

CHAPTER FIVE

THE VOLATILITY OF THE AGRICULTURAL MARKETS AND THE WORLD FOOD CRISIS

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ABSTRACT

The paper analyzes the main causes of strong and sudden increase in agricultural prices and food prices in the first half of 2008 that caused food crisis, which was complex, multifactorial and not cyclical. After that, significant price reductions on 2009 and part of 2010 have taken place and again price increased strongly from August 2010 until July 2011. This situation supports the view of a strong agricultural price volatility, which is one of the problems concern to the international community, as evidenced by the fact that the G-20 considered the issue of agricultural market volatility and its impact on the global food crisis as one of the key themes in 2011 under the French Presidency. Structural causes of the high volatility and particularly strong and price spikes, particularly the supply-demand imbalance and climate change, mean that humanity faces a challenge of long-term food supply, which can only be solved through innovation and technology adoption, increased agricultural investment, design and implementation of appropriate agricultural policies and a new global governance for food and agriculture.

Key Words:

Food security, food crisis, price volatility, agricultural investment, agricultural policy.

■ THE GLOBAL FOOD CRISIS OF 2007-2008

The global food crisis began in late 2007 as a result of soaring food prices. The spectacular rise in food prices posed a serious problem for consumers, particularly for the more vulnerable households in developing countries whose food expenditure represents between 60 and 80% of total household expenses⁽¹⁾. But the increase in agricultural prices also represents a great opportunity for agricultural producers, although it is usually only the producers in the most developed countries and commercial farmers in developing countries who are capable of taking advantage of high agricultural prices, as in fact occurred in 2007-2008⁽²⁾. Although from July 2008 world food prices began to fall, they never returned to their previous levels, and in many countries -particularly the poorer ones- food prices did not decline with the same intensity as international prices⁽³⁾. The rise in food prices was compounded by the financial and economic crisis which began at about the same time, and took a turn for the worse in the summer of 2008. The economic downturn led to a reduction in the employment and income of the most vulnerable populations in developing nations and caused serious problems of economic access to food in poorer households, and thus serious problems of food security. The conjunction of these two crises caused an acute increase in the number of people suffering from hunger all over the world, which went from 850 million in 2007 to 1.02 billion by the end of 2009. The return to the path of economic growth in emerging countries and the continuation through 2009 and a large part of 2010 of prices below 2008 levels explains the decline in the number of people suffering from hunger to 925 million in 2010⁽⁴⁾. However, the food crisis not only affected the number of people in the world who suffer from hunger, but also increased the cost of importing food for low-income countries and net food importers, which led to major imbalances in their balance of payments, a rise in public debt in order to finance their food imports and an increase in public expenditure on subsidies for staple foods in order to quiet social unrest.

■ The Nature and Causes of the Global Food Crisis

The 2007-2008 global food crisis marked a new stage in world food insecurity and was quite different to previous crises⁽⁵⁾. The current world food crisis can be defined by three main characteristics: it is global, multifactorial and long-lasting. As we will see later, the complex nature of the current food crisis was at the root of the considerable difficulty that governments and international

⁽¹⁾ FAO. The state of food insecurity in the world (2008a).

⁽²⁾ FAO. The state of food commodity markets (2009a).

⁽³⁾ Ibidem.

⁽⁴⁾ FAO. The state of food insecurity in the world (2010).

⁽⁵⁾ It is necessary to go back to 1972, with the USA's soy and maize embargo of the USSR, which had lost a large part of its harvest, to find a price rise of the same magnitude, and in that case it was more a specific market crisis due to geopolitical reasons that disappeared in the following campaign when the agricultural production in the USSR returned to its normal levels.

institutions experienced in tackling the crisis and alleviating the negative impacts on world food security. Some of the factors involved in the crisis can be addressed by governments, whilst others are more volatile and beyond their control, being market-driven akin to oil prices.

- *Global crisis*

The current crisis is global in the sense that what occurs in some countries (economic development, increase in per capita income, the urbanisation process, increase in the demand for agricultural produce, changes in diet, and the various economic, commercial, agricultural, environmental and energy policies adopted) affects many others due to the phenomenon of globalisation and the interdependence of the global economy in recent years.

Nonetheless, the globalisation of the global economy does not mean only spatial interdependence, but also sectorial interdependence. In fact, the food crisis is a clear example of sectorial interdependence with the energy and financial sectors. The food crisis that began in 2007 and worsened in 2008 cannot be understood without considering the effects of the energy crisis and the financial crisis on the international agricultural and food markets.

The relationship between the energy crisis and the food crisis occurs in two ways. The first is cost inflation. In fact, the prices of some of the primary means of production used in agriculture, such as fertilisers, plastics, herbicides, insecticides, diesel oil, transport depend largely on oil prices. In this way, a rise in oil prices ultimately leads to an increase in the cost of food due to higher agricultural costs caused by the substantial rise in the price of oil.

The second is the production of biofuels⁽⁶⁾, since as the price of oil increases, the production of biofuels from agricultural products becomes economically viable⁽⁷⁾ or else the subsidies designed to make it so are significantly reduced. This leads to an increase in the amount of agricultural commodities that are dedicated to non-food uses, thereby reducing the food supply and forcing a rise in food prices⁽⁸⁾.

The relationship between the economic and financial crisis and the food crisis is also clear. In this sense, the macroeconomic imbalances in the United States, with a strong balance of payments deficit and the policy of extremely low interest rates followed by the Fed, caused the value of the dollar to fall steeply, which affected international agricultural trade flows and contributed to a rise in agricultural

⁽⁶⁾ See the article *Food for Fuel* (DASCHLE, FORD RUNGE and SENAUER, 2007).

⁽⁷⁾ For the relationship between the prices of agricultural commodities and oil prices and the threshold which makes the production of biofuels profitable -in particular maize for the production of ethanol in the USA- see the work of *Tyner et al, 2008* and the study by the International Monetary Fund in 2008.

⁽⁸⁾ See the article by Medina in that same issue which explores in-depth the relationship between food security and energy security.

commodities prices. Furthermore, the housing and financial crisis of 2007 meant that a large amount of money that had previously been deposited in real estate and financial assets was displaced to other markets, in an attempt to flee the dismal profitability forecasts and the uncertainties of financial assets. Thus large volumes of funds ceased to be invested in financial products and were diverted to the futures markets and agricultural commodities exchanges, where prices were already undergoing a clearly upward trend. This in turn led to a considerable increase in the international prices of the main agricultural products, and particularly cereals.

There has been considerable debate as to the role played by speculation by institutional investors and by investment and pension funds⁽⁹⁾ (not traditional commodities traders in the futures markets and grain exchanges) in the steep rise in the international prices of cereals and oilcrops. The main problem from an analytical point of view is to determine the causal link. The question is the following: is it the high price of agricultural commodities that causes funds which were previously invested in other assets to move towards the futures and options markets for agricultural commodities, or is it the diversion of funds from financial assets to the trade in agricultural commodities futures and options that provokes the rise in the prices of the agricultural commodities? A recent research project⁽¹⁰⁾ determined -albeit inconclusively- that it was the first. However more information and research is required into this subject before any conclusions can be drawn as to the responsibility of the speculation in the agricultural commodities markets and exchanges for the steep rise in international agricultural prices. In any case, what is certainly a proven fact is that in the period between 2006-2008 there was a notable increase in non-traditional traders in the agricultural commodities markets, such as investment and pension funds, who took long-term positions in the futures and options markets for cereals and oilcrops. Specifically between 2006 and 2008, non-traditional traders doubled their participation in the futures and options market for maize, wheat and soy, and in the first nine months of 2007 alone, the trading volume of futures and options increased by 30% (FAO, 2008 b)⁽¹¹⁾.

- *Multifactorial crisis*

One of the features that best defines and helps to understand the complexity of the current world food crisis is its multifactorial character; that is to say, there is no one single factor which explains the crisis, but rather it is a crisis caused by multiple factors which at times interact. In the previous point we have already mentioned some of the factors involved in the interrelation between markets, such as the increase in the price of oil, the intensification of the policy for the promotion of biofuels, the devaluation of the dollar and speculative financial

⁽⁹⁾ For a thorough analysis of the relationship between financial investments and agricultural prices see the article by DOMANSKI and HEATH, 2007.

⁽¹⁰⁾ Irwin, García and Good, 2007.

⁽¹¹⁾ For an in depth analysis of the relationship between the evolution of the grain futures markets and international food prices see the FAO publication entitled «Food outlook. Global market analysis» corresponding to November 2008 and December 2009.

movements. These factors could be defined as exogenous to the agricultural and food sector, and their characteristics are more closely associated with other crises such as the energy crisis, the economic crisis and the financial crisis.

In addition to these factors, there are others which could be considered to be endogenous to the agricultural and food sector, and which in some cases have a more structural nature. These include poor harvests due to natural disasters and adverse climate conditions, the increase in the demand for food in developing countries, and particularly in what are known as the emerging countries (China, India, Indonesia, Korea, Thailand, Brazil, Mexico), and the result of both phenomena combined -a reduction in supply and an increase in demand- which is the constant reduction of the level of stocks in the last ten years.

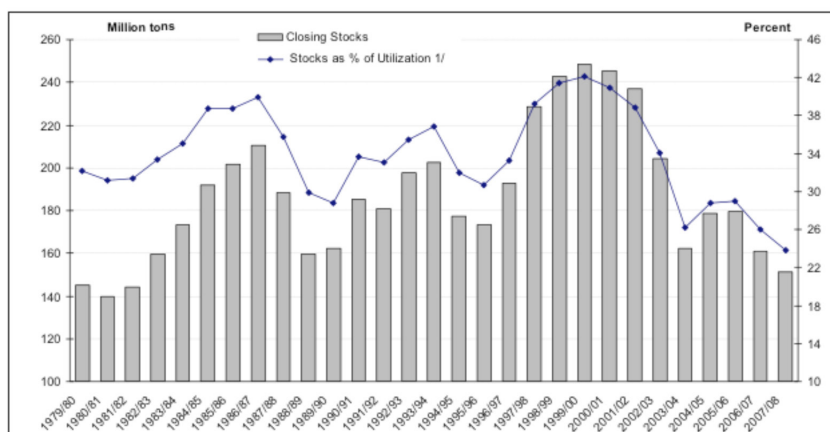
One of the elements that has triggered the rise in agricultural prices has been the decline in cereal production in exporting countries due to adverse climate conditions, which began in 2006 and continued in 2007, and involved a drop in production of 4% and 7% respectively (FAO, 2008). Poor harvests were observed in 2007 due to drought in countries such as Australia, Ukraine and Argentina, but these were offset by increases in production in the United States and the European Union; whereas in 2008, in response to high prices, cereal production increased by 11% in developed countries and by only 1% in developing countries, confirming fears that only farmers in developed countries and a small minority of farmers in developing countries would be capable of reacting to high agricultural prices by increasing their supply. The cause of this situation is that poor farmers in developing countries have no access to land and water, nor can they increase their use of certified seeds or fertilisers to boost production owing to their lack of financial resources, to structural deficiencies in the markets for seeds, fertilisers and other production resources, and -in some cases- even to the lack of availability of these same production resources.

The most important variable, however, was not so much the evolution of agricultural supply as that of agricultural demand, as a result of the sustained and cumulative increase in the last ten years in the demand for agricultural commodities in developing nations, and primarily in emerging countries. This increase has occurred as a consequence of the substantial and sustained rates of growth in these countries, the increase in per capita income and the elevated elasticity of the demand with regard to per capita income. But there has not only been a rise in the volume of food demanded; there has also been a change in dietary habits and thus the composition of food demand, with an increased proportion of meat, milk and eggs, which in turn has boosted the demand for the cereals, fodder and oilcrops that form the basis of cattle feed.

The result of the evolution of the supply and demand of agricultural commodities is that the gap that existed in the 1980s and 90s -the surplus of supply over demand- gradually narrowed until it practically disappeared in 2007, a year in which stocks

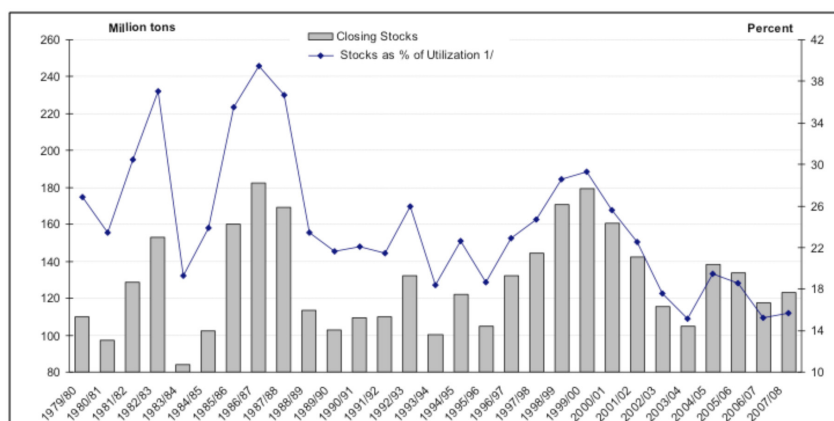
fell to their lowest levels in the last 25 years (graphs 1 and 2). In the opinion of many experts, this constitutes the primary cause for the sharp increase in agricultural prices in 2007 and the first half of 2008. In fact the level of stocks plays a key role in balancing the markets and in mitigating the oscillations in international agricultural prices. If the level of stocks is low in relation to total use, the markets have great difficulty in absorbing a sudden shock in supply or demand, and therefore any drop in supply due to natural disasters and/or adverse climate conditions, or increases in demand, will provoke a sharp increase in agricultural prices, as was the case in 2007 and 2008. In fact, as can be seen in the following graph, the stock-to-use ratio for the main cereals fell to its lowest values in the last 25 years.

Figure 1 – Stocks to utilization ratio for wheat (1979/80-2007/08)



Source: FAO 2008 b

Figure 2. Stocks to utilization ratio for maize (1979/80-2007/08)



Source: 2008 b

Apart from a greater recurrence of natural disasters and adverse climate conditions, droughts, frosts, floods, hurricanes and other phenomena, which many experts link to climate change, certain modifications have been introduced in the agricultural policies of developed countries and some developing countries after the Uruguay Round Agreement; this has led to a sharp reduction in the levels of stocks in the main exporting countries. The volume of cereal reserves maintained by public institutions has been drastically reduced as a consequence of the elimination of intervention purchases by these same institutions, the high cost of storing agricultural produce, the development of other less costly risk management instruments than the policy of regulatory stock, the increase in the number of countries with an export capacity, and the advances in information and transport technology. When there are several poor harvests in a row in the main exporting countries-as a consequence of climate phenomena, a reduction in the planting area for a particular crop, or other reasons- in a situation of low stock levels, the international markets hold back and become highly volatile so that any sudden shock in supply or demand is rapidly and strongly transferred to the prices of agricultural commodities. According to many experts this is one of the main causes for the soaring agricultural prices in 2007 and early 2008.

148 | However, the major world economic recession of 2008 and 2009 and the drop in the income of poorer families has led to a decline in the demand for food and a contraction of global trade which, together with the increase in world agricultural production in 2008 (record harvests) and in 2009 (albeit to a lesser degree), has meant lower agricultural prices globally and in developed nations. Thus, at the present time, high agricultural and food prices in many developing countries coexist with low prices in developed countries, as in the case of the countries of the European Union, where farmers are mobilising in order to maintain farm subsidies.

The last factor that explains the recent steep price rises in the period from March to July 2008, when the international agricultural markets reached record historical highs, involve the defensive public policies followed by some countries since early 2008 in order to defend their domestic consumers. In fact, when the panic took hold of consumers (it is worth recalling how American consumers stockpiled rice around this time, leading to several supermarket chains placing limits on the amount of rice a person could buy) or governments, who began to prohibit, limit or tax agricultural exports, prices shot up and went out of control. For example, in March 2008 and after the limitation on rice exports introduced by several of the main exporting countries, the global price for rice increased by 75% in just one week (FAO, 2008b). Nevertheless, these factors have a temporary effect and when the gravity of the situation subsides, these measures are gradually relaxed.

- *Structural crisis*

One of the most inflamed debates on the nature of the global food crisis concerns the issue of whether it is interim and transitory or permanent or, at least, long-lasting. Most experts and analysts have reached the conclusion that this is not a transitory or short-term crisis like the one in 1972-73, when agricultural grain prices rose exorbitantly due to the shortfall in the harvest in the USSR and other countries and the embargo on maize and soy exports implemented by the main exporter, the United States. Most studies predict that we have entered a phase of high agricultural prices which will last a minimum of five to seven years. There are two main arguments supporting the hypothesis that this is a long-term crisis. This is an issue of considerable importance, as the combination of measures to be adopted in order to tackle this crisis will be different depending on whether this is an interim and temporary situation or whether it is more structural.

The first of the variables to defend the thesis that we are in the presence of a long-term crisis is the low stock levels, the lowest in 25 years. In fact, to recover an acceptable volume of stocks and attain an adequate stock-to-use ratio is not something that can be achieved in one agricultural campaign, but requires various campaigns and sustained growth in agricultural production, which is no easy task. The second variable to explain the persistence of the global food crisis is the demand for food, since the increase in demand can be expected to continue in the medium and long term, and with a high rate of growth, as a consequence of population growth and the increase in per capita income in developing countries.

However, international cereal and oilcrop prices began to fall in July 2008. The drop in world prices for primary agricultural commodities was due to the exacerbation of the international economic and financial crisis which negatively affected the economic growth rates in a number of countries, even in certain developed countries with negative rates, with the resulting impact on the decline in food demand, a sharp fall in the price of oil, and the drain of capital from the futures and options markets. This new situation reignited the debate on whether the global food crisis was interim or structural, with some experts even considering that the crisis had already been overcome and that a new period of low agricultural prices was about to begin.

However, most experts and international organisations, led by the FAO, considered that it was too early to speak of the end of the global food crisis. In the first place, because although it is true that prices had been falling since August 2008, the levels were still higher than the average prices for the period 2005-2007. Secondly, because although international prices had dropped noticeably, the mechanisms whereby international prices are transmitted to

national and local prices are not immediate or effective, causing food prices to continue to remain very high in many developing countries. Thirdly, because stocks were very low, so that any shock in supply, or a reduction in planting as a result of the fall in agricultural prices, particularly in developed countries, could trigger another rise in prices in 2009. Finally, developing countries and particularly emerging countries returned to a path of healthy economic growth rates in 2010, so that the demand for food once again began to increase strongly in those countries. It was thus that in August 2010, as a result of the poor wheat harvest in the Russian Federation and the Ukraine caused by drought and fire, the ban on wheat exports by these major exporting countries and the low maize harvest in the United States at the end of 2010 set off a new food crisis as a consequence of soaring prices from August 2010 to August 2011, when they began to decline slightly until December 2011, although they still remained high. In January and February 2012 international agricultural prices have once again recovered their upward trend. This evolution of international agricultural prices, and particularly cereal grains and oilcrops, confirms the thesis of the experts and organisations such as the FAO, who in 2008 predicted that this was a structural crisis and not an interim and transitory situation⁽¹²⁾.

■ Lessons from the Global Food Crisis

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The present crisis leaves us with a series of lessons that we will attempt to summarise below. The first and most important is that there is an absence of global governance or adequate mechanisms for tackling a global food crisis of the kind we have undergone and are currently experiencing. The global economy and the markets have become globalised, but no global monitoring and coordination mechanisms have been created, nor have the necessary international regulations been established to prevent or at least to tackle this type of crisis when it occurs. The powerlessness of the United Nations and other international organisations such as the World Trade Organization to establish some rules of the game or international regulation in the matter of international agricultural trade, or to obtain international agreements on biofuel policies, the possible creation of global grain reserves, and -in a general manner- public policies, reveals the need to rethink the institutional architecture and the global governance of agriculture and food.

In fact one of the proposals that was presented at the Conference of Rome and which was then discussed at the meeting of the G-8 in July and again at the High-Level Conference in January 2009 held in Madrid, is the creation of a Global Alliance on agriculture and food which, in addition to governments and international agencies, will involve the participation of civil society and the private sector. Agriculture is a private economic activity, and thus to tackle the world food security crisis decisively requires not only the commitment of the

⁽¹²⁾ For the evolution of international agricultural prices, see the FAO publication entitled *“Food outlook. Global market analysis”* of August 2012.

public sector, but also the participation of the private sector and civil society. This Global Alliance would play a key role in the international coordination of public policies which affect food security (agricultural policies, trade policies, biofuel policies and others), as well as promoting a medium and long-term increase in public and private investment, official development aid, and the agriculture and food security of developing countries. It would serve as a forum for discussing the approval of international regulations on sensitive issues which affect world food security, such as international grain reserves, for example.

A second lesson is the lack of financial instruments for immediate response when beset by the most pressing and immediate effects of a food security crisis such as the one experienced. Indeed the United Nations has various financial mechanisms to respond rapidly in the case of natural or humanitarian disasters, but there is no type of mechanism or instrument when the cause that provokes the food crisis is a market shock, as in the case of the 2007-2008 food crisis. There is currently a discussion under way on the possibility of creating a fund with these characteristics, or of extending one of the already existing funds, and various financial options are being debated in order to enable the mobilisation of resources in the short and medium-term for the purpose of stimulating an increase in food production.

This crisis has also highlighted the multiplicity of causes and its complex nature which have made it so difficult to tackle. There is a lack consensus on the primary causes of the crisis, the remedies to be applied, and the public policies to be followed. Issues so seemingly far removed from agriculture and food as the housing crisis, the energy crisis, financial speculation or climate change affect world food security, and it is therefore necessary to set up multidisciplinary groups of high-level experts and networks of research institutions to improve our knowledge of this type of crises, both with regard to their causes, and the remedies and policies to be enacted to avert or resolve future crises of this kind.

In every crisis there are always opportunities, and the international community reacted positively in this crisis, albeit not as quickly as might have been hoped. Today, governments and society in general are much more aware of the problem of hunger, and this will ultimately bear fruit. Today there is no world summit at which the hunger and food crisis is not a topic for discussion. This implies a social awareness which will certainly lead to policy changes and additional financial resources in order to combat hunger. Another positive element that became clear from the FAO conference in June 2008 is that agriculture and food security have returned to the international agenda after many years in the wilderness. Finally, it is worth pointing out the fact that the international agencies that make up the United Nations and the Bretton Woods system have succeeded in working together in a coordinated manner. This has been another

important result of this crisis and an opportunity which has been maximised under the leadership of the Secretary General of the United Nations.

The final conclusion is the need to abstain from implementing only short-term measures as a means of fighting against the crisis. In fact, given that the crisis is not transitory but long-term, the only approach is to use a combination of short, medium and long-term measures, and to integrate these measures into national strategies and policies on food security.

■ THE VOLATILITY OF THE AGRICULTURAL COMMODITIES MARKETS

■ The Increase in the Volatility of the Agricultural Markets and its Effects

The volatility of the agricultural markets is nothing new for agricultural economists, but is a characteristic that is inherent in the agricultural sector which has to do with the elasticities of agricultural supply and demand, the lag between the decision to plant and the time the crops are harvested, the variability in harvests as a consequence of the variation in the climate conditions in each campaign, and other factors. Developed countries implemented agricultural policies such as market intervention (and even price guarantees in certain cases), direct aid to production, protection at the borders and export subsidies and/or food aid, which succeeded in reducing the volatility of agricultural prices -at the expense, of course, of exporting the volatility to the rest of the world.

However, since 2007 the volatility of the agricultural markets has increased significantly⁽¹³⁾, with episodes of sharp rises in the period from November 2007-June 2008 and August 2010-June 2011 and major falls in the period from July 2008-July 2010. The negative effects of high volatility are multiple and vary depending on the actors involved in the food chain. In the short term it offers an opportunity for producers to improve their profits, an opportunity which experience shows is only exploited by farmers in developed countries and by commercial producers in developing countries, but which also creates uncertainty in the medium term leading to sub-optimal decisions with regard to agricultural investment. For consumers in low-income countries and net food importers it represents problems for economic access to food, and thus greater food insecurity. For the governments of poor countries it creates serious macroeconomic imbalances due to the increase in the cost of food imports, lower income due to the reduction of tariffs, and higher expenditure due to subsidies for agricultural production means and/or foodstuffs. And for international bodies, particularly those responsible for food aid, it represents enormous problems, as against a backdrop of serious food insecurity, they

⁽¹³⁾ For a more detailed analysis on the causes of the rise in agricultural prices see *Leipziger, 2008, Mitchell, 2008 and OECD 2008*.

must reduce the number of people they can help as a consequence of the sharp rise in agricultural prices, unless donors provide additional contributions to offset the rise in food prices, which does not always occur⁽¹⁴⁾.

■ International Action to Reduce the Volatility of Agricultural Markets

In view of the above, it is not surprising as a result that the G-20 summit held in Seoul in November 2010 approved a multi-year plan for development including a chapter on agriculture and food, which discusses the issue of the volatility of agricultural markets. It is less surprising that France, a country with a long farming tradition, and which held the presidency of the G-20 in 2011, chose the issue of volatility as the central theme of the G-20 that year. At the request of the G-20, the international bodies, particularly the World Bank, the OECD and the FAO, drew up an analysis of the problem of the volatility of agricultural prices and presented a series of proposals to reduce this volatility⁽¹⁵⁾. These proposals were subsequently debated by the meeting of the agriculture ministers of the G-20 in June 2011, and finally approved at the G-20 summit of November 2011. The measures approved at that summit focused on improving information and intelligence systems for agricultural markets⁽¹⁶⁾, improving information, and establishing regulation for the futures markets, introducing a system of notification, justification and monitoring before the WTO for restrictions on agricultural exports, a commitment to advances in the Doha Round under way with regard to the deregulation of the international agricultural commodities trade, exemptions from measures restricting exports in the case of purchases by international bodies for food aid, support for instruments of market risk management, including agricultural insurance, and stimulating increases in agricultural productivity. In contrast, they were unable to approve any commitment to eliminate obligatory mandates for the use of biofuels and/or the subsidies for its production from cereals and oilcrops or its consumption; nor did they consider the establishment of an international stock management system, either physical or virtual -not even for emergencies- due to the problems of management, the high cost, and doubts as to its effectiveness. However they did approve an upgrade in real-time information on existing stocks in the world, as part of the commitment to improve the information and intelligence on the agricultural markets.

⁽¹⁴⁾ In the 2008 food crisis the World Food Programme (WFP) had to appeal to the international community to increase its resources by 1.5 billion dollars, of which they achieved only 60%, in order to offset the rise in the price of the food needed for its programmes. The restrictions on rice exports which caused the price of rice to soar in March 2008 were also applied to the purchases of the WFP, which aroused serious criticism from the international community and became one of the primary demands of the High-Level Group set up by the SG of the UN in April 2008 in order to coordinate the actions of all the agencies in the United Nations system.

⁽¹⁵⁾ For more details on the proposals of the international agencies to the G-20, see the publication *Price Volatility in Food and Agricultural Markets: Policy responses March 2011*

⁽¹⁶⁾ Specifically, it approved the creation of the AMIS (Agricultural Market Information Systems) as an inter-institutional system formed by the various international agencies that work in this field, whose secretariat is at the FAO.

The question that arises is: which of these measures is the most decisive and can contribute most to reducing the volatility of the agricultural markets, and therefore to reducing the negative effects of this volatility, particularly on vulnerable consumers in developing countries, or -in other words- on the food crisis suffered by the world since 2008 and which has led to a situation where the number of people living under minimum levels of nourishment has gone from 850 million to almost 1 billion? But before we can answer this question we need to ask what are the primary causes underlying the increased volatility of the agricultural markets. This we will do in the following section.

■ Causes of the Increased Volatility in the Agricultural Markets

One of the great debates amongst agricultural economists in recent years has been whether the deregulation of the agricultural commodities markets approved at the Uruguay Round would increase or decrease their volatility⁽¹⁷⁾. However in spite of numerous studies, a clear conclusion has yet to be reached on this issue. What is clear, however, is that prior to deregulation there was less volatility in agricultural commodities markets in developed countries, thanks to the protectionist policies enacted since the 1960s⁽¹⁸⁾, although the same cannot be said of developing countries, or of the volatility in international agricultural markets. In contrast, critics of deregulation consider that it has led to an increase in volatility in the agricultural commodities markets, although many of these critics come from the developed world, which has powerful and protectionist agricultural policies. In a global economy (and whether we like it or not, globalisation is here to stay), it is evident that the lack of deregulation existing in the international agricultural commodities trade is one of the causes of the volatility on international markets. For this reason it is understandable that the undertaking of the G-20 summit to reduce volatility included a commitment to conclude the Doha Round in order to reinvigorate the deregulation of the international agricultural commodities trade.

Beyond this academic debate, however, it is worth posing the same question in view of the situation during the crisis of 2007-2008, when the price of staple foods rose between 50 and 100% in a few short months. There is a divergence with regard to the relative importance of each factor in explaining these steep price rises, but there is total consensus as to the underlying factors, and even as to the distinction between the primary and secondary causes. The crucial and originating factor explaining the increase in the volatility on agricultural markets is that since the year 2000, and as a consequence of the rapid growth of emerging countries such as Brazil, China and India (demand), and a decline in agricultural investment in developing countries (supply), the demand for food

⁽¹⁷⁾ For an analysis of the effects of the deregulation of international agricultural trade on the volatility of agricultural prices, see the work of *Trostle 2008*.

⁽¹⁸⁾ For an analysis of the volatility of prices in the agricultural markets in developed countries and in particular in the EU, see the article by *Cramon-Taubadel, 2009*.

has grown faster than its supply, to the point where the minimum historic levels of global grain stocks were reached in 2007. This is true for cereals for human consumption, but even more so for cereals for animal fodder. The increase in per capita income in emerging nations has not only boosted demand for food, but has also led to changes in diet, with an increase in the consumption of animal products, leading in turn to greater demand for fodder cereals, oilcrops and protein crops. The gap between supply and demand is so narrow and the levels of stocks are so low that there is not much room for manoeuvre. This means any climate event that reduces the harvest in a major producing country -as occurred in Australia (wheat) and Argentina (soy and wheat) in 2008 or Russia (wheat) and the USA (maize) in 2010- can trigger steep and very rapid price increases (soaring prices). The increase in the recurrence of extreme climate events due to climate change, and the shocks in supply they produce have played a part in exacerbating the volatility of agricultural prices.

Financial speculation in the futures markets and the increase in the demand for grain to produce biofuels, due to their profitability in a climate of high oil prices or due to legal mandates in response to environmental concerns, have also affected the rise in prices, but should be considered as secondary causes or factors accompanying the original factor mentioned above. Finally, once the crisis, caused by reduced harvests in various major producing and exporting countries, as a result of drought, or other climate phenomena, is under way, the ensuing panic leads governments to adopt certain measures such as restrictions or even bans on exports, which ultimately aggravates the crisis. This also highlights the lack of mechanisms for the coordination and convergence of policies and systems of global governance -a subject discussed below- in order to prevent and avert this second crisis wave caused by these defensive and hastily enacted policies. We have already mentioned the case of rice (a staple foodstuff for 2 billion people) which in April 2008 saw its international prices shoot up by 70% in one week due to the prohibition on rice exports adopted by three of the world's five main rice-exporting countries. Other countries decided on hasty purchases in the grip of panic when faced with the prospect of a rice shortage, which were later seen to be unnecessary when the markets settled down after a few months, and contributed to aggravating the food crisis of 2008.

Therefore the main measure, although not the only one, for reducing the volatility of the agricultural commodities markets is to increase the supply of food, and in order to do so it is necessary to boost agricultural production and productivity. In this aspect the experience of the crisis of 2008 is far from encouraging, as although the supply of agricultural produce reacted to trading signals, it did so very unevenly. Thus, although developed countries increased their production of cereals by 10% in response to the high cereal prices, in developing countries the increase was only 1% due to the inability of poor and

smallholder farmers in these countries to increase their agricultural production due to lack of land and water, lack of financing for purchasing certified seeds and pesticides, fertilisers, fuel and fodder, lack of training, lack of transparency in the markets for agricultural inputs and other factors. And in view of the fact that the imbalance between supply and demand is the primary cause of the increasing volatility of the agricultural markets and of world food insecurity, and that for the future the great potential for the increase in world agricultural production lies not in developed countries but in developing countries, there are reasonable doubts as to the future of the volatility on agricultural markets and global food security, which will be analysed throughout the rest of this article.

■ THE CHALLENGE OF FEEDING THE GLOBAL POPULATION IN 2050

Mankind has always lived under the threat of the Malthusian prophecy, which predicted that the population would grow exponentially while food production would grow linearly, and the time would come when there would be insufficient natural resources on the planet to feed mankind. Today, this prophecy has not come about fundamentally for two reasons. The first is that the demographic policies of the most populated countries of the world, and particularly in the aspect of birth control, have succeeded in slowing the demographic explosion of the first half of the 20th century. The second is that the technological revolution in agriculture has enabled crop and livestock yields to increase more than linearly in the second half of the century. Examples of that revolution include the member countries of the European Economic Community, which in the 1960s had a deficit in almost all agricultural produce, and in only 20 years following a highly protectionist agricultural policy which made it profitable for the wholesale application of new agricultural technologies, went to a situation of surpluses in all basic products such as cereals, milk, meat, oils, wine and other products, which had to be given outlet through extremely expensive export subsidies. But there are also examples of productive successes in developing countries, and it is perhaps the case of India that best illustrates the success of the green revolution which has enabled crop yields to be multiplied three- or fourfold and the milk and meat production yield to be increased. This has been a decisive factor in the country's development and the elimination of famine in a country with 1 billion inhabitants.

Although the demographic explosion has slowed thanks to the intervention of birth control policies in the most populated countries in the world, in 2050 global population will reach a figure of 9.2 billion inhabitants, an increase of 35% over the current population. Most of this increase in population will occur in developing countries. The urban population will represent 70% of

the total, compared to 49% today, and the per capita income will rise sharply in developing countries. In order to satisfy the increased demand for food in an ever-growing, more urban and more prosperous population, it is estimated that global food production will need to increase between now and 2050 by 70%, and to double in developing countries. This is the great challenge facing mankind for the future⁽¹⁹⁾.

■ The Challenges Facing World Agriculture

The pressure of the demand for food from an expanding world population will be aggravated in the coming decades by the impact of climate change on agricultural productivity -particularly in the countries in sub-Saharan Africa-, the degradation of natural resources, soil, water, forests and fisheries, and the increase in the use of agricultural commodities for the production of biofuels. According to the conclusions of a meeting of international experts held at the FAO headquarters in October 2009⁽²⁰⁾, 90% (80% in developing countries) of the increase in food production will come from an increase in crop yields, and only 10% (20% in developing countries) will come from an increase in land under cultivation, given that there has been a considerable expansion of agricultural boundaries in recent decades, and land is now limited; further, this also poses vast challenges and produces serious environmental problems⁽²¹⁾. The uneven evolution of global population and the total area of arable land means that the arable land per inhabitant will decrease from 4.3 ha in 1960 to 2.6 ha in 2010 and 1.5 ha in 2050. Therefore, and given that there are clear limits to the expansion of the agricultural boundary and the increase in the area under cultivation, in order to feed the global population, each hectare will have to produce more food than it does today, against a backdrop of scarce resources, particularly water and land, and climate change, which represents a major challenge for agriculture. The bad news is that the average growth rates of world agricultural productivity have gone from 3% in the 1960s to only 1.4% in the first decade of the 21st century, and it is estimated it will fall below 1% in the 2050s. Furthermore, and after the lessons learnt from the technological revolution of the second half of the 20th century, and particularly from the green revolution and its negative impacts on the environment and on natural resources, the rise in agricultural productivity must be achieved by means of agricultural systems and practices which ensure that the increase

⁽¹⁹⁾ [How to feed the world in 2050](#). International conference organised by the FAO in Rome. October 2009, where a group of international experts analysed and debated for three days the primary challenges facing agriculture in its quest to feed mankind in 2050.

⁽²⁰⁾ [Ibidem](#)

⁽²¹⁾ In a recent study on the possible extension of crop lands in the world, three scenarios were considered based on the information from two international databases (GAEZ and SAGE); these scenarios were much more expansive than the one considered by the experts gathered at the FAO in the international conference mentioned above in October 2009. However these scenarios only take into account soil data and the suitability of lands for cultivation, without considering economic and social criteria (Roudart and Even, 2010).

in food production is compatible with the conservation of natural resources, the mitigation of climate change and with economic and environmental sustainability. And the only way of ensuring that these objectives are compatible is by adopting existing agricultural technologies that are economically and environmentally sustainable, and of course by generating and adopting profitable new agricultural technologies adapted to climate change.

■ Technologies

The first conclusion is that the use of agricultural technologies that safeguard the environment, natural resources and climate change, and are well-adapted to the particular ecological, economic and social conditions prevailing in developing countries, will be a key factor in increasing agricultural productivity in a sustainable way and in feeding mankind in 2050. This is because the great potential for increasing food production does not lie in developed countries, which are now almost near their biological limits, but in developing and emerging countries, where the margin for increasing agricultural productivity is still very significant, as the initial levels are very low. In Africa, for example, the irrigated area is no more than 5% and the average fertiliser dose used is 7 kg per hectare⁽²²⁾. The good news is that there are already some well-proven agricultural policies which enable agricultural productivity to be increased without damaging the environment and natural resources, and which may contribute to mitigating climate change. These technologies are grouped into what the FAO designates the ecosystem approach to sustainable productive intensification, constituting the basis of the second green revolution, which must be adopted in developing countries, and particularly in Africa. Some of these technologies and practices include conservation agriculture, precision agriculture and particularly the efficient use and application of fertilisers, integrated plague management, sustainable management of natural resources, water, land, forests and fisheries, and the conservation and sustainable use of genetic resources.

But feeding the world population in 2050 is not simply a technological challenge, amongst other reasons because -as we have just seen- there are already new technologies that have been successfully tried and tested and allow productivity to be increased in a sustainable way, without degrading the environment and natural resources, and that even have a positive effect on mitigating climate change. Nonetheless, all this is of no use at all if these proven and available technologies are not adopted in developing countries and by poor smallholder farmers who produce more than half the food in the world⁽²³⁾. In order for these proven and available technologies, and others that may be generated in the future, to be adopted by poor farmers in developing

⁽²²⁾ See the work *The special challenge for sub-Saharan Africa*, presented at the International Conference *How to feed the world in 2050* FAO, 2009.

⁽²³⁾ Sustainable intensification (FAO, 2011).

countries, it is necessary to have adequate policies and strong institutions, both at the global and national level, in addition to a significant increase in public and private investment in agriculture and food security.

■ Policies

The World Summit on Food Security in 2009 established a twin-track model which consists of combining emergency measures such as food aid and social protection networks for the most vulnerable populations, with medium and long-term measures designed to improve rural production infrastructures (electrification, storage, irrigation, roads, transformation and processing of agricultural products), research and development (R&D), agricultural extension, access to markets for means of production and agricultural products, the establishment and reinforcement of agricultural credits and risk management systems, the creation of food reserve systems, at least to tackle emergency situations, dismantling agricultural subsidies for developed countries which distort the international agricultural commodities trade and supporting farmers in developing countries with public aid for private investment, and providing public assets such as plant health and animals.

In the first quarter of 2008 and to tackle the crisis situation caused by the sharp increases in food prices, many governments adopted protectionist policies in an attempt to contain social unrest. However many of these policies had negative effects which made the crisis worse, for example, the reduction of import tariffs and the subsidy on staple foods which exacerbated public deficits and foreign debt, the fixing of maximum prices for agricultural products and sometimes for seeds and fertilisers -which caused even greater scarcity as operators stockpiled agricultural production and production means whilst awaiting the relaxation of these exceptional measures-, or the emergence of a black market. Most governments in developing countries affected by the crisis, and international bodies, focused on emergency measures to achieve a short-term increase in production through the subsidised or even free distribution of seeds, fertilisers and other means of production. The lessons learnt from the crisis of 2008, however, demonstrate that although it is necessary to implement emergency and food aid measures, paramount importance should be given to applying the most suitable policies, and not merely prioritising short-term but also long-term measures in order to establish the foundations for sustainable agricultural development.

One of the main problems of agricultural policies in developing countries is that they are aimed at commercial farmers, and fail to take account of poor smallholders and subsistence farmers. Three billion people live in a rural environment, and 2.5 billion are engaged in farming on 400-500 million farm holdings of 2 hectares or less. Approximately 75% of the world's poor and

hungry live and work on these smallholdings. Various studies, and specifically the 2008 report on world development by the World Bank⁽²⁴⁾, have demonstrated that agricultural development is more effective for alleviating poverty and hunger than other types of development. The experience of many countries has also shown that a farmer in the developing world with 2 ha or less can be viable when the policies and incentives are correct, and that when this occurs, small-scale farmers in developing countries respond to price signals⁽²⁵⁾.

Smallholder peasant and family-run farms have long experienced major difficulties which new technologies can contribute to resolving. In many countries the quality of the soil and water is deteriorating, and there is a decline in the growth rate of agricultural productivity and even in the yields of certain crops. The services of some other ecosystems are also deteriorating, for example forest and grassland systems. Smallholder farmers and peasants have been ignored by their governments, and by scientists, donors, the private sector and practically everyone, but they are still today responsible for most of the world's food production, and they can do more to feed themselves and feed others with a little help. The FAO is promoting the ecosystem approach for the sustainable intensification of agricultural production as the best means to overcome food insecurity, poverty and the degradation of natural resources in a context of climate change. This method is based on technologies, policies, knowledge, information, and development of capabilities, so that the developing countries can increase the agricultural productivity and profitability of smallholder farmers in a sustainable way.

■ Institutions

With regard to international institutions, the food crisis triggered at the start of 2008 by the sharp increase in food prices revealed that one of the causes of that crisis was the lack of an international institutional architecture and a system of global governance for agriculture and food which would guarantee the regulation, convergence and coordination of national policies which adversely affected global food security, a subject which will be discussed in another section of this article.

With regard to national institutions, it is essential to reorganise and reinforce the ministries of agriculture and the public institutions responsible for animal and plant health and food safety, as these are public resources which must be financed by the public sector at least through mixed -not purely private- formulae, as this was already attempted in the 1990s with the result of a sub-optimum contribution of public assets. It is also crucial to rebuild and strengthen the institutions for agricultural research and experimentation, since many of the new technologies cannot simply be transferred from one country to another but must be previously adapted to local conditions, and this is the

⁽²⁴⁾ World Development Report 2008. World Bank.

⁽²⁵⁾ The example of the green revolution in India.

role of the agricultural experimentation centres. The agricultural extension services, using methodologies such as the Farmer Field Schools, are also an essential instrument in ensuring the adoption of technologies by smallholder farmers in developing countries.

■ Investments

According to estimates by the FAO, the gross annual agricultural investment needed to achieve an increase in agricultural production in order to feed the world population in 2050 must go from 142 billion to 209 billion USD (2009 dollars) -an increase of 50%⁽²⁶⁾. Increasing investment in agriculture and food by 50% requires raising both private investment and public expenditure in developing countries, as well as agriculture and food aid from developed countries. Numerous developing countries devote less than 10% of their public expenditure to agriculture, even though in these countries this is in many cases a key sector for the balance of trade, contribution to GDP, and even more so to employment. On the other hand, the proportion of development aid for developing countries that is dedicated to agriculture has fallen from 17% in the 1980s to 3% in the period 2005-2008⁽²⁷⁾. Furthermore, the total amount of development aid has been falling since 2008 as a consequence of the economic and financial crisis besetting developed countries, which further aggravates the situation.

The same study by the FAO calculates that the investments necessary in developing countries to support this expansion of agricultural production accounts for a net annual average of 83 billion USD (2009 dollars)⁽²⁸⁾. This total includes investments in primary agricultural activity and post-harvest services such as storage and processing, but does not include public assets such as roads, large-scale irrigation projects, electrification and others that are also necessary. Another challenge is to increase capital stocks in lagging areas with a view to both reducing hunger and improving agricultural productivity. One study examining the long-term results of investment in agriculture since the 1970s highlighted the fact that, in general, the countries that had made the greatest steps in reducing hunger also presented the highest rates of net investment per farm worker. During the whole of the 1990s, the added value per worker in the group of countries with less than 2.5% of undernourished population was approximately 20 times higher than in the group in which over 35% of their population was undernourished.

⁽²⁶⁾ See the work *Investment*, presented at the International Conference *How to feed the world in 2050*, FAO 2009.

⁽²⁷⁾ Ibidem.

⁽²⁸⁾ The predicted 83 billion net USD in net annual investment in agriculture until 2050 comprises around 20 billion USD destined to crop production and 13 billion for livestock production, whereas the other 50 billion USD would be destined to support services for secondary activities such as cold and dry storage, facilities for rural markets and wholesalers, and the first stage of processing.

In particular, investments in research and development into agriculture have been demonstrated to produce very high yield rates and have a potentially important role to play. Currently a large body of public research is carried out by international centres within the Consultative Group on International Agricultural Research (CGIAR). Although there is general acknowledgement of the usefulness and the advantages of this system of international research bodies and affiliated organisations -which has made an enormous contribution to the worldwide stock of agricultural technology and knowledge- it continues to be a matter of debate as to how to finance these bodies, as often governments do not consider that it is in their interests to provide substantial donations to a body whose benefits are distributed far beyond its components or borders. For this reason it is understandable that the reform and financing of the CGIAR appeared on the G-20's agenda as a central element for increasing agricultural productivity and reducing the volatility of the agricultural markets.

Agriculture is not a public activity; it is a private activity, even though it may generate public externalities which benefit the whole of society and which should be remunerated (payments for environmental services, conservation of natural resources -particularly soil and water-, carbon sequestration, and others), and for this reason a large part of the investment in agriculture should be private. However, in order to increase private investment in agriculture it is necessary to have a favourable legal and economic climate. With regard to the first, it is essential to address the security of property rights, -including intellectual property- and the regulation of foreign investments -including the purchase of land-, and the repatriation of profits. With regard to the economic climate, the essential variable is agricultural commodities prices. The situation of high prices for agricultural commodities that we saw in 2007 and 2008, and have again been experiencing since August 2010, has a serious negative impact on global food security and on food for poorer consumers, as well as on the public finances of low income countries and net food importers; however it definitely represents an opportunity for increasing agricultural investment and productivity, and farmers' incomes.

Nevertheless, the poor in developing countries have a limited capacity to resolve their investment deficit. The proportion of public spending corresponding to agriculture has dropped to approximately 7% in developing countries and to an even lower level in Africa, whereas the percentage of Official Development Aid that is dedicated to the sector has gone from 17% in the 1980s to 3.8% today⁽²⁹⁾. The proportion of loans from the World Bank and regional development banks that are granted to agriculture in developing countries is also very low, and is less than 10% in sub-Saharan Africa. Although private investment funds dedicated to African agriculture represent an interesting new development in recent years, the actual volume of these investments is still very low.

⁽²⁹⁾ Data from OECD reports on the ODA (Official Development Assistance).

■ THE NEED FOR GLOBAL GOVERNANCE OF AGRICULTURE AND FOOD

■ Advances Achieved after the Global Food Crisis of 2007-2008

International agencies reacted rapidly to the world food crisis of 2007-2008. Thus in December 2007 the FAO launched its ISFP programme (Initiative on Soaring Food Prices), which was embodied in an ambitious action programme in 2008⁽³⁰⁾. But it soon became clear that the lack of coordination between the main international agencies was one of the primary hindrances to providing an effective response to a food crisis that was worldwide, complex and of vast proportions. It was thus that at the end of April the Secretary-General of the United Nations convened a meeting of the heads of all the agencies in the United Nations and the Bretton Woods system (World Bank, International Monetary Fund and World Trade Organization), in which it was decided to create a High-Level Group (HLG) for the global food crisis, chaired by the Secretary General of the United Nations, with the Director General of the FAO as its Vice President and all the directors and chairmen of each of the agencies mentioned as members. The ultimate aim of the HLG was to guarantee the coordination between all the agencies, to draw up a Global Action Plan (GAP) and to ensure the application and effectiveness of this GAP in the countries most seriously affected by the crisis, which were basically low-income countries and net food importers.

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In June 2008, at the peak of the explosion in food prices, a high-level international conference was held at the headquarters of the FAO in Rome. This conference produced significant achievements, such as the acknowledgement of the strategic importance of agriculture and food, the need to increase public and private investment in agriculture, and to earmark development aid for agriculture and food, lead to the reinstatement of agriculture and food on the international agenda. Various heads of state, ministers and presidents of the World Bank and regional development banks announced additional financial resources to combat the global food crisis to the tune of 22 billion dollars. However the weak point of the conference was its final declaration, as it was impossible for the 183 countries present to reach an agreement on such sensitive but important issues for alleviating the crisis as the moratorium on subsidies to stimulate the production and use of biofuels, or the elimination of export restrictions. The wide-ranging interests of the different FAO member countries, the difficulty of reaching agreements due to the rule of unanimity for the taking of decisions in the organisations of the United Nations, and the prevalence of national interests over and above global interests, prevented

⁽³⁰⁾ Soaring Food Prices (FAO, 2008).

agreements being achieved on the most sensitive issues, and highlighted the need for a new global system of governance for agriculture and food⁽³¹⁾.

The exacerbation of the financial crisis and the economic recession in the middle of 2008 diverted the attention of the international community towards this new crisis, although the food crisis continued largely unabated, in spite of the reduction in international prices observed from August 2008. The financial crisis adversely affected the mobilisation of financial resources announced at the High-Level Conference held in Rome in June 2008, and in January 2009 only 20% of the total resources stated at the Conference had been reached. The only initiative worth highlighting was that of the European Commission, which dedicated 1 billion euro to the EU Food Facility approved in late 2008 to finance rapid response actions aimed at increasing agricultural production in fifty countries, mostly in Africa.

The G8 Summit was held in L'Aquila in July 2009, and was enlarged with the presence of emerging countries, some aid-receiving countries and international agencies. At this summit one of the most important international agreements in the matter of food security was achieved with the creation of a fund of 20 billion dollars for three years. The L'Aquila Food Security Initiative recognises that the means of ending poverty and hunger in the world is not through food aid, but by developing agriculture in developing countries. The L'Aquila declaration enshrines five fundamental principles, in line with the Declarations of Paris and Accra on the effectiveness of development aid, which are the following: 1) support for national plans led by developing countries; 2) support for national plans which contemplate broad measures in the short and long-term to increase agricultural production and economic access to food; 3) improved coordination between donors, beneficiary governments, interest groups and international agencies on both the global, regional and national scale; 4) importance of the role of international technical and financial agencies; and 5) ongoing and sustainable financial support for national food security plans with monitoring and accountability. These five principles became the World Summit on Food Security of November 2009 organised by the FAO, on the Rome principles.

Part of the conclusions of the international conference on world food security organised by the Spanish Prime Minister and the Secretary General of the United Nations and held in Madrid on 26 and 27 January 2009 included the initiation of discussions and work to reform the Committee on World Food Security as a central element of the Global Alliance for agriculture and food proposed at the international conference in Rome in June 2008. The Committee on World Food Security was set up at the World Summit on Food Security in 1996, and was based in the FAO, but it had long since ceased to perform any

⁽³¹⁾ The international High-Level Conference held in Rome in June 2008 marked the first time the need for a Global Alliance for Agriculture and Food was raised, although it was not specified what this Alliance would consist of.

relevant function. The reforms which were discussed and approved by all the actors and interest groups involved made it more inclusive -so that not only participating governments took part, but also the private sector, organisations in civil society, private foundations, agencies of the United Nations and the World Bank-, reinforcing its attributions -particularly in the coordination and convergence of policies-, increasing its resources and endowing it with a high-level panel of experts. The 2009 Summit approved the reform of the Committee on World Food Security, which thus became a central element in the new system of world governance for agriculture and food. The first plenary session in October 2010 approved the committee's working plan for 2010-2011, as well as the high-level panel of experts for the analysis of policies which affect food security and the recommendations for measures to be adopted for the coordination and convergence of policies. The execution of the work plan was analysed in the plenary session of November 2011.

The riots and social protests provoked by the food crisis were enough to convince world leaders and the United Nations that it was impossible to ensure a safe and peaceful world in which almost 1 billion people suffered from hunger, and this has largely contributed to the reinstatement of the issue of agriculture and food on the international agenda after many years of oblivion. Thus the last G-20 summit held in Seoul in November 2010 approved a multi-year work plan to promote global development, consisting of seven chapters, one of which is agriculture and food security. The issues addressed in this chapter include the need to invest in research and development, reforming and increasing the financing of the CGIAR, monitoring compliance with the initiative of the amplified L'Aquila G-8 summit (AFSI), studying measures to attenuate the strong volatility of agricultural prices, and a code of conduct for foreign investment in land. The French presidency of the G-20 in 2011 chose as its central theme the volatility of agricultural prices, and in the summit of the G-20 in November 2011, as indicated above, important agreements were achieved on the adoption of measures to reduce the volatility of agricultural prices. It is also worth highlighting the considerable advances of the G-20 in reinforcing the international system of R&D and establishing a code of conduct for foreign investment. These issues will be discussed below.

■ Strengthening the International R&D System

The role of technological innovation will be fundamental, and in addition to already existing technologies, innovation in technology is potentially important for increasing agricultural productivity, but this must be achieved using clean low-carbon technologies to mitigate and adapt to climate change. In this regard, it is worth pointing out the importance of biotechnology and genetic engineering. Given the complex challenges facing agriculture in its quest to increase world food production -against a background of degradation

and scarcity of natural resources and climate change- turning our backs on biotechnology and genetic engineering is something that mankind can probably not afford to do. It will be vital to establish all the necessary precautions and to enact legislation on biosecurity to minimise the risks of genetically modified organisms, but biotechnology has so much potential that it will be very difficult to do without it if we wish to feed the population in 2050, and even more so against a backdrop of climate change. A large part of the adaptation of agriculture to climate change will come through biotechnology. But in order for that potential to be developed, it is essential to increase public and private resources dedicated to agricultural research, to reform and reinforce the Consultative Group on International Agricultural Research, and to reconstitute the national systems of agricultural research.

It will undoubtedly be necessary to design and implement new and imaginative formulae for promoting R&D in agriculture and food in developing countries. An important challenge is to close the gap between research and development with regard to the main cereals and the staple foods which are most important for smallholder farmers in regions with a high prevalence of hunger, for example secondary cereals such as sorghum and millet. Most of the investment in the private sector was made by private companies in high-income countries. In contrast, the role of the private sector in most developing countries is very limited, due to lack of opportunities for financing and incentives for private research, in addition to the uncertainty of the returns. This is particularly true in the case of biotechnology and genetic engineering, where a small number of multinationals conduct research in order to launch new varieties of commercial crops such as soy, maize, rapeseed and cotton, which allow these companies to recover the necessary investment to launch new transgenic varieties onto the market. The application of biotechnology to crops which are less commercial but which are of great interest for food security in some regions would require public-private agreements in order to exploit the greater scientific and research potential of the major multinationals, but with public-sector or international cooperation funds cofinancing part of the research and development, so that the new varieties can be sold to poor farmers in developing countries at low prices, following a similar pattern to the approach taken by the pharmaceutical industry, international organisations and public health funds to promote the sale of generic medicines at low prices.

Code of Conduct for foreign Investment in Agriculture

Given the limitations of alternative sources of financing for investment, direct foreign investment in agriculture could make an important contribution to reducing the investment deficit in agriculture in developing countries. But this investment has increasingly been directed to the purchase of land, for purposes ranging from the production of biofuels, to the diversification of

investors' portfolios or food security. Although this type of investment may provide benefits for development in terms of transfer of technology, creation of employment and promoting infrastructure and gains from exports, the associated increases in food production are often destined to be exported to the country of the investing company or sovereign wealth fund, which raises a range of political, economic, and even ethical issues, particularly when investments are made in a country which is beset by food insecurity, and a sovereign wealth fund or public company from another country buys hundreds of thousands or even millions of hectares. The fundamental question is whether the outlook for food security and the reduction of poverty in developing countries is better with these investments or without them, and how to enhance their benefits and avert their negative consequences. For this reason a code of good practices has been drawn up for foreign investment in agriculture and food by various international agencies such as the World Bank and the FAO, which is currently being analysed by the G-20.

■ CONCLUSIONS

After all we have seen so far, we can now attempt to respond to the question: is it possible to reduce the volatility of agricultural prices and avoid food crises such as the one we have been experiencing since 2007? The answer is complex because it depends on many factors, including the evolution of nutritional patterns for the global population between now and 2050. If in 2050 the 9 billion inhabitants on the planet were to eat like we do today in developed countries, the answer is that there would not be enough food in the world, and the food crisis -and even the Malthusian prophecy- would become a reality. However, this is unlikely to happen, amongst other reasons because from the standpoint of nutrition and public health, it is unadvisable to eat the way a large part of the population in the developed countries does, where obesity is one of the most serious public health problems. Thus we find ourselves facing a problem not only of production but also of distribution, not -in this case- of wealth, but of foodstuffs, as whilst one part of the world's population has too little to eat and is undernourished, the other part eats too much and suffers from obesity.

If we start from the basis of adequate nutritional levels and a sufficient and healthy diet, we can conclude that the wholesale adoption of already available sustainable technologies -plus the generation and adaptation of new technologies- will in the coming decades allow greater flexibility between supply and demand in the agricultural markets. This would lead to a situation of lower volatility and lower prices than at present, thereby improving world food security, and particularly if advances are made in the deregulation of the international agricultural trade, which is certain to come about sooner or later.

But in order for the sustainable increase in agricultural productivity -the key factor- to become a reality in the context of a scarcity of natural resources and climate change, it is not enough only to reinforce the international and national system of R&D to generate the required technological innovation; it is also necessary to move towards reinforcing national agricultural institutions, designing and applying adequate agricultural and food policies, and increasing public and private investment. To do all this, it is essential to achieve a new global governability for agriculture and food. All this is a commitment to be undertaken by everyone: by the governments of the poorer nations, who are primarily responsible for developing their agriculture and eradicating hunger in their countries; by the governments of rich countries who must supply more development aid for the agriculture of these countries, and eliminate policies which adversely affect the agricultural sector of developing countries; and by international organisations, civil society and the private sector.

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