

An Assessment on Food Security in Developing Economies- Problems and Policy Initiatives

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Abstract: Food is a basic necessity of life. Yet more than 800 million people in developing countries are not getting enough of it. Food security is a condition related to the ongoing availability of food. According to the Food (FAO), food security "exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". Individuals who are food secure do not live in hunger or fear of starvation. Food security indicators and measures are derived from country level household income and expenditure surveys to estimate per capita caloric availability. In general the objective of food security indicators and measures is to capture some or all of the main components of food security in terms of food availability, access and utilization or adequacy. With its prevalence of undernourishment (POU) indicator, the FAO reported that almost 870 million people were chronically undernourished in the years 2010-2012. This represents 12.5% of the global population, or 1 in 8 people. Higher rates occur in developing countries, where 852 million people (about 15% of the population) are chronically undernourished. The report noted that Asia and Latin America have achieved reductions in rates of undernourishment that put these regions on track for achieving the Millennium Development Goal of halving the prevalence of undernourishment by 2015. The UN noted that about 2 billion people do not consume a sufficient amount of vitamins and minerals. In India, the second-most populous country in the world, 30 million people have been added to the ranks of the hungry since the mid-1990s and 46% of children are underweight (Data source: FAO). The present paper mainly focused on the present situation of Food security in USA and developing economies, the main issues of World summit on food security. The study also highlights about the main Pillars of food security, Effects of food security, Challenges to achieving food security and Risks to achieve Food Security. Finally concluded by giving some of the Approaches under taken by the United Nation Agency for International Development, (FAO) By the Food and Agriculture Organization and By the World Food Programme to achieve food security.

Key words: Food security, FAO, World summit on food security, World Food Programme

I. Introduction

Food is a basic necessity of life. Yet more than 800 million people in developing countries are not getting enough of it. Food security is a condition related to the ongoing availability of food. Concerns over food security have existed throughout history; there is evidence of granaries being in use over 10,000 years ago, with central authorities in civilizations including Ancient China and Ancient Egypt being known to release food from storage in times of famine. Yet it was only at the 1974 World Food Conference that the term 'food security' was established as a formal concept. Originally, food security was understood to apply at the national level, with a state being food secure when there was sufficient food to "sustain a steady expansion of food consumption and to offset fluctuations in production and prices". A new definition emerged at 1996 World Food Summit; this time with the emphasis being on individuals enjoying food security, rather than the nation. According to the Food (FAO), food security "exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life". Individuals who are food secure do not live in hunger or fear of starvation. Food insecurity, on the other hand, is a situation of "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways", according to the United States Department of Agriculture (USDA) Food security incorporates a measure of resilience to future disruption or unavailability of critical food supply due to various risk factors including droughts, shipping disruptions, fuel shortages, economic instability, and wars. In the years 2011-2013, an estimated 842 million people were suffering from chronic hunger. The United Nations (UN) recognized the Right to food in the Declaration of Human Rights in 1948, and has since noted that it is vital for the enjoyment of all other rights.

Food security indicators and measures are derived from country level household income and expenditure surveys to estimate per capita caloric availability. In general the objective of food security indicators and measures is to capture some or all of the main components of food security in terms of food availability, access and utilization or adequacy. While availability (production and supply) and utilization/adequacy (nutritional status/anthropometric measures) seemed much easier to estimate, thus more popular, access (ability to acquire

sufficient quantity and quality) remain largely elusive. The factors influencing household food access are often context specific. Thus the financial and technical demands of collecting and analyzing data on all aspects of household's experience of food access and the development of valid and clear measures remain a huge challenge. Nevertheless several measures have been developed that aim to capture the access component of food security, with some notable examples developed by the USAID-funded Food and Nutrition Technical Assistance (FANTA) project, collaborating with Cornell and Tufts University and Africare and World Vision. These include:

Household Food Insecurity Access Scale (HFIAS) - continuous measure of the degree of food insecurity (access) in the household in the previous month

Household Dietary Diversity Scale (HDDS) - measures the number of different food groups consumed over a specific reference period (24hrs/48hrs/7days).

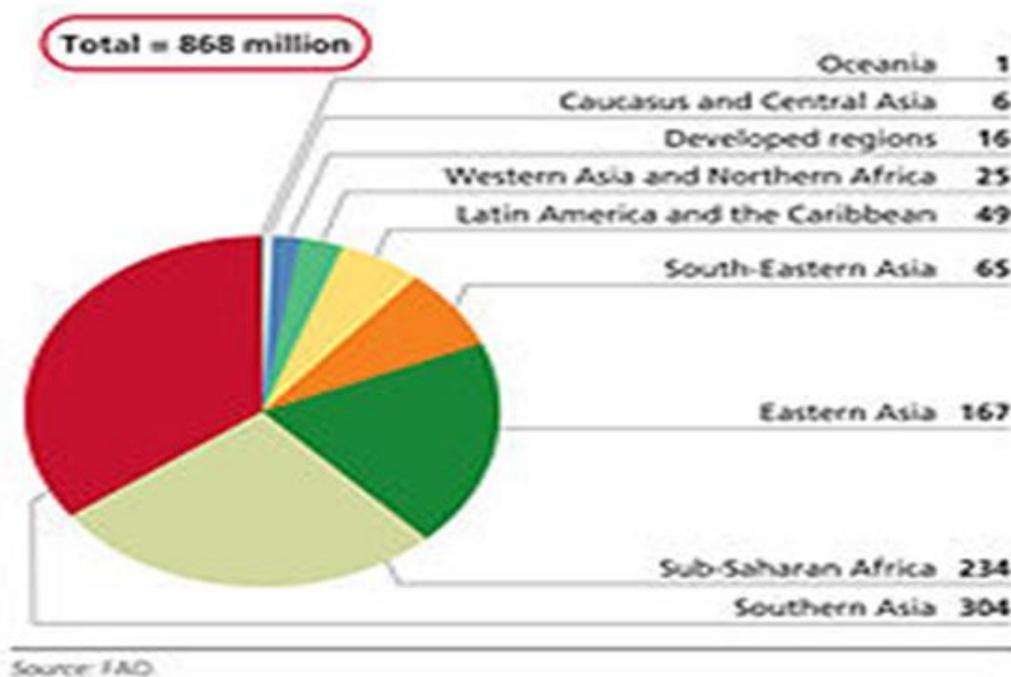
Household Hunger Scale (HHS) - measures the experience of household food deprivation based on a set of predictable reactions, captured through a survey and summarized in a scale.

Coping Strategies Index (CSI) - assesses household behaviors and rates them based on a set of varied established behaviors on how households cope with food shortages. The methodology for this research is base on collecting data on a single question: "What do you do when you do not have enough food, and do not have enough money to buy food-/"

The FAO, World Food Programme (WFP), and International Fund for Agricultural Development (IFAD) collaborate to produce **The State of Food Insecurity in the World. The 2012** edition described improvements made by the FAO to the prevalence of undernourishment (POU) indicator that is used to measure rates of food insecurity. New features include revised minimum dietary energy requirements for individual countries, updates to the world population data, and estimates of food losses in retail distribution for each country. Measurements that factor into the indicator include dietary energy supply, food production, food prices, food expenditures, and volatility of the food system. The insecurity range from food secure situations to full-scale famine.

Rates

Number of people affected by undernourishment, 2010–12 (by region, in millions)



With its prevalence of undernourishment (POU) indicator, the FAO reported that almost 870 million people were chronically undernourished in the years 2010-2012. This represents 12.5% of the global population, or 1 in 8 people. Higher rates occur in developing countries, where 852 million people (about 15% of the population) are chronically undernourished. The report noted that Asia and Latin America have achieved reductions in rates of undernourishment that put these regions on track for achieving the Millennium Development Goal of halving the prevalence of undernourishment by 2015. The UN noted that about 2 billion people do not consume a sufficient amount of vitamins and minerals. In India, the second-most populous country in the world, 30 million people have been added to the ranks of the hungry since the mid-1990s and 46% of children are underweight(Data source: FAO)

Food security in USA

The United States Department of Agriculture defines food insecurity as "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways. National Food Security Surveys are the main survey tool used by the USDA to measure food security in the United States. Based on respondents' answers to survey questions, the household can be placed on a continuum of food security defined by the USDA. This continuum has four categories: high food security, marginal food security, low food security, and very low food security.^[41] Economic Research Service report number 155 (ERS-155) estimates that 14.5 percent (17.6 million) of US households were food insecure at some point in 2012. The prevalence of food insecurity has been relatively in the United States since the economic recession 2008. In 2012: 49.0 million People lived in food-insecure households. 12.4 million Adults lived in households with very low food security. 8.3 million Children lived in food-insecure households in which children, along with adults, were food insecure. 977,000 children lived in households in which one or more child experienced very low food security.

Feed the Future programme

The government of the United States has taken up an initiative along with other local government agencies as well as global partners, the G8 countries, and donors to reduce global hunger and to improve food security condition in the world. Exploiting the G8 Summit of 2009 held in L'Aquila, Italy, and President Barack Obama insisted global leaders to revert the three-decade old trend of reduced agricultural investments, and instead, choose to increase cash flow in their respective agricultural sectors in a drive to bolster global food security. This led to the birth of the "Feed the Future" program. Initially, the U.S had been successful in collecting above \$18 billion as funds for the program from the G8 countries as well as other donors. The "Feed the Future" initiative is presently led by the U.S Agency for International Development and has the support of other government-funded bodies like the State Department, Peace Corps, Millennium Challenge Corporation, the Treasury Department, U.S. Trade Representative, Overseas Private Investment Corporation, the U.S. African Development Foundation, and the U.S Department of Agriculture. The target group of this initiative is the smallholder farmers, especially women. Feed the Future has plans to help partner countries to develop their agricultural sector with an aim to improve their agricultural output. Spurt in economic growth would ultimately lead to higher income and help into eradicate hunger, poverty as well as under nutrition from the society. This initiative is expected to work on the basis of country-led priorities that call for consistent support by the governments, donor organizations, the private sector, and the civil society to accomplish its long-term goals.

World summit on food security

The world summit on food security held in Rome in 1996, noted that "food should not be used as an instrument for political and economic pressure". According to the **International Centre for Trade and Sustainable Development**, failed agriculture market regulation and the lack of anti-dumping mechanisms engenders much of the world's food scarcity and malnutrition. As of late 2007, export restrictions and panic buying, US Dollar Depreciation, increased farming for use in biofuels, world oil prices at more than \$100 a barrel, global population growth, climate change, loss of agricultural land to residential and industrial development, and growing consumer demand in China and India are claimed to have pushed up the price of grain aimed to renew a global commitment to the fight against hunger. The Food and Agriculture Organization of the United Nations (FAO) called the summit in response to widespread under-nutrition and growing concern about the capacity of agriculture to meet future food needs. The conference produced two key documents, the Rome Declaration on World Food Security and the World Food Summit Plan of Action. The Rome Declaration calls for the members of the United Nations to work to halve the number of chronically undernourished people on the Earth by the year 2015. The Plan of Action sets a number of targets for government and non-governmental organizations for achieving food security, at the individual, household, national, regional and global levels. Another World Summit on Food Security took place in Rome between November 16 and 18, 2009. The decision to convene the summit was taken by the Council of FAO in June 2009, at the proposal of FAO Director-General Dr Jacques Diouf. Heads of State and Government attended the summit, which took place at the FAO's headquarters.

II. Pillars of food security

The WHO states that there are three pillars that determine food security: food availability, food access, and food use. The FAO adds a fourth pillar: the stability of the first three dimensions of food security over time. In 2009, the World Summit on Food Security stated that the "four pillars of food security are availability, access, utilization, and stability".

Availability

Food availability relates to the supply of food through production, distribution, and exchange is determined by a variety of factors including land ownership and use; soil management; crop selection, breeding, and management; livestock breeding and management; and harvesting. Crop production can be impacted by changes in rainfall and temperatures.¹ The use of land, water, and energy to grow food often competes with other uses, which can affect food production. Land used for agriculture can be used for urbanization or lost to desertification, salinization, and soil erosion due to unsustainable agricultural practices. Crop production is not required for a country to achieve food security. Nations don't have to have the natural resources required to produce crops in order to achieve food security, as seen in the examples of Japan¹ and Singapore. Because food consumers outnumber producers in every country, food must be distributed to different regions or nations. Food distribution involves the storage, processing, transport, packaging, and marketing of food. Food-chain infrastructure and storage technologies on farms can also impact the amount of food wasted in the distribution process. Poor transport infrastructure can increase the price of supplying water and fertilizer as well as the price of moving food to national and global markets. Around the world, few individuals or households are continuously self-reliant for food. This creates the need for a bartering, exchange, or cash economy to acquire food. The exchange of food requires efficient trading systems and market institutions, which can have an impact on food security. Per capita world food supplies are more than adequate to provide food security to all, and thus food accessibility is a greater barrier to achieving food security.

Access

Goats are an important part of the solution to global food security because they are fairly low maintenance and easy to raise and farm. Food access refers to the affordability and allocation of food, as well as the preferences of individuals and households. The UN Committee on Economic, Social, and Cultural Rights noted that the causes of hunger and malnutrition are often not a scarcity of food but an inability to access available food, usually due to poverty. Poverty can limit access to food, and can also increase how vulnerable an individual or household is to food price spikes. Access depends on whether the household has enough income to purchase food at prevailing prices or has sufficient land and other resources to grow its own food. Households with enough resources can overcome unstable harvests and local food shortages and maintain their access to food.

There are two distinct types of access to food: direct access, in which a household produces food using human and material resources, and economic access, in which a household purchases food produced elsewhere. Location can affect access to food and which type of access a family will rely on. The assets of a household, including income, land, products of labor, inheritances, and gifts can determine a household's access to food. However, the ability to access to sufficient food may not lead to the purchase of food over other materials and services. Demographics and education levels of members of the household as well as the gender of the household head determine the preferences of the household, which influences the type of food that are purchased. A household's access to enough and nutritious food may not assure adequate food intake of all household members, as intrahousehold food allocation may not sufficiently meet the requirements of each member of the household. The USDA adds that access to food must be available in socially acceptable ways, without, for example, resorting to emergency food supplies, scavenging, stealing, or other coping strategies

Utilization

The final pillar of food security is food utilization, which refers to the metabolism of food by individuals once food is obtained by a household, a variety of factors impact the quantity and quality of food that reaches members of the household. In order to achieve food security, the food ingested must be safe and must be enough to meet the physiological requirements of each individual. Food safety impacts food utilization, and can be impacted by the preparation, processing, and cooking of food in the community and household. Nutritional value of the household determine food choice. Access to healthcare is another determinant of food utilization, since the health of individuals controls how the food is metabolized. For example, intestinal parasites can take nutrients from the body and decrease food utilization. Sanitation can also decrease the occurrence and spread of diseases that can affect food utilization. Education about nutrition and food preparation can impact food utilization and improve this pillar of food security.

Stability

Food stability refers to the ability to obtain food over time. Food security can be transitory, seasonal, or chronic. In transitory food insecurity, food may be unavailable during certain periods of time. At the food production level, natural disasters and drought result in crop failure and decreased food availability. Civil conflicts can also decrease access to food. Instability in markets resulting in food-price spikes can cause transitory food insecurity. Other factors that can temporarily cause food insecurity are loss of employment or

productivity, which can be caused by illness. Seasonal food insecurity can result from the regular pattern of growing seasons in food production. Chronic (or permanent) food insecurity is defined as the long-term, persistent lack of adequate food. In this case, households are constantly at risk of being unable to acquire food to meet the needs of all members. Chronic and transitory food insecurity is linked, since the reoccurrence of transitory food security can make households more vulnerable to chronic food insecurity.

III. Effects of food security

"Famine and hunger are both rooted in food insecurity. Chronic food insecurity translates into a high degree of vulnerability to famine and hunger; ensuring food security presupposes elimination of that vulnerability."

Stunting and chronic nutritional deficiencies (Malnutrition)

Many countries experience ongoing food shortages and distribution problems. These result in chronic and often widespread hunger amongst significant numbers of people. Human populations can respond to chronic hunger and malnutrition by decreasing body size, known in medical terms as stunting or stunted growth. This process starts in utero if the mother is malnourished and continues through approximately the third year of life. It leads to higher infant and child mortality, but at rates far lower than during famines. Once stunting has occurred, improved nutritional intake after the age of about two years is unable to reverse the damage. Stunting itself can be viewed as a coping mechanism, bringing body size into alignment with the calories available during adulthood in the location where the child is born. Limiting body size as a way of adapting to low levels of energy (calories) adversely affects health in three ways:

1. Premature failure of vital organs during adulthood. For example, a 50-year-old individual might die of heart failure because his/her heart suffered structural defects during early development;
2. Stunted individuals suffer a higher rate of disease and illness than those who have not undergone stunting
3. Severe malnutrition in early childhood often leads to defects in cognitive development.

IV. Challenges to achieving food security

Global water crisis; Water, which are already spurring heavy grain imports in numerous smaller countries, may soon do the same in larger countries, such as China or India. The water tables are falling in scores of countries (including northern China, the US, and India) due to widespread over pumping using powerful diesel and electric pumps. Other countries affected include Pakistan, Afghanistan, and Iran. This will eventually lead to water scarcity and cutbacks in grain harvest. Even with the over pumping of its aquifers, China is developing a grain deficit. When this happens, it will almost certainly drive grain prices upward. Most of the 3 billion people projected to be born worldwide by mid-century will be born in countries already experiencing water shortages. After China and India, there is a second tier of smaller countries with large water deficits – Afghanistan, Algeria, Egypt, Iran, Mexico, and Pakistan. Four of these already import a large share of their grain.

Regionally, Sub-Saharan Africa has the largest number of water-stressed countries of any other place on the globe and as of an estimated 800 million people who live in Africa, 300 million live in a water stressed environment. It is estimated that by 2030, 75 million to 250 million people in Africa will be living in areas of high water stress, which will likely displace anywhere between 24 million and 700 million people as conditions become increasingly unlivable. Because the majority of Africa remains dependent on an agricultural lifestyle and 80% to 90% of all families in rural Africa rely upon producing their own food water scarcity translates to a loss of food security. A 2010 report concluded that the industry is not sustainable and accuses investors, including the World Bank, of failing to take proper responsibility for the impact of their decisions on the water resources of poorer countries. Diverting water from the headwaters of the Ica River to asparagus fields has also led to a water shortage in the mountain region of Huancavelica, where indigenous communities make a marginal living herding

Land degradation (Desertification); Intensive farming often leads to a vicious cycle of exhaustion of soil fertility and decline of agricultural yields. Approximately 40% of the world's agricultural land is seriously degraded. In Africa, if current trends of soil degradation continue the continent might be able to feed just 25% of its population by 2025, according to UNU's Ghana-based Institute for Natural Resources in Africa.

Climate change and Agriculture; Extreme events, such as droughts and floods, are forecast to increase as climate change takes hold. Ranging from overnight floods to gradually worsening droughts, these will have a range of impacts on the agricultural sector. By 2040, almost the entire Nile region, which once included large areas of irrigated agricultural land, is expected to become hot desert where cultivation is impossible due to water limitation. According to the Climate & Development Knowledge Network report *Managing Climate Extremes and Disasters in the Agriculture Sectors: Lessons from the IPCC SREX Report*, the impacts will include changing productivity and livelihood patterns, economic losses, and impacts on infrastructure, markets and food security. Food security in future will be linked to our ability to adapt agricultural systems to extreme events. For example,

the Garifuna women in Honduras are helping to ensure food security locally by reviving and improving production of traditional root crops, building up traditional methods of soil conservation, carrying out training in organic composting and pesticide use and creating the first Garifuna farmers' market. Sixteen towns have worked together to establish tool and seed banks. Efforts to plant wild fruit trees along the coast are helping to prevent soil erosion. The aim is to reduce the communities' vulnerability to the hazards of shifting weather patterns

Approximately 2.4 billion people live in the drainage basin of the Himalayan rivers India, China, Pakistan, Afghanistan, Bangladesh, Nepal and Myanmar could experience floods followed by severe droughts in coming decades. In India alone, the Ganges provides water for drinking and farming for more than 500 million people. The west coast of North America, which gets much of its water from glaciers in mountain ranges such as the Rocky Mountains and Sierra Nevada, also would be affected. Glaciers aren't the only worry that the developing nations have; sea level is reported to rise as climate change progresses, reducing the amount of land available for agriculture. In other parts of the world, a big effect will be low yields of grain according to the World Food Trade Model, specifically in the low latitude regions where much of the developing world is located. From this the price of grain will rise, along with the developing nations trying to grow the grain. Due to this, every 2–2.5% price hike will increase the number of hungry people by 1% Low crop yields are just one of the problem facing farmers in the low latitudes and tropical regions. The timing and length of the growing seasons, when farmers plant their crops, are going to be changing dramatically, per the USDA, due to unknown changes in soil temperature and moisture conditions.

Agricultural diseases; Diseases affecting livestock or crops can have devastating effects on food availability especially if there are no contingency plans in place. For example, Ug99, a lineage of wheat stem rust which can cause up to 100% crop losses, is present in wheat fields in several countries in Africa and the Middle East and is predicted to spread rapidly through these regions and possibly further afield, potentially causing a wheat production disaster that would affect food security worldwide. The genetic diversity of the crop wild relatives of wheat can be used to improve modern varieties to be more resistant to rust. In their centers of origin wild wheat plants are screened for resistance to rust, then their genetic information is studied and finally wild plants and modern varieties are crossed through means of modern plant in order to transfer the resistance genes from the wild plants to the modern varieties.

Dictatorship and kleptocracy (Political corruption); Nobel Prize-winning economist Amartya Sen has observed that "there is no such thing as an apolitical food problem." While drought and other naturally occurring events may trigger famine conditions, it is government action or inaction that determines its severity, and often even whether or not a famine will occur. The 20th century is full of examples of governments undermining the food security of their own nations—sometimes intentionally. When governments come to power by force or rigged elections, and not by way of fair and open elections, their base of support is often narrow and built upon cronyism and patronage. Under such conditions "The distribution of food within a country is a political issue. Governments in most countries give priority to urban areas, since that is where the most influential and powerful families and enterprises are usually located. The government often neglects subsistence farmers and rural areas in general. The more remote and underdeveloped the area the less likely the government will be to effectively meet its needs. Many agrarian policies, especially the pricing of agricultural commodities, discriminate against rural areas. Governments often keep prices of basic grains at such artificially low levels that subsistence producers cannot accumulate enough capital to make investments to improve their production. Thus, they are effectively prevented from getting out of their precarious situation

As pointed out by William Bernstein in his book *The Birth of Plenty*: "Individuals without property are susceptible to starvation, and it is much easier to bend the fearful and hungry to the will of the state. If a [farmer's] property can be arbitrarily threatened by the state, that power will inevitably be employed to intimidate those with divergent political and religious opinions."

Food sovereignty; The approach known as food sovereignty views the business practices of multinational corporations as a form of neocolonialism. It contends that multinational corporations have the financial resources available to buy up the agricultural resources of impoverished nations, particularly in the tropics. They also have the political clout to convert these resources to the exclusive production of cash crops for sale to industrialized nations outside of the tropics, and in the process to squeeze the poor off of the more productive lands.¹ Under this view subsistence farmers are left to cultivate only lands that are so marginal in terms of productivity as to be of no interest to the multinational corporations. Likewise, food sovereignty holds it to be true that communities should be able to define their own means of production and that food is a basic human right. With several multinational corporations now pushing agricultural technologies on developing countries, technologies that include improved seeds, chemical fertilizers, and pesticides, crop production has become an increasingly analyzed and debated issue. Many communities calling for food sovereignty are protesting the imposition of Western technologies on to their indigenous systems and agency.

V. Risks to Food Security

Population growth; Current UN projections show a continued increase in population in the near future (but a steady decline in the population growth rate), with the global population expected to reach between 8.3 and 10.9 billion by 2050. UN Population Division estimates for the year 2150 range between 3.2 and 24.8 billion; mathematical modeling supports the lower estimate. Some analysts have questioned the sustainability of further world population growth, highlighting the growing pressures on the environment, global food supplies, and energy resources. Solutions for feeding the nine billion in the future are being studied and documented. One out of every seven people on our planet goes to sleep hungry. People are suffering due to overpopulation, 25,000 people die of malnutrition and hunger related diseases every day.

Fossil fuel dependence: Agriculture and petroleum ; While agricultural output increased as a result of the Green Revolution, the energy input into the process (that is, the energy that must be expended to produce a crop) has also increased at a greater rate, so that the ratio of crops produced to energy input has decreased over time. Green Revolution techniques also heavily rely on chemical fertilizers, pesticides and herbicides, some of which must be developed from fossil fuels, making agriculture increasingly reliant on petroleum products. Between 1950 and 1984, as the Green Revolution transformed agriculture around the globe, world grain production increased by 250%. The energy for the Green Revolution was provided by fossil fuels in the form of fertilizers (natural gas), pesticides (oil), and hydrocarbon fueled irrigation. David Pimentel, professor of ecology and agriculture at Cornell University, and Mario Giampietro, senior researcher at the National Research Institute on Food and Nutrition (INRAN), place in their study *Food, Land, Population and the U.S. Economy* the maximum U.S. population for a sustainable economy at 200 million. To achieve a sustainable economy and avert disaster, the United States must reduce its population by at least one-third, and world population will have to be reduced by two-thirds, says the study. The authors of this study believe that the mentioned agricultural crisis will only begin to impact us after 2020, and will not become critical until 2050. The oncoming peaking of global oil production (and subsequent decline of production), along with the peak of North American natural gas production will very likely precipitate this agricultural crisis much sooner than expected. Geologist Dale Allen Pfeiffer claims that coming decades could see spiraling food prices without relief and massive starvation on a global level such as never experienced before.

Hybridization, genetic engineering, and loss of biodiversity; In agriculture and animal husbandry, the Green Revolution popularized the use of conventional hybridization to increase yield by creating "high-yielding varieties". Often the handful of hybridized breeds originated in developed countries and was further hybridized with local varieties in the rest of the developing world to create high yield strains resistant to local climate and diseases. Local governments and industry have been pushing hybridization which has resulted in several of the indigenous breeds becoming extinct or threatened. Disuse because of unprofitability and uncontrolled intentional and unintentional cross-pollination and crossbreeding (genetic pollution), formerly huge gene pools of various wild and indigenous breeds has collapsed causing widespread genetic erosion and genetic pollution. This has resulted in loss of genetic and biodiversity as a whole. A genetically modified organism (GMO) is an organism whose genetic material has been altered using the genetic engineering techniques generally known as recombinant DNA technology. Genetically Modified (GM) crops today have become a common source for genetic pollution, not only of wild varieties but also of other domesticated varieties derived from relatively natural hybridization. Genetic erosion coupled with genetic pollution may be destroying unique genotypes, thereby creating a hidden crisis which could result in a severe threat to our food security. Diverse genetic material could cease to exist which would impact our ability to further hybridize food crops and livestock against more resistant diseases and climatic changes.

The area sown to genetically engineered crops in developing countries is rapidly catching up with the area sown in industrial nations. According to the International Service for the Acquisition of Agri-biotech Applications (ISAAA), genetically engineered (biotech, GM) crops were grown by approximately 8.5 million farmers in 21 countries in 2005; up from 8.25 million farmers in 17 countries in 2004. However, it should be noted that the ISAAA is funded by organisations including prominent agricultural biotechnology corporations, such as Monsanto and Bayer, and there have been several challenges made to the accuracy of ISAAA's global figures. In a review of Borlaug's 2000 publication entitled *Ending world hunger: the promise of biotechnology and the threat of antiscience zealotry*, the authors argued that Borlaug's warnings were still true in 2010, GM crops are as natural and safe as today's bread wheat, opined Dr. Borlaug, who also reminded agricultural scientists of their moral obligation to stand up to the antiscience crowd and warn policy makers that global food insecurity will not disappear without this new technology and ignoring this reality global food insecurity would make future solutions all the more difficult to achieve.—Rozwadowski and Kagale

Intellectual property rights; There is much debate on whether IPRs hurt or harm independent development in terms of agriculture and food production. Hartmut Meyer and Annette von Lossau describe both sides of the issue, while saying "Among scholars, the thesis that the impetus to self-determined development and the protection of intellectual property go hand in hand is disputed – to put it mildly. Many studies have concluded

that there is virtually no positive correlation between establishing self-sustained economic growth and ensuring protection of intellectual property rights.

Price setting; On April 30, 2008, Thailand, one of the world's biggest rice exporters, announces the project of the creation of the Organization of Rice Exporting Countries with the potential to develop into a price-fixing cartel for rice. It is a project to organize 21 rice exporting countries to create a homonymous organisation to control the price of rice. The group is mainly made up of Thailand, Vietnam, Cambodia, Laos and Myanmar. The organization attempts to serve the purpose of making a "contribution to ensuring food stability, not just in an individual country but also to address food shortages in the region and the world". However, it is still questionable whether this organization will serve its role as an effective rice price fixing cartel that is similar to OPEC's mechanism for managing petroleum. Economic analysts and traders said the proposal would go nowhere because of the inability of governments to cooperate with each other and control farmers' output. Moreover, countries that are involved expressed their concern, that this could only worsen the food security.

Land use change; China needs not less than 120 million hectares of arable land for its food security. China has recently reported a surplus of 15 million hectares. On the other side of the coin, some 4 million hectares of conversion to urban use and 3 million hectares of contaminated land have been reported as well. Furthermore, a survey found that 2.5% of China's arable land is too contaminated to grow food without harm. In Europe, the conversion of agricultural soil implied a net loss of potential. But the rapid loss in the area of arable soils appears to be economically meaningless because EU is perceived to be dependent on internal food supply anymore. During the period 2000-2006 the European Union lost the 0.27% of its cropland and 0.26% of its crop productive potential. The loss of agricultural land during the same time was the highest in the Netherlands, which lost 1.57% of its crop production potential within six years. The figures are quite alarming for Cyprus (0.84%), Ireland (0.77%) and Spain (0.49%) as well. In Italy, in the Emilia-Romagna plain (ERP), the conversion of 15,000 ha of agricultural soil (period 2003-2008) implied a net loss of 109,000 Mg per year of wheat, which accounts for the calories needed by 14% of ERP population (425,000 people). Such a loss in wheat production is just 0.02% of gross domestic product (GDP) of the Emilia-Romagna region which is actually a minor impact in financial terms. Additionally, the income from the new land use is often much higher than the one guaranteed by agriculture, as in the case of urbanisation or extraction of raw materials.

VI. Approaches for food security

By the United Nation; The UN Millennium Development Goals are one of the initiatives aimed at achieving food security in the world. The first Millennium Development Goal states that the UN "is to eradicate extreme hunger and poverty" by 2015. Olivier De Schutter, the UN Special Reporter on the Right to Food, advocates for a multidimensional approach to food security challenges. This approach emphasizes the physical availability of food; the social, economic and physical access people have to food; and the nutrition, safety and cultural appropriateness or adequacy of food.

By the Food and Agriculture Organization; The Food and Agriculture Organization of the United Nations stated in *The State of Food Insecurity in the World 2003* that countries that have reduced hunger often had rapid economic growth, specifically in their agricultural sectors. These countries were also characterized as having slower population growth, lower HIV rates, and higher rankings in the Index. At that time, the FAO considered addressing agriculture and population growth vital to achieving food security. In *The State of Food Insecurity in the World 2012*, the FAO restated its focus on economic growth and agricultural growth to achieve food security and added a focus on the poor and on "nutrition-sensitive" growth. For example, economic growth should be used by governments to provide public services to benefit poor and hungry populations. The FAO also cited smallholders, including women, as groups that should be involved in agricultural growth to generate employment for the poor. For economic and agricultural growth to be "nutrition-sensitive", resources should be utilized to improve access to diverse diets for the poor as well as access to a safe water supply and to healthcare. The FAO has proposed a "twin track" approach to fight food insecurity that combines sustainable development and short-term hunger relief. Development approaches include investing in rural markets and rural infrastructure. The use of conditional or unconditional food or cash transfers was another approach the FAO noted. Conditional transfers could include school feeding programs, while unconditional transfers could include general food distribution, emergency or cash transfers. A third approach is the use of subsidies as safety nets to increase the purchasing power of households. The FAO stated that "approaches should be human rights-based, target the poor, promote gender equality, enhance long-term resilience and allow sustainable graduation out of poverty.

The FAO noted that some countries have been successful in fighting food insecurity and decreasing the number of people suffering from undernourishment. Bangladesh is an example of a country that has met the Millennium Development Goal hunger target. The FAO credited growth in agricultural productivity and macroeconomic stability for the rapid economic growth in the 1990s that resulted in an increase in food security. Irrigation systems were established through infrastructure development programs. Two programs,

Harvest Plus and the Golden Rice Project, provided biofortified crops in order to decrease micronutrient deficiencies. World Food Day was established on October 16, in honor of the date that the FAO was founded in 1945. On this day, the FAO hosts a variety of event at the headquarters in Rome and around the world, as well as seminars with UN officials.

By the World Food Programme]



Fight Hunger: Walk the World campaign is a United Nations World Food Programme initiative.

The World Food Programme (WFP) is an agency of the United Nations that uses food aid to promote food security and eradicate hunger and poverty. In particular, the WFP provides food aid to refugees and to others experiencing food emergencies. It also seeks to improve nutrition and quality of life to the most vulnerable populations and promote self-reliance. An example of a WFP program is the "Food For Assets" program in which participants work on new infrastructure, or learn new skills, that will increase food security, in exchange for food. The WFP and the Government of Kenya have partnered in the Food For Assets program in hopes of increasing the resilience of communities to shocks.

By the United States Agency for International Development; The United States Agency for International Development (USAID) proposes several key steps to increasing agricultural productivity which is in turn key to increasing rural income and reducing food insecurity. They include: **1.** Boosting agricultural science and technology. Current agricultural yields are insufficient to feed the growing populations. Eventually, the rising agricultural productivity drives economic growth. **2.** Securing property rights and access to finance. **3.** Enhancing human capital through education and improved health. **4.** Conflict prevention and resolution mechanisms and democracy and governance based on principles of accountability and transparency in public institutions and the rule of law are basic to reducing vulnerable members of society. Since the 1960s, the U.S. has been implementing a Food Stamp Program (now called the Supplemental Nutrition Assistance Program) to directly target consumers who lack the income to purchase food.

Improving agricultural productivity to benefit the rural poor; There are strong, direct relationships between agricultural productivity, hunger, poverty, and sustainability. Three-quarters of the world's poor live in rural areas and make their living from agriculture. Hunger and child malnutrition are greater in these areas than in urban areas. Moreover, the higher the proportion of the rural population that obtains its income solely from subsistence farming (without the benefit of pro-poor technologies and access to markets), the higher the incidence of malnutrition. Therefore, improvements in agricultural productivity aimed at small-scale farmers will benefit the rural poor first. Food and feed crop demand is likely to double in the next 50 years, as the global population approaches nine billion. Growing sufficient food will require people to make changes such as increasing productivity in areas dependent on rainfed agriculture; improving soil fertility management; expanding cropped areas; investing in irrigation; conducting agricultural trade between countries; and reducing gross food demand by influencing diets and reducing post-harvest losses.

VII. Conclusions

The achievement of food security for all, and especially for the most deprived, requires Policy Coherence for Development at all levels. Coherent action should be implemented by advanced economies, emerging economies and developing countries, as well as civil society and international organizations. Without everyone pulling in the same direction, the challenge of raising incomes, ensuring sustainable and improved agricultural production and equitable consumption can never be achieved. Choices made at European level impact food availability and accessibility in LDCs. Biofuels, land grabbing, trade policies, are a few horizontal issues that need to be tackled and challenged from different points of view. Europe and the OECD hold a shared responsibility not to implement policies that counteract development. Development is related not only to southern partners and humanitarian agencies, but also to European and OECD agriculture, environment, climate and health policies. The cooperation of all these EU Directorate Generals should be welcomed and reinforced.

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