

## Does science have the answer to most issues of food security?

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### Abstract

Today, the attention to food security has grown with the awareness of resources' scarcity, earth excessive exploitation, population growth and climate change, all factors that are associated with an impelling food emergency. A plethora of theoretical perspectives adopted in analysing food security issue reflects in diverse normative approaches. Some focus on the rapport between population demand and food supply, seeking to reduce the former or increase the latter in order to achieve food security. Applying the technological progress of scientific research will have its positive outcomes: production will increase, keeping prices low; the limited resources will be used more efficiently, decreasing the consumption of water, energy and land; the environment will benefit from a more sustainable production. However, scientific solutions, such as population control, that do not restore individuals' entitlement to food will be ineffective in preventing food insecurity. Therefore, food security it is not achievable by the sole means of science. A greater quantity of food does not guarantee a more equal distribution of resources. Increasing food production without altering its uneven distribution will only augment this inequality, making who has access to food more secure but not helping who is currently affected by the food insecurity issues. Science can play its role, but development towards the solutions to food insecurity must be led by politics.

**KEY WORDS:** food security; global health; socioeconomic factors.

## Riassunto

Oggi l'attenzione alla sicurezza alimentare nel mondo è cresciuta insieme alla consapevolezza della mancanza di risorse, dell'eccessivo sfruttamento della terra, della crescita della popolazione e dei cambiamenti climatici, tutti fattori associati con una impellente emergenza alimentare. Una pletera di posizioni teoriche adottate per l'analisi della sicurezza alimentare si riflettono in approcci normativi differenti. Alcuni focalizzano l'attenzione sul rapporto tra la domanda della popolazione e la disponibilità di cibo, proponendo per raggiungere la sicurezza alimentare, di ridurre la prima o di incrementare quest'ultima. Applicare in tale ambito il progresso tecnologico della ricerca scientifica darà dei risultati positivi: la produzione aumenterà, mantenendo i prezzi bassi; le risorse limitate saranno utilizzate in modo più efficiente, diminuendo il consumo di acqua, energia e terra; l'ambiente avrà dei benefici grazie ad una produzione più sostenibile. Tuttavia, le soluzioni scientifiche, come per esempio il controllo della popolazione, se non soddisfano il diritto al cibo degli individui saranno inefficaci nel prevenire la scarsità di cibo. Pertanto, la sicurezza alimentare non può essere ottenuta con i mezzi esclusivi della scienza. Una maggiore quantità di cibo non garantirà una maggiore equa distribuzione delle risorse. Incrementare la produzione di cibo senza incidere sulla sua ineguale distribuzione aumenterà solo tale disuguaglianza, rendendo più sicuro chi ha accesso al cibo ma non aiutando chi attualmente è colpito dai problemi dovuti all'insicurezza alimentare. La scienza può giocare il suo ruolo, ma lo sviluppo di soluzioni al problema dell'insicurezza alimentare deve essere dato dalla politica.

### TAKE-HOME MESSAGE

*Science can play its role to address most issue of food security, but development towards the solutions to food insecurity must be led by politics.*

**Competing interests** - none declared.

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## INTRODUCTION

Food is the most basic need of mankind. Well before the idea of food security was codified, man tried to secure the means of subsistence for himself and his kinship. Today, food security is acknowledgedly defined as 'physical and economic access for all people, at all times, to sufficient, safe and nutritious food to meet their dietary need and food preferences for an active and healthy life' [1]. Its achievement depends on four pillars: availability, access, utilisation and stability of the first three factors over time [2]. Given its multifaceted nature, the issues of food security are many and diverse, from mass starvation and chronic malnutrition to obesity. Its outcomes tangle with political and economic issues, impacting social fabric as well as international security. Major implications of food insecurity are: insufficiency, or lack of food availability, anxiety, derived from the struggle to gain access to limited alimentary resources, and instability of the region or the society affected [3]. The attention to food security has grown with the awareness of resources' scarcity, earth excessive exploitation, population growth and climate change, all factors that are associated with an impelling food emergency [4]. This threat to food security has been placed high on the political agenda from 2008, with the establishment of a High-Level Task Force on the Global Food Security Crisis by the World Health Organisation [5]. A plethora of theoretical perspectives adopted in analysing food security issue reflects in diverse normative approaches. Some focus on the rapport between population demand and food supply, seeking to reduce the former or increase the latter in order to achieve food security. Population control is at the root of Rev Thomas Malthus' theory, that viewed food insecurity as a natural law, and, even if politically and humanly brutal, mass starvation as the only positive check to ensure the conservation of balance between natural resources and population's force [6]. Another scientific approach targets food production. According to the New Green Revolution [7] movement, food security can be improved through

a mass implementation of new technologies and scientific research, such as agro-science, genetically modified crops and clean-tech technologies, on Norman Borlaug's model of 'Green Revolution' [8]. Nobel Prize economist Amartya Sen shifted the question from the scarcity of resources to their distribution. Sen addresses the ability of the individual to access food through an 'entitlement', and the 'deprivation' consequent to entitlement's failure. According to this theory, the protection or the reconstruction of individuals' entitlement will allow access to food, ensuring a fairer distribution of resources [9]. Considering these theoretical approaches and their application to three outcomes (insufficiency, anxiety and instability) of food insecurity, this paper will argue that a merely scientific and technological solution to the issues of food security will be neither effective nor applicable. Firstly, the cause of food insufficiency is the inequality in the distribution of resources rather than the shortage of food, and therefore producing more food would not necessarily prevent famine. Secondly, the failure of accessing available food and the consequent anxiety over the battle for resources are a product of social institution, not the results of an overcrowded competition. Finally, the issues of food security are essentially political, in their consequences if not in their causes, and need to be addressed politically.

## DISCUSSION

In the first place, the exacerbating of food security issues may be avoided by growing more nutritious food in crops without pesticides or chemical agents, creating more resilient and adaptable plant varieties and finding ways to reuse wasted food [10]. That being said, these procedures would not be able to prevent a food crisis, nor would they solve the current food insecurity. Equalizing food security with food self-sufficiency can be treacherous and misleading, driving the attention from the role of human agency in the issue. Applying the technological progress of scientific research will have its positive outcomes: production will increase, keeping prices low; the limited resources will be used more efficiently, decre-

asing the consumption of water, energy and land; the environment will benefit from a more sustainable production [11]. A change in the means of production is needed to face the 'perfect storm' [12], as Beddington defines it, of exponential demand for energy, water and food. Many of these technologies have already been developed, but access to them is still limited. On one hand, biotechnologies are expensive, for example genetically modified seeds cost by average twice what organic seeds cost. They provide more security and can be sold at higher prices, but for many small and middle-sized farmers the cost of a production shift is not affordable. Equally, consumer behaviour is an obstacle to achieve food security through increase in food availability, and new tendency towards civic-minded consumption is likely to discourage the purchase of Genetically Modified Organisms (GMOs) foods [13]. The gap between research and use needs to be bridged by the implementation of governmental policies. While in the United States there is a greater openness to agro-science [14], the European Union embittered since the 1990s [15]. To date, only two varieties of GMOs are permitted for cultivation and commercialisation in the Union, and six member states have banned certain types of GMOs [15], interfering with their diffusion. This demonstrates how the lack of political intention can prevent every solution, no matter how effective, to be applied to an existing problem. The condition of mass starvation is not necessarily strictly connected with a decline in food output. Famine and food export can co-exist, as happened during Bangladesh Famine of 1974 [16] and during the infamous Irish Famine of 1840s [9]. Bangladesh Famine occurred during a peak in food production, and affected only a part of the population [16]. Sen [9] and Alamgir [16] have concluded that the causes of Bangladesh Famine can be found in market speculation and 'distributional failures' of the national stock, enhanced by the absence of infrastructures and the weakness of the new Bengalese State. Similarly, Cecil Woodham-Smith declares that '*The problem in Ire-*

*land was not lack of food, which was plentiful, but the price of it, which was beyond the reach of the poor*', as the exports of food to England were constant for all the years of the famine [17]. According to the United Nations Food and Agriculture Organisation, the world produces enough food to feed everyone [18]. The way it is distributed causes 870 million people in the world to be affected by chronic hunger [18]. It has been analysed how the availability of food is not enough to prevent mass starvation. Malthusian thinkers tend to see the food security question in terms of consumption and quantity of resources [19]. Comparing a fixed necessity of food per person to the earth's resources and the figures of human development, they believe that the growth in population will lead to an apocalyptic famine [20]. Food security appears as competition among the world population to gain access to goods. On the other hand, Sen's approach to food security focuses more on the relation between individuals and commodities that can be transformed into food, rather than on the balance between quantity of demand and quantity of supply [21]. Adopting Sen's theory of entitlement, it can be said that the problem is not a specific group's or region's lack of food or overpopulation, but the lack of access to food supplies. The lack of access to food is strictly related to the failure of 'entitlements', the economic, social and legal right to a given benefit. Scientific solutions, such as population control, that do not restore individuals' entitlement to food will be ineffective in preventing food insecurity. Malthusian normative proposal assumes that, if there were less people on Earth in need of food, more people would have entitlement to access food. Under this assumption the human sociological, economic and behavioural patterns behind the problem of food insecurity are neglected. Initially, Sen's view saw entitlement as mainly regulated by economic power and legal principles [22], but as Platteau [23] and Osmani [24] have pointed out, this definition of entitlement has to be widened to include every form of socially-accepted ownership, such as particular forms of collective owner-

ship of traditional village society [23]. Gasper affirms *'beyond legal rights, effective access within institutions typically depends not only on formal rules but on particular relationships of authority and influence'* [25]. Therefore, entitlement can be influenced by a wide range of factors aside the standard purchasing power, including individual characteristics, such as seniority, ethnicity, citizenship or gender, social context and formal-legal institutional mechanisms in place [26]. The role of these social factors in enhancing, preventing or avoiding a food crisis cannot be overlooked. Social institutions, in the form of kinship, social class or shared interests' groups, nationality or ethnicity, can work both in favour or against food security. During a food crisis, the pattern of 'divided fortunes', instead of one of 'unified starvation', is often observable, with only an average of 10% of the population affected by starvation [21]. Groups tend to protect themselves, sharing resources, knowledge and technology, and during a crisis, as Rangasami affirms, 'benefits accrue to one section of the community while losses flow to the other' [27]. The difference in food availability and crisis response between the city inhabitants and the outsiders during 1974 Bengal famine [28] can be drawn as an effective example. Another observable of socially driven behaviour is the 'socio-cultural and political alienation' [21], the detachment between governed and governors, two ethnical groups, or social classes in a crisis situation. *'Ireland was considered by Britain as an alien and even a hostile nation'*, writes Mokyr about the British perception of the Great Irish famine [29]. As many famines occurred under foreign dominations, the cultural and social differences influenced greatly intervention and non-intervention policies. The same under-covered racism is behind Malthus' analysis and, particularly, its modern interpretation. As well as ascribing the reason of Great Irish famine to potato-based diet [17] and the Bengal mass starvation to natives who 'breed like rabbits' [30], identifying the cause of current mass starvation phenomena in the overpopulation of affected countries reflects a vision of cultu-

ral superiority, a tendency to blame the victims and to restrict food insecurity to a 'third world problem'. On the other hand, sociological mechanisms can be used against food insecurity issues. Firstly, as suggested by Sen's work, to create 'social security systems of safety nets' [9], in order to prevent entitlement's lost. Secondly, to start a behavioural change entitlement allocation and perceived right to food, as well as the overall perception of famine. Access and availability are not the only necessary elements to achieve food security, and mass starvation is not its only outcome, albeit the most well-known. Food security is dependent on politics and has an enormous power over politics and society. For this reason, technical answers and absolute theoretical framework will always be ineffective in dealing with food insecurity. Firstly, as declared by Germany Permanent Mission to the United Nations, food security can be both a cause and a consequence of violent conflict [31]. Food security issues reflect on the region and the society, generating shocks of the food chain, struggle for resources, trade disruption, civil conflict, mass migration and human conflict. Food insecurity's connected consequences provoke instability, affecting directly the political sphere or society. The Arab Spring uprising was, for instance, preceded by a rise in food prices and 'bread riots' [32]. The risk and statistics consulting firm Maplecroft reports that sixty countries have an extreme or high risk of food insecurity [33], exposing the world to the socio-economic, geo-political and humanitarian risks [34]. Secondly, politics is entirely responsible of food crisis prevention and reaction, and it is crucial in the developing process of food crisis and in the condition of food insecurity as well. Sen [21] points out that no functioning multiparty democracy has ever suffered from famine, stressing the importance of information freedom, uncensored public opinion, representative democracy and party competition in reacting to food insecurity. He declares *'a free press and an active political opposition constitute the best early warning system a country threatened by famine can have'* [21], in opposition to the political

immunity of politics in authoritarian countries, often translated in a dogmatic perpetuation of damaging policies. Finally, politics can be the very cause of food insecurity of mass starvation. Edkins highlighted an aspect of famine neglected in Sen's work: political responsibility [35]. When food is available and individuals possess entitlement to benefit it, the access to food can be denied by force employed on the behalf of famine's beneficiaries or groups that possess food [35]. Denying people achievement of food security might be used as a political or military tool. Edkins argues that starvation is a political process, which implies decision making and responsibility, rather than simple rule following. In this view, food security issues, mass starvation in particular, should be regarded as crimes against humanity instead of a failure of technical and theoretical principles [35]. Analysing 1980s South-western Sudan mass starvation, Keen applied the approach usually used for crimes such as genocide, focusing on the famine perpetrators and beneficiaries, posing the questions '*what use is famine, what function does it assure, in what strategies is it integrated?*' [36]. 'Famines are not caused by abstractions – climate, food supply, entitlement failure, war – they are brought about through the acts or omission of people or group of people' [35], writes Edkins. Even limiting her extreme view, recognising that mass starvation can be the intentional work of determined actors, either by denying access to food or by avoiding any preventive or relief intervention, is fundamental in adjusting food security response. On these grounds, food security issues are entirely political issues. Having food insecurity

political outcomes, political influence and political causes and responsibilities, it is impossible to treat the symptoms without addressing deep causes and foreseeable consequences. '*There is no such a thing as an apolitical food problem*', Sen wrote [8].

## CONCLUSION

It can be understood from the above analysis that food security affects and is impacted by socio-political variables, and therefore it is not achievable by the sole means of science. A greater quantity of food does not guarantee a more equal distribution of resources. Increasing food production without altering its uneven distribution will only augment this inequality, making who has access to food more secure but not helping who is currently affected by the food insecurity issues. In the same way, food security is not affected by the quantity of food demand. The access of individuals to food is determined by social and economic entitlements: decreasing the number of people competing for food will not effect their ability or inability to correspond food to these entitlements. Lastly, food insecurity has political origins and repercussions, that science is unable to address. The disproportionate exploitation of resources is likely to provoke a major food security crisis. If not properly addressed, it could lead to a humanitarian disaster. For this reason, it is important to recognise the roots of food insecurity issues, and face them with joint effort and coordinated responses. Science can play its role, but development towards the solutions to food insecurity must be led by politics.

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