Trade and Food Security Insights

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Balancing the Global Food Security Equation: $GFS = \frac{T^3}{C^3}$

ACHIEVING FOOD SECURITY is one of the most important public policy goals regardless of the level of development of a country. The challenges, however, are numerous including those beyond one's control and territorial jurisdiction such as the climate change, conflicts and pandemics like the COVID-19. The solutions are there as well, but the most important ones such as the trade and technology need cross-border collaboration. This makes the Food Security a global problem with global solutions. Having food self-sufficiency may not be practical beyond a few countries. The following note outlines challenges (Climate Change, Conflicts, COVID-19) and Solutions (Territorial Productivity, Trade, Technology) for achieving a Global Food Security. It also proposes global actions such as the "Global Compact on Food Security", "Global Agriculture Technology Pool", and "Global Food Security Impact Bonds".

Context

The 2030 Agenda for Sustainable Development chalks out a global strategy and rethinks on how to eradicate poverty and hunger. The Sustainable Development Goal 2 (SDG-2) calls for achieving "Zero Hunger" by the year 2030. Global Food Security (GFS) is not a new challenge per se but it has certainly got more complex due to variety of externalities in recent years.

Unfortunately, after decades of steady advances in the global fight against hunger, food insecurity and malnutrition, we are now witnessing a reversal of the progress made: as at 2019 the number of undernourished people had increased to 821 million, taking us back to the figures registered a decade ago.

The impacts of climate change, a surge in the number and complexity of conflicts in African and Near East countries, and economic slowdowns are the main reasons behind the increase. Recent estimates project an additional 130-265 million hungry people, across the globe, due to COVID-19.

The increase in production and yields, at local levels, has been focused upon in recent years as a solution to problem of increasing food demand. This is coupled with increasing levels of international trade in food and agriculture that provides a level of security particularly to net food importing countries. The use of technology, at production, distribution and even at consumption levels have (and carry a huge growth potential) enhanced food security at national and global levels.

Proposed Equation

The Conflicts, Climate Change, and COVID19 (3Cs) are "denominators", or negative externalities, while the Territorial productivity, Trade and Technology (3Ts), are the "numerators" or positive externalities for balancing the global food security equation.

$$GFS = \frac{T^3}{C^3}$$

$$GFS = \frac{\text{Territorial}^2 \times \text{Trade} \times \text{Technology } (T^3)}{\text{Climate Change} \times \text{Conflicts} \times \text{Covid19 } (C^3)}$$

GFS = Global Food Security

Denominators: **Climate Change**

According to the FAO State of Agriculture Commodity Report 2018[3], climate change will have significant implications for agriculture and food security. By the middle of this century, higher average temperatures, changes in precipitation, rising sea levels, an increase in the frequency and intensity of extreme weather events, as well as the possibility of an increase in damage from pests and disease, are expected to affect crop and livestock production, as well as fisheries and aquaculture. This impact will be

1 Economist (Trade and Food Security) FAO Liaison Office Geneva. The views expressed are of author's own and do not necessarily represent official position of the Food and Agriculture Organization of the United Nations (FAO).

2 Territorial = National/State/Local productivity.

3 http://www.fao.org/publications/soco/en/

uneven across regions and countries. In low-latitude regions, where most developing and least developed countries are located, agriculture is already being adversely affected by climate change, specifically, by a higher frequency of droughts and floods. For some developing countries, climate change will exacerbate the food security challenges they already experience.

Climate change will worsen the living conditions of farmers, fishers and forest-dependent people who are already vulnerable and food insecure. Hunger and malnutrition will increase. Rural communities, particularly those living in already fragile environments, face an immediate and ever-growing risk of increased crop failure, loss of livestock, and reduced availability of marine, aquaculture and forest products. More frequent and more intense extreme weather events will have adverse impacts on food availability, accessibility, stability and utilization, as well as on livelihood assets and opportunities in both rural and urban areas. Poor people will be at risk of food insecurity due to loss of assets and lack of adequate insurance coverage. Rural people's ability to cope with climate change impacts depends on the existing cultural and policy context, as well as on socio-economic factors such as gender, household composition, age, and the distribution of household assets.

Denominators: **Conflicts**

Food insecurity affects the lives of millions of people across the world and is increasingly concentrated in conflict-affected regions. All 19 countries the FAO currently classifies as being in a protracted food crisis are also currently affected by conflict and violence (Holleman et al., 2017). Globally, 60 percent of the 815 million undernourished individuals and 79 percent of the 155 million stunted children live in countries affected by violent conflict (FAO et al., 2017). In 2018 two-thirds of those facing acute hunger were in 21 countries and territories affected by conflict or insecurity.

According to the FAO State of Food Security and Nutrition in the World[4], exacerbated by climate-related shocks, conflicts seriously affect food security and are a cause of much of the recent increase in food insecurity. Conflict is a key driver of situations of severe food crisis and recently re-emerged famines, while hunger and undernutrition are significantly worse where conflicts are prolonged and institutional capacities weak. Addressing food insecurity and malnutrition in conflict-affected situations cannot be "business as usual". It requires a conflict-sensitive approach that aligns actions for immediate humanitarian assistance, long-term development and sustaining peace.

Denominators: **COVID-19**

According to the FAO Policy Brief "Anticipating the impacts of COVID-19 in humanitarian and food crisis contexts", although the impact of the COVID-19 pandemic on short- and long-term food security is difficult to predict, particularly at this early juncture, some risk factors can be identified. Lessons from previous pandemics or global crises indicate that food security could be rapidly and dramatically affected, particularly in fragile countries and, within them, the most vulnerable populations have a lot to lose.

While the COVID-19 pandemic is devastating lives, public health systems, livelihoods and economies all over the world, populations living in food crisis contexts are particularly exposed to its effects. Food crisis contexts – as defined by the Global Report on Food Crises[5] – are those areas where a large share of the population is acutely food insecure and in need of urgent humanitarian action, as a result of a significant shock and where the government requires external assistance to cope with the impact of a shock on food security and nutrition.

The COVID-19 pandemic risks further escalating these figures, with likely significant rises in humanitarian needs and food insecurity as a consequence of the pandemic itself and of some of the containment efforts. Evidence of the potential impact on number of food insecure people can be inferred by observing what occurred in previous crises. For instance, during the food prices crisis in 2007–2008, the significant growth in world food prices increased the number of undernourished people in the world by 14 percent in two years (from 848 million people to 963 million). Countries with existing humanitarian crises are particularly exposed to the effects of the pandemic, in terms of both direct impacts on people's health, and indirect effects, such as disruption of livelihoods, food supply chains and access to food, basic services as well as humanitarian assistance.

The COVID-19 pandemic is already directly affecting food systems through impacts on food supply and

4 http://www.fao.org/state-of-food-security-nutrition/2017/en/

5 http://www.fao.org/emergencies/resources/documents/resources-detail/en/c/1272014/

demand, and indirectly through decreases in purchasing power, the capacity to produce and distribute food, and the intensification of care tasks, all of which will have differentiated impacts and will more strongly affect the most vulnerable populations. The effects could be even stronger in countries that are already facing exceptional emergencies with direct consequences for the agricultural sectors, such as the ongoing desert locust outbreak in Eastern Africa, the Near East and Southwest Asia.

Numerators: **Territorial Productivity**

As per FAO's "The Future of Food and Agriculture: Alternative Pathways to 2050"[6], to meet demand, agriculture in 2050 will need to produce almost 50 percent more food, feed and biofuel than it did in 2012. This FAO estimate takes into account recent United Nations (UN) projections indicating that the world's population would reach 9.73 billion in 2050[7]. In sub-Saharan Africa and South Asia, agricultural output would need to more than double by 2050 to meet increased demand, while in the rest of the world the projected increase would be about one-third above current levels.

Meeting the increased demand should not be a major challenge, if past achievements are a guide. Historically, much bigger increases in agricultural production have been recorded in comparable time frames. Between 1961 and 2011, global agricultural output more than tripled. In low-income countries, livestock production has been one of the fastest growing agricultural subsectors. Since the early 1970s, per capita consumption of milk, dairy products and vegetable oils has almost doubled, while meat consumption has almost tripled (Alexandratos and Bruinsma, 2012). Over the past five decades, per capita consumption of fish has more than doubled. Since the 1980s, virtually all of the increase in the amount of fish consumed has come from aquaculture, which has outpaced population growth and become the world's fastest growing food production industry (FAO, 2016).

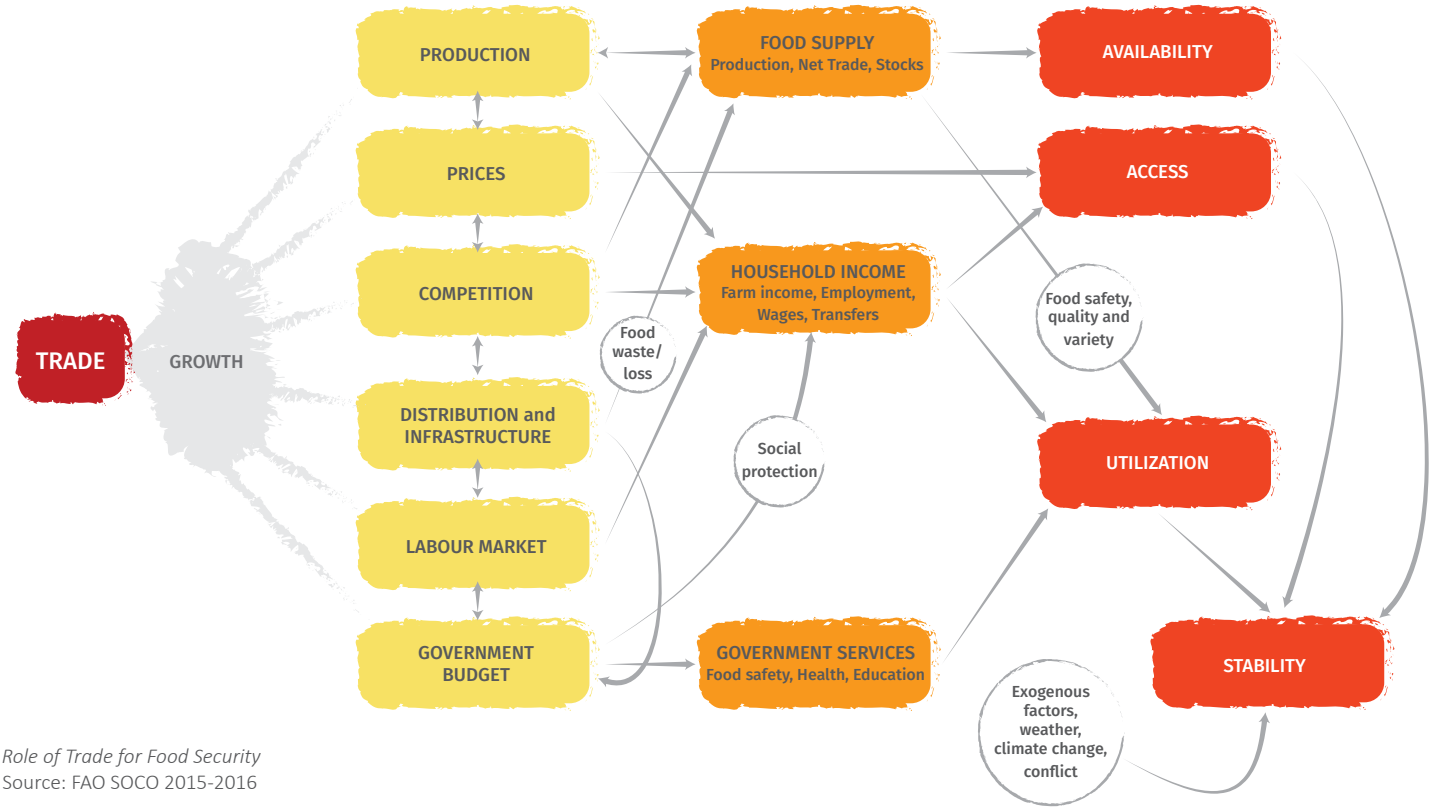
Numerators: **Trade**

According to FAO's State of Agriculture Commodity Markets[8] (2015-16), the relationship between trade and food security is attracting increased attention on both

6 http://www.fao.org/publications/fofa/en/

7 The estimated increase to 2050 differs from AT2050's projection of an increase of 60 percent (Alexandratos and Bruinsma, 2012). The updated figure here accounts for both the UN's revised population projection and increases in production between 2005/07 (the previous base year) and 2012 (the new base year). Accounting only for the revised population projections, global agricultural demand is projected to increase by more than 63 percent between 2005/07 and 2050. Since production expanded by 15 percent between 2005/07 and 2012, the projected increase in agricultural demand from 2013 to 2050 would amount to approximately 49 percent

8 http://www.fao.org/publications/soco/the-state-of-agricultural-commodity-markets-2015-16/en/



Role of Trade for Food Security
Source: FAO SOCO 2015-2016

the trade and the development agendas. The eradication of global hunger by 2030 is a key goal in the new 2030 Agenda for Sustainable Development, and trade is recognized as one of the means for achieving the SDGs. As patterns of consumption and production continue to evolve, global trade in agricultural products is expected to continue to increase over the next decade, with substantial implications for the extent and nature of food security across all regions of the globe.

The challenge is how to ensure that the expansion of agricultural trade works for and not against, the elimination of hunger, food insecurity and malnutrition. This challenge has been at the forefront as governments' struggle to negotiate the changes to the current global agreements on agricultural trade that are needed to ensure that trade results in enhanced food security.

Growing income per capita and reduced poverty boosted food consumption and imports, while increases in agricultural productivity led to growing exports. Developing countries are increasingly participating in international markets. South–South agricultural trade has also expanded significantly. For Least Developed Countries, agricultural imports have grown faster than exports. Agricultural trade can also help in adapting to climate change and in ensuring food security. It can support adaptation efforts by stabilizing markets and reallocating food from surplus to deficit regions.

Numerators: **Technology**

Innovation and use of technology have been at the forefront of growth in all sectors of economy including Agriculture. Increasing productivity/yield has been a serious challenge in recent decades that is largely met by deploying appropriate technologies. Whether it is soil and farmer management, genetic modifications and post-harvest techniques, the availability and access of technologies has improved significantly in recent years though certain gaps or divide is visible in some regions and countries.

Technologies can support farmers to anticipate and respond to pest attacks, crop failures and climatic changes through timely weather-based agro-advisory messages; Precision Agriculture (PA) is an example of an application of the Internet of Things (IoT) in agriculture. The use of Guidance Systems during planting and fertilizer application can lead to cost savings in terms of seed, fertilizer and tractor fuel, and can reduce working hours in the field. Variable Rate Technologies (VRT) and drones (UAV) can also reduce water and pesticide use and reduce labour and resource costs. The importance of ERP software in agriculture is high, as it has the potential to help streamline every process, from procurement to production to and distribution. ERP can enable a farm (or related business) to respond more organically to environmental challenges, adjust systems accordingly, and grow into a more cost-efficient business. Over the last few years, the growth in Artificial Intelligence technology (AI) has strengthened agro-based businesses to run more efficiently. Companies that use AI help farmers to scan their fields and monitor every stage of the production cycle. AI technology is transforming the agricultural sector, as farmers can depend on the data that satellite or UAV record to determine the state of the farm rather than walking all the distance. AI can improve resource use, support early decision making through predictive models and maintain 24/7 monitoring systems.

Digitalization will change every part of the agrifood chain. Management of resources throughout the system can become highly optimized, individualized, intelligent and anticipatory. It will function in real time in a hyper-connected way, driven by data. Value chains will become traceable and coordinated at the most detailed level whilst different fields, crops and animals can be accurately managed to their own optimal prescriptions. Digital agriculture will create systems that are highly productive, anticipatory and adaptable to changes such as those caused by climate change. This, in turn, could lead to greater food security, profitability and sustainability. In the context of the Sustainable Development Goals, digital agriculture has the potential to deliver economic benefits through increased agricultural productivity, cost efficiency and market opportunities, social and cultural benefits through increased communication and inclusivity and environmental benefits through optimized resource use as well as adaptation to climate change.

Balancing Act

The GFS Equation needs to be balanced (GFS=1) in order to achieve Zero Hunger as per SDG-2, however, the denominators of this equation have been surging while the numerators, except technology, are not following an upward trajectory, particularly in recent years. Mitigating the denominators, i.e. Climate Change, Conflicts and COVID-19 would be the ideal way to balance GFS equation. The first C (Climate Change) needs a longer-term and sustained effort while the next two Cs could be

mitigated in short to medium term. Efforts are already underway to control the COVID-19 and mitigate its impacts. The Conflicts are quite complex in nature but certainly not out the realm of possible solutions. The Secretary-General of the United Nations has already appealed a halt/ceasefire and an ultimate end to ongoing conflicts as these are major cause of food insecurity, hunger and migration. Global efforts are also geared towards mitigating climate change impact but, thus far, efforts are not at par with the negative impacts.

Regarding numerators, the following may be considered to strengthen the 3Ts:

1. In order to enhance Territorial productivity (first T) the "Trade in Technology", i.e. global access to agriculture technologies, should be made accessible and easier.

2. The approach on international trade in food and agriculture, which is largely transactional in nature, needs to be tailored for incorporating a humanitarian perspective.

3. At the WTO, a discussion could be started to assess the existing rules (in relevant Agreements) on how these could be made more food-security-friendly.

4. Increased use of, and strengthening, regional supply and value chains in food may mitigate the challenges that multilateral trade in food is facing.

Special Act

In order to achieve sustainable Global Food Security, there could be a **"Global Compact on Food Security"** that establishes a framework of commitments at global level to ensure free flow of agriculture and food supplies and refraining from unnecessary trade restrictions. This Compact may include the following elements:

1. Establishment of a "Global Food Security Observatory", hosted at the Food and Agriculture Organization of the United Nations. This Observatory will incorporate existing monitoring and data tools and strengthen it with further inputs from Big Data and Artificial Intelligence, to record and report (including early warning) food stocks, anticipated deficits and track flow of food across the borders.

2. Commitment by member countries of the Compact, on not introducing any unnecessary trade restrictions that may hamper food security in other countries.

3. Maintenance of "Global Strategic Reserves" of food for filling the unanticipated deficit in any member countries. These reserves may be kept in producing countries but committed to be used only for critical shortages in any of the member countries. Replenishments of such stocks may be managed according to the nature of commodity and stock use.

There could be also be a **"Global Agriculture Technology Pool"** established at the global level and housed at the FAO. This Technology Pool will ensure access of latest technologies in agriculture, on preferential terms, to the developing countries and LDCs. It may also promote dissemination, through startups, of the off-patent agriculture technologies that may not have reached some parts of the world.

Fund managers, at global level, may introduce **"Global Food Security Impact Bonds"**, that would fill the investment needs for achieving food security.