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Ethiopia, Malnutrition

**Ethiopia: Examining the Effectiveness of Golden Rice Aid in Alleviating Malnutrition**

Global Food Insecurity is an ever-increasing struggle. The unfortunate truth is that many people of varying ages and identities are struggling to keep themselves, and their families fed. An issue of such prevalence must have a cause, and by identifying what it is we can begin taking steps to solve the problem. Ethiopia is among the list of countries who are severely food insecure, and especially malnourished, and I believe Golden Rice may be their life-saving answer.

Ethiopia is located in the Horn of Africa. It's population is estimated to be around 120.3 million, 77.83 % of whom reside in rural areas. (Ethiopia Rural Population, Percent - Data, Chart, n.d.). Ethiopians live under a federal parliamentary republic that has been headed by Prime Minister and Leader of the Prosperity Party, Abiy Ahmed since 2018. Annual salaries in Ethiopia sit at about 377,006 ETB per year (Ethiopia | Average Salary Survey 2023, n.d.). In comparison, 1 ETB is equal to 0.019 US dollars. Occupations in Agriculture account for 85% of total employment. (Agriculture and Food Security | Basic Page, n.d.) Regarding healthcare, access is minimal, and in rural areas, nearly nonexistent. Many struggle to find a supportive job due to the crippling lack of education for Ethiopian citizens.

38.5 million hectares of Ethiopia’s land is cultivated, which equates to 34% of the total land area (Statista, 2022). An average American farm equals about 250 Ethiopian hectares, while the average Ethiopian farm is about 96. In other words, an Ethiopian farm is less than half the size of an American farm. Ethiopian terrain consists of high plateaus, mountains, and dry lowland plains. Climate ranges from high rainfall and humidity in the south and southwest to afromontane and desert regions in the northeast, east, and southwest. (World Bank Climate Change Knowledge Portal, n.d.).

 The average Ethiopian family consists of five members (Average Household Size - Area Database - Table - Global Data Lab, n.d.), all of whom typically inhabit a poorly built, cramped house made of mud and wood. For an Ethiopian family, the diet usually consists of various vegetable dishes, assorted spicy meat, stews, and curries. These dishes are served over a large, traditional, sourdough flatbread called injera. They also take pleasure in a good cup of coffee.

Ethiopians rely on rain-fed agriculture to produce the ingredients for their meals. However, the issue of droughts throughout Ethiopia is consistent and widespread. We can conclude they are the result of global warming; problems within the government; and lack of water management. Under current conditions, the country is experiencing sickness and disease, poverty, and a lack of education on nutrition, water preservation, and crop production.

Since the beginning of the Tigray War in November 2020, Ethiopia has been facing increasingly critical food shortages. So far almost 400 Ethiopians have died from starvation, and millions more need food aid. (De Waal, B. A. (2024, January 24). Ethiopia starvation: Fear of famine in Tigray grows) Vitamin A deficiency (VAD) is one of the major public health problems in many third-world countries including Ethiopia. Despite this fact, little attention has been given to vitamin A supplementation in hard-to-reach rural areas and districts. A study from the Archives of Public Health assessed vitamin A supplementation coverage and associated factors in children aged 6–59 months throughout Ethiopia in 2021. An estimated 44.4 % of preschool children in Africa are at risk for VAD and in Ethiopia alone, VAD leads to 80,000 deaths a year, affecting 61% of preschool children. (Abrha, T., Girma, Y., Haile, K., Hailu, M., & Hailemariam, M. (2016).

In Ethiopia, there are four major rice-growing regions, Amhara, Benishangul Gumuz, Oromia, and SWEP. These states combined make up 98% of the cultivated area of rice for the entire country. The rice farming system in Ethiopia is made up of complex production units that involve interdependent mixed cropping and livestock activities, which are mainly characterized by rain-fed agriculture. Rice is their dominant crop, followed by maize and grass peas. According to their study results, rice, maize, and grass pea, took up 39%, 12%, and 10%, of the cultivated crop area. In total production, rice makes up 54% of the total grain production in households. Rice is planted and harvested yearly, usually from early June to early November. (Assaye, A., Habte, E., & Sakurai, S. (2023b)

As we can see, rice is already a big part of the Ethiopian life. It’s very plausible that a different breed of rice, containing a greater amount of nutrients, could help decrease Ethiopian malnutrition. “Food security is no longer just about combating hunger. In its truest sense, food security is only achieved when rice-growing countries are also producing nutritious and high-quality rice to satisfy the rise in demand and nutritional needs of rice-consuming populations.”- IRRI. IRRI, or the International Rice Research Institute, works closely with research networks, governments, the development sector, the private sector, and farmer communities to ensure that the approach to developing large amounts of healthier rice varieties reaps the best returns for everyone involved. (Africa. (2024, February 16).

The IRRI, has developed a GMO rice which is titled, “Golden Rice”. Golden Rice contains beta carotene, a plant pigment that the body converts into vitamin A. This compound is what gives this grain its yellow-orange or golden color. Golden Rice is developed through genetic engineering. Though ordinary rice does produce beta-carotene, it is not found within the grain. Following extensive research, IRRI scientists used genetic engineering to add the compound to the grain, improving its nutritional value. The beta carotene in Golden Rice is made possible by adding two new enzymes. It’s identical to the naturally occurring beta-carotene found in leafy greens, yellow-colored vegetables, orange-colored fruit, and separate ingredients. Golden Rice doesn’t require cultivation different from other rice and also maintains the same yield and agronomic performance. (Africa. (2024, February 16). International Rice Research Institute.)

While vitamin A can be obtained from food products and supplements, there are many challenges regarding their availability, accessibility, and affordability, thus making it difficult to properly address the problem of vitamin A deficiency (VAD). Rice is a staple food in Ethiopia, meaning Golden Rice can be a significant help in improving the vitamin A status once the grain becomes available for public consumption. Vitamin A is important for normal vision, immune system health, reproduction, growth, and development. Vitamin A is also essential to the health of your heart, lungs, and other organs. As previously stated, VAD is the cause of over 80,000 deaths annually in Ethiopia, and the means to help are directly in front of us. (*Office of Dietary Supplements - Vitamin A and Carotenoids*, n.d.)

The Ethiopian Ministry of Agriculture recognizes the importance of rice, referring to it as the "millennium crop”. In fact, they expect it to ensure food security in the country. Since its introduction, the amount of rice produced yearly has rapidly expanded to various parts of the country. (Assaye, A., Habte, E., & Sakurai, S. (2023c).) Africa has the highest reserves of untapped natural resources for food production, especially water and land, in the world. With over 130 million hectares in inland valleys suitable for rice production—but only about 10 million hectares are currently being used— Africa’s tremendous potential in agriculture remains untouched. Africa can address food and nutrition security issues, especially for vulnerable socio-economic groups such as the poor, women, and children, if the region develops agri-food systems that are market-driven, more productive, nutrition-focused, resilient, and equitable. (Africa. (2024, February 16). International Rice Research Institute.)

Information about groundwater in Ethiopia is limited. There is a huge need for proper groundwater assessment, mapping, and monitoring. The total groundwater volume is currently estimated at 40 billion cubic meters while the groundwater withdrawal rate is estimated at less than three billion cubic meters. Representing approximately two percent of the average renewable surface water (122 billion cubic meters) flowing in the Ethiopian rivers annually. Safe groundwater yield represents only a small fraction of the annual renewable surface water supply. Water utilization strategies in Ethiopia need to emphasize efficient surface water use as much as possible. Deep groundwater sources should be regarded as savings bank accounts while renewable surface water sources should represent a checking account for everyday transactions. (Contributor. (2022, April 7). Groundwater: an untapped solution to climate variability | The Reporter)

 If the IRRI acts with the Ethiopian government and is permitted to work with Golden Rice, an NGO such as GlobalGiving could donate money to the government of Ethiopia so that they could afford to plant and harvest the Golden Rice, and food insecurity rates would decrease greatly. The VAD rates would likely fall greatly within the first year. It should also be noted that Golden Rice has been accepted as safe for consumption by the Governments of Australia, Canada, New Zealand, and the USA, while other locations have pending registrations, and all have been successful in decreasing VAD rates. (Jorge Mayer. (n.d.). The Golden Rice Project. Copyright Golden Rice Humanitarian Board)

Still, getting Ethiopians on board with harvesting and adopting Golden Rice into their everyday diet could be a difficult task. Not very many are educated on exactly what GMOs are, and how they differ from traditional crops. Instead, many people hear “GMO” and decide to steer clear of the product without any deeper research. It’s plausible that by taking the steps to educate the Ethiopian government and giving them the means to therefore educate their people, more people would opt to adopt Golden Rice into their daily diets, reaping all of the health benefits that this rice has to offer.

This is why education is going to be a key step in the plan to decrease malnutrition related deseases and deaths throughout Ethiopia. What ethiopians need to know, is are GM foods really safe to eat? “Yes. Golden Rice is safe to eat, just like other genetically engineered foods developed under strict regulation by experts.” - *IRRI* (*Golden Rice FAQs*, 2022) What many don't understand is that genetically modified foods can be a cure to malnutrition. By inserting missing vitamins into foods that are already widley consumed, more people will be consuming vital nutrients, helping decrease malnutrition throughout developing countries. Golden rice has been proven to decrease VADs, which is vital for increasing the lifespan and nutritional intake of Ethiopians.

Since NGOs would be the primary funding for the Golden Rice project, we must ensure that Ethiopia woud be acceptingof them. A research paper completed by Desta Atnafu Yesgut delved deep into the effects of NGO program “GOAL” and it's effects on socio-economic development. GOAL is a humanitarian program which focuses on helping vulnerable communities regain stability, especially after crises. “Goal has been delivering a range of programs including child protection, development, nutrition, emergency relief and rehabilitation in Ethiopia.” (*Goal Ethiopia*, n.d.) In Yesgut’s paper, she highlights the positive impacts GOAL has had on the Ethiopian community. Impacts which include reduction of poverting, improved living standards for the impoverished, and womens empowerment. (Atnafu Yesgat, 2017)

 NGOs emerged in Ethiopia in 1930s as a result of urbanization and economic development (World Bank, 2000). They have been widley accepted since then, stemming from the desire to avert chaos and famine through out the society. in fact, a quote Yesgut references in her paper states,“The NGOs sector is the strongest part of the civil society in Ethiopia” (Zewdie and Pausewang, 2002: 105).

There even exits a code of conduct for NGOs in Ethiopia. The code is split into to parts, standards of conduct, and code observation. The mission of this code “Is to improve and advance the public good, the quality of life of those who are disadvantaged and vulnerable and the proper management of the environment for future generations. To realise this mission, NGOs shall seek to empower and build community capacity, and provide services for sustainable development. They shall also work in partnership with each other the Government donors community partners and the public.” (‘The Code of Conduct for NGOs in Ethiopia, 1998) With the cited research we can conclude that not only are NGOs accepted through out Ethiopia, but they are celebrated.

Another issue that must be taken into account is the cultural acceptance of Golden rice. As research shows, rice is of extreme cultural importance in Ethiopia. For over 3000 years, cultivation of rice has been ongoing throughout Africa. African rice, or *Oryza glaberrima*, is a unique and integral part of the culture in many African communities. Rice production and consumption provides a notable pathway out of poverty for Africans, as rice availability and prices are major determinants for welfare in impoverished African consumers. It's also been found that rice is primarily a women's crop in the rainfed ecologies in Africa, since they provide the bulk of the labor including sowing to weeding, harvesting, processing and marketing.

Additionally, the rice sector could potentially employ the 17 million young adults entering the job market in Africa each year. There are enough human, physical and economic resources to produce enough quality rice in a sustainable manner fr Africa to feed itself and after a while, to export to other regions. (*AfricaRice | Why Rice Matters for Africa*, n.d.) On top of the economic benefits, research proves that proponents of GM crops have the potential improve crop quality, decrease pesticide use (Buiatti et al., 2012), fight micronutrient deficiencies, adapt plants to climate change and facilitate economic growth.

Before starting to change something that is such a cultural staple in another country, we should first receive approval from their government. Sending representatives from groups like the IRRI and associated NGOs could be a step in this process. Once approval has been gained, the next step would be to move on to education of associated businesses, rice farming companies, and agriculturalists. This would be possibly the most challenging part. Human have a tendency to be set in their ways, something as simple as changing a rice breed, could be heavily controversial. This is why harping on the health and economic benefits is extrmely crucial.

The last step to implemementing Golden rice, is to visualize the educational process. Many young activists are searching for a way to help others. There are hundreds if not thousands of humans aware of the severity of malnutrition and miseducation. People with a passion to help are constantly looking for an opportunity to positively affect the lives of others. By educating these passionate people with the life-changing possibilities of Golden rice,they could then be sent to developing countries such as Ethiopia to connect connect to citizens on a deeper level, and help teach about differences between regular, and Golden rice, and how truly beneficial it could be.

Malnutrition and the lack of key vitamins and minerals lead to the death of human beings every day. We now know that Vitamin A Deficiency (VAD) kills. There is a solution at the tip of our fingers, so why not implement it? GMOs do not automatically mean bad, in fact, in this case, they mean better. By allowing the IRRI to use their knowledge of Golden Rice to help Ethiopians, we would be taking the initiative in increasing food security and decreasing malnutrition. The resources and knowledge are available, all that is left is taking action.

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