

## Review

# Food security in the Asia-Pacific: Malthus, limits and environmental challenges

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This is the first of two articles on the steepening challenges which confront global agriculture, food security and hence nutrition and population health. The recent deterioration in global food security has caught most experts by surprise. While the Asia Pacific region as a whole has so far fared reasonably well, there should be no complacency about medium to long term food security in the region, whether or not food security improves in the near future. The first paper places this debate in the context of the long-standing arguments between Malthusianists and optimists. The apparent reversal of position in the last decade of two leading agricultural experts is discussed. Their recent writings reflect intensified Malthusian concerns curbed in their writings from the 1990s. The paper concludes that far more credence needs to be given to the pessimistic position in order to avoid it becoming reality. The second paper focusses on five interrelated challenges to future food security in the Asia Pacific. These may be conceptualised as pathways by which pessimistic Malthusian scenarios become manifest. The mechanisms are (1) climate change, (2) water scarcity, (3) tropospheric ozone pollution, (4) impending scarcity of phosphorus and conventional oil and (5) the possible interaction between future population displacement, conflict and poor governance. The article concludes that a sustainable improvement in food security requires a radical transformation in society's approach to the environment, population growth, agricultural research and the distribution of rights, opportunities and entitlements.

**Key Words:** global food security, Malthus, FAO, CAFOs, limits to growth

## INTRODUCTION

Humans live in the biosphere, the thin sleeve of interacting living and inert material which exists not only at the surface of the earth but also in the lower atmosphere, the soil, the ocean and the interior of volcanoes. The existence of civilisation and thus good population health remains utterly dependent on both the biosphere and the solar energy which ultimately fuels most of the activity of life. This truism may seem trite, yet is worth stressing.

Some of us have grown up watching films such as "Star Trek" which, among other miracles shows the almost routine creation of food and drink from apparently empty air. Many people, especially those who are affluent and influential, live in families and communities which have little contact with farming and other agricultural activities. In the US for example, as few as 2-3% of the labour force work directly in agriculture, though more engage in home gardening. There are stories, perhaps apocryphal, that some urbanised children do not understand that milk comes from cows or that potatoes grow in the ground. Hardly any of us have seen, even on television, the interior of a concentrated animal feeding operation (CAFO). Even fewer of us have visited one. Yet, in industrialised and many industrialising countries, CAFOs are now the main way that animals are reared for meat. Additionally, the intense crowding of animals in CAFOs may promote the evolution of more virulent pathogens.<sup>1</sup> CAFOs should raise more than ethical and environmental concerns. Pig

farms have been linked with the emergence of human swine flu, and a recent editorial in *Nature* described surveillance of human diseases that originate in animals as stagnating in the nineteenth century.<sup>2</sup> For most people, CAFOs are as invisible and little considered as are cows to children in urban industrialised areas.

These elements illustrate the "disconnect" between disproportionately well-fed, well-off and influential individuals on the one hand and nature, ecosystems and food production on the other. Together with other long-term cycles of human opinion, particularly the recent period of excessive credulity in the wisdom of market forces<sup>3</sup> this disconnect has helped to create and nurture a policy environment which is extraordinarily risky for future generations. Considerable evidence supports this large claim.

On the hopeful side, this complacency is easing, thanks to the scale of the current global food crisis. One

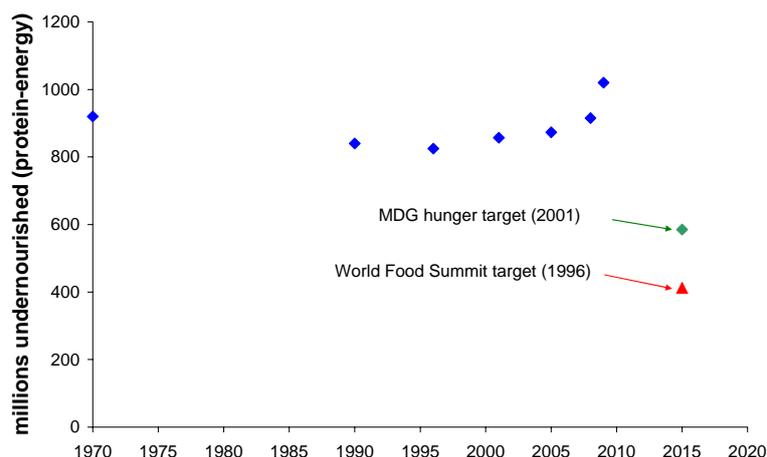
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**Figure 1.** The global population who experience insufficient energy or protein for health. The gap between the hunger targets set in 1996 and 2001 continues to widen. Data FAO.

billion – a thousand million – people now experience daily undernutrition of energy (calories) and of protein (“macronutrients”)<sup>4</sup> (Figure 1). This is a steep increase since 2000. This number is over half the entire population alive a century ago. Today, the world population is 6.8 billion, and increasing by at least 75 million per annum.<sup>5</sup> Almost all of these additional people are born into families experiencing poverty and undernutrition. The late economist, Julian Simon, described additional people as the “Ultimate Resource”, claiming that every extra person on Earth could contribute to the creation of a well-ordered, harmonious and prosperous society.<sup>6</sup> Less acknowledged is the possibility that every additional person born on Earth can also add to the sum of problems, especially if that additional person fails to receive the resources needed for a “good life” such as enough food, nurturing, education and opportunity for employment.

Without numerous and immediate changes in policy, technology and behaviour, the scale of undernutrition will increase. This issue causes immense human suffering and wastes enormous human potential. The rise in global hunger has already caused many food riots; both the United Nations (UN) and Food and Agricultural Organisation (FAO) warn that it will intensify social instability.<sup>7</sup> Some predict that worsening hunger could precipitate state, regional and even global governance failure.<sup>8</sup>

The hunger reduction targets set in 1996 at the World Food Summit and watered down to become target c of the first Millennium Development Goal<sup>9,10</sup> are now impossibly out of reach (Figure 1). As human numbers increase, we may reasonably ask “what lies ahead?”

Note too that more than one billion additional people not classed as hungry still suffer significant micronutrient deficiency, especially of zinc, iron and Vitamin A. Even this lesser degree of undernutrition reduces economic productivity, immunity and learning capacity.<sup>11</sup>

It is common to assert that we inhabit a globalised world. In fact, this world is bipolar, and the gap between the two poles continues to widen. Though undernutrition is the largest problem, hundreds of millions of people are over-nourished<sup>12</sup> to the detriment of their long-term

health. Credible sources predict that a continuing obesity epidemic heralds a decline in life expectancy in the US.<sup>13</sup>

If the global food and underlying social systems had been designed by an architect set the objective to maximise population health, then we could reasonably call it an abject failure and request a revised model. Of course, this is impossible. While the global food system is not the responsibility of any individual, nor has it been imposed upon humanity by a higher power. Rather, it has instead evolved over millennia from the decisions, policies and actions of past and current generations. It can be altered.

Many analysts and influential policy makers claim to strive for sustainable and more equitable global population health. Such individuals should periodically ponder the quality of their analysis. Genuine reflection would surely be salutary. While a minority of critics have sounded a warning, in recent decades the vast majority of learned journals, writers and policy makers have shared a view that the long-term trajectory of human civilisation will continue to improve, even though parts, especially in sub-Saharan Africa, have been predicted to face comparative development failure.

This optimistic view could even be characterised as “why invest now for the benefit of people in the future? They will be so much better off than we are today”. Illustrating this optimism, the Malthusian scholar William Peterson writes, “Avery ends by using Malthus's alleged prediction to enlist him in support of the preposterous notion that currently the Earth is running out of food. In his Acknowledgments the author expresses gratitude to Anne Ehrlich, who with her husband has persisted in endlessly repeating this disastrous prognosis, no matter how often it has been proved wrong.”<sup>14</sup>

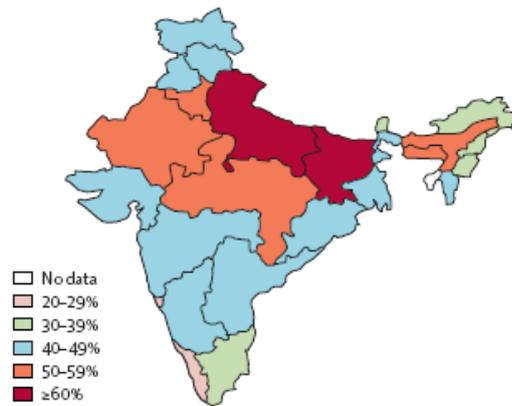
The number of people with inadequate nutrition is far higher than that forecast a decade ago by most elite policy makers and their advisers. This includes those who made pledges at the World Food Summit, and the much less ambitious hunger target of the first Millennium Development Goal (MDG),<sup>9,10</sup> which aims to halve the proportion of people [in 1990] who suffer from hunger [by 2015] (figure 1). While sub-Saharan Africa holds the

worst hunger problems, many also live in the Asia Pacific region, especially in South Asia.<sup>15</sup> (Figure 2).

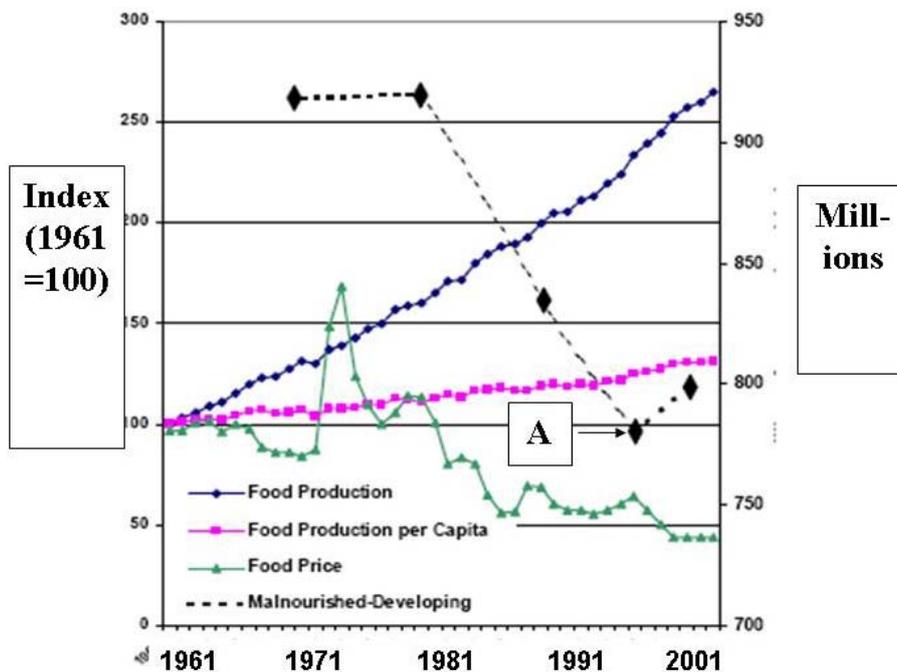
The growing severity of food insecurity is, however, not surprising to the minority of scientists, writers and futurists whose warnings over the last few decades have been discounted in a way that may be regarded as cavalier. It would also be of no surprise to the authors of the Limits of Growth, published in the 1970s, and increasingly recognized as still valid.<sup>17</sup> If we are to improve the outlook for food security, including in the Asia Pacific region, then the views of this minority, long dismissed as pessimists and doomsayers, should be given much greater weight.

## TWO HUNDRED YEARS OF DEBATE ABOUT FOOD: OPTIMISM AND PESSIMISM

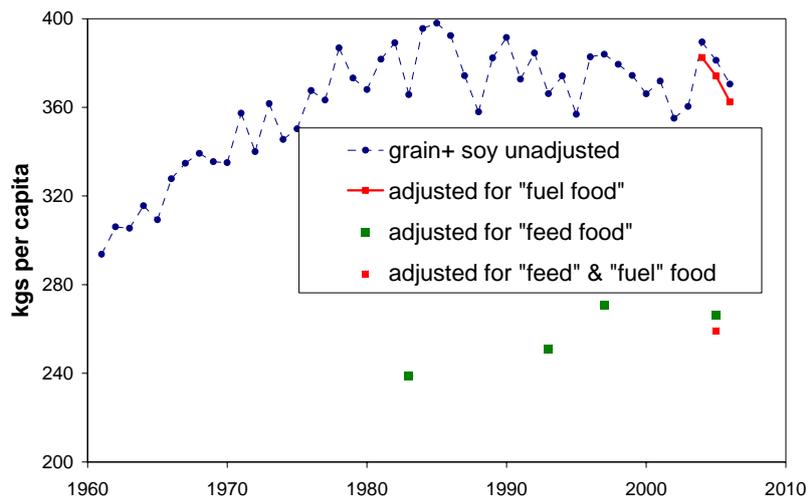
The recent increase number of hungry people was not meant to occur. In the 1990s, the FAO reported a steady decline in both the number of hungry people and the cost of food (Figure 3). Near the middle of this decade, in 1996, Nikos Alexandratos, then head of global perspective studies at the FAO, expressed skepticism at the position of Lester Brown, whose book "Who Will Feed China?"<sup>18</sup> had recently been published. For example, Alexandratos wrote: "I conclude that Brown's apocalyptic vision of the future, based as it is on such unrealistic assumptions, will probably fare no better than his earlier predictions of impending catastrophe, e.g. his prediction



**Figure 2.** Prevalence of stunting among children under 5 years old in India by state. Reprinted from The Lancet, 371, Black R, et al, Maternal and child undernutrition: global and regional exposures and health consequences, 243-60 (2008)<sup>15</sup> with permission from Elsevier.



**Figure 3.** Data for 1961-2001 which supported the optimistic assessments made in the late 1990s. Food production increased, the food price decreased, and until the late 1990s the number of people estimated as hungry declined sharply. However, the turn around in the number of hungry in the late 1990s (point A) shows that these optimistic data (food price, food production and food production per person) cannot tell the full story. If they did tell the full story, then the number of hungry would have continued to fall. Figure from *Ecosystems and Human Well-Being: Current States and Trends* by the Millennium Ecosystem Assessment. Copyright © 2006 Millennium Ecosystem Assessment. Reproduced by permission of Island Press, Washington, D.C.<sup>16</sup>



**Figure 4.** Global grain and soy, per person, 1961–2006, substantially adjusted for “feed” and “fuel” food. Raw data FAOstat, UN population division

that real food prices would continue to rise.”<sup>19</sup> Yet, eleven years later, the same author wrote: “World cereals production did not grow during 1997–2003. Shortfalls in China, largely compensated by drawing down its huge cereal stocks, were instrumental in this outcome. This set the stage for the price rises in subsequent years.”<sup>20</sup>

In 1998 the US National Academy of Sciences held a colloquium called “Plants and Population: Is There Time?” Three important publications resulted.<sup>21–23</sup> Of these, those by Alexandratos<sup>21</sup> and Dyson<sup>22</sup> were cautiously optimistic, while the third, by the agricultural scientist, Cassman was far more reserved.<sup>23</sup>

Whereas Brown predicted an impending global grain shortage to which the world should respond by means that include reduced feeding of grain to animals,<sup>24</sup> Dyson and Alexandratos were essentially confident that the “plow” which produces grain (and soy, though soy was little mentioned by either author) would continue to keep ahead of the “stork” of increasing human numbers. Alexandratos pointed out that the “per person food availability for direct human consumption grew 19% (to 2,720 kcal/day) in the 35 years to the 3-year average 1994–1996, whereas that of the developing countries grew 32% (to a still adequate 2,580 kcal/day)”<sup>21</sup> These data are reflected in figure 3. Persuasive as they are, they cannot tell the whole story. If they did, then the turnaround in the global number of undernourished people that occurred in the late 1990s would not have occurred.

Two obvious explanations for the inadequacy of these raw data are an increasing proportion of the “food” which is produced is fed to animals (particularly “feed” such as maize and soy) and a smaller, but increasing fraction is used for biofuels, such from maize and palm oil. Unfortunately, data that are adjusted to remove this double counting are extremely incomplete and hard to find (Figure 4). These explanations are unlikely to be complete. The FAO data show that the price of food continued to decline even after the point beyond which the number of hungry increased. An additional explanation is that the number of people outside the formal economy (e.g. subsistence farmers) increased. Alternatively, perhaps the income of

additional people declined, making food unaffordable even at its then record low price. Although this explanation may not be very important for the turn of the millennium, it is clearly important now. Food prices have fallen substantially in 2009, yet the number of undernourished people is now at a record high. This increase is widely and plausibly attributed to the global financial crisis.

The second author in the 1998 colloquium, Tim Dyson, is also eminent in the field of population and food security.<sup>25</sup> His paper was slightly more reserved, and interestingly stressed the significance of socio-political stability for continuing food security. Of note in these three papers, climate change was scarcely mentioned, though the paper by Cassman repeatedly discussed climatic influences on crop production.

That the paper by Alexandratos did not mention climate change or global warming despite its title (“World food and agriculture: Outlook for the medium and longer term”) might seem surprising in hindsight, since the issue of climate change and future food security had by then been a topic of serious research for some years.<sup>26</sup> However, as far as the author is aware, there is little evidence that the FAO considered climate change as a serious threat to food security until 2003, when it highlighted climate change at the 29th session of the FAO Committee on World Food Security.<sup>27</sup> Climate change was also discussed in the major FAO outlook report “World Agriculture Towards 2015/2030”<sup>28</sup> edited by Bruinsma, successor to Alexandratos, and published in the same year.

At the turn of the Millennium, the FAO had other reasons to be optimistic about the global food outlook. The declining numbers of the hungry and the fall in food prices have already been mentioned. This was also a time in which optimism about market forces prevailed. It was thus politically difficult to think pessimistically, especially organisationally. Several other reasons can also be identified for the delayed awakening by the FAO to the risk that climate change poses to world agriculture. These reasons will be discussed shortly.

Prior to that, this paper will position this recent debate concerning global food security within a longer history. It

will also reflect on more recent publications by Alexandratos and Dyson, each of whom now expresses far less optimism and each of whom now refers explicitly to the return of Malthusian forces for some particularly disadvantaged populations.

Readers of this journal may be familiar with Malthus. We stress that the tension between human numbers and human demands, which can be considered as shorthand for Malthusianism is ancient and not confined to Western thinkers. While this essay is not exhaustive, it is relevant to mention that Hung Liang-chi (1744-1809) and Honda Toschiaki (1744-1821) have been called Chinese and Japanese exponents of “Malthusian” views.<sup>29</sup> Dyson recently explained in *National Geographic* that the Chinese word for population has two characters: one for a person, the other for an open mouth.<sup>30</sup>

Less well known, however, is that the famous essay by the English clergyman Thomas Robert Malthus was written substantially in reaction to the optimism of the French aristocrat Condorcet who, even when held in the Bastille, believed that humanity was on the verge of a wonderful breakthrough to a new level of consciousness and to the end of frank want and misery.<sup>31</sup> This debate between optimists and pessimists continues. For example, in 2000, the late agricultural economist D Gale Johnson asked: “What made it possible for the world to escape the Malthusian trap? .. the creation of knowledge”.<sup>32</sup>

The pessimistic view dominated for several decades following Malthus’s book. Malthusian theories helped explain (and alas partially justify) the Irish famine of the late 1840s.<sup>33</sup> Malthusian forces also explain the enormous out-migration from Europe during the nineteenth and twentieth centuries.<sup>34</sup> Repeated famines in India, may also be analysed, at least partially, in Malthusian terms,<sup>35</sup> though the weak political position of the hungry – virtually always an element in famine<sup>36</sup> – was also crucial, especially in the colonial period.<sup>37</sup>

In the late 1960s, the annual global population increase crested at slightly over 2.0%. Malthusian principles were again raised, not only by the US ecologist Paul Ehrlich but also by the world’s most famous agricultural scientist, Norman Borlaug, who was awarded the Nobel Prize for Peace in 1970. In his acceptance speech, Borlaug warned that the Green Revolution (in which he played a crucial role and for which he received the Nobel Prize) would buy “only a generation” of time, unless the “frightening power of human reproduction” was curbed.<sup>38</sup>

The Club of Rome and Lester Brown were also prominent pessimists in that period. They remain so to this day. In the 1970s two marvellous processes unfolded. The first was that the population growth rate started to decline. One of several reasons was the increasing use of the oral contraceptive pill, introduced in the West in 1960.<sup>39</sup> The Green Revolution, albeit sometimes imposed on less powerful populations, similar to the enclosure movement which had earlier increased agricultural productivity in Britain, begat a dramatic increase in agricultural productivity in both Asia and the West which had seen the debut of several improved high-yielding cultivars, such as dwarf wheat, saw a dramatic increase in agricultural productivity, including in Asia as well as the

West.<sup>39</sup> Combined, these two trends saw per-capita grain rise steadily, peaking around 1985 (Figure 4).

About this time, only fourteen years after Borlaug’s warning, President Reagan proclaimed that population was unimportant.<sup>41,42</sup> At the 1984 Mexico City population conference, much to the consternation of the US delegation, the US government, influenced by population (and therefore food) optimists such as Julian Simon,<sup>6</sup> announced a distancing from the earlier US position.<sup>41</sup> This optimism on food and population persisted through the 1990s despite the efforts of doubters, represented not only by Brown and Ehrlich but also by such public health workers as Maurice King<sup>43</sup> and AJ McMichael.<sup>44</sup> The weight of learned opinion, however, supported Dyson and Alexandatos. It is highly pertinent to this paper, therefore, that both authors have repeatedly mentioned Malthus in more recent writing.

Indeed, as recently as June 2009, Dyson mentions Malthus when quoted in a lead article on the food crisis, entitled “The global food crisis. The end of plenty”: “People who say Malthus is wrong usually haven’t read him .. no one in their right mind doubts the idea that populations have to live within their resource base. And that the capacity of society to increase resources from that base is ultimately limited.”<sup>30</sup>

### THREE REASONS FOR THE SLOW AWAKENING BY FAO TO THE THREAT WHICH CLIMATE CHANGE POSES TO GLOBAL FOOD SECURITY

Several reasons exist for the assertion above that the FAO awakened comparatively slowly to the risk posed by climate change to global food security. First, large organisations such as the FAO move cautiously and generally in tune with the time. This, perhaps unkindly, can be described as a form of herd thinking. Second, even in 2003, when it was first discussed, the maximum warming predicted by the FAO to occur by 2100 was extremely modest – no more than 2 degrees. Third, it is here suggested, that the consensus of opinion in the 1990s and early in the current decade was that climate change and food security would deliver gains in agricultural productivity in high-income (high-latitude) countries. This consensus is now shifting. There are growing claims that climate change is already harming agricultural production and thus health, and there is increasing concern that the net impacts of climate change on health will be negative, including for many parts of the Asia Pacific. This literature will be discussed in the next paper.

### CONCLUSION

Optimists and pessimists debate protractedly about global food security. Although the absolute extent of hunger and other forms of undernutrition could be considered shameful, the world has experienced this for so long that most people, whether well-fed or otherwise, see this situation as normal. Periodically, especially since the 1960s, high-level promises have been made to improve global hunger. In the last two decades of the twentieth century, substantial progress was made in reducing global undernutrition, and optimists gained the ascendancy. In recent years the global food situation has worsened, primarily due to the spike in commodity prices (due

especially to the oil price rise) and, more recently, the global financial crisis, which has greatly eroded the purchasing power of the poor. Ahead, multiple problems such as intensifying climate change, further oil price rises and scarcity of water, soil and phosphorus appear likely to exacerbate global food security, especially given ongoing diversion of food to feed and fuel a rapid population increase. Some of these issues will be discussed in greater detail in the companion paper.<sup>45</sup>

Collectively, these issues are daunting. No single solution will be enough. The single most important element of the solution will be for leading policy makers and analysts to acknowledge the dimension of the problem. Much can be done, such as a dramatic increase in the development of better cultivars, and the introduction of high-yielding plants to those parts of the world where the Green Revolution has not yet penetrated widely. Populations who consume ample animal products, especially grain and soy-fed meat, must be educated to lower their consumption. Simultaneously, populations who eat little meat should be subsidised to eat more. Above all, the numerous factors which accelerate the demographic transition in poor countries should be fostered, such as schooling for girls, primary health care, and greater human rights. Although undisturbed ecosystems are intrinsically valuable, the conversion of even more forests and coastlines to grow grain and fish farms appears inevitable, at least this century. Finally, the world must act on a massive scale to switch to clean energy sources and to tackle climate change.

#### AUTHOR DISCLOSURES

None declared.

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## Review

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## 亞太地區糧食安全性：馬爾薩斯理論、限制及環境挑戰

此篇文章是討論全球農業、糧食安全性及伴隨的營養與人口健康面對的日益高漲的挑戰之兩篇文章中的第一篇。近來全球糧食安全性的惡化情況已讓每個專家都感到訝異。雖然整體來看，亞太地區於目前的糧食供應不差，但無論糧食安全在近期內是否變得更好，對於中長期的糧食安全性不該自滿。這篇文章從馬爾薩斯主義者及樂觀主義者的長期辯爭間探究這個議題。敘述兩位領先的農業專家在過去十年明顯的立場改變。他們近年來的著作反映了強化馬爾薩斯理論，而 1990 年代的著作卻遏制馬爾薩斯理論。本文的結論是，需要更多的信任給予悲觀的立場，以避免它成為真實的。第二篇文章則是將重點放在未來亞太地區糧食安全性的五個相互關聯的挑戰。這些挑戰可被概念化為途徑，引導出顯著的馬爾薩斯悲觀情境。這些機制為(1)氣候的改變(2)水資源的缺乏(3)對流層中臭氧的污染(4)磷及常規石油的急迫短缺(5)未來的人口流離、衝突及管理不善間的可能交互作用。文章的結論是，要使糧食安全性永續地改善，需要從社會對環境的施為、人口成長、農業研究及分配的權利、機會與配額來做徹底的改變。

**關鍵字：**全球糧食安全性、馬爾薩斯、聯合國糧農組織、集中餵養動物作業、成長限制