Priority 3: Socio-economic dynamics and global markets

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Priority 3:
Socio-economic dynamics and global markets

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I – Rationale

We have experienced a period of great agricultural capacity almost on a global scale, called “the Green Revolution”. This is a term used to refer to the remarkable increase in world agricultural production between the early 1960s and the end of the 1980s. The technological progress experienced in the more developed economies and its transfer to other regions, especially Asia and Latin America, led at that moment to the doubling of yields for some cereal crops which are basic for the human diet, like rice, wheat and maize, besides the productivity of other plant species and livestock.

This real production boom has been able to meet rising food demand in the past 30 years and has also ensured a certain stability to food prices. A historical phase in which giant steps taken in developing pesticides and fertilizers, combined with an improvement in production techniques and plant breeding, allowed a rapid growth in farmland yields. Certainly, not everywhere: in Asia, yield increases were obtained practically without increases in cultivated areas, while in Africa yields were stationary despite the bringing into cultivation of new lands.

However, we are talking of a quarter-century of sustained yield increases, coinciding with a marked rise in public investment in agricultural research, both in more developed and in developing countries. The result was a mean annual global increase in cereal production of 2%, with the highest rises in Asia (+2.5%). The Green Revolution seemed universally to be the death knell of the Malthusian theory of growth.

What has changed? How can we account for an alarming situation that today goes well beyond the ever-neglected issue of hunger in the world’s poor areas? What has compromised the reaching of internationally-agreed goals regarding the war against malnutrition?

The international markets for agricultural commodities are the stage on which the new scarcity is shown in all its clarity. The roller-coaster ride of commodity prices fully expresses the tensions between demand and supply which are responsible for price rises.

It would be clear now that, referring at market instability, one of the main drivers is the headlong growth in food consumption, associated with population growth, but especially with the higher purchasing power among increasingly broad ranges of the population in emerging countries. As early as the mid 1990s, major increases were being witnessed in the demand for some strategic agricultural commodities, such as wheat, whose prices had long been in constant decline. Demand began to rise at an average rate of 2% per annum, especially thanks to China, India and Brazil, able on their own to account for at least one-third of increases in world requirements at that time. There has been a transition from a period of abundance, albeit characterized by problems of unfair distribution of available resources, to one of structural scarcity manifested in a progressive widening of the scissors between food availability and demand against a trend, at first timid and

then more marked, of price rises. For many years the change was not perceived or was at the very least underestimated.

II – Extended summary

This work is concerned with the issue of food security, placing special emphasis on the current situation of South Mediterranean countries.

The events of 2007/2008 and those of 2010/2011, has been unfortunately more than an alarm-bell. The most recent spike in food prices alone has shifted almost 45 million people below the poverty line, synonymous with leading an existence on less than 1.25 USD a day, which is already experienced by more than 1.2 billion people around the world. The tensions between supply and demand suggest this is a structural imbalance that will grow in the years to come. The failure to meet the first of the millennium development goals, a reduction in hunger in the world, ought to restore a sense of urgency and determination in order to conceive and design renewed policies at the international level, to build a new overview of global food security. Given the scale of the problem, this need cannot be relegated solely to its traditional place on the agenda on just how to support agricultural development and food self-sufficiency in late-developing areas, but should be tackled with decisions that necessarily involve agriculture world-wide. It is a problem that affects us all and not just a question of how to help "others".

After decades in the wilderness it is no coincidence that the issue of food security is once again part of the lexicon of American and European policy makers, just at the moment when the USA and EU are preparing to reform their own agricultural policies, the longest established and also the most criticized.

By a brief introduction of the main conceptual aspects of food security, this work point out the shift from a former focus on food energy availability to a more comprehensive appraisal of this phenomenon in recent times. The most likely causes of recent rises in food prices are also described. Food security issues are analyzed in connection with rural poverty issues and with the failure to achieve successful agricultural development in some developing countries, which sometimes have to overcome strong restrictions concerning the availability of land and water resources for food production. The paper points to the convenience of using multivariate statistical tools to summarize a wealth of food security-related indicators, and a practical example of the use of Principal Components Analysis (PCA) for data concerning SEMC countries is provided, with a dataset originally comprising 11 variables. The PCA methodology is described in a non-mathematical fashion, also showing the basic steps in its application to this case. Two basic composite indicators, or 'principal components' are selected, one in connection with 'human development' and the other with 'being at risk of hunger', and countries in the sample are ranked according to their situation with regards to these dimensions.

III – Key messages

Food volatility: 1) Structural characteristic of the food market; 2) Food Security question in South Mediterranean Countries since these countries are the largest net importers of cereal calories in the world.

Agricultural Policy in SEMC countries: 1) lack of adequate infrastructures, and efficient markets challenge; 2) policy aimed to support value chain efficiency and risk management tools; 3) strengthen credit, transport and storage capability in these countries; 4) marketing and producers organization.

1. The Background: A new era in the global agriculture commodity market

From the early fifties there was a long period of stagnating and declining prices on agricultural markets, interrupted only by some spurt in concomitance with extraordinary events (like the "oil shock" in the 1970s). The scenario changes in the mid 1990s where an inverse trend begins, with sharp peaks in farm commodity prices in 2007/2008 and 2010/2011. The most recent forecasts indicate a sizeable rise in prices for the coming years.

Several causes are driving the increase in agricultural commodity prices. One of the main is the headlong growth in food consumption, associated with population growth, but especially with the higher purchasing power among increasingly broad ranges of the population in emerging countries. According to FAO, world population will exceed nine billion in 2050. This represents an increase of about one third against the current population of 6.9 billion. An increase that will be lower than in the past. In fact, the population increase of over 30% predicted by the FAO for the next 40 years is well below the relative growth in the past four decades, during which the population more than doubled.

The largest increases will take place in developing countries, while the population in high-income economies will remain almost stable and in some areas, especially in some regions of Europe, there may even be population declines. By contrast, in Africa the population is expected to double, growing from one to two million by 2050. In emerging areas growth will continue to be sustained especially in India, while China's growth should slow down; absolute increases will remain appreciable. In these two countries, which now make up over one-third of the world's population, the number of inhabitants is expected to rise from the current 2.5 billion to 3.2 by the year 2050.

The global effects of population increases will be strictly linked to migration intensity between countryside and town. Around 50% of the world's population is now distributed in urban areas, the other half in rural areas. In 1950 only 28% of the population lived in large urban agglomerations; in 2050 this percentage is destined to reach 70%. Compared with today, there will be 19 more cities with over ten million inhabitants and five of these will be in Asia where the trend toward metropolitan concentration will be particularly marked. FAO estimates the population reduction active in agriculture in the next 40 years at around 30%. However, it will also contribute to orienting consumer choices for much of the world's population towards products with larger contents of services (starting from processing) and thus bring them closer to the food styles in the planet's wealthier areas.

The most important contribution to the global convergence of diets will be made by the expansion of the middle classes in emerging areas. Individual income in countries like India, Brazil and China rose at sustained rates in recent years, only to slow down, but not stop, during this long phase of world economic recession. The cases that stand out most are those of China and India which have recorded annual growth rates close to the double figures in the years immediately prior to the recession and which are forecast, according to the International Monetary Fund, to continue their trend at least for the next 20 years. This means on one hand that expenditure on food consumption grow fast, on the other that food habits change radically (the so called "substitution effect" explained by Engel's Law).

As populations gradually become richer, in their diets the unprocessed starch products (like rice and flour) are replaced by products with a higher protein content (such as meat, milk and other dairy products) and by processed products with greater value added, promoting a process of dietary convergence worldwide along the models of richer populations. This trend is involving several billion people in emerging countries and the demand of livestock product is forecast to increase very fast in the coming years with the consequence of a multiplying effect on the demand for some agricultural raw materials, like soya and wheat, which are at the basis of animal feed[1].

Competition in land use is not restricted to the process of urbanization but now includes also the rise of the areas covered by biofuels production. The bioethanol production for the next ten years is projected to reach about 60 million litres, with the US, Brazil and EU-27 soaking up much of the expected increase. As regards biodiesel, an increase is expected of over 25 million litres. The raw materials used will largely be ad hoc crops. In 2020 13% of global maize production, 15% of vegetable oils and 30% of sugar cane will be used for the production of biofuels. Crops for biofuels have taken up about 20-22 million hectares in the last few years and could, due to further development, reach over 35-40 million hectares in 2020.

The policies supporting biofuel production are affecting the food market in two main ways: the change in land use from food to energy production, and the quantity of foodstuffs progressively removed from market trading. To what extent this has actually supported the upward trend in prices remains uncertain, yet it is undeniable that biofuel represents an additional source of agriculture commodity demand for a market, already short, of strategic commodities like sugar and cereals.

In general terms, the objective of increasing the amount of foodstuffs available on the markets cannot pass through the expanding of world agricultural areas. This option can today play a marginal role. Of the land remaining, the more fertile areas are already farmed and thus possible expansion can only rely on marginal and scarcely productive lands or on reduction, not at all desirable, of the current surface area given over to forests.

The per capita farmed area decreased by over 50% between 1963 and 2008. The used agricultural area (UAA) increased at an average rate of 0.30% per year in the last 40 years while increases close to zero are forecast for the near future (+ 0.1% per year).

Subjected to growing competition between the various uses, also water has become a critical factor not because its overall availability worldwide is not sufficient to cover demand, but because it is not distributed on the basis of the various regional needs: 15% of the world's fresh water is concentrated in the Amazon forest inhabited by only 1% of the world's population. By contrast in China, which accounts for 20% of the population, only 7% of water is available. This makes the water problem geographically specific.

Critical situations concerning water consumption may arise from overexploitation, climatic stress and pollution, in the case in which water courses receive more waste than they can assimilate. In the course of time, some such situations have been alleviated in many parts of the world thanks to technological progress, which has allowed an increase of about 700% in the storage capacity of fluvial systems in the past 50 years, promoting economic development, especially agriculture.

By contrast, problems have become more serious in other areas, for example where economic and urban expansion have required large quantities of water, exchanged for ever greater doses of pollution. There are also cases where erosion has led to a reduction in water availability in many large areas of Africa, including some SEMC. This is a clear constraint to possible expansion in the agriculture sector, which becomes even more serious if we view the growing negative implications accompanying the relationship between water and agriculture starting with the Green Revolution: agriculture is indirectly responsible for about 40% of pollution of surface water, stemming from the increase in use of chemicals, as fertilizers and pesticides, whose use seems to intensify when areas are devoted to biofuel production.

In past years the adjustment of supply to demand was guaranteed by technical progress. The agriculture sector has experienced a period of great agricultural capacity almost on a global scale, called "the Green Revolution" that has seen a remarkable increase in world agricultural production between the early 1960s and the end of the 1980s. The technological progress experienced in the more developed economies and its transfer to other regions, especially led to the doubling of yields for some cereal crops which are basic for the human diet, like rice, wheat and maize, besides the productivity of other plant species and livestock. The sustained yield increases was

lead by a marked rise in public investment in agricultural research, both in more developed and in developing countries.

Now we are faced with two types of limits: on the one hand the need for more sustainable agriculture, hence based on less use of chemical inputs, one of the main protagonists of the Green Revolution; on the other, the concern at having reached a technological barrier such as to be able to achieve only marginal short-term increases.

The OECD and FAO recently estimated that for the coming years the annual growth in production will continue to be slower than in the past, falling from an annual average of 2.4% for the previous decade to 1.7% for the coming years. According to many analysts, these data indicate unequivocally the end of the season of the Green Revolution and the reaching of a level of efficiency that will be hard to beat in the short-medium term (Brown, 2012).

This concern is reinforced by the decline in public expenditure devoted to research and development in the farm sector, which has stagnated in poorer countries, while in more developed countries it is growing at decidedly lower rates than in previous decades. Only in some emerging countries the investments in R&D are growing and many voices have pointed out the close relationship between the trend in public expenditure in research and the decline in growth rates for farm productivity. We are dealing with a sector in which, more than in others, public investments are fundamental.

The particular fragmentation affected the farming system limits private R&D activity. Even where firms reach a significant size, such as in the seed or agro-chemicals sectors, they are characterized by a short-medium term view and are calibrated on production scales such as to maximize the rate of return on investments as rapidly as possible. Instead, public research allows investment in long-term solutions, taking due account of the diversity of contexts in which the research is to be applied as well as the social and environmental sustainability of the technical improvement.

What gives cause for concern is not only long-term structural factors. Also those of a contingent nature have far more impact than in the past, since the greater integration of the economy favors a more rapid transfer of signals (and shocks) from one market to another (De Castro et. al. 2012). Such integration is also partly responsible for another aspect of the current scenario: market volatility.

This term is used when the frequency and range of price variations recorded in a given time span are greater than the historical average. Between 2007 and 2008 the farm price index used by the International Monetary Fund (IMF) rose by 50%, to then drop sharply (without return to its pre-boom levels) and rise to even higher levels at the beginning of 2011, representing a rise of 130% against 2002 levels.

This phenomenon, depending on several causes, exacerbates the natural instability of agricultural markets linked to the seasonal cycles. One cause arise from the small-scale market, characterized by low volumes and a restricted number of exporters. Only 12% of maize and 18% of wheat are traded on international markets; the remaining part stays within producer countries.

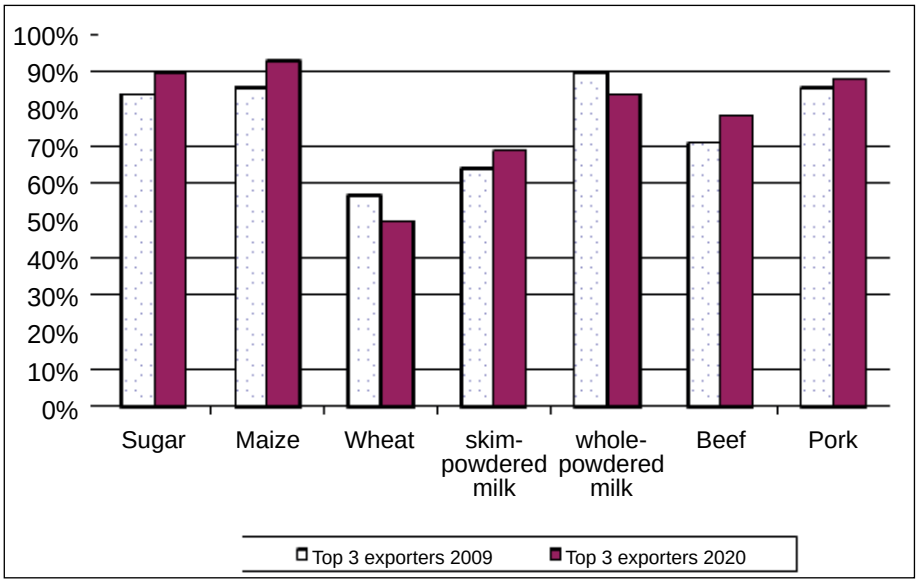

Figure 1. Market share of the world's first three exporters
Source: Our elaboration from FAPRI data

This means that also in the case of modest shocks, repercussions on prices may be significant and the return to equilibrium may take a long time. This is what has happened with increasing frequency of extreme meteorological events linked to the broader phenomenon of climate change.

Often reactions to these events have led to restrictions of trade. In 2010 we experienced a new cycle of measures which were completely uncoordinated at the international level. In summer 2010, following huge wildfires which hit Russia and caused damage to crops, Moscow banned grain exports, triggering price increases. The Russian example was followed by Ukraine, while in parallel many governments began to subsidize imports or reduce their taxation. The announcement of the ban was enough for many concerned importers to begin to negotiate higher volumes than in the past, fearing subsequent price rises. According to the FAO, world wheat prices increased by between 60 and 80% between July and September 2010 after the export ban decided by Russia.

Government reactions to price booms have aimed to stabilize domestic supply as rapidly as possible by adopting protective measures (such as bans on exports or incentives for imports), to alleviate the impact of increases upon its citizens. Yet these initiatives have had the sole result of exporting instability (and inflation), taking it from national to international markets (Tangermann 2011), amplifying price oscillations and triggering a vicious circle which made the markets even more precarious.

The scenario is further complicated by the state of reserves of strategic agricultural products. Today, the level of food reserves is much lower than in the past. In 2007 cereal reserves reached their historical minimum. This actually made the agricultural supply even more inelastic than it is naturally, further restricting the capacity to respond to price increases.

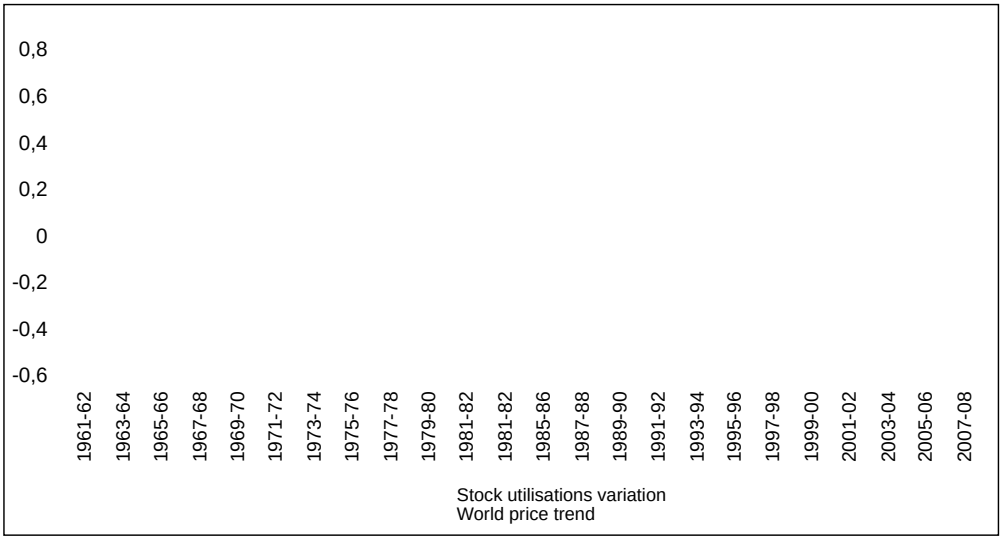

Figure 2. Wheat stocks are negatively correlated with wheat prices
Source: Our elaboration from USDA data

Also the role played by the financial markets during the price rises is more hotly debated. Some governments, but also several analysts and representatives of international institutions have pointed the finger at financial speculation, it being identified as one of the main drivers behind recent booms in farm prices.

In its broader, more authoritative strands the economics literature is rather skeptical regarding the nexus of direct causality which is thought by many to connect speculation and price rises. The trend in futures quotations is theoretically tied to expectations on demand-supply relations and thus tends to converge on the real market value of the traded commodity as the contract expiry date approaches.

By contrast, financial operations conducted outside commodity exchange circuits are different, such as in the so-called “over the counter” (OTC) market, where it is large institutional intermediaries which trade commodities through non-standardized contracts and without solvency guarantees made available by stock exchanges. This generates large risks, like those which became reality during the financial bubble in 2007, in which the contractual reneging of many players who had taken on excessive risks led to real market failure.

2. Aim and scope

A. Foundation: Measuring food security in South Mediterranean Countries. Towards a more comprehensive approach.

The development in analyzing the field of food security reflect the shift from a former focus on food energy availability to a more comprehensive appraisal of this phenomenon developed in recent years.

In September 2000 189 nations approved the “United Nations Millennium Declaration “ (UNMD), calls for halving by the year 2015, the number of people who live on less than one dollar a day. The Millennium Development Goals pointed out by the UNMD include eight priorities: Eradicate

extreme poverty and hunger, Achieve universal primary education, Promote gender equality and empower women, Reduce child mortality, Improve maternal health, Combat HIV/AIDS, malaria and other diseases, Ensure environmental sustainability and Develop a global partnership for development. The level of this goals are measured each year using more than 60 indicators[2].

What emerge applying the upgraded $1.25-a-day poverty line, which is used to measure progress toward the first Millennium Development Goal (MDG), is that official poverty rates in most south Mediterranean countries are lower than in many other low- and middle-income countries (LMICs). Extreme poverty affects less than 3% of the population. But going depth in the analysis of non – income MDG indicators the situation change and the difference between south Mediterranean countries (and in general all Arab countries) and other LMICs appears less pronounced (IFPRI 2012, World Bank 2011).

On this field, is interesting the results come out from a study conducted by International Food Policy Institute (IFPRI) in 2012[3], pointing out how poverty and income inequality in the SEMC context are likely higher than official numbers have long suggested. In this study a new indicator of food insecurity risk is developed, merging a macro-level and a micro-level measure of food insecurity. The first one is defined as the share of food imports divided by total exports plus net remittance inflows[4], while the prevalence of child under nutrition is used for representing the micro micro-level measure of food insecurity. The result is a classification of SEMC countries into five risk groups, based on this composed indicator.

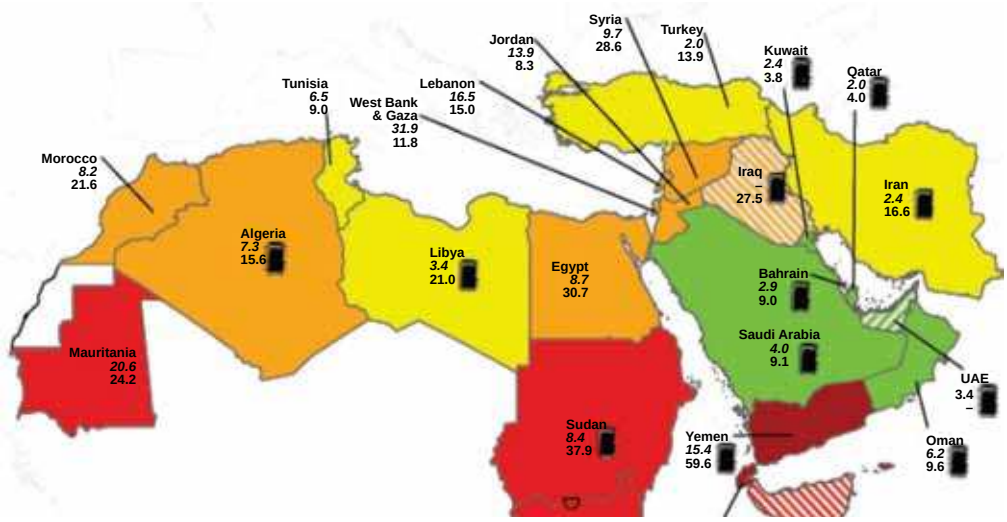

Figure 3. The SEMC food insecurity.
Source: IFPRI 2011

This approach goes beyond the traditional micro aspects put at the basis of the Global Hunger Index (GHI)[5], calculated each year by the International Food Policy Research Institute (IFPRI). The GHI provide a multidimensional overview of the hunger, combining three equally weighted indicators.

The proportion of undernourished as a percentage of the population, which reflects the share of the population with insufficient dietary energy intake.

The prevalence of underweight children under the age of five, which indicates the proportion of children suffering from low weight with regards to the adequate weight for their age.

The mortality rate of children under the age of five, reflecting the interaction between an inadequate energy intake and an unhealthy environment.

The scores for some selected North Africa and Middle East countries, in comparison with the six countries at the bottom of the world list in 2010, show that the situation of South Mediterranean countries is relatively good and widely differs from the situation of those African countries that suffer the most from food insecurity. All the selected countries are classed, in 2010, in the category of countries with low hunger levels, with the exception of Morocco and Syria, which appear with moderate hunger levels. The best scores among the SEMC correspond to Tunisia, and the worst to Morocco, where the prevalence of underweight children under five years of age has increased between the average of 1988-92 and the average of 2003-08, to 9,9%.

A factor becomes more and more crucial in measuring the multiple dimension of the concept of food security is the exposure to food import. The South Mediterranean Region has as one of the most food import-dependent area in the world, with net food imports accounting for 25-50 % of national consumption. This result is a consequence of a very rapidly demographic growth in the last few decades combined with the change in consumption patterns linked to the increasing average income. A direct consequence of this development has been the rising external food trade deficits, that if in general it should not mean self-sufficiency deficit[6], in the cases of some South Mediterranean countries the figure gives rise some concerns, related to the high ratio of food imports over total exports. In particular in those countries characterized for an high dependence of export earnings from oil, the exposure to food security risks is directly related with the oil price fluctuations. The quota of total exports used to pay for imports is in the SMC higher than the world average. The food dependence is more pronounced for Palestinian Territories, Lebanon, Jordan and Egypt than in the other countries included in the region.

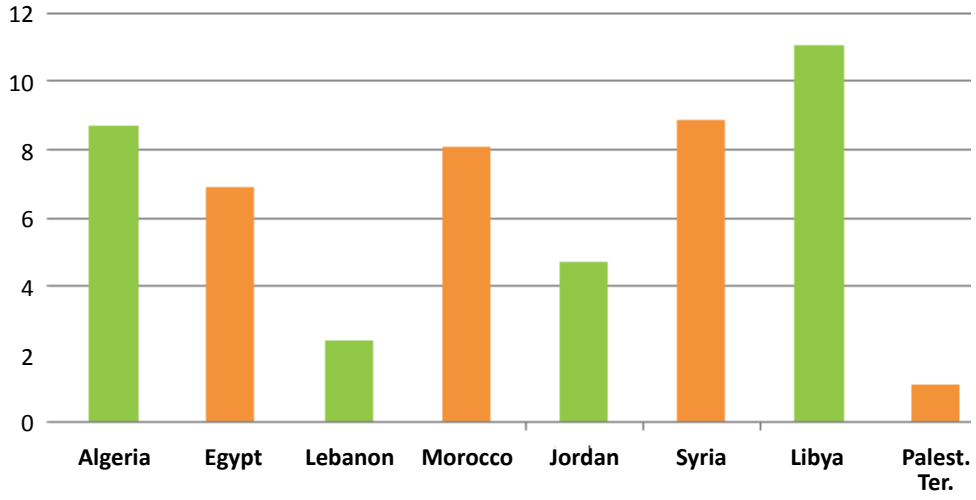

Figure 4. Total exports / Food imports in SEMC (2010)
Source: Breisinger et al. (2010)

Combining the number of times that total exports cover food imports with the food production per capita, the GHI, and Gross National Income per capita, on the basic distinction grounded on the mineral resources endowment of each country, Breisinger and other authors have proposed a

food security countries classification in which all the South Mediterranean countries considered are included in the category countries facing a food security challenge (Breisinger *et al.*, 2010).

A most recent multidimensional food security indicator is the Global Food Security Index (GFSI) developed by The Economist Intelligence Unit, that consider the core issues of affordability, availability, quality and safety across a set of 105 countries. The index is a dynamic quantitative and qualitative benchmarking model, constructed from 25 unique indicators, that measures these drivers of food security across both developing and developed countries, providing a rank of countries in function of their food vulnerability. The 2012 GFSI for the South Mediterranean countries covered by the survey provide the following result.

Table 1. Global Food Security Index in some SEMC (2012).

	Overall Score	Affordability	Availability	Quality and Safety	GFS Rank
Algeria	40.1	38,2	39,1	47,6	72
Egypt	50,4	38,1	59,8	55,3	52
Morocco	49,1	49,5	47,5	52,6	57
Tunisia	52,2	52	48,6	66	49
Turkey	62,2	55,6	66,6	66,2	33
Jordan	49,8	51,8	49	47,1	49
Syria	40,9	33,6	44,9	47,9	70

Source: "The Economist" Intelligence Unit

3. Objectives of the White Paper

The situation of the SEMC countries in terms of food security is not particularly bad when compared with other regions of the developing world, but they still face a host of problems: scarce endowments of agricultural land and water, excessive food-import dependence, and the presence of some poverty-stricken rural zones. A World Bank typology, which classifies developing economies according to their stage of agricultural development, has placed most SEMC countries in the middle-of-the-way category of transforming countries. A specific issue for this type of countries is the great divide between the rural and urban conditions concerning incomes and poverty, as nonagricultural sectors now account for most of their economic growth. The SEMC have experienced substantial progress, with regards to GHI, between 1990 and 2010. All of them are classed in 2010 in the category of countries with low hunger levels, with the exception of Morocco and Syria which appear with moderate hunger levels. Among them, Tunisia registers the best scores, and Morocco the worst.

As we seen, many factor influence what we call food insecurity. It is a complex phenomenon, encompassing elements related to standards of living, health, income distribution, import dependency and other aspects, and where is fundamental to consider the connection linking the various key factor influencing the state of a Country in terms of food security.

In this context, the priority is contributing to develop a multidimensional approach in measuring food security, aimed to better explore the country – specific factor which affect the state of food security and the exposure to price shock in the international food market. In this scenario, a multivariate analysis is proposed in order to summarize in a small number of composite indicators an array of data concerned with specific social and economic aspects related to food insecurity. It would be clear that, in parallel, the output of the model should help analyst and policy maker to better understand the specific need of each country in order to improve their food security state and coping with risks associated to prolonged price shock on international commodity market.

The second priority is strictly linked to the previous, aiming at analyzing the specific country -performance in managing the domestic effects of international food price volatility. Many factors can contribute to isolate households from price volatility and food inflation. One of this, as we seen, is the set of public measures implemented by Governments in order to mitigate the effects of prolonged price peak on the poorest population. Other are factors are at the basis of the asymmetric price transmission that characterized the SEMC area. The analysis of the causes leading asymmetric transmission of price is often complex and associated with several factors (Meyer and Cramon-Taubadel, 2004), which largely represents traditional concerns in SEMC countries. In fact, the level of transports and distribution cost, domestic market distortion, the ability and cost in managing reserves, including food subsides, are in overall factor which affect price transmission from international to domestic market.

If we aims to improve the state of food security in SEMC countries needs a set of action, where some of them are strictly related to the global scenario, implying choices in terms of global food security. In this concerns, since the "G8 Leaders Statement on Global Food Security" delivered in Hokkaido in 2008, the food security issue has entered the agenda of the meetings of the leaders of the most relevant economies in the world. In the 2009 G8-Summit held in L'Aquila, the leaders issued a stronger declaration prioritising the need of an increase of the agricultural productivity and of agricultural investments. For the first time in G8 history, a meeting of agricultural ministers preceded the Summit. After that, the G8 leaders committed to raise 22 billion dollars in 3 years for agricultural investments and launched the "L'Aquila Food Security Initiative" (AFSI), endorsed by 26 Nations and 14 international organizations. This was based on a "comprehensive approach", including: "increased agriculture productivity, stimulus to pre and post-harvest interventions, emphasis on private sector growth, smallholders, women and families, preservation of the natural resource base, expansion of employment and decent work opportunities, knowledge and training, increased trade flows, and support for good governance and policy reform". Since 2009, the AFSI has met on a regular basis, in a roadmap that ideally is accomplished in 2012, with the declaration of Camp David launching the New Alliance for Food Security and Nutrition. Recognized to be the "next phase" of the G8 "shared commitment to achieving global food security", the priorities of the New Alliance are: mobilizing "private capital for food security"; taking "innovation to scale"; reducing and managing the risk; improving nutritional outcomes and reducing child stunting. A report on the implementation of the New Alliance is expected to be presented at the 2013 G-8 Summit, to be held next summer in Northern Ireland under the UK Presidency. In last January, food security, nutrition and hunger have been announced being among the central issues of the Summit. In his most recent speeches, though, UK Prime Minister David Cameron's references to food security appear to fade out.

Regarding G20, whose leaders has been meeting officially only since 2008, food security is one of the nine key pillars of the "Seoul Development Consensus for Shared Growth", a set of principles endorsed by G20 leaders at the Seoul Summit, in 2010. The G8-G20 French Presidency of 2011 promoted the "Action Plan on Food Price Volatility and Agriculture", adopted by the G20 Agriculture ministers in June 2011 and endorsed by the G20 leaders the following November, in the Cannes declaration. In spite of disappointment and criticism, it is – so far – the most ambitious attempt to approach some aspects related to food security, such as the volatility of markets, on a global and comprehensive perspective. The plan objectives are: "improving agricultural production and productivity, (ii) increasing market information and transparency, (iii) reducing the effects of price volatility for the most vulnerable, (iv) strengthening international policy coordination and (v) improving the functioning of agricultural commodity derivatives' markets". Among the other initiatives, the 2011 G20 launched the AMIS (Agricultural Markets Information System) to improve transparency of the markets; supported the "International Research Initiative for Wheat Improvement" to foster public funded studies on the wheat genome; constituted the "Rapid Response Forum" to enhance the international community's capacity to coordinate policies and develop common responses in time of market crises. Others initiatives, such as agreement to

"remove food export restrictions or extraordinary taxes for food purchased for non-commercial humanitarian purposes by the World Food Program and agree not to impose them in the future" were not implemented at Wto level. The Mexican presidency of G20 (2012) continued along the ambitious French program, without any further relevant achievement. Meeting in Los Cabos the deputy-ministers of Agriculture of G20 nations launched the "AgResults Initiative, aimed at improving food security for the poor and vulnerable by encouraging private sector innovation of new agricultural products and systems constrained by market failures in agriculture". Food security is mentioned among the Russian's presidency priorities, but only as one of the sub-headings of a more general approach to "Development to all". The next meeting of G20 leaders will take place in Saint Petersburg on December 1, 2013.

In this global perspective the paper provide a set of suggestion based on the general figures used in the first part of the work, in order to better priorities for an agenda for the global food security.

On the other hand there are specific country-condition influencing food security that need of other specific suggestion that the paper organize in the following sub priorities.

Addressing weakness factor in enhancing domestic food supply.

Integration in the global food market and reduce food price pass-through negative effects improving market infrastructure.

Better performing safety nets measures to dampen the effects of food-price shocks.

4. *Assessment Indicators, Scientific approach and conceptual framework*

As well known in literature, the implementation of the multivariate analysis is based on a set of variable capable to reflect the basic determinants of food consumption. Since the seminal work conducted by Reig (2010), we add in our analysis the contribution provide by the "import dependency" dimension.

In addition to the traditional measures related to the concept of food security the work take into account also specific variables representing this dimension, enriching the framework proposed by Reig, organized on three pillar (availability, access and utilization) that are inherently hierarchical (Barrett, 2010).

The Caloric intake is a variable representing the supply side (availability) of the food security problem, while Gross National Income per capita is a basic determinant of access. Access is also conditioned by the degree of inequality in the distribution of income, which can be measured by the Income Gini Coefficient. A concern for utilization has led to the inclusion of several variables related to human health, like life expectancy at birth, and with the health conditions of children, a particularly vulnerable group, using underweight and early mortality as indicators. The influence of a healthy/unhealthy environment is reflected in the inclusion of two variables that measure the access to fresh water and basic sanitation facilities. Also, the intake of basic nutrients has been represented by the daily intake of iron in the diet.

Three variables are intended to measure net food security outcomes: the proportion of the undernourished in the total population and the intensity of food deprivation (food deficit of the undernourished population).

Finally, a group of two variables aims to measure the dependence on the external market: the share of food imports on total exports and the food dependency ratio (Net Imports as a Share of Consumption).

Therefore, the following variables are included in measuring the level of food security in the considered countries:

- Gross National Income per capita
- Dietary Energy Consumption (calories/person/day)
- Proportion of undernourished in total population
- Life expectancy at birth
- Under-five children mortality rate
- Improved sanitation facilities (% of population with access)
- Improved water source (% of population with access)
- Female participation rate in the labour force (%)
- Income Gini Coefficient, 2000-2010
- Total exports/ total food imports
- Net imports as a share of consumption

Principal Components Analysis has been recognized as one of the main methods currently available for analysts concerned with the construction of composite indicators (Nardo *et al.* 2008). Principal Components Analysis (PCA) is a statistical technique, belonging to the field of multivariate analysis, which is particularly suitable in summarizing the impact of a set of interconnected variables, as occur in the problem at hand.

The objective of the analysis is to select the minimum number of factors needed to account for the maximum portion of the total variance represented in the original set of variables, and then being able to assign a reasonable practical meaning to each factor. After doing that, and taking into account the specific influence of each original variable on each factor ('factor loadings') it is possible to ascertain the 'factor scores' corresponding to each observation.

Observations are countries in our case, and we are constrained to take into account that their number must be kept in proportion with the number of the original variables included in the analysis.

The interest of using PCA is double. First, we gain insight into the structure of the food security problem, by discovering a reduced set of underlying factors strongly connected to a collection of partial indicators or variables that we are able to observe. Second, we are able to substitute these factors for a larger number of variables and summarize the performance of each country according to each factor. Doing this, it is possible to simplify the analysis of the information at hand, allowing for a ranking reflecting the relative position of each country in a scale that depicts the seriousness of the problem.

IV – Findings

In the analysis carried out, the usefulness of a multivariate technique, Principal Components Analysis, is expounded and illustrated with an exercise comprising all SEMC countries and a set of 11 variables, addressing different facets of food security. The main aim of adopting this methodology (Nardo *et al.*, 2008) in this case is to summarize the information contained in the data in a small number of dimensions, or 'principal components'. The computation process has been carried out involving the deletion of some food security-related variables from the original set.

Following Reig, we found two components, so called "human development" and "risk of suffering from hunger", that have been finally retained and given an interpretation.

It has been found that the following variables have strong links ('loads') with the first component: Gross National Income per capita, life expectancy at birth, under five years child mortality rate, access to adequate sanitation facilities, access to drinkable and safe water supplies. The relationship is positive with those variables for which an increase implies a rise in wellbeing, and negative with those for which higher levels of the variable are associated with a situation of low social and economic development and the presence of deprivation.

Another group of variables mainly exert their influence on shaping the second component: dietary energy consumption, proportion of undernourished people, and net import. All of them are clearly linked to the intake of energy contained in food. The association is positive with variables measuring undernourishment and food deficit, and negative with caloric intake.

Countries in the sample have been ranked according to the aforementioned two components. All SEMC countries scored the higher value concerning the 'human development' indicator – a sub-indicator of food security - with Tunisia, which occupies the third position, as the best positioned country among the SEMC. The second sub-indicator, which measures the 'risk of hunger', gives rise to a more blurred ranking. Now some countries with a relatively high standard of living – within the African context – appear not as well-off as expected.

The main findings which we found carrying out our analysis is there exists the need for deeply investigation aimed to understand the reason and the solution for the food security problem in this region.

We emphasized that with less than two hectares per capita, small farmers account for almost all economic activity and enterprise, supply and demand, production and consumption in these regions. In some cases small-scale agriculture amounts to more than 80% of the food production in some developing regions. These people are therefore major actors in triggering the processes leading to economic growth. As a result these local actors should also be decisive for investments in agriculture in developing countries. The technical and organizational growth of agricultural systems falls by necessity on their shoulders and can best be configured only with the coherence of their initiatives.

To do this we must raise their knowledge and skills level, improve the quality of services and their ability to access them, calibrating the research and transfer of innovation on the specific aspects of the environmental and production conditions in the areas in which they live.

Improving human capital is a prerequisite. Keeping pace with these markets means having to interpret these multiple phenomena and translate this interpretation into management initiatives that tend to become increasingly complex, requiring continuous updating to take into account both technical and organizational innovations. This objective implies a greater incisiveness of gender policies: women make up over half of small farmers around the world and enhancing their role can be of great significance in terms of the stability of food supplies.

Raising the sum of human capital is one condition. Equally important is the contribution they can make to the development of the services and infrastructure starting with irrigation systems. The FAO estimates that about 1.2 billion people live in regions with marked problems of water scarcity and the situation could worsen in the short term, coming to affect another 600 million people by 2025. The advantages gained through the establishment of new and efficient irrigation infrastructure could be immense, particularly in Africa. The productivity differential is approximately 130% between irrigated and non-irrigated areas, and in places where water is not only a problem of distribution but also with regard to the volumes available, updated irrigation techniques can help to achieve major results. The transport and storage infrastructure should also be supported and fostered. Farmers in the poorest areas of the world sell their product at harvest when the price is at its lowest, having to buy it back when the cost is higher, contributing, paradoxically, to a general increase in prices. This is due to a lack of appropriate technology and facilities for handling,

storage and processing, which would extend the shelf-life of the product and raise its value in the market place. Finally, there is the need to strengthen the credit system and, more generally, risk management. The poverty in which farm families live represents a barrier to investment that becomes insurmountable in the face of the slightest adversity, such as falls in production, lower prices or increased energy costs. Unfavorable years often affect the continuity of farming, making it impossible to maintain operating costs at normal levels and in such a situation the ability to borrow or have access to tools for income stabilization is essential in the short term, to ensure that farms are economically viable and are able to respond more consistently to market signals.

Another important question is the specificity of all single country in SEMC region; even if there are common problem which affect the agricultural sector efficiency in this region, among countries we observed specific characteristics and linked problem for each country. In this context, due to the lack of reliable data, to investigate more deeply the topic for better understanding and proposing probable solutions to different type of risk in these countries, e.g. food security question, we performing in three countries (Syria, Turkey and Tunisia) a "Delphi Method" which is a methodology built on interviewing number of experts (bankers, traders, wholesalers, insurers, policy makers, consumers, etc.) and farmers (farmers, farmers' leaders, farmer association members and farmer union members) as well.

For example, in Syria our analysis underlines that one of a major problem of Syrian agriculture is the lack of facilities for marketing. In particular, as stressed by expert's opinions, farmers face severe difficulties during the marketing operations, especially for perishable products. The lack of adequate infrastructures, and efficient markets challenge the crossing of supply and demand sides. In Turkey, unexpected price fluctuations and apriori price uncertainty during marketing heavily affects farmers income. The shift in agricultural policy which moved away from coupled agricultural policies towards decoupled payments negatively affected this aspect. In Tunisia, the production/yield risk revealed to the main type of risk faced by farmers, followed by market risk and financial risk. This is explainable by the fact that there is a strong market intervention aimed at administratively fixing prices thereby protecting both farmers and consumers from market risk. The risk of policy change and personal risk are therefore less perceived by farmers as possible sources of risk as a result. Another significant source of risk is the increasingly limited availability of labor.

In conclusion, as well known, SEMC are experiencing a substantial phase of instability and policy changes. Besides the vulnerability implied by those changes, they might represent a rather unique opportunity to rethink the policy, and precisely the leading instruments to revitalize the agricultural sector. But, it would be important to emphasize that the target of the agricultural policy of each country should be set on the single specificity of the agricultural sector.

1. *Structural factors affecting food security in South Est. Mediterranean Countries*

The population growth rate of SEMC countries has averaged 2.1 percent in the last seven years compared to a world rate of 1.2 %. In the southern and eastern Mediterranean countries, high population growth rates have been recorded over the past three decades with natural growth peaks of 3% and more. Profiles vary widely, however. Population growth in the Maghreb countries is controlled as the result of a steep decline in fertility rate: this is the case in Tunisia, whose population has grown from 5 million in 1970 to 10 million at the present time but should not exceed 15 million by 2050. Population growth is still buoyant in most of the countries in the Near East. In Syria, Jordan, Egypt and the Palestinian Territories the annual growth rate is still around 2%. Egypt, for example, which had a population of 35 million in 1970, now has some 75 million inhabitants, and the figure could rise to almost 120 million by 2050. In the Near East, population trends are very correlated to socio-economic disparities: the demographic and socio-economic profile of Lebanon, for instance, is far removed from that of Syria.

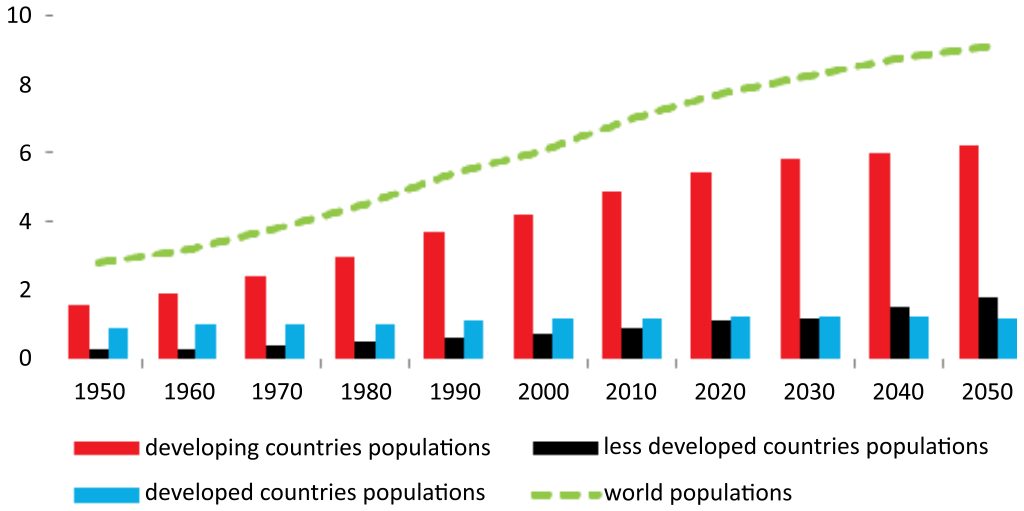

Figure 5. Total population growth and projections
Source: FAO

This trend has been accompanied by a rapid urban growth in the SEMC, where the number of city dwellers will have doubled by 2020 compared to the figure for 1990. Yet rural areas, on the whole, are not becoming depopulated. There has been a steep decline in the rural population in most SEMC in general terms, but the relative share of the rural population is decreasing in absolute terms as a necessary corollary of galloping urbanization, rural areas have never been so populated, particularly in the countries of the Near East and in Egypt, where the rural population is still larger than the urban population and farming still remain the primary activity in large part of this region (World Bank, 2011).

Figure 6. Rural population trend (total and annual %)

At the same time the average income growth rate has been roughly 3.0 % in the last decade, compared to the world average of 1.1 %, redrawing, hand in hand with the increasing urbanization, the consumption patterns of the entire region and leading, as previously recalled, toward a progressive exposure in terms of food trade deficits.

Figure 7. GDP per capita (US$)

The competition in covering soil has seen an increasing role of the urban area, often at the expense of fertile areas. In a region characterized by a strictly limited resources of arable land and water this means limiting option available for contributing to cover the increasing food demand. In Algeria, Jordan, Libya and Egypt, for example, the acreage of arable land accounts for less than 5% of the total area of the country. In many of the SEMC the arable land per capita is below the global average and its decline has been rapid.

Figure 8. Arable land (Ha per person)

In order to get around water scarcity, the people of the SEMC developed efficient systems of water engineering, which they used mainly for watering their crops (CIHEAM 2012). In Egypt, where crops cannot grow without irrigation, numerous techniques have been used for thousands of years to exploit Nile spates. But it was in the 20th century that irrigation was developed most, at least in terms of areas covered.

Irrigation is no doubt reaching its limit after years of rapid development, particularly in SEMCs, which are amongst the least endowed in the world in terms of available water resources: half of the world's "water-poor" (less than 1000 cubic meters per capita) live in the region. The natural resources exploitation index (the ratio between the volumes abstracted and the renewable water resources available) gives a worrying indication of the pressure that now weighs on water resources. Most of the SEMCs have an exploitation index of over 50%, for instance, but it is the situation in the east of the basin that is reason for the greatest concern. With the exception of Lebanon and Turkey, both of which have water resources, the indexes are already very high (over 75%) and, to judge by trend scenarios, are liable to rise further. These quantitative limits are compounded by signs of deterioration in water quality.

As seen previously, SMC are particularly concerned about food security because they are highly dependent on international commodity markets. The level of exposure is directly related both to the ratio of food imports to total exports and the fiscal balances.

SEMC countries are the largest net importers of cereal calories in the world, importing roughly 56 percent of the cereal calories they consume. This dependence on foreign market concerns all countries of the south Mediterranean region, which are the world largest net importers of cereal calories buying on the international market more than 50% of the cereal consumed calories. Wheat represents a significant part of the SMC diet, reaching in the case of Tunisia roughly 50% of the total consumed calories.

The exposure of SEMC countries to world food price volatility is firstly linked to their high dependence on the external market. The World Bank (2012) has calculated the ratios of net imports to domestic consumption, as indicative of the dependency on foreign imports to satisfy domestic food demand[7]. The results show that dependence on food imports in general is high across SEMC countries.

Table 1. Food Dependency Ratios, Import, and Consumption Share for 2010.

Country / Food Item	Net Imports as a Share of Consumption	Commodity Import Shares	Commodity Consumption Shares
Algeria			
Grains	68%	52%	52%
Oils	88%	22%	18%
Meat	33%	7%	15%
Sugar	89%	19%	15%
Food	69%	100%	100%
Bahrain			
Grains	100%	28%	25%
Oils	n/a	n/a	n/a
Meat	88%	62%	65%
Sugar	100%	10%	9%
Food	92%	100%	100%
Egypt			
Grains	39%	54%	62%
Oils	78%	27%	14%
Meat	37%	10%	13%
Sugar	37%	9%	11%
Food	44%	100%	100%
Iran			
Grains	19%	32%	46%
Oils	80%	28%	11%
Meat	23%	24%	34%
Sugar	61%	17%	9%
Food	31%	100%	100%
Iraq			
Grains	71%	56%	58%
Oils	100%	9%	7%
Meat	62%	20%	25%
Sugar	104%	15%	11%
Food	75%	100%	100%
Jordan			
Grains	97%	42%	35%
Oils	68%	17%	20%
Meat	25%	27%	34%
Sugar	98%	14%	11%
Food	67%	100%	100%
Kuwait			
Grains	101%	25%	26%
Oils	100%	3%	3%
Meat	86%	67%	66%
Sugar	100%	6%	6%
Food	91%	100%	100%
Yemen			
Grains	84%	54%	55%
Oils	100%	8%	7%
Meat	43%	10%	20%
Sugar	104%	27%	18%
Food	81%	100%	100%
Lebanon			
Grains	87%	39%	32%
Oils	38%	7%	8%
Meat	56%	38%	49%
Sugar	100%	16%	11%
Food	70%	100%	100%
Morocco			
Grains	51%	57%	61%
Oils	59%	24%	21%
Meat	n/a	n/a	n/a
Sugar	57%	19%	18%
Food	54%	100%	100%
Oman			
Grains	91%	26%	24%
Oils	93%	27%	18%
Meat	88%	37%	45%
Sugar	85%	10%	12%
Food	89%	100%	100%
Saudi Arabia			
Grains	85%	35%	34%
Oils	95%	12%	10%
Meat	57%	33%	46%
Sugar	151%	20%	11%
Food	80%	100%	100%
Syria			
Grains	51%	53%	62%
Oils	6%	7%	19%
Meat	n/a	n/a	n/a
Sugar	126%	40%	19%
Food	56%	100%	100%
Tunisia			
Grains	68%	58%	63%
Oils	-73%	15%	22%
Meat	n/a	n/a	n/a
Sugar	104%	27%	16%
Food	43%	100%	100%
United Arab Emirates			
Grains	100%	18%	22%
Oils	82%	19%	19%
Meat	87%	24%	51%
Sugar	82%	40%	8%
Food	89%	100%	100%

Source: Calculations using USDA data collected by Cristina Savescu.

This situation shall produce, in case of price shock, dramatic consequences in terms of food inflation. The SEMC region is the largest wheat importer in the world, and wheat prices increased by 70 percent in the second half of the 2000s. The incidence of food consumption in the basket household expenditures in SEMC countries is, in fact, still account between 30 and 50% and consequently food inflation often represent the most important component of the overall inflation.

It is well known, that the effects on the field of food security are strictly correlated with the income distribution among the population. The question of the high concentration of household living near the poverty line that characterized the SEMC area, would represent in case of prolonged price shock a threat in increasing the severity of poverty levels (IFPRI 2012). About half of the populations of the SEMC countries live in rural areas, and within this category agricultural sector plays a key role in, Syria, Egypt, Tunisia, Morocco and Jordan. Therefore, we need to emphasize that rural poverty is at the core of food security problems in the region, and recent rises in food prices have contributed to an increase in the incidence, depth and severity of poverty. Some preliminary analysis carried out during last years have stressed the link between increase in food price and increase in poverty in these countries; these results suggested that about a 30 percent increase in food prices in Egypt would result in a 12 percentage point increase in poverty, and a 14 percent increase in food prices in Morocco would result in a 4 percentage point increase in poverty (World Bank, 2011).

Furthermore, the tight of supply available on the food commodity market for certain strategic products, like cereals, increase the risk of disruptions in procurement and shortfalls in food availability in countries with high food dependency ratios (World Bank and FAO 2012). A further point which should be emphasized is the similarity often misleading of the concept of food security compared at self-sufficiency; indeed, food trade deficits may be an acceptable way of guaranteeing the availability of food supplies, but only under the condition that deficit-prone countries are able to generate enough foreign currency to pay for their imports. In practice it means being able to keep a relatively low ratio of food imports over total exports. In this context, SEMC countries are currently using 11.5% of their total exports to pay for their food imports. As underlined by the joint World Bank/IFAD/FAO report on improving food security in SEMC countries (World Bank 2009), food security in the region is determined by resource endowments which affect the level of food import requirements and also by fiscal balance which influences a country's ability to afford food imports.

This means that vulnerability to food price shock is basically influenced by the import dependence, but also by the fiscal position of the considered country. High import dependence associated with a sound fiscal position is not of concern, excepted in case of quantity shock such as export bans (African Development Bank 2012).

Global price movements in some strategic agricultural products markets is one important source in conditioning domestic price levels, accompanied by others linked to country-specific factors, including public policy measures.

Governments of SEMC countries use many policy instruments in order to mitigate the effects on consumers rising from fluctuations in global agriculture commodity price. Those measures has helped SEMC countries in isolating households from price volatility and food inflation. As observed by Ortiz *et al.* (2011) different policy interventions (especially an extensive use of price subsides, but also measures aimed at managing and regulating food consumption, production and trade) are used by SEMC countries in this field.

The latest peaks in international price has consequently complicated the macroeconomic scenario, leading toward an extensive use of resource devoted to price subsides measures and others instruments, including production subsidies, import protection cuts, and build-up of food reserves, taking away fiscal resources that can be used to finance growth-enhancing investments (World Bank 2012). The effects of food price transmission is linked to both the level and the typology of policy instrument used to mitigate the transmission into the domestic market. In case

of prolonged period of increasing food price fiscal, the amount of resources for covering the cost of those measures increase, generating a heavy fiscal drain on government budget and compromising the sustainability of these kind of response.

Inevitably fiscal and inflationary pressure has grown in many SEMC countries that are experimenting a fast growing domestic food demand and spending a relevant share of their GDP on food subsides. Some SEMC countries with high food import dependence and large fiscal deficit, such as Libya, Jordan, Lebanon, Egypt, Algeria, and Tunisia, appears most vulnerable to a sustained food price shock (IFPRI 2012, World Bank 2009).

In countries with limited fiscal budget and high import food dependency the space for price subsides in order to keep domestic prices stable decrease hand in hand with the increase in food price. In the last years public policy expenditures in some countries, like Egypt, Tunisia, Morocco, Algeria, has seen an increase arising from extending food and fuel subsidies. In parallel the fiscal deficit has grown.

Albers and Peeters (2011) analyzing the fiscal implications of increased expenditure on subsidies argue that the impact on public finances of the commodity price increases has been large by comparison with other. For Egypt, Algeria and Tunisia food subsidies as a percentage of GDP increased during 2007 and 2008 food price peak,. The weight of the combination of food and fuel subsidies on total government expenditure increased dramatically in Egypt where they reached 30.9% of current government expenditure in 2008, but also in Morocco and Tunisia where they reached 19.9% and 17.7% in 2008.

In this regard, by and large, observers have identified amongst the causes of the “Arab Spring” a set of common factors including social inequality, high levels of youth unemployment, a desire for greater individual freedoms together with a widespread sense of dissatisfaction in the population, stressing that at the root of the protests were significant “factors unrelated to income”[8] This having been said, one cannot underestimate the impact, especially in some countries, of the increased weight of food expenditure on family incomes brought about by the volatility in prices of agricultural commodities since 2007.

In December 2010, following the spike in prices of agricultural commodities, the global prices of sugar and cereals had increased by 77 and 40% over the previous year. This was a decisive event for the stability of many SEMC countries, where the availability of the two commodities, which provide 61% of per capita calorie intake in these regions, is largely dependent on imports (De Castro *et al.* 2012).

Table 2. Percentage of income spent on Food and Non-alcoholic beverage in 2008.

USA	**6.8**
UAE	**9.0**
Qatar	**12.8**
Kuwait	**14.6**
Israel	**17.8**
Saudi Arabia	**23.7**
Iran	**26.3**
Tunisia	**35.8**
Egypt	**38.3**
Morocco	**40.3**
Jordan	**40.8**
Algeria	**43.8**

Source: US Department of Agriculture

Given that much of the food imported into North Africa consists of bulky cereals, a large part of the final cost is due to international and domestic transport, warehousing and storage costs. Economic and Social Commission for Western Asia (ESCWA, 2010) argues that countries in the region, (which includes Egypt as the only North African country) tend to perform worse than other Middle Income Countries in terms of trade development indicators such as the World Bank's Logistics Performance Index. This is partly due to lack of integration of border services and inspections, lack of simplified procedures for transit freight, the poor state of railways and roads, inefficient and lengthy border clearance procedures, and lack of ability to trace and track consignments.

The Logistics Performance Index (LPI) for the four North African countries included in the World Bank's sample. As evident in the Table, there is considerable scope for all four countries to improve their trade logistics. This is particularly true for Algeria and Libya who rank 130th and 132nd out of 155 countries and have a LPI below the average for the SEMC region as a whole as well as below the average for Lower Middle Income countries (when they are Upper Middle Income) and below the East Asia Pacific region. There is a positive relationship between the LPI and food security with the latter measured by the Global Hunger Index (ESCWA 2010). Hence, reforms to improve trade logistics in North Africa may well have a beneficial impact in terms of food security. Furthermore countries need to tailor their stockpiling strategies to their specific needs. Food stocks serve multiple purposes: as rapid emergency food aid in times of crisis, as working stocks for regular distribution, and as buffer stocks to stabilize domestic prices (Dorosh, 2008).

Each country must assess how useful each of these purposes is for their needs.

Key factors in making this assessment are national consumption, variability of domestic production (increasing with climate change), storage costs, size of the country relative to the international market, risks of production shortfalls and high prices to the poor, and thinness of international markets.

Although wheat reserve offer no protection against structural, long-term price increases, they effectively serve as an insurance policy with costs and benefits that must be carefully considered. In fact, many SEMC countries are considering expanding their strategic reserves to be able to hold six months' to one year's worth of wheat stocks.

Despite being the largest wheat-importing region, in 2010 SEMC countries held only 10 percent of the world's wheat stocks. Egypt is the only SEMC country among the top-ten wheat stock holding countries. The majority of global wheat stocks are held in wheat producing countries such as China, the United States, and India, which may indicate that it is more cost effective to hold stocks close to production. As food security concerns have grown, many SEMC governments have revisited the idea of strategic reserves and are planning to increase their level of wheat stocks. Overall storage capacity in the region is on average six months of consumption, and estimated ending stocks are four and one-half months.

The relative size of the subsidy in SEMC countries can be estimated by comparing their storage costs with the cost of storage in the Netherlands, South Korea, and the United States. In all three benchmark countries, the private sector manages the WISC in markets characterized by high competition.

Assuming the long-term marginal cost of storage is approximately US$2 per metric ton per month, in 2009, four SEMC countries fell below this international rate, suggesting either lower land, labor or capital costs or the presence of direct or indirect subsidies.

On the other hand SEMC governments are responding to the recent price shock with a combination of trade policies, wage increases, and safety-net programs that will be difficult to scale back. Trade - and tax - policy changes have been a common initial response, aimed at increasing food security and controlling consumer prices. Public-sector wages have been increased in several

countries, including Jordan, Egypt, Syria, although these increases are largely intended as compensation for both higher energy and food prices. Some countries have used cash transfers to increase the purchasing power of the poor. Food subsidies are popular, but have substantial drawbacks. Many countries in the region rely heavily on food subsidies as the primary safety net, including Egypt, Jordan, Syria, and Morocco, among others. In-kind food subsidies are particularly popular and many countries have expanded these subsidies in response to the recent price shock. food subsidies absorb up to 2% of GDP in some cases.

Table 3. Food Subsidies as % GDP 2002-2010 in Four North African Economies.

	Algeria	Egypt	Morocco	Tunisia
2002	0.0	1.2	n/a	0.6
2003	0.0	1.2	0.4	0.5
2004	0.0	1.7	0.4	0.6
2005	0.0	2.1	0.7	0.6
2006	0.0	1.5	1.0	0.7
2007	1.8	1.3	-1.2	1.2
2008	1.5	1.8	0.8	2.1
2009	1.8	2.0	0.1	1.6
2010	n/a	1.4*	0.6*	1.4*

Notes: *= estimates

Source: Albers and Peeters, 2011, Boxes 3 and 4.

Subsidies have several disadvantages. First, they divert significant resources from alternative, more productive uses. Second, when they are not targeted, they are unnecessarily expensive, because most benefits are captured by the non poor. And third, in-kind food distribution systems entail heavy administrative overhead and substantial wastes due to storage losses, and they encourage corruption, waste, and leakage of food to non-human uses. Existing safety nets do not reach those most in need.

Programs need to be targeted to the poor because they are most affected by price shocks, spending proportionately more on staple foods. Most cash-transfer programs in the region are small, amounting to less than 1% of GDP in most cases. Most programs use categorical targeting approaches. Households and individuals are entitled to benefits if they fall into eligible categories, such as single mother, widow, unemployed, elderly, or disabled. These categories are not limited to the poor, and do not necessarily cover the poorest sectors of the population.

V – Policy Outcomes

Strategic wheat reserves require sound management in order to mitigate import supply and price risks effectively.

Mismanagement of strategic reserves may outweigh the benefits of maintaining wheat stocks, ultimately weakening a country's food security (Murphy 2009). To ensure a well managed reserve, each country must establish a set of guiding principles regarding when to draw down stocks and when to replenish, assuming the first-in-first-out (FIFO) principle. These guidelines must be clear and must be designed with the objective of mitigating supply and price risks, and the purchasing and selling of the wheat reserves must be done in a competitive and transparent market. In

addition, to ensure that wheat is accessible when needed it is important to make sure that all stakeholders are well informed about the guidelines and that staff located both at the site of the reserves and in back offices are properly trained. Lastly, the management of wheat reserves must be adequately financed (Murphy 2009).

Three factors must be considered in establishing the guidelines for the reserves: the threshold domestic price that will trigger the drawdown of wheat reserves, the target reserve level, and the rate of reserves replenishment. A recent analysis argues (Larson *et al.* 2011) that selecting a higher threshold domestic price turns the reserve into more of a safety net to be used in emergency situations rather than as a tool for price stabilization; with a high threshold price, strategic reserves may not have much of an impact on domestic price volatility as long as prices remain below the threshold. The larger the targeted size of the reserve, the more costly it will be to maintain, but the more food-security coverage the reserve will provide. Lastly, a more aggressive rate of building up and replenishing the reserves is more likely to smooth domestic price volatility, as there is less chance of there being insufficient reserves. However, replenishing reserves increases demand from international markets, which may aggravate international price volatility.

The appropriate management structure of the reserve is specific to each country and should be designed to minimize costs, ensure food safety, and reduce distortive impacts of stock policies on grain markets (Rashid and Lemma 2011). Once the strategic reserve policy is established, there may be opportunities to create public-private-partnerships (PPPs) for management.

The government could pay private operators to manage logistics and storage operations for strategic stocks or could play a more limited role, getting involved only during severe price and supply shocks.

Improve the design of safety nets to dampen the effects of food-price shocks and prevent them from doing permanent harm.

Strengthen program coordination and enhance payment mechanisms to improve resource efficiency. At the policy level, program coordination needs to be improved to reduce overlapping beneficiaries and mandates that waste resources. Implement safety nets that are flexible enough to be scaled up when shocks strike and scaled down when they recede.

This is important because scalability enables relief for the vulnerable when prices are high and a reduction in the fiscal burden when prices are low. If possible, existing targeted cash-transfer programs should be the prime candidates to be scaled up. These include poverty-focused social assistance, as well as social pensions, unemployment assistance, and disability pensions. Where public workfare is already part of the safety net, it may be useful to expand program reach. The next most desirable candidate would be food stamps or other near-cash assistance that could be targeted and scaled up or down. Direct subsidies and food distribution would be the least desirable option, only advisable when food markets are functioning poorly or when subsidies are the only available safety net.

Agricultural markets in SEMC appears nowadays still organizationally and structurally weak: the role of the policy maker is therefore one of a great responsibility.

International coordination of measures is required to prevent unilateral actions (such as export bans) aimed at promoting food security within particular areas that end up destabilizing the global food supply and increasing the size of those populations at risk from hunger and malnutrition. As recently pointed by leading scholars in agricultural economics, trade policy initiatives aimed at reducing the impacts of price increases have been a major stimulus to the increases that immediately followed. In particular, the adoption of restrictive measures exacerbated the price increase trend.

A further important topic to be taken into account is the management of risks. The large exposure of agricultural sector to risks related to natural events and the instability of the market still require a significant public intervention. As pointed by our field research, SEMC Poverty, Food Security and Risk Management in SEMC lack of a solid structure to help farmers in managing risks. This in turn exposes MPCs to risks of disasters, reduction in productive potential, vulnerability and food insecurity.

An appropriate intervention strategy would be to ensure a fair functioning of markets. The incentives must drive the adoption of practices and technologies to increase yields and have less impact, as well as compensating farmers for the environmental benefits they produce. In other words, support policies should be directed towards the stabilization of incomes rather than the market, using intelligent, flexible measures. Among them a special role needs to be played by the tools of risk management. Access to the opportunities offered by traditional devices for risk transfer to third parties, such as insurance, should also play their part.

1. Econometric assessment of Food Security: autologistic regression

Information available on measurements of variables such as food security, hunger and poverty use absolute, alternative and subjective approach methods. These methods use single indicators such as income, headcount ratios, nutritional variables or household expenditures as proxies (Booth, 1996). Using a single indicator or a few of them as proxies do not capture the real situation of the individual households. There are approximately 200 definitions and more than 450 indicators or explanatory variables of food security (Hoddinot, 1999).

As introduced above, in this study we adopted the most commonly used definition of food security which states “food security is widely defined as access by all people at all times to enough food for active healthy life.” It is a condition in which a population has physical, social and economic access to sufficient safe and nutritious food secure population can meet its consumption needs during the given consumption period by using strategies that do not compromise future food security. Food security is therefore a very complex multidimensional phenomenon, which varies through a continuum ofexcessive stages as the conditions change. Food security is therefore a very complex multidimensional namely, vulnerability access sufficiency and sustainability. Therefore, food security status of a given population is very complex product in a farming system characterized by interdependency and interactions at 1 varying levels between agents such as public sector entities markets NGOs and the community among many others. These interactions result into non-linear effects - population.

The difficulty in documenting an econometric model analyzing food security stems from the fact that 450 variables are really just too many for a model.

Whereas food insecurity intervention is multi-criteria in decision making, econometric estimation of parameters in such a model may be impossible because of errors in variables, heteroscedasticity, multicollinearity and autocorrelation. Further, the situation becomes even much more complicated because these relationships arise from the larger systems of food security status. This tasks often difficult and the interaction of the pieces is uncertain and complexity with respect to food security, there is no limitations of uncertainty and complexity with respect to food security and there is no consensus to date among social scientists in how food security should be econometrically documented.

In this context, this study introduce a spatial analysis which could represents a way to determine those variables that affect household poverty and to estimate the number of poor people in the target areas. This type of analysis is based on the assumption that measured geographic variables often exhibit properties of spatial dependency (the tendency of the same variables measured in locations in close proximity to be related) and spatial heterogeneity (non-stationarity of most geographic processes, meaning that global parameters do not well reflect processes occurring at

a particular location). While traditional statistical techniques have treated these two last features as nuisances, spatial statistics considers them explicitly.

As a special case, generalized spatial linear models include spatial linear regression and analysis of variance models, spatial logit and probit models for binary responses, loglinear models and multinomial response models for counts.

Let c_i denote the level of consumption per household, z denote the poverty line, and $s_i = c_i/z$ be the normalized welfare indicator per household. The household z poverty indicator is determined by the normalized welfare function as follows:

$$y_i = 1 \text{ if } \ln s_i < 0$$

$$y_i = 0 \text{ if } \ln s_i \geq 0$$

The households are observed in n sites that form a subset S of the space. Each point (household) i has a binary response y_i and a vector $k \times 1$ of covariates x_i. The responses constitute a map $Y = (y_i)_{i=1}^{n}$

The regression model is called autologistic and states the conditional probability p_i that y_i is equal to 1, given all other site values $y_i = (j \neq i)$:

$$p_i = Pr(y_i = 1 | y_i, j \neq i) = Pr\left(y_i = 1 | y_j, j \in N(i)\right) = \Phi\left(\beta_0 + \beta^H x_i^H + \beta^C x_i^C + \gamma y_i^*\right) \quad (1)$$

where N(i) is the neighbor set of site i according to a neighborhood structure, β^H and β^C are the vectors of regression coefficients and y_i^* is the sum of the values of the dependent variable of the neighbours of the site i, that is:

$$y_i^* = \sum_{j=1}^{n} y_j I(i \cong j) = \sum_{j:i \cong j} y_j \qquad (2)$$

where $i \cong j$ denotes denotes that the households i and j are neighbors.

This kind of model takes into account the spatial distribution of the welfare indicator, incorporating the neighborhood structure in the model as another parameter to estimate.

In the model, X^H is the vector of explanatory variables that describe the household characteristics, X^C is the vector of explanatory variables describing the characteristics of the area in which the households reside, and Φ is a cumulative distribution function that is standard normal in the case of probit regression.

For a given poverty line and a given set of observation on X^H and X^C, the estimates of β^H, β^C and γ can be obtained by the maximum pseudo-likelihood method.

Besag (1975) has demonstrated that the pseudo-likelihood method produces consistent parameter estimates under regular conditions.

Given the above generalized linear model, a maximum pseudo-likelihood estimator (MPE) for the unknown parameter vector $\Theta = \{\beta_0, \beta^H, \beta^C, \gamma\}$ will be defined as the vector $\hat{\Theta}$ that maximizes the pseudo-likelihood function:

$$\prod_{i=1}^{n} Pr(y_i = 1 | y_i, j \neq i) = \prod_{i=1}^{n} p_i^{y_i} (1 - p_i)^{y_i} \quad (3)$$

As a result, the function in Equation 3 is not a full likelihood. An analytical form of the full likelihood is intractable for this problem because there is generally an unknown normalizing function (Besag, 1974). Note that the logit expressions in equation 3 are not independent across households because each household's variable y_i is related to the y_i variables of all the other households. Consequently, from the standpoint of the maximum likelihood estimation theory, we should not

multiply the *n* logit likelihoods generated by equation 3 together to compute the overall likelihood function. Nevertheless, it can be shown that maximizing the function obtained by multiplying together the logit likelihoods represented by equation 3, yields consistent estimates of model parameters. This procedure, known as maximum pseudo-likelihood estimation (MPLE) (Cressie, 1993), provides consistent estimates of model parameters.

For the autologistic model, this approach is computationally simple since it amounts to using standard logit software to estimate the model parameters - ignoring the fact that the response variables are actually interdependent.

Therefore, the pseudo-likelihood estimation procedure proposed is an intuitively plausible method that avoids the technical difficulties of the full maximum likelihood approach. A drawback of the method is that its sampling properties have not been studied as extensively as those of the full maximum likelihood estimators.

Besag (1977) discusses the consistency and efficiency of pseudo-likelihood estimation for simple spatial Gaussian schemes. Strauss and Ikeda (1990) have shown that, for a logit model, maximization of Equation 3 is equivalent to a maximum likelihood fit for a logit regression model with independent observations y_i. Consequently, estimates can be obtained by using an iteratively reweighted least squares procedure. Therefore, any standard logistic regression routine can be used to obtain MPEs of the parameters. However, the standard errors of the estimated parameters calculated by the standard programs are not directly applicable because they are based on the assumption of independence of the observations.

The next step is the estimation of the incidence of poverty in all counties. These estimates are made on the basis of the relationship between the area characteristics and the probability that households residing in these areas are poor. The probability that households in a given county are poor is estimated only on the basis of the area characteristics:

$$\pi_C = \Phi(X^C\beta^H + X^C\beta^C) \qquad (4)$$

where $\overline{X}^c$ is a vector of variables describing the household characteristics calculated at area level, β^H and β^C are the coefficients from Equation 1 and π_c is the probability that a household drawn from a certain county is poor. The parameter estimates from the regression are applied to the census data in order to obtain an imputed value for π_c, the percentage of poor households in a county. In this way, the poor households in all the counties are estimated. Finally, using the information on household size, the probability of a household being poor can be extended to the probability of an individual being poor. At this stage, by implement and carry out an empirical application for SEMC's, would be necessary to collect survey data for each country, on all dimensions of household well-being and socio-economic characteristics including highly disaggregated data on household consumption expenditures. The survey design incorporated both clustering and stratification on the basis of the country's three main agroclimatic zones and rural-urban breakdown.

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Notes

[1] To globally satisfy a diet which will be increasingly enriched in calories and change in its composition, annual cereals production will have to reach around three billion tons, about one third higher than today, that of soya will have to increase by 140% and that of meat will have to reach 470 million tons, 200 million more than current production (FAO 2010).

[2] The official list is available on http://mdgs.un.org/unsd/mdg/Host.aspx?Content=Indicators/OfficialList.htm

[3] *Beyond the SEMC Awakening: Policies and Investments for Poverty Reduction and Food Security* (IFPRI 2012)

[4] Food imports / [total exports + net remittance inflows]

[5] The GHI ranks countries on a 100-point scale. Values less than 5.0 reflect low levels of hunger, values between 5.0 and 9.9 reflect moderate hunger, values between 10.0 and 19,9 indicates the presence of a serious problem of hunger, values between 20.0 and 29.9 are alarming, and values of 30.0 or higher are considered as extremely alarming.

[6] Food trade deficits may be an acceptable way of guaranteeing the availability of food supplies, but only under the condition that deficit-prone countries are able to generate enough foreign currency to pay for their imports.

[7] Dependency ratios is calculated as: $D_i = \frac{M_i}{C_i}$ where M_i is net imports of food product I, C_i is the domestic consumption with I corresponding to grains, edible oils, meat, and sugar.

[8] Breisinger C., Ecker O., Al-Riffai P., *Economics of the SEMC awakening: from revolution to transformation and food security*. IFPRI Policy Brief 18, May 2011. http://www.ifpri.org/publication/economics-SEMC-awakening