

## **Feeding the world: Harmony between small-scale and intensive livestock production**

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### **Abstract**

Food production has undergone a revolution in the last 40 years and is now globalised in a free market economy. Western science and business have developed large-scale, intensive, industrial systems of livestock and crop production which produce cheap food for Western supermarkets. These systems depend upon large external inputs of capital, fossil fuel, chemicals and water; they also have negative side effects. At the same time, one billion people remain hungry and undernourished and world population is expected to increase by another three billion to a total of ten billion by 2050. This is a crisis situation. Will the present system be able to feed the world? Many think that further intensification and high technology is the only way. Today, 70% of world food is produced by several billion small-scale farm families, livestock keepers and pastoralists in Africa, Asia and Latin America. Innovative research over the last ten years on the ground with these small-scale primary producers shows that targeted empowerment suited to the management skills, local bio-resources, climate and other conditions enables these small farms to increase food production substantially. Nearly half the world population still lives in rural areas and close to the land. New methods of development at the grass-roots are needed with low-level inputs and appropriate science and extension services and government assistance to provide access to markets. Many of the intergovernmental and non-governmental organisations are now actively engaged in promoting the development of the small farms and livestock producers. The question is whether leaders in governments, business and science will listen and act for they hold the power to change the system. The paper argues that industrial food production and small-scale producers can work together in harmony to successfully feed the exploding world population. The resources are available. A changed attitude is needed. There are moral aspects to this decision for it involves the rich sharing more equitably with the poor. The paper calls for social justice to be added to the free market in the food chain in order to provide a sustainable food supply and food security. Options for change are proposed.

### **Keywords**

**World food supply, small farms, empowerment, intensification, harmony, justice.**

## **Harmony**

Harmony happens when humans intentionally work together for an agreed goal in transparency, accountability and justice and each decides not to push individual interest to the detriment of others and the common good. Members of a concert orchestra follow the agreed score thus allowing each to excel appropriately and together they produce harmonious music that would be impossible for one player alone. Life and human activities are complex and harmony among the participants is essential for sustained success. Rarely can one person or one institution, acting alone or dominating all others, contribute meaningfully to human progress. Quality of life and civilised society are built upon harmonious organisation with social, economic, financial, political, national, international, or global components. Harmony is not a remote concept, an abstraction, a transcendent irrelevancy or an optional extra in any human activity. Harmony is basic for life. For example, harmony is essential for success in families, local and national governments, universities, research, business, banks and financial transactions, transport, music, sport, exploration, health, provision of healthcare, etc. Harmony is not a natural resource, not a chemical, not an equation nor a financial investment. Harmony is not uniformity but unity in diversity. Harmony occurs when participants in a common goal ensure that their contributions enrich the whole and do not diminish the contributions of others. This self-discipline does not happen automatically but when freedom is used responsibly.

### **Harmony or stress and disorder in the food chain?**

The food chain from the farm to the consumer today is a complex human activity with many stages and participants. In Western society and in global trading, food has become a commodity passing through many hands as it is processed, combined, repackaged, sold and resold. Food is no longer a simple matter of the husbandry of land, crops and animals and the sale of food to local consumers. Upstream and downstream trading activities involve seeds, fertiliser, sprays, animal feed, animal health products, fuel, bank finance, mechanical equipment, packaging, etc. plus the disposal of by-products and care of the environment. Today trading partners are no longer local but often large-scale, multinational, businesses engaged in agriculture and food solely for profit. Farmer and consumer no longer meet. The farmer must engage with legal contracts with precise specifications drawn up by lawyers who, together with the markets that fix final prices, are often located on the other side of the world. Personal relations between individuals play only a limited part. The creation of harmony in the modern food chain therefore depends upon ethical behaviour by farmers, ethical policies by top business people who direct their staff to behave according to these values and also upon governments legislating equitably for all parties. Some businesses maintain transparent, just and accountable relationships with farmers and other trading partners. However, the system is now so very long with many processing plants and traders, some of them owning the food commodity briefly, all of them primarily seeking profit, that transparent local trading is often absent and inequity is easily hidden. Huge changes in the food chain have taken place in recent decades. In this paper there is no attempt to turn the clock back. But to understand the food chain today and to find answers to feeding the world of 10 billion people in the foreseeable future, we need to grasp the implications of change. Until recently, Western agriculture was structured by small family farms and this is the position today throughout most of Africa, Asia and Latin America. Therefore, without wishing to go backwards, we need carefully to examine the best policies and practices of the past that truly enabled small farmers in the West to grow in prosperity and to contribute to sustainable food production and food security.

The pace of change is illustrated by my family. Less than 100 years ago, my grandfather in England went each week from the city to Banbury, a nearby market town, and bought eggs, cheese, butter, chickens and rabbits from farmers' wives to sell in his two retail shops. Nowadays, by contrast, a few huge food companies and supermarket chains with international outlets control the supply and sale of food to consumers. They compete with each other for market share to gain more profit from sales volume. To this end they want ever cheaper food to attract consumers away from rival supermarkets. This pressure to reduce costs flows back along the food chain through each stage to the primary producer whose only recourse to remain in business is expansion into larger scale production. Today in the West, few small-scale farmers and livestock producers remain and they feel vulnerable as they know the economic system sees them as disposable. Land is amalgamated into massive crop sections; and livestock production is concentrated into huge units with hundreds of thousands of animals. The owners, who invest capital to set up these industrial food producing plants are not farmers and may never visit the property. This type of production requires high inputs of capital, technology, feed, fossil fuel, water and minimum labour. It is more accurately described as industrial food production rather than farming. Business that is only focused upon profit can

easily move away from food into more profitable avenues of investment. Food security is at risk, as shown when financial inducements for production of biofuels attracted corn and sugar cane away from the food chain. The US now uses one third of its corn production to produce fuel for vehicles. Since the market views food as a commodity, financial speculation causes increased volatility in food prices. Spikes in the price of food match increased child malnutrition in developing countries [1]. These authors point out that the free market has turned food into commodities for making money, causing stress, shocks and shortages in the food chain. Typically, the farmer receives little benefit.

### **Alternative views on how to feed the world**

The focus of this discussion is harmony between small-scale and intensive livestock production. The intensive large-scale system dominates food production in the West where agriculture now employs no more than 5% of the national workforce. It has been a painful process for traditional farming in Europe and North America. There are convincing signs that the shift to intensive large-scale agriculture has gone too far. Until recently many policymakers, politicians, and business leaders have assumed that intensive food production is the only way to feed the world population expected to grow from 7 to 10 billion in the foreseeable future. Intensive food production is very attractive to investors because the long-term demand for food is even more certain than the demand for oil. People holding this view have also assumed that small-scale family farms are unable to increase food production. For decades, many small farms in developing countries have been overlooked by agricultural research. However this posture is changing. Numerous prominent thinkers and institutions in agriculture and development now advocate focus upon small-scale family farms in the developing world as an essential part of feeding the growing world population. This view comes from the realisation that the intensive food system has reached the limit of sustainability as well as from growing awareness that small-scale farming has much more to contribute than was previously thought. Thus targeted empowerment of small-scale family farms is now publicly embraced by most prominent intergovernmental agencies including the Food and Agriculture Organization of the UN (FAO), United Nations Development Program (UNDP), the World Bank, International Fund for Agricultural Development (IFAD), UN Environment Program (UNEP), and Consultative Group on International Agricultural Research (CGIAR), and others. The UN has declared 2014 as the Year of the Family Farm. Many NGOs support the new focus on the small farm and there is a growing number of associations organised by small-scale food producers, peasants and pastoralists. Significantly, at the United Nations World Conference on Sustainable Development (RIO+20) in June 2012 the governments of the world overwhelmingly endorsed Green Agriculture as the best hope for feeding the world in the next decades. Green Agriculture recognises small farms as a key resource because recent research shows that increased production of food results from empowerment. The most comprehensive study on global agriculture in recent years was organised by the United Nations from 2005-2007 and drew upon the resources of hundreds of research scientists, with agricultural development specialists, policymakers, economists, governments and business representatives. Entitled *Agriculture at a Crossroads* [2], it identified the unsustainability of continually replicating and expanding the size and number of intensive production units and specifically recognised the potential for increased food by empowerment of small-scale family farms in the developing world.

However, tension remains between the two major views of how to feed 10 billion people. On the one hand is the growing movement for investment, research, development and extension by targeted empowerment of small-scale producers in Africa, Asia and Latin America. These farms, with their families plus the landless labourers working on farms, number several billion people and supply about 35% of the world's workforce. On the other hand there is a very strong lobby for the proliferation of intensive industrial style food production in the developing world through plantations for crops and large-scale livestock production units. It is essential that harmony be developed at the policy level and in practice between these two views. They do not need to conflict. For the world to survive and feed 10 billion people, the intensive and small-scale food production methods must proceed side-by-side, thus strengthening both and gaining from the synergy between them. However, the economic system currently used to run the world food chain makes little or no provision for small farms. The economic system is loaded against them. It is not a level playing-field. Today, slightly less than half the world population lives in rural areas, but as a further 3 billion people are added in coming decades the absolute numbers in rural areas will increase substantially. Most of the additional people will be born into poor families in rural areas or in the shantytowns of the Third World. This huge part of the human family whose background and skills are rooted in the land and agriculture must be embraced as a significant and valued partner in solving the world food problem. It is inhuman and uncivilised to allow the system to drive several billion people into urban slums. Cities will be unable to

function. Unfortunately, the prospects do not look good because the food chain is operated in the framework of the unregulated free market. Unless the rules of the market are changed for agriculture and food we shall continue to see the expansion of industrialised food production and billions of people in rural societies pushed to the margins of society and denied prosperity.

To take this discussion forward, we now look more closely at the small-scale food producers, at the intensive large-scale system and at the globalised market for food. Finally, we examine the possibility of change and what an alternative policy might include to promote harmony between large and small-scale producers in feeding the world.

### **Targeted empowerment of small-scale farmers and livestock keepers**

There is a common worldview even among politicians, scientists and business leaders that small-scale food producers are primitive, incapable of change, and irrelevant to the major task of supplying 10 billion people with food. This posture is false. The half a billion small-scale farming families in the world currently contribute about 70% of the world food supply by producing, consuming and selling to an extended local market of several billion people [3]. In Africa 90% of the food consumed is produced by small-scale farmers [4]. By definition, each farm has only a few hectares with integrated crops and livestock and in some cases their animals graze larger areas of natural grassland, often owned or managed collectively. These small-scale family food producers are spread over an enormously wide spectrum of husbandry practices and environments to which they are adapted. At the top end, some use modest external inputs but, as they have limited or no cash resources, as a group they do not practice high input farming. Some small-scale producers located close to plantations, large livestock units and cities sometimes practice low-level intensification.

What can this vast group contribute to feeding the growing world population beyond their local community?

First, they usually bring dedication to their own business, flexibility and resourcefulness in changing circumstances, hard work with family labour, especially women and sometimes children; vast and long experience of producing food in both adversity and prosperity having for millennia adapted to the local combination of land, water, and weather which may range from tropical to semitropical, dry, swampy, saline, mangrove, low, medium or high elevations, etc. Second, and of great importance, is their skill and experience in the use of local natural resources including the indigenous livestock breeds, the plant species for food and livestock feed, and natural vegetation. Third, they have long cultural memories of how to live successfully as a community, working together in harmony at peak periods of seed time and harvest and in times of crisis when disaster strikes. There are, of course, small-scale farmers and communities that lack these skills and dedication but this deficit needs to be changed by long-term investment in rural education which is also a means of empowerment. Devendra [5] provides a detailed study and analysis of small-scale farms in Asia with many examples of success and potentials.

Sadly, small-scale food producers face other problems that impede their progress upwards. Increasingly they are victims of 'land grabs' and 'water grabs' particularly in Africa but also in Asia and Latin America. Rich individuals, companies, sovereign wealth funds and some governments from the Gulf and Asia are buying the best agricultural land and water sources, often at minimum prices, on which they develop plantations and intensive livestock production units. Some responsible investors help, but in many cases small-scale farmers receive minimum payment and are often forced off their land by the buyers in collusion with local governments and without legal redress as land registers often do not exist. Land and water grabbing have increased markedly during the first decade of the 21st century affecting 62 countries and growing [6].

A further regrettable development is the ambition of some multinational seed companies to claim ownership, by patent, of indigenous wild and domesticated plant species in developing countries for pharmaceutical drugs and food seeds held for future development and sale back to the farming communities which, historically, have domesticated these food species. This bio-piracy is fuelled by greed and is supported by unethical but legal patent laws that had their origin in the US Supreme Court in 1980 when, by a narrow 5-4 landmark judgment in *Diamond vs. Chakrabarty*, the court awarded a patent for a genetically modified bacterium. This modest precedent has subsequently allowed corporate interests to claim ownership of living organisms and even of species hitherto treated by humanity as part of the Commons, thus challenging the ancient boundary of Rule of Law and replacing it by Rule by Law. The introduction of genetically modified seeds for corn, canola and soya food crops has not increased average production per hectare [2, 7] and has caused stress rather than harmony, and many issues remain unresolved. The deficiencies and unanswered questions are well described by Tudge [8].

The challenge to empower small-scale farmers presents a new field of opportunity for agricultural development, research and extension. This new approach of targeted empowerment results in increased food

production because vast human and social capital is waiting for the opportunity to improve itself and to provide a better future for children who otherwise leave without hope for the often more hopeless life in shanty towns. Targeted empowerment means working from the grassroots up rather than top-down. In addition to targeted empowerment at the local level, small farm production needs some improved infrastructures to bring the increased food products to the market. These infrastructures played key roles in the earlier process of empowering small-scale farmers in Europe and North America in the 19<sup>th</sup> and 20<sup>th</sup> centuries: market access, roads and transport, and farmer organised groups which may develop into producer-owned cooperative institutions or small local businesses. Wibberley [9] discusses beneficial trading options for small farms in developing countries.

Many examples of targeted empowerment can be found from grassroots projects in developing countries in recent decades. Pretty et al. [10] give details of 40 projects and programmes in 20 countries where sustainable intensification has been developed during the 1990s and 2000s with documented benefits for 10 million farmers with improvements on approximately 12 million hectares. Using targeted empowerment, by 2010 yields per hectare had increased on average by 2.13 times by appropriate management of crops, livestock or fish. The authors consider these results can be effective for many more millions of small farmers and pastoralists across Africa. From other sources, four examples are briefly mentioned as indicators of the ways alternative and adapted methods can substantially increase food production from small farms: conservation or no-till agriculture which reduces fossil oil use, conserves soil quality and increases yield; the System of Rice Intensification (SRI) which started in Madagascar and is now used widely, needs less water and increases yields on average by 25%; the grazing lands on the banks of the Awash River in north eastern Ethiopia which has returned to livestock production from intensive sugar and cotton and is now more productive; and the successful marketing of camel milk and milk products through a locally owned small business in Mauritania. Targeted empowerment is successful.

### **Intensive large-scale farming and industrial food production**

The undesirable effects of large-scale industrial livestock production are now well known. They include dependence upon and excessive use of fossil fuels and fertilizers, environmental degradation of water, soil and air, difficulties in disposal of manure and effluent, negative effects upon climate change due to large-scale transport of resources to and from distant locations, food safety and quality, concerns about animal welfare, and unhealthy environments in which new and existing zoonoses can proliferate into epidemics; for example, swine fever. These analyses started with the book 'Silent Spring' by Rachel Carson in 1962. While intensive production appears to produce cheap food, the external costs are frequently ignored and paid therefore by the community at large [11].

The negative aspects raise questions about sustainability, and there are now calls for legislative limits to intensive animal production in Europe. However, there are no global laws to harmonise and enforce compliance. Sadly, this situation encourages exploitation by some unscrupulous businesses, a practice less common when food comes from local, traceable, accountable and trusted sources. Lack of transparency and accountability challenge the right of the consumer to know what he or she is eating. Because maximising profit is the goal of each upstream link in the food chain, punitive contracts are often imposed upon farmers when they buy seed, feed, young livestock, chicks, and other resources, even to the extent of defining details of the management system; for example, the precise sequence of light and dark in poultry houses. Upstream suppliers and downstream supermarkets increasingly work together, and the primary producer must comply to gain market access. Supermarkets drive very hard bargains with producers, demanding absolute uniformity of product, time of delivery, specific quantities, etc., and other conditions that inevitably lead to food waste. A recent study [12] shows that 33% of all food produced for Western markets is lost at various stages, due to spoilage, discards from households and restaurants and excessive advertising and promotions by supermarkets. This obscene waste is, of course, also accompanied in Western society by growing obesity in the population. By contrast food wastage in developing countries is estimated by FAO [13] at around 10% although it may be higher due to the difficulty of measuring loss in the field and in small farm storage in the tropics.

### **Globalisation, industrial food production and trade**

From the early days of settled farming about 12,000 years ago, individuals and communities have practised trade in farm products. Many of the ancient trade routes were established for the sale of food and fibre products together with salt and live animals. Growing cities depended upon food supply from the hinterland. New ways of preserving food lengthened trade routes. The invention of refrigeration extended trade routes

by sea; for example, lamb, cheese and butter from the Antipodes to Europe. In the last 30 years unprecedented changes have taken place in the international food trade, enhanced by instant communication, ease of international transport, free movement of capital, liberalised markets and outsourced agricultural production in plantations and intensive livestock units. Globalisation is driven by market forces devoid of any social or environmental components which historically often accompanied local food trade. Food frequently passes through many hands before reaching supermarkets and consumers, and many businesses do not consciously practice Corporate Social Responsibility. Further, the laws of the World Trade Organisation, WTO, have no social content.

How did globalisation arise? From the end of the 19th century until about 40 years ago, American and many European governments were committed to sustaining their domestic agriculture and making it more efficient. They used public funds to persuade farmers to adopt new techniques, facilitated organised marketing, funded agricultural research and education and provided free extension services. Sometimes these governments also fixed agriculture and food prices. This system was what economists call a 'mixed economy' in which governments played important roles in the market for the benefit of their farmers and consumers. Gradually over the last 40 years this historic pattern changed so that government financial support now goes directly to farmers, as in the EU Common Agricultural Policy (CAP) where compliance with environmental standards is now included. Market forces decide prices through supply and demand. The change from a mixed economy to a free market economy can be largely attributed to politicians in the 1980s, particularly during the administrations of President Reagan and Mrs. Thatcher, to the influential advocacy of Milton Friedman and his fellow economists, and to lobbying of governments by business. A common view today holds that a liberal economy with unrestricted competition is the best and indeed the only viable economic system for material prosperity. This view elevates profit as the highest good.

Undoubtedly globalised division of labour in the manufacturing sector reduces costs, creates more wealth and increases profit. Sadly, in this unregulated system, greed easily replaces harmony and newly created wealth is not shared equitably by participants. 'The Gap' is now acknowledged as an entrenched feature of modern economic activity, as emphasized by two prominent economists [14, 15, 16]. Trickle-down does not work. The rich and powerful control financial and intellectual capital, science and technology and forge strong alliances with politicians and governments; on the other side are the masses and the poor with little capital and limited voice in society. The Gap is formally described and measured as the Gini index. This index shows precisely the extent of disparity within a country between the rich who get richer and the poor who become poorer. In the USA, the top 1% own 40% of the wealth and receive 25% of the national income; by contrast the bottom 80% of people own 7% of the wealth.

When harmony is absent, life becomes a power struggle and the Gap widens. Globalisation has enabled a few developing countries to narrow the Gap, but individuals within rich and poor countries alike, experience ever more disparity of wealth and quality-of-life. Human society is now desperately unbalanced. The free market offers unrestricted opportunity in which some gain huge profits but, sooner or later, their self-interest renders the group dysfunctional. In organised war, the absence of harmony between opposing military forces always results in suffering and destruction. Economic war also leads to loss and suffering. The last six years have demonstrated the tragedy of human greed in a globalised world, first in the financial crash and then the collapse of banks through which millions of people lost their homes and jobs and many suffered permanent loss of their savings. Greed is never satisfied. The free market economy, that enabled many banks over-reach and to bankrupt themselves, was unable to rescue them. Governments in the US and the EU had to rescue them thus resorting to mixed economy practice.

The free market economy for agriculture and the food chain vividly demonstrates the Gap as food producers in the developing world are disempowered and marginalised. Provision of food needs cooperative effort. When humans were Hunter-Gatherers, food was available by work alone. With settled farming, more advanced division of labour put us on the road to prosperity and civilisation but also made war and slavery economically attractive. Together with land, labour and food thus became prime tradable resources in any subsequent socio-economic system from barter to capitalism. Food supply is the fundamental necessity of sustainable civilisation. Even today, when food supply temporarily ceases in a city, chaos, confusion and riots ensue. To avoid violence and suffering over food, all parties in the food chain must work together harmoniously with self-restraint. In earlier times, tribal fights may have brought temporary benefit to one side; today in the global village we have to learn quickly to harmonise the food chain, or risk perishing. Once disrupted, global food supplies cannot be quickly restored. Local food is more reliable. We tend to forget these important lessons as we reshaped the human food chain in the last 30 years and gave power to

the globalised free market to govern food supply [17]. Food has become only a tradable commodity which is an invitation to greed. Instead of using money as a means of trading other commodities, the banks tried to make money from money. Similarly, capital rich businesses no longer see food as a necessity of life, but as a means of making money.

Fundamental changes have taken place in agricultural science over the last 30 years which is now deeply influenced by the dominance of profit in business to which scientists have become increasingly enlisted. This linkage inevitably upsets the balance of power and therefore the harmony of the food chain. Separation of powers is a vital principle of human governance. We scientists need to reconnect with those whom we primarily serve, namely producers and customers. Targeted empowerment for small-scale farmers requires a new approach in agricultural research, bringing together farmers, extension workers and researchers. This new type of collaboration is being pioneered by CGIAR [18], entitled 'Re-imagining agricultural research in development'. The possibilities for exploring the use of bioscience for small farms in Africa are being examined by the B4FA group [19].

### **Change in the socio-economic system is imperative**

The possibilities for change do not lie primarily in calculating how many calories and grams of protein will be needed by 10 billion people. Nor is the answer a silver bullet of technology. The problem is caused by the system, and we have to change the way the system works for food and agriculture. This is not a revolutionary way of thinking, it is simply a return to the way civilised nations have treated their farmers and food supplies in time past, even until 40 years ago. Everything else in life depends upon a sustainable food supply. Our global food supply is threatened by allowing it to be used to make money. The food chain is an enormously large and profitable business for a few organisations and people. A change in human behaviour is needed to bring harmony. There are moral implications for all of us, because harmony in the food chain requires a will to change and application of restraint and self-discipline in the interests of all. This is basically a moral issue (Sandel, 2012). We shall not find an adequate solution by debating only technical and scientific issues. They are vitally important but impotent unless we bring socio-economics and human behaviour into focus, and that means dealing with morality based on wisdom. Even in science, as Einstein remarked, knowledge and imagination must be based upon morality.

Our own experience, our observation of society as well as history, all demonstrate the human bias towards self-interest. We are capable of exploiting and benefiting at the expense of others. Few of us may engage in corruption, manipulation, deceit, violence, abuse and neglect. But we are supporting an unjust economic system. As scientists we are not limited to scientific honesty, we also have a moral responsibility to challenge injustice. Harmony in the food chain will not come automatically. We are morally responsible. Even though our self-interest is rooted in self-preservation we are free to make ethical decisions and are responsible for them. Harmony is not a soft option that fails to deal with the realities of life; it is the opposite – harmony means engaging with the realities of life.

Some may feel that competition alone is at the heart of progress in life. It is a common world view today but wrong. Harmony does not exclude competition provided it is just, transparent and accountable. Competition and cooperation are essential ingredients for successful human activities, operating together in harness for a common objective just as they do in nature and evolution.

### **Feeding the world; why bother?**

This is an important, not a flippant question. Why are we concerned with feeding the world as the population grows towards 10 billion people? Why bother? Why not look after ourselves and practise triage for the less fortunate billions? After all we do not worry about provision of food for wildlife species. Why do most societies view humans as infinitely valuable? Why do we debate euthanasia, abortion, genocide, human rights and the oppression of minorities? Why do we care about feeding others? Why does the Golden Rule that calls upon us to treat others as we wish them to treat us underlie standards of acceptable behaviour in most religions? Why are we aware of the needs of others and why does our conscience tell us that we ought to help and not neglect or exploit others? Why is Homo sapiens uniquely different from all other species in having these imperative moral qualities? These questions are not just for the philosophers – they lie at the heart of whether we want to do anything about changing the food system to prevent large-scale famine. For me, the most meaningful and satisfactory answers about human uniqueness are provided by Judeo-Christian teaching given in the Bible; namely, that humans are made of the biological material that is the stuff of life and also uniquely made in the image of God That is what gives us our moral awareness and our freedom of choice to live ethically or not. This view of the nature of mankind is held by most of the 33% of the world populations who are Christians or Jews.

The Bible also calls us to practise justice and to care for the poor and disadvantaged who are the large majority today in our world. But we support and contribute to a socio-economic system which damages the interests of billions of small-scale farmers, livestock producers and pastoralists. This harsh policy is not designed with malignant intent. Nevertheless it is selfish. This system of industrial agriculture has been developed to provide the West with abundant, cheap food. But expansion of this system will not feed the billions in Africa, Asia and Latin America. A new policy of food production is needed which recognises the value of small farms and enables them to contribute harmoniously as equal partners with large-scale intensive food production. Small-scale farmers need targeted empowerment; intensive industrial production needs adjustments to overcome negative effects. This major change in policy will have positive effects upon other major problems by reducing rural-urban drift, lifting the quality of rural life, caring for the environment, reducing energy and water depletion, improving animal welfare and climate change, etc. Most of us respond immediately to another person close to us who is in need. But because of our belief and commitment to the globalised food market, we allow the distant and anonymous billions whose lives revolve around farming and the land to be neglected and abused. Their suffering is accepted as an unavoidable side-effect that sees industrial food production as the ONLY way to feed the world. The issue of feeding 10 billion people is soluble. The natural resources are available, the sun's energy is unlimited, land and water properly used are adequate, and biodiversity is prolific and well adapted to the huge variety of natural environments where humans have chosen to live. Change requires courage because it involves moral imperatives and challenges the established way of doing things.

### **Options for change**

Radical changes are needed in the socio-economic system to achieve sustainable food production and food security which cannot be brought about by a 'silver bullet' solution. Some principal areas are suggested below.

- A mixed economy policy for food and agriculture instead of the present free market economy.
- Legislation by national governments to recognise agriculture and farmers as unique and vital national resources that need protection and public investment.
- National policies to encourage the production, marketing and consumption of local food.
- Research, education and extension to engage in targeted empowerment of small-scale farmers, livestock producers and pastoralists suited to local circumstances and resources.
- A national and international ban on land grabbing and water grabbing.
- Mini-loans for small-scale farmers, particularly for women.
- Improvements in the quality of life in rural communities by many different means such as eco-friendly local power production, adding value to farm products, upgrading education especially for farm families.
- Redirection of bio-fuel production into use of vegetation from outside the human food chain, thus releasing land and grain for humans.
- A massive campaign in the Western world to reduce food waste at all levels and obesity.
- Practice of Conservation Agriculture (no till farming).
- Legislation to ensure that large-scale intensive production units pay the external costs.
- Empowerment small livestock producers and pastoralists to use more effectively the natural grasslands that occupy 25% of global land surface.
- Further encouragement of organic (bio) food which in the EU has been growing at 10% per annum of the last decade and is already a component of the EU CAP; organic food production reduces use of fossil fuel.
- Exploration of a Tobin type levy on multinational companies exporting food across national boundaries; and use of the revenue to promote targeted empowerment of small-scale farmers. This effect is comparable to the new EU levy of 0.1% on stock and bond trades and 0.01% on derivative transactions, which will yield €35 billion euros per annum.
- Legislation to facilitate formation of farmer groups and cooperatives in developing countries for processing and marketing of food products.

- Encouragement of small-scale farmers and pastoralists to develop eco-tourism in areas of natural beauty wildlife and special-interest.
- Education of young agricultural scientists to gain a holistic understanding of food agriculture and farming, particularly those entering research.
- Discourage the use of genetically modified crops and livestock until they have been independently evaluated and shown to be economically valuable.
- Legislation to change patenting laws to exclude species used for food production, thus preserving the traditional intellectual property rights of farmers.

The year 2014 is designated as the Year of the Family Farm with major focus on targeted empowerment and Green Agriculture with the aim of feeding billions more people. Small-scale family farm can produce much more food to feed 10 billion people. Leaders in government, business and science need to recognise that large-scale and small-scale farming each have major contributions to make and need to be harmonised.

### Short biography - Professor Dr. John Hodges

Professor John Hodges is an animal geneticist. He taught at Cambridge University and was Professor of Animal Genetics at the University of British Columbia, Canada. Earlier he worked in agribusiness in the UK as Head of Production Division of the Milk Marketing Board. Later, with the UN Food and Agriculture Organization (FAO) in Rome he directed genetic improvement of livestock in the developing world and also started the UN programme for conserving endangered breeds. He took part in drafting the Convention on Biodiversity. Subsequently he worked under contract for the European Union in Central and Eastern Europe assisting governments to prepare their agricultural sector for accession to the EU. He has degrees in Agriculture, Animal Production and Genetics from the UK and in Business Administration from the Harvard Business School.



Currently he is an author and speaker on Genetics and Ethics in Agriculture, Food and the Environment and lives in Austria. He is a committed follower of Jesus, and derives his ethical understanding and values from the Bible. Email: [hodges.chalet@gmail.com](mailto:hodges.chalet@gmail.com)

### References

- [1] Braun, Joachim von, & Torero. 2013. Food price volatility and food security. Workshop by German Federal Ministry of Economic Cooperation and Development, BMZ, and International Food Policy Research Institute, IFPRI. [www.ifpri.org/sites/default/files/publications/oc72a.pdf](http://www.ifpri.org/sites/default/files/publications/oc72a.pdf)
- [2] IAASTD. 2009. Agriculture at a crossroads. International Assessment of Agricultural Knowledge, Science and Technology for Development. Global report, Island Press, Washington DC. Also: [www.agassessment.org](http://www.agassessment.org)
- [3] FAO, 2010. World census of agriculture, 2000. FAO, Rome.
- [4] Spenser, D. 2002. The future of small farms in Sub-Saharan Africa and S. Asia: Wither the small farm? In: Sustainable food security for all by 2020. IFPRI, Conf. Bonn, Germany. [www.ifpri.org](http://www.ifpri.org)
- [5] Devendra, C. 2010. Small farms in Asia. Academy of Sciences Malaysia. 175 pp.
- [6] Pearce, F. 2012. The Land Grabbers: the new fight over who owns the earth. Beacon Press, Boston.
- [7] IFPRI. 2009. International Food Policy Research Institute. Measuring the economic impact transgenic crops in developing agriculture during the first decade: Approaches, findings and future directions. Food Policy Review 10.
- [8] Tudge, C. 2013. Seven obvious questions about GMOs. Campaign for real farming. UK.
- [9] Wibberley, E. J. 2011. Managing towards fairer international agricultural trading, (FIAT). pp. 287 – 299. Vol 2. In: thriving in the global market, innovation, cooperation and leadership. 18th World Congress International Farm Management Association New Zealand.

- [10] Pretty, J, Toulmin C, Williams S. 2011. Sustainable intensification in African agriculture. *International Journal of Agricultural Sustainability*. 9(1) pp 5-24.
- [11] Pretty, J., C. Brett, D. Gee, R. Hine, C. F. Mason, J. I. L. Morrison, H. Raven, M. Rayment and G. van der Bijl. 2000. An assessment of the total external costs of UK agriculture. *Agricultural Systems* 65. (2), 113-136.
- [12] Royal Society, The. 2010. Food waste within food supply chains: qualifications and potential for change. *Philosophical Transactions of The Royal Society: Biological*. B27. 365. No. 1554. 3065-3081.
- [13] FAO. 2011. Save food: extent, causes, prevention. Otterdijk, R. van & Metbeck, A. FAO, Rome, Italy.
- [14] Galbraith, James K. 2012. Inequality and instability: a study of the world economy just before the great crisis. 336 pp.
- [15] Stiglitz, J. P. 2002. Globalisation and its discontents. Penguin, London.
- [16] Stiglitz, J. P. 2012. The price of inequality: how today's divided society endangers our future. Norton.
- [17] Hodges, John. 2005. Cheap food and feeding the world sustainably. *Livestock Production Science*, 92. 1 – 16.
- [18] CGIAR. 2013. Re-imagining agricultural research in development. Consultative Group on International Agricultural Research. [www.cgiar.org](http://www.cgiar.org)
- [19] Heap, R.B. & Bennett, D.J. (Eds.) 2013. Insights: Africa's future – can biosciences contribute? Bamson/B4FA.
- [20] Sandel, M. 2012. What money can't buy: the moral limits of markets. Allen Lane, London. 244 pp.