global scale. Creation and publication of the Universal Declaration of Hunger and Malnutrition, which invited and outlined the future procedures of international cooperation and approach to resolve the world food problem.

1981	World Food Day is established on the 16th of October. It is created as a day to promote awareness and emphasis on World hunger, and to direct consciousness to the realities of the food industry and consumers.
1992	First International Conference on the issue of nutrition managed in association of the Food and Agriculture Organization (FAO) and the World Health Organization (WHO). These bodies managed the drafting of the action plan on the issue of malnutrition and outlined nutritive goals.
2000	UN Millennium Goals Declaration, created as a global partnership in order to end worldly extreme poverty and hunger, which should be reduced to half in 15 years (by 2015).
2015	United Nations Sustainable Development Summit takes place in New York. To achieve Zero World Hunger was declared number two in the list, and it should be accomplished by 2030 in collaboration with the international community.

UN involvement, Relevant Resolutions, Treaties and Policies

Ever since the establishment of the UN, food security has been a present issue. As a result, bodies such as the Food and Agriculture Organization (FAO) have been created, and multiple summits have taken place in the past decades. In addition, countless resolutions have been passed to take action on this issue. Lately, to end world hunger was pronounced one of the millennial goals in the year 2000, and in 2015 it was named the second of the Sustainable Goals.

- Creation of the Universal Declaration of Hunger and Malnutrition
- Resolutions XV and XVI
- World Food Conference
- International Conference on Nutrition

- World Food Summit
- World Summit +5

Evaluation of Previous Attempts to Resolve the Issue

There has been talk of multiple previous attempts to resolve the current issue of food insecurity, however not much action. The issue of food insecurity clearly commenced with the realization of the incredible rates of hunger and malnourishment. Since then, countless of organizations and resolutions have tried to tackle the issue, but have failed miserably to act due to a lack of competence and organization. World Hunger is an obvious and imminent threat that is not relatively new, as it has been an evident problem for decades now that organizations nor countries have been able to alleviate. Multiple resolutions, goals and plans of actions have been created, yet have not been put in action, therefore useless. As a result, a clear recommendation is for countries to open up to collaboration with each other and contributing to the fight against world hunger as a step to achieve collective food security worldwide. In addition, the UN and the FAO should take a stronger stand by consistently inviting countries to come together to solve this present issue.

Possible Solutions

Short Term Solutions

Food security regarding the two topics of world hunger and technological advances, they have differing solutions, yet a common goal. Established food security is commonly defined as a state where all people in all places have proper access to nutritious food that is up to health standards. It is key for development to have proper food collective security for the development of the world; however in the short term, it is imperative to acknowledge and resolve the immediate effects of food insecurity that are occurring in the present and internationally. Which is why, in the short term world hunger should be addressed first in the utmost holistic way to stop the immediate illness and death that results from famine.

In regards to world hunger, that is an issue that should be dealt with immediately in the

way that it reduces losses in any way. This is why, the fastest approach is systematic food aid and reallocation of resources of countries in the scale. Alluding to previous UN resolutions, in an extreme case, developed nations should allocate their own food surpluses to underdeveloped nations within the UN with food deficiency. Although this, in no way, should be a permanent establishment, it should be a clear attack against current hunger and malnourishment that, as a result, will severely decrease death and illness rates related to these. Prioritizing countries in the lower rankings will help guide developed countries to objectively give aid to those who need it the most. Direct help through the UN and the FAO will ensure the aid gets to benefit the affected.

Targeting food for direct consumption and targeting specific lands for closing the yield back will prompt food insecurity in countries that need to improve their food security. Although this is incredibly hard, considering most rural farmers farm prioritizing feeding themselves and their family, that is majorly harmful in an industrial perspective. Considering selling is a secondary priority, hectares of space and billions of calories go to waste if crops are not sold. Therefore, making sure small farmers have business is essential, or making sure they do not plant more crops that they are going to sell, in order to maximize the use of their abilities, and lessen the potential waste.

Spreading awareness and educating individuals will help motivate populations to be more conscious about food security. Education is key to solve food security, as a large part of the system are consumers. Humans need food to survive, yet that is a broad statement, due to the fact that humans require adequate nutrition to survive. Consumers ultimately make the choice to buy the product they want; therefore it should be each government's responsibility to launch campaigns and even laws to promote healthy eating and good nutrition to avoid malnourishment, even when food is available. Imposing laws on schools and workplaces introduces healthy habits from the start, as it separates society from foul eating habits that contribute to food insecurity as people

Therefore, by implementing these short term solutions in the current food system will help alleviate the current distraught of the situation. One of the primary goals of these short term

solutions is to quickly address world hunger in an immediate systematic way, in order to start avoiding the deaths and illnesses related to this issue. By initiating the first steps to ease into the tackling of food security, it is imperative to address those issues that directly affect individuals first, hence most solutions being related to the sustainable goal of Zero World Hunger.

Long Term Solutions

Food security regarding the two topics of world hunger and technological advances, they have differing solutions, yet a common goal. Due to the fact that countries around the globe have different levels of food security, each has individual needs, influence and ability to contribute to the resolution of this conflict. Transforming the current food system and industry is key as a long term solution. The rethought of a system can be done as soon as all countries are majorly stable in their national food security, and world hunger is majorly tackled. This way, a more sustainable and modern food system can take the place of the flawed current one that is mistakenly allocating resources, and wasting tonnes of food while hundreds of millions starve. However, a new system can only be adopted once the short term solutions are in place. In addition, the development of technology is imperative to create a more sustainable system that eliminates waste and maximizes utility, accessibility and benefits to the population as well as suppliers and researchers.

A long term solution to the prevention of hunger is the end of poverty, specifically rural poverty. As this is the first of the Sustainable Goals, and given that ending hunger is the second, these are directly correlated. While of course, food aid serves as an immediate solution, it most definitely does not serve beneficial to developed nations in the long term. Therefore, a larger investment

Implementing a technological way to improve agricultural productivity is a quintessential part to reshaping the system for maximum efficiency. Bioengineered agriculture in underdeveloped countries will aid in the sense that they will be technologically up to date, and will make them independently sustainable, as well as aiding their national industries. Engineering crops to resist droughts or floods, and animals to resist better temperatures in different habitats would be ideal. Given that most countries with high hunger and

malnourishment rates also have extreme climate that makes their soil not at all fertile, the only way they could be sustainable and self sufficient is by genetically altering their soil, crops and animals. Nonetheless, this is a slow process that requires extensive research and funds, which is why it would be in the long term. The UN should invite developed countries to provide a fraction of the financial support and scientists to look into sustainable solutions that come with permanent infrastructure to establish permanent food security with the aid of technology.

In addition, reducing food waste is another long term solution that is essential for the execution of the solution to this issue. Currently one third of the food produce goes to waste. In terms of monetary losses, in industrialized countries approximately US\$680 billion dollars and in developing countries US\$310 billion on food is wasted every year. This is a major flaw and leak of the food system, therefore requires action to decrease these numbers. In the long term, it would be ideal to make it as the food production equals the consumption, as opposed to producing way over the quantities needed. The world currently is not in need for food surpluses to be created, specially in the time where food is lacking in other places around the world. Therefore, every quantity of food produced should be targeted specifically.

As a result, implementing these long term solutions target to solve the systemic problems within the food industry that affect and threaten food security. The current system is incredibly flawed, yet most of these failures that make it up cannot be solved without the stable basis that the short term solutions will provide. Focusing freely on the industry details without the concern of major failures that might directly affect the already affected population. These improvements and paths to take will maximize productivity and utility of the current food industry, therefore will create long term collective food security worldwide at the four levels of availability, access, utilization and stability.

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