Universitat Politècnica de Catalunya

Trabajo Final de Máster

Soberanía Alimentaria en América Latina

Food Sovereignty in Latin America

Que para obtener el grado de:

Máster en Sostenibilidad

P R E S E N T A

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Barcelona Junio 2012

Food Sovereignty in Latin America

Absrtract: Hunger and undernourishment have been widely acknowledged as central problems of human rights in various forums and conferences. In spite of this recognition, hunger has kept increasing in a world where food is produced in abundance. FAO figures released in 2009 show that by 2008 there were around 1.020 million human beings suffering from hunger on a daily basis. The problems of undernourishment and hunger are somehow stressed in developing regions where infrastructure and production resources are restricted. One such region is that of Latin American Countries, which faces staggering levels of poverty and food supply constraints. This work attempts to develop an Index on advancement on hunger based on the five pillars proposed for Foreign Sovereignty (FSv) principles that some countries of the Latin American region (and other regions) have adopted. The resulting Index, named Foreign Sovereignty Index (FSvI) was then used to produce a relative position (ranking) for the set of countries that integrate the region of Latin America, and analyze whether there exist diverse results as a consequence of the Latin American countries which have included policies aiming at reaching FSv in their countries. We did not find support for this proposition; however, the adoption of the FSv legal framework is relatively recent (Bolivia in 2007, Ecuador in 2010 and Venezuela in 2008; Fernández Such and Rivera Ferre, 2011), therefore it is still too soon to observe progress in those countries; we, thus, remain confident that further research on this topic will provide more optimistic results.

*The first version of Food Sovereignty Index (FSvI) is the result of the joint collaboration with two other colleagues: Mohammed Mahmoud and Neşat Çomak. This work has been led by Marta G. Rivera Ferre, advisor of this work.

Resumen: La hambruna y la malnutrición han sido ampliamente reconocidas como problemas fundamentales de derechos humanos en diversos foros y conferencias. A pesar de este hecho, la hambruna ha seguido creciendo en un mundo donde la producción de alimentos es abundante. Datos de la FAO publicados en 2009 muestran que hacia 2008 existían alrededor de 1.020 millones de seres humanos sufriendo de hambruna diariamente. Estos problemas aparecen de manera más cruda en regiones donde la infraestructura y la producción de recursos es limitada. Una de estas regiones es Latinoamérica, cuyos países enfrentan asombrosos niveles de pobreza y restricciones en la provisión de alimentos. Este trabajo intenta desarrollar un Índice relativo a los avances en temas de hambruna, basado en los cinco pilares propuestos para los principios del marco de Soberanía Alimentaria (FSv, por sus siglas en ingles) que han sido adoptados por algunos países de la región de Latinoamérica (y por otras regiones). El Índice resultante, llamado Índice de Soberanía Alimentaria (FSvI,

por sus siglas en ingles) fue posteriormente utilizado para producir un listado de posiciones relativas (ranking) para el conjunto de países que integran la región Latinoamericana y analizar si existen resultados diversos como consecuencia de la adopción del marco legal de Soberanía Alimentaria de algunos países de esa región. No encontramos soporte para esta proposición, sin embargo, la adopción de este marco legal se ha llevado a cabo recientemente (Bolivia en 2007, Ecuador en 2010 y Venezuela en 2008; Fernández Such and Rivera Ferre, 2011), por lo tanto aún es temprano para observar progreso en estos países. A la vista de estos hechos nos mantenemos confiados de que futuras investigaciones en esta materia arrojarán resultados más optimistas.

* La primera versión del Índice Internacional de Soberanía Alimentaria (IISA) se realizó en colaboración con un grupo de trabajo liderado por Marta G. Rivera Ferre, tutora de este trabajo, y formado por Mahmud Mohammed, Neşat Çomak y Adriana Ruiz Almeida.

Resum: La fam i la malnutrició han estat àmpliament reconegudes com a problemes fonamentals de drets humans en diversos fòrums i conferències. Malgrat aquest fet, la fam ha seguit creixent en un món on la producció d'aliments és abundant. Dades de la FAO publicats en 2009 mostren que cap a 2008 existien al voltant d'1.020 milions d'éssers humans sofrint de fam diàriament. Aquests problemes apareixen de manera més crua en regions on la infraestructura i la producció de recursos és limitada. Una d'aquestes regions és Llatinoamèrica, els països de les quals enfronten sorprenents nivells de pobresa i restriccions en la provisió d'aliments. Aquest treball intenta desenvolupar un Índex relatiu als avanços en temes de fam, basat en els cinc pilars proposats per als principis del marc de Sobirania Alimentària (FSv, per les seves sigles en engonals) que han estat adoptats per alguns països de la regió de Llatinoamèrica (i per altres regions). L'Índex resultant, anomenat Índex de Sobirania Alimentària (FSvI, per les seves sigles en engonals) va ser posteriorment utilitzat per produir un llistat de posicions relatives (rànquing) per al conjunt de països que integren la regió Llatinoamericana i analitzar si existeixen resultats diversos com a conseqüència de l'adopció del marc legal de Sobirania Alimentària d'alguns països d'aquesta regió. No trobem suport per a aquesta proposició, no obstant això, l'adopció d'aquest marc legal s'ha dut a terme recentment (Bolívia en 2007, Equador en 2010 i Veneçuela en 2008; Fernández Such i Rivera Ferre, 2011), per tant encara és primerenc per observar progrés en aquests països. A la vista d'aquests fets ens mantenim confiats que futures investigacions en aquesta matèria llançaran resultats més optimistes.

* La primera versió de l'Índex Internacional de Sobirania Alimentària (IISA) es va realitzar en col·laboració amb un grup de treball liderat per Marta G. Rivera Ferre, tutora d'aquest treball, i format per Mahmud Mohammed, Neşat Çomak i Adriana Ruiz Almeida.

Food Sovereignty in Latin America

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1 Introduction

Hunger became the center of governmental priorities after discussions at the World Food Summit held in Rome on 1996, more than 20 years after the World Food Conference proclaimed that every man, woman and child has the "inalienable right to be free from hunger and malnutrition in order to develop their physical and mental faculties" (World Food Conference 1974), and more than 40 years after the recognition of the Right to Food as a basic Human Right. During the World Food Summit all countries, NGOs and development agencies committed themselves to help to reduce hunger by half by 2015 through sound policies and strategies aimed at tackling such fundamental issue.

However, in a world where food is produced in abundance, the number of persons suffering from hunger has continued to increase. While the current system still seems to be productive in terms of global output[1], there are problems with the distribution of benefits to the poor and the hunger, and its unsustainable production methods have led to the marginalization of smallholder farmers and to long-term environmental threats (Commit to Food Sovereignty, 2002).

FAO figures released in 2009 show that by 2008 there were almost 1.020 million human beings suffering from hunger on a daily basis.[2] The problems of malnutrition and hunger are somehow stressed in developing regions where infrastructure and production resources are restricted. One such region is that of Latin American Countries, which faces staggering levels of poverty and food supply constraints.

That entire regions face strong hunger problems is a matter of serious concern that can never be acceptable and the entire international community must act in order to find alternative solutions to this problem. Three main alternatives to tackle hunger have been developed and widely recognized: the Right to Food (RF), Food Security (FSc) and Food Sovereignty (FSv).

RF consists on the recognition of an individual and basic human right contemplated in the Article 25 of The Declaration of Human Rights in 1948. Its acknowledgment established a conceptual and legal framework that allows citizens to demand respect, protection and safeguard for their needs to access adequate and sufficient sources of food. The Committee on Economic, Social and Cultural Rights (Committee on ESCR) in its General Comment 12 defined RF as follows (1999)[3]:

> *"The right to adequate food is realized when every man, woman and child, alone or in community with others, has physical and economic access at all times to adequate food or means for its procurement."*

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[1] This refers to the productivity measured for one culture (monoculture) produced per Ha. Other measures of productivity, as per area unit are considered (e.g. what is entirely grown in terms of food (polyculture)) are not

[2] 2008 is the last official data provided by FAO. Given that a new methodology is under revision, no new estimation was provided for 2009 and 2010 (see FAO 2011). It is estimated, however, that this figure will start decreasing in the incoming years.

[3] http://www.webcitation.org/68ClsYzMy (last consulted 06/2012)

According to Windfuhr (2002), RF empowers oppressed communities and individuals against the state and other powerful actors. The state should provide an environment that facilitates implementation of these responsibilities assuring that all members of society; individuals, families, local communities, civil society as well as the private sector have responsibilities in the realization of the right to adequate food.

Alternatively, FSc stands as a technical concept that attempts to address issues related to the access of food at either country or regional level; for instance, access by food-deficient countries to surplus products, import and export quotas, food aid, agricultural techniques to increase production, and irrigation, (Eide et al., 1991). The official definition is stated on The State of Food Insecurity (FAO, 2001), as follows:

> *"Food security [is] a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"*

There are a series of differences between these two related concepts. For instance, contrary to RF, FSc is no legally obliged to state which mechanisms could be used by malnourished people to protect themselves against the denial of their access to food, also FSc focuses on global, national or regional availability of food, rather than individual access to food by deprived persons or groups (Windfuhr, 2002). FSc does not set any priorities when it comes to the implementation of policies. RF debates on access to productive resources and incorporates a particular set of rules and regulations for states with regard to people living in their territory, but it also includes extraterritorial obligations (Alston et al., 1984).

While both previous alternatives are improving steps toward solving the problem of hunger, they remain limited by a series of constraints that are better covered by the concept of FSv; hence, to the best of our knowledge, this latter choice offers a more useful framework. For example, while it also delineates access to productive resources as RF does, it goes further by including more precise policy proposals that define the access and control of resources to produce food (FAO, 2004; People's Food Sovereignty, 2002).

Furthermore, FSv poses political challenges, which require that states regain the necessary policy space to conduct their fight against hunger and to be able to implement fully their obligations to their citizens in ensuring both their right to adequate food and other human rights (Windfuhr, 2003).

Finally, while both, RF and FSc, emphasize the economic access[4] to food, FSv can be considered, in short, a policy framework for an alternative model of society.

The objective of the present work is twofold:

First, to focus on FSv as the benchmark framework for assessing and comparing the different developments that Latin American Countries have faced in dealing with hunger and other crucial social issues (poverty, rural development, gender equity, and so on). In particular, this work attempts to develop a Food Sovereignty Index (FSvI) based on the pool of indicators previously set by Ortega-Cerdà and Rivera-Ferre (2010), compare this Index with other relevant measures that have been used historically to measure progress in mitigating the problem of hunger and propose it as an efficient tool to establish a relative position (rank) among the set of countries pertaining to Latin America.

Second, to assess whether countries that have adopted FSv principles within its policies and processes are now in a better position *vis a vis* those which have failed to do so, as measured by the FSvI above proposed.

To fulfill this purpose we have pursued a set of secondary objectives, namely:

- Collected and analyzed indicators for generating the FSvI above described, and then used such index to compare with other indicators of development (e.g. Human Development Index, Food Security Index, Environmental Performance Index and Democracy Index),
- Carried out an analysis of FSv using each of the five pillars that are intrinsic to such framework.
- And analyzed if diverse results are a consequence of the differences among Latin American countries which have included policies aiming at reaching FSv in their countries.

The present work is structured as follows: Section two presents a brief history on the development of the concept of FSv together with its definition, and describes the steps undertaken to achieve FSv quantifiable measure and the five pillars that are now an integral part of this concept. Section three puts forth the current context faced by Latin American countries and categorizes the countries integrating this region into four domains on the basis of its circumstances, position and actions with regard to FSv. Section four clarifies the motivation, viability and limitations for this research work. Section six offers the results of the five-pillar analysis, the Index comparisons and the country ranking for the Latin American region. Finally section seven concludes.

[4] The "economic access" refers to the adequate purchasing power to buy food and access to resources: land, seeds and livestock breeds, water and fishery resources, basic capital and credit, skills, etc. (FAO 2004b)

2 Food Sovereignty's Definition

Since its inception in April 1996, as a result of the International Conference of La Via Campensina in Tlaxcala, Mexico, the political proposal on FSv has sought to develop a just and sustainable development of the agri-food system. This broad proposal seeks to achieve the right to food, poverty reduction, rural development and environmental sustainability, from the perspective of social justice and gender equity.

In November 1996, during the World Summit on Food in Rome, La Via Campesina stated that FSv "is a precondition to genuine food security", and therefore to the Right to Food.

The proposal rapidly became a reference in international debates about hunger, agriculture, rural poverty or food systems, and especially for social movements around the world (Windfuhr & Jonsén, 2005). FSv proposal managed to establish itself as a potential alternative to the current model of development in areas of production, distribution and consumption of food. Currently, many Organizations of Civil Society (OCSs), Non-Governmental Organizations (NGOs), multilateral institutions (UNEP, Commissioner of the Right to Food) and Governments (Mali, Nepal, Indonesia, Ecuador, Bolivia) acknowledge its potential in the development of sustainable food systems.

FSv's concept has been evolving over time since its establishment. However most definitions proposed have marginal differences, and maintain the core principles within their structure: "Food Sovereignty principles of La Via Campesina". According to Windfuhr and Jonsén (2005) one such principle, the most commonly used, is that of the International Planning Committee for Food Sovereignty (IPC) in 2002; which defines FSv as:

> "*the right of peoples, communities and countries to define their own agricultural, labour, fishing, food and land policies, which are ecologically, socially, economically and culturally appropriate to their unique circumstances. It includes the right to food and to produce food, which means that all people have the right to safe, nutritious and cultural appropriate food an to food-producing resources and the ability of sustain themselves and their societies*."[5]

In 2007, however, La Via Campesina redefined FSv on the Declaration of Nyeleni (Mali) as:

> *"the right of peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems. It puts the aspirations and needs of those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations. It defends the interests and inclusion of the next generation. It offers a strategy to resist and dismantle the current corporate trade and food regime, and directions for food, farming, pastoral and fisheries systems determined by local producers and users. Food sovereignty*

[5] http://www.foodsovereignty.org/

prioritizes local and national economies and markets and empowers peasant and family farmer-driven agriculture, artisanal - fishing, pastoralist-led grazing, and food production, distribution and consumption based on environmental, social and economic sustainability. Food sovereignty promotes transparent trade that guarantees just incomes to all peoples as well as the rights of consumers to control their food and nutrition. It ensures that the rights to use and manage lands, territories, waters, seeds, livestock and biodiversity are in the hands of those of us who produce food. Food sovereignty implies new social relations free of oppression and inequality between men and women, peoples, racial groups, social and economic classes and generations."[6]

It can be inferred from the above definition that FSv serves as a political tool to address environmental, social, economic and health issues; it is a guideline, or aspiration, in terms of a direction to be heading in, and hence, encourage continuous steps towards shortening the food supply chain and empower both peasants and consumers.

Notwithstanding the source of definition, FSv's concept always refers to both the right to food and the right to produce, which recognizes that people all around the world must have access not only to safe, nutritious and culturally appropriate food, but also to the resources and mechanisms for its production in order to support themselves and their societies. It also puts the aspirations and needs of those who produce, distribute and consume food at the heart of food systems and policies rather than at the demand of markets and corporations (Declaration of Nyeleni, 2007)[7].

Many authors have discussed the accuracy of FSv's proposal in times of globalization (Windfuhr & Jonsén, 2005), some consider the proposal as an anti-trade scheme; however, it has meant to demand the right to control policies, distribution of resources, and national and international decision-making for those who are directly affected by such policies; it has also attempted to promote local democracy and participatory development of national policy formulation (Walelign, 2002).

FSv is a holistic proposal, a framework to change the dominant vision. With this in mind, La Via Campesina developed seven principles to reach FSv (see Box 1 below).

Box 1 – Summary of La Via Campesina's Seven Principles

1. **Food: A Basic Human Right.** Everyone must have access to safe, nutritious and culturally appropriate food in sufficient quantity and quality to sustain a healthy life with full human dignity. Each nation should declare that access to food is a constitutional right and guarantee the development of the primary sector to ensure the concrete realization of this fundamental right.

[6] http://www.nyeleni.org/spip.php?article290 (06/2012)
[7] Available on line: http://www.nyeleni.org/spip.php?article198 (06/2012)

2. **Agrarian Reform.** A genuine agrarian reform is necessary which gives landless and farming people – especially women – ownership and control of the land they work and returns territories to indigenous peoples. The right to land must be free of discrimination on the basis of gender, religion, race, social class or ideology; the land belongs to those who work it.

3. **Protecting Natural Resources.** Food Sovereignty entails the sustainable care and use of natural resources, especially land, water, and seeds and livestock breeds. The people who work the land must have the right to practice sustainable management of natural resources and to conserve biodiversity free of restrictive intellectual property rights. This can only be done from a sound economic basis with security of tenure, healthy soils and reduced use of agro-chemicals.

4. **Reorganizing Food Trade.** Food is first and foremost a source of nutrition and only secondarily an item of trade. National agricultural policies must prioritize production for domestic consumption and food self-sufficiency. Food imports must not displace local production nor depress prices.

5. **Ending the Globalization of Hunger.** Food Sovereignty is undermined by multilateral institutions and by speculative capital. The growing control of multinational corporations over agricultural policies has been facilitated by the economic policies of multilateral organizations such as the WTO, World Bank and the IMF. Regulation and taxation of speculative capital and a strictly enforced Code of Conduct for TNCs is therefore needed.

6. **Social Peace.** Everyone has the right to be free from violence. Food must not be used as a weapon. Increasing levels of poverty and marginalization in the countryside, along with the growing oppression of ethnic minorities and indigenous populations, aggravate situations of injustice and hopelessness. The on-going displacement, forced urbanization, repression and increasing incidence of racism of smallholder farmers cannot be tolerated.

7. **Democratic control.** Smallholder farmers must have direct input into formulating agricultural policies at all levels. The United Nations and related organizations will have to undergo a process of democratization to enable this to become a reality. Everyone has the right to honest, accurate information and open and democratic decision-making. These rights form the basis of good governance, accountability and equal participation in economic, political and social life, free from all forms of discrimination. Rural women, in particular, must be granted direct and active decision making on food and rural issues.

Source: FIAN-International (2005) base on La Via Campesina.

FSv not only deals with hunger; it is also a framework for rural development policies that empower producers and consumers, a proposal of a new Food Regime (Friedmann & McMichael, 1989). Likewise, FSv relates to public health and food safety. Currently about 1500 million people suffer from diseases related to food (GRAIN, 2011).

According to CIOEC (2003), although there are economic and efficiency benefits in an increasingly global economy, this centralization of food production implies both, that it travels further, and that consumers lose their tangible connection with the food that they eat, and this, raise concerns with regard to food safety.

While FSv contributes to a re-connection of consumers with producers, there remains high scope to improve the understanding between urban and rural dwellers (David & Joanna, 2011).

2.1 Measuring Food Sovereignty

Since its recognition, hunger became a Millennium Objective Goal (MOG) and several indices measuring hunger eradication have been proposed in the literature in order to evaluate the efficiency of Governments' policies on this matter. There are several international organizations and institutions that have proposed indicators or indices to measure hunger, such indicators differ since they are built with different policy purposes in mind (e.g. budget allocations, aid allocation, efficiency measurement). FSv has not only focused on the abolition of hunger, but has also aimed at reaching a sustainable agro-system from a perspective of social justice and gender equity. Therefore, in order to measure FSv several other indicators related with each pillar must be required.

To date, FSv's proposal has been studied, as an alternative to reach Right to Food, to reduce rural poverty or to reach gender equity (Altieri, 2009; Desmarais, 2003). Few recent studies have analyzed whether the proposal has the capacity to achieve a fair and sustainable development. A pioneer study on this matter was presented by Ortega-Cerdà and Rivera-Ferre (2010), with the purpose to provide analytical tools and to position the proposal at the international level. In their work, Ortega-Cerdà and Rivera-Ferre developed a set of international indicators for FSv across countries that allow to define the World state of the art, as well as to evaluate the impact of FSv in different countries of diverse agricultural, trade and environmental policies.

As a political concept, FSv's measures must aim at determining whether it stands as a valid alternative to the current development model. With this in mind, a team led by the authors started a new project to put in practice the preliminary set of indicators initially proposed. Accordingly, the suitability of the 128 indicators proposed was analyzed and as a consequence the authors created an aggregated index: Food Sovereignty Index (FSvI).

Based on La Via Campesina's principles, in the Havana meeting in 2002 the IPC developed five pillars that support FSv's concept (García, 2003), in which Ortega-Cerdà and Rivera-Ferre (2010) based on to define a group of indicators to study the state of art of FSv worldwide.

Pillar One: Access to Resources

> *"Food Sovereignty attempts to foster and to support individual and community processes on access and control over resources (land, seeds, credit, etc.) in a sustainable manner, respecting usage rights of indigenous communities, particularly emphasizing women's access to resources."*

The indicators in this pillar are designed to measure availability, access and control of natural resources in a country or region. They also refer to resource re-distribution and identification in order to fight rural poverty (IFAD, 2001; Windfuhr and Jonsén, 2005).

Pillar Two: Production Models

> *"Food Sovereignty attempts to increase local and diversified familiar production, recovering, validating and divulging traditional models of agricultural production in an environmentally, socially and culturally sustainable manner. It supports endogenous agricultural development models and the right to produce food."*

These indicators are designed to identify rural population, agricultural and food production activities, land use and resources sustainability, which allow policymakers to favor community, group and individual based decisions (FAO, 2004).

They stand as a conservationist approach, by encouraging agro-ecological practices that would increase productivity on marginal soils and revert the damaging industrial production systems. This could be the right instrument to conserve traditional species, diversify the local biodiversity and hence preserve the environment. Yet, important gaps exist in this group of indicators.

Pillar Three: Transformation and Commercialization

> *"Food Sovereignty protects the rights of farmers, landless rural workers, fishers, shepherds and indigenous counties to sell their products to feed their local population. Such action implies the creation and support of local markets, and impulse of direct selling or at least with a minimum of intermediaries, depending on the context."*

The indicators of this pillar focus on the right of peasants, rural workers (particularly those without land), fishers, pastoralists and indigenous peoples to sell their products to feed mainly the local population. This involves the creation and support of local sources of distribution, minimizing intermediaries and costs on the food chain.

They could measure the "family type" relationship between local consumers and producers, which is a result of the close and frequent relationship in terms of trade-off and responsibility, favoring powerful trust-based relations between producers and consumers like the individuals of a family.

This pillar focuses on self-reliance and promotes a fair trade. It measures the concentration and distribution of products in the local and global markets, and warns against the monopolistic markets.

Pillar Four: Food consumption and Right to Food

> *"Food Sovereignty protects citizens' right to consume healthy, nutritive and culturally appropriated food, which comes from local producers and is elaborated with agro-ecological techniques."*

The indicators for this pillar are designed to measure food insecurity in the country or region, focusing primarily in the hunger and the poor; it measures the nutritious status of the people by providing their daily nutritious intake and their minimum requirement.

Likewise, measures the degree of dependence and vulnerability of a country or region by providing information on the three most used groups of food and the concentration of global markets for those groups and on its local production. This pillar, could serve as a complement for technical consultation on Food Insecurity and Vulnerability Information and Mapping Systems (FIVIMS) which were held at the FAO in March 1997 and were published in 2000 (IAGW-FIVIMS, 2000); and also warns against the 'misuse' of food aid.

Pillar Five: Agrarian Policies

> *"Food Sovereignty protects farmers' right to know, participate and influence over the local public policies related with Food Sovereignty."*

In this pillar the indicators attempts to capture the importance given to agriculture through public, private enterprises, as well as government expenditure on agricultural sector. It focuses on the estimated support both for producers and consumers, as well as the general service. It warns from subsides going directly to trading and storage companies and tries to capture agricultural tariffs, so as to measure the trade obstacles.

Likewise, this pillar pays special emphasis on development assistance given or received in order to create awareness of society on the distribution and effective use of their resources.

To the best of our knowledge, the FSvI has been the first attempt to rank countries on the five pillars that stand as the support basis for Food Sovereignty. This index would allow policymakers to compare different regulations in different countries in order to evaluate the effectiveness of policies aimed at achieving FSv and, if applicable, to find new ways to achieve sustainability for their food systems.

3 Territorial Context

For purposes of this work, Latin America (LA) is the region comprised by twenty countries extended along the Americas, where Romance languages are spoken, specifically Spanish, Portuguese and French, it includes the following countries (Figure 1): Mexico (in North America); Guatemala, Honduras, Costa Rica, El Salvador, Nicaragua and Panama (in Central America); Cuba, Dominican Republic and Haiti in the Caribbean; and Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay and Venezuela (in South America).

LA is a region where almost 13% of the population does not have enough resources to fulfill their nutritional requirements and where one in every three persons lives below the poverty line (CEPAL,

2009), and the vast majority people is settled on rural areas. In this region, to achieve FSv must be considered a priority. Despite the efforts coming from Governments, NGOs, peasant and civil organizations, FSv in LA region has been threatened by several factors that have characterized the region: high rates of inequality (See Figure 2 below); political, economic and social instability; discrimination against indigenous communities and women; the effects of United States of America's agricultural policies (dumping) and cultural way of life (change in diet); the growing trend in the region towards energy crops (Rubio Vega, 2010; Figure 3), the effects of the so called "food crisis" in 2008, the more frequently concentration of food distribution in few agri-food companies[8]; land-grabbing, especially in Uruguay, Paraguay, Brazil and Argentina (GRAIN, 2009 and 2011)[9]; natural disasters affecting the region that have been increasing as climate change effect (CEPAL, 2009).

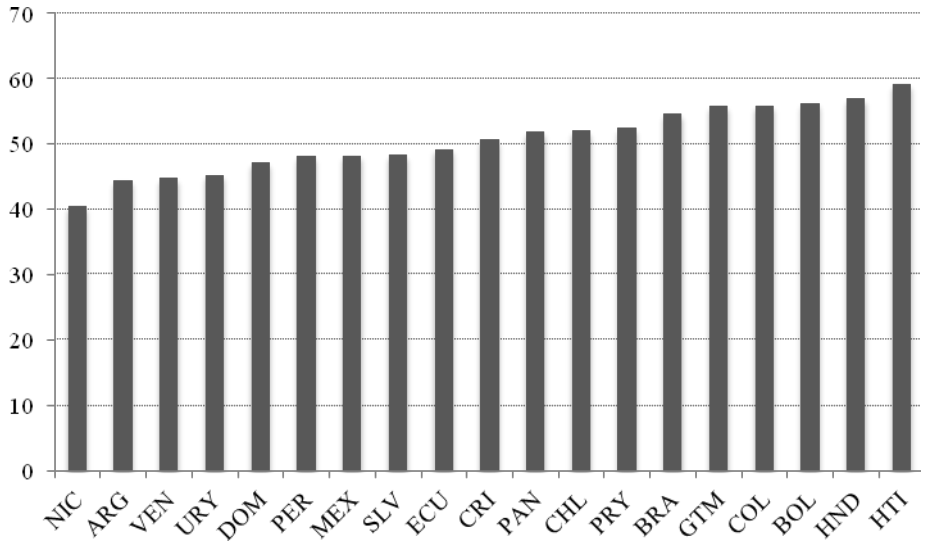
Figure 1 - Latin America's Map

Source: Author based on Internet sources.

[8] In Mexico, 66% of corn commercialization depends on four companies: Cargill, Archier Daniel Midland, Maseca and Minsa (Rubio Vega, 2010). For more information see GRAIN (2009) available online: http://www.grain.org/article/entries/716-corporations-are-still-making-a-killing-from-hunger

[9] Available at http://www.grain.org/

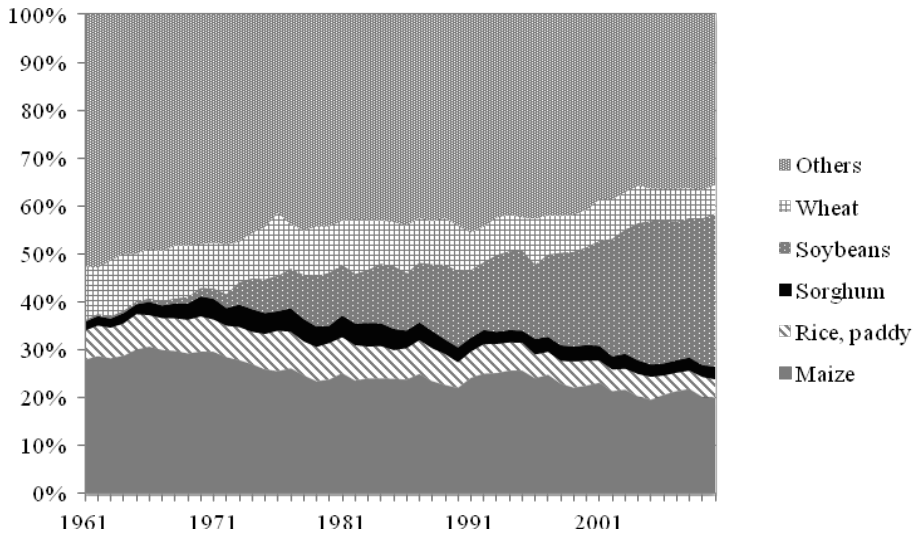
Figure 2 - GINI Index[a/]



Source: World Bank. a/ Last available data for each country. There is no data for Cuba.

The GINI Index for LA region, 0.51 in average, is on of the measures that exposes the problems of impoverishment, inequality and social exclusion that had threaten historically LA society are reflected in the usual food shortages and the loss of FSv in LA (Segrelles Serrano, 2011).

Figure 3 - Evolution of the Percentage of Area Harvested (Ha) of the Main Crops in LA



Source: FAOSTAT

As mentioned above, the phenomenon of land-grabbing in some LA countries, together with increasing demand of agrofuels over the past years, has changed drastically the use of land for crops. Since 1980, harvested area for soybean has increased almost 300% (See Table 1 below), Uruguay exhibits the biggest percentage variation, 2.034%. However in absolute values, Brazil increased in

almost 15 thousands hectares (Ha) the harvested area for Soybean. As of 2010, four countries concentrated 97% of the harvested area for this crop.

At 2010, maize and soybeans represented 51,8% of the harvested area in LA (Figure 3). Both, maize and soybean are used for agrofuel production. In particular, it is surprising how soybean production grows in the region, tripling its importance in 30 years (from 11.1% in 1980 to 30.9% in 2010).

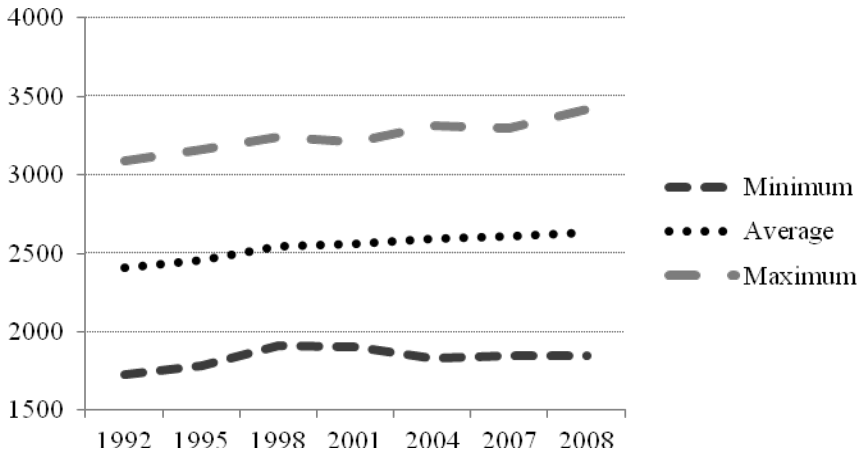
Table 1 - Percentage Variation on Harvested Area for Soybean

Country	1980 ('000 Ha)		2010 ('000 Ha)		Percentage Variation
Argentina	2.030	17.5%	18.131	39.1%	793%
Brazil	8.774	75.5%	23.293	50.3%	165%
Paraguay	475	4.1%	2.671	5.8%	462%
Uruguay	40	0.3%	863	1.9%	2.034%
Total LA Region	**11.623**		**46.329**		299%

Source: FAOSTAT

In 2008, the last worldwide food crisis generated by international food markets, neoliberal policies and food speculation, increased hunger and food insecurity in the region. According to the Economic Commission for Latin America (the Spanish acronym is CEPAL, 2009) close to 45 million people didn't have access to the minimum energy requirements, this figure is expected to increase due to the food crisis' effects. In LA, almost all countries are above the minimum requirement (Figure 4), with Haiti being the only country with dietary energy consumption below 2.000 Kcal/person/day in 2008.

Figure 4 - Dietary Energy Consumption (Kcal/person/day)



Source: FAO Statistical Yearbook

Many efforts have been undertaken in some LA countries aimed at achieving FSv: social movements have emerge for resistance to the dominant model and its effects (Landless Rural Workers' Movement

in Brazil, National Liberation Zapatista Army in Mexico, "cocaleros" in Bolivia, Indigenous National Confederation in Ecuador, "piqueteros" in Argentina) and other initiatives based on the solidarity, cooperation and collective benefits as the Bolivarian Alliance of the America (ALBA its acronym in Spanish), Petrocaribe as a mechanism of south-south cooperation, South Nations Union (UNASUR its acronym in Spanish), among others. Nonetheless, there remain many unfortunate cases in which people and Governments remain on the same path as the dominant model even though this has been proved unsuccessful.

Although LA is usually generalized as a region, there are varying positions, some even contradictory with regards to FSv. On the one hand, there are countries such as Bolivia, Ecuador and Venezuela that have managed to incorporate FSv's proposals on their country laws. By contrast, countries like Mexico, that has not even recognized the RF in its Constitution, continue tackling the problem of hunger by strengthening their food aid programs, which instead of promoting the sustainable human development of their people, increase its population's dependence on aid, and hence their vulnerability.

Four main categories have been identified based on the countries circumstances, position and actions regarding FSv:

1) **Low-Income Food-Deficit Countries (LIFDC).**[10] A classification defined by FAO for analytical purposes based on two criteria: gross national income per capita (for 2009 is USD 1.905) and the average net food import position (i.e. gross imports less gross exports) of the last three years. The following LA countries match this category for 2012: Haiti, Honduras and Nicaragua.

2) **Post-Neoliberal Countries (PNC)**. A classification made by Rubio Vega (2010) based on Emir Sader (2009) definition as "a descriptive category designating different degrees of denial to the model [foods system] but still no constitute a new model". The four countries that have included FSv's proposals to their laws form this category: Bolivia, Cuba, Ecuador and Venezuela.

3) **Business as Usual Countries (BUC).** For those countries that continue to deepen in the dominant model without any transformations towards FSv's proposal and those for which non-specific FSv's policy has been founded. In this category we can find: Chile, Colombia, Dominican Republic, El Salvador, Guatemala, Panama, Peru, Costa Rica and Mexico.

4) **Progressive Countries (PC).** A classification made by Rubio Vega (2010) for those that have made social reforms without questioning the basis of the dominant model: Argentina, Brazil, Paraguay and Uruguay are in this category.

[10] http://www.fao.org/countryprofiles/lifdc.asp?lang=en

4 Research motivation, viability and limitations

Many socio-economic and environmental models aim at reaching a sustainable and equitable development without exhausting natural resources. There have been several efforts to demonstrate performance through quantitative metrics, such as the Human Development Index, Food Security Index and Environmental Index. All of them are focused in one sector and cover smaller ranges. Since its arising, FSv has been a target of studies. At a theoretical level, several authors emphasize the potential of the proposal to promote alternative developments (Ortega-Cerda & Rivera-Ferre, 2010), reduce hunger and rural poverty (Altieri, 2009), pursue sustainable development on rural areas, or promote gender equity (Desmarais, 2003). However, there is yet no applied research at the international level to test the validity of these propositions.

As described previously, the FSvI aims at evaluating the progress achieved on rural development, poverty and hunger policies, from the perspective of FSv. This may be done through the performance of analysis by pillars and comparative rankings, using aggregated indicators of interest for a group of countries or regions, facilitating the global analysis and its use in international policy discussions related to issues such as: agriculture, food and environment.

Upon the stated in the previous paragraphs, this study proposes the FSvI as an appropriate instrument to monitor the socio-economic and environmental development of the multi-functional agricultural sector of a country or a region, and attempts to use it to establish a relative position for LA countries, and assess whether those countries that have adopted FSv principles (above categorized as Post Neo-Liberal Countries) are ranked better in the combat of a series of social problems encompassing hunger, rural marginalization and poverty than those which have failed to do so.

The previous work conducted by Ortega-Cerdà and Rivera-Ferre (2010), set the basis for the elaboration of this Index by identifying a pool of relevant indicators that we used for its development, and thus granted viability to this project.

There are, however, a series of limitations when undertaking an integral analysis of this type,, many such limitations can be improved with further research. Some indicators of the panel of indicators used as the basis for this study had descriptive objectives and as a result, they could not be used in the aggregation process; others were double counting and others had clear data limitations (see Appendix 2).

It was also impossible to determine the lower and target benchmark for some of the indicators, as it required the opinion of experts through direct consultation and a more in-depth documentary analysis. For this study, we just assume positive or negative values for each indicator. As a manner of example, percentage of rural population with respect to the total population was assumed positive, however it doesn't mean it is good to have 100 percent of the population in rural areas. For this particular reasons, in its present from, the FSvI should not be considered as if the country is good or bad in

terms of FSv, but as an approximation to it and as a source of valid and extremely useful information when analyzed by pillars.

5 Methodology

The methodology used for this work is based on the OECD Aggregated Environmental Indices (OECD, 2009), particularly synoptic indices, which claim to give a comprehensive view of very complex things, such as FSv. The main strategies considered were conceptual (analyze, evaluate and relate the FSv and other development indicators), empirical (aggregate indicators for the comparative rankings) and interventionist (establish proposals for future policy assessments).

Once achieved a clear interpretation of the concept and its principles, a re-selection of the panel of indicators proposed to evaluate FSv (Ortega-Cerdà and Rivera-Ferre, 2010) was performed. The selection process starts with 128 indicators, grouped into 35 sub-categories and five pillars for the countries member of the United Nations.

An aggregation method consists basically in the addition of variables or units with similar properties in order to come up with a single number that represents the overall value. It involves several steps depending on its objectives. However, there are four basic steps on which every aggregation process relies: selection of variables, transformation, weighting and valuation.

5.1 Selection of Variables

Previous to this work more than 350 indicators had been identified as potentially relevant for FSv. Ortega-Cerdà and Rivera-Ferre (2010) analyzed each indicator in order to determine which of them could serve as an integral part, and hence were suitable to be pooled. Their objective was to choose indicators that were useful to governments and multilateral agencies. The selection criteria developed by the authors, established that indicators had to be coherent with FSv's principles. As a result they came out with a list of 128 indicators that fulfilled such requirement. In addition to the selection criteria established by these authors we included three other criteria: i) indicators must allow comparisons between countries; ii) must provide essential and unique information to the aggregated index, and iii) data must be publicly available on each indicator. If an indicator does not meet point two, it should be eliminated from the list, and for those for which public data are not available, alternative sources must be provided, if not, the indicator must be removed from the list.

Some of the indicators are used without any change since they are suitable for the empirical comparison of the FSv. In the case of those indicators that do not allow comparisons at the country level, additional separated analysis was required:

- Indicators which were common to all countries, e.g. those that make references to international markets, but are considered to be essential for the qualitative analyze, were maintained for country analysis. Two examples of this kind of indicators are: Market of seed license (percentage with respect to seeds traded) and market share of top 10 companies in the field of seed license (percentage of patented seeds).
- Indicators with strong differences among countries due to country size were relativized with other indicators (see Annex 2, in which the detailed is included), e.g. hectares of agricultural area could present significant variations among countries (Haiti and Brazil), thus direct comparison is not recommended; in order to make this indicator comparable we decided to relativized with total population so the final indicator would be "Agricultural Area (hectares per person)".
- Finally, some modifications or distinctive calculations were applied for indicators that could not be used directly (see Annex 2).

Data sources were double-checked to assure its measurability, availability, simplicity comparability over time and space, reliability and clarity. Some other indicators have been added to the list following the criteria detailed above. As a result, the final list of the indicators of FSvI has been determined (see Tables in section 5).

The data and the indicators selected represent the best available data or indicator at this time. Most of the data sources used were of recognized standing and with international scope in agriculture and food in all its dimensions (social, ecological, economical). The vast majority of them come from public data available online; nonetheless a few of them are not publicly available (e.g. IMF database available only for a few days with the free trial option).

The main data sources were:

- Institutions, agencies and programs related to the United Nations Organization (UN): Food and Agriculture Organization (FAOSTAT, FAO statistical year book, FAO Statistical Division, FAO-Food Security, TERRASTAT, FISHSTAT and AQUASTAT), United Nation Development Program (UNDP), United Nations Environment Programme (UNEP and GEODATA), Millennium Indicators, World Development Indicators (WDI).
- International Financial Institutions: World Bank (WB) and International Monetary Fund (IMF).
- Other international organizations: Organization for Economic Cooperation and Development (OECD), World Trade Organization (WTO), See Around Us, World Resources Institute, Action Group on Erosion, Technology and Concentration (ETC) and Agricultural Science and Technology Institute (ASTI).

At the end, 98 indicators were considered for the calculation of the FSvI. Similar studies like the Environmental Performance Index (EPI), developed by Yale and Columbia Universities, evaluates countries on 22 performance indicators grouped into ten policy categories under two objectives: Environmental Health, which measures environmental stresses to Human Health, and Ecosystem Vitality that measures ecosystem health and natural resource management. While The Economist Intelligence Unit's Democracy Index (DI) is based on five categories: electoral process and pluralism, civil liberties, the functioning of government, political participation and political culture.

Moreover, Worldwide Governance Indicators (WGI) develops cross-country indicators of governance into six composite indicators: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption. On the other side, the Food Security Index (FSI) is comprised of 18 key indicators, grouped into four indices: the current nutritional and health status of the population, intrinsic vulnerability of a country to food insecurity, indicators of societal environmental and macroeconomic risk which provides a forward-looking approach to assessing food security risk.

5.2 Transformations

Once the indicators were determined, a transformation was needed in order to be able to express variables in the same metric, and hence allow comparability. This process ensured that changes in one variable did not dominate those of the others in the final score of the index. In some cases, due to disparities between countries, additional measures were needed: e.g., logarithmic transformation on EPI calculation.

In our case, we followed four steps: First, the raw data sets were cleaned and prepared for use; in particular, missing values and their nature (e.g. a country not included in the source data set, a country included but with a value missing or not applicable) were carefully noted. Hence, when missing values occurred as gaps in the interior of a series, linear values were inputted, based on closest available data points and, when missing values occurred at the beginning or end of a series, they were extrapolated using the closest year of available data (this methodology has been used in the EPI calculation).

Second, some raw data values were transformed by dividing them by another indicator as a denominator (e.g. agricultural tractors and capital stock in agriculture needed to be transformed by dividing by agricultural area and agricultural income per capita respectively) in order to make the data comparable across countries. Note that in each case we ensured that the denominator was relevant for the Food Sovereignty.

Since the transformed data can be heavily skewed; a logarithmic transformation was performed on several of the indicators (those who were in absolute value)[11]. This transformation served two purposes: First, if an indicator has a size-able number of countries with very close values, a logarithmic scale more clearly differentiates among the best performing, since untransformed data ignores small differences among top-performing countries and only acknowledges more substantial differences between leaders and laggards. Second, logarithmic transformation improves the interpretation of differences between opposite ends of the scale (outliers), as in the Environmental Performance Index (John W. et al, 2012).

Finally, we performed a statistical standardization process which permits to homogenize the scales of the different variables, hence, the new value would be laid between 0 (minimum value) and 1 (maximum value). Then, for every country *i* and indicator *j*, transformation will be:

$$\frac{x_{ij} - \min\left[x_{ij} | \forall i\right]}{\max\left[x_{ij} | \forall i\right] - \min\left[x_{ij} | \forall i\right]}$$

5.3 Weighting

There is no clear consensus among experts on composite index construction as to how to best determine a methodological strategy for combining diverse issues, and hence, the issues of weighting and aggregation are particularly sensitive and subjective.

We recognize that there may be legitimate differences of opinion regarding the relative importance of each pillar as well as each indicator from country to country. For example, the access to resources might be more important for the developing countries while agrarian policy would be more important for the developed ones. Yet, for the sake of neutrality and objectivity we assumed an equal weighting for each pillar in our calculations, this assumption, however, did not prevent us from undertaking analysis of each pillar on a separate basis. Likewise, the DI is a simple average of the 60 indicators grouped on the five categories on a 0 to 10 scale. Also, the EPI weights 0.3 and 0.7 to its two main objectives (Environmental Health, and Ecosystem Vitality respectively) while the indicators have specific weighting given by experts.

Accordingly, the formulae for calculating each pillar and integrating it into the FSvI are as follows respectively:

[11] The reason why we didn't generalize the logarithmic transformation for those who are given in percentage was to avoid unnecessary distortion of the data as well as to avoid false interpretation. For example, the value of the indicator P1C14_R-WATER for Angola using max-min is 0.124 while using max-min (log) is 0.640, using the same number of countries in both methods.

$$P_k = \frac{1}{n_k} I_1 + \ldots + \frac{1}{n_k} I_{nk}$$

$$FSvI = \frac{1}{5} \sum_k P_k$$

Where, P refers to the pillars and $k=1,2\ldots5$ (the five pillars) and n_k is the number of indicators in each pillar k. Note that, for the any indicator m that has negative interpretations in the FSvI (e.g. GINI Index for land distribution), the addition should be $\frac{1}{n_k}(1 - I_m)$.

It should be noted that, apart from this explicit weighting process, the procedure for selecting variables has already introduced an implicit weighting to each variable. This is because the number of variables chosen affects the relative importance of each in the overall index and thus already assigns a weighting of sorts.

Finally, we would like to highlight that these weights do not reflect the actual (or expected) relative contribution of each indicator or pillar. We believe that, weightings should be determined based on expert judgments and stakeholders participation, having in consideration the relative importance of each indicator and pillar for each country or region.

5.4 Valuation

Given the complexity of the indicator's perception, which as stated above have being attached a binary value as either positive or negative, and because a valuation process needs the judgments of experts, like in the weighting process, the FSvI serves more as a ranking mechanism than as a tool for providing an objective quantifiable value. Hence, we acknowledge that valuation is not valid in our case; we thus rather focus on the relative position outcome offered by the FSvI.

We recognize the complexity of the subject, but we believe that an alternative solution could be to set optimal values for each indicator and then use "proximity to target" methodology in further studies, as it is done, for instance, in EPI calculations.

Other methodologies, like FSI and DI, classify countries according to the final number: the FSI in extreme, high, medium and low risky countries; while in the DI in full democracies; flawed democracies; hybrid regimes; and authoritarian regimes.

5.5 Pillar-base analysis

Finally, we also pursued a Pillar-based-analysis. Since, each of the five pillars that support this work, outlined above, will yield an index that will eventually be added to the final calculation of FSvI, it is at these levels where we can find more detail and relevant information to assess the state of the art of

the study of the Latin American region. For this reason, the study has focused on each of the statements produced through these five pillars.

Pillar-based analysis offers two additional advantages: it may allow us to make policy recommendations regarding specific issues in each country or region, and also enables decompose ranking changes and thus better understand them.

6 Results

This work considered 193 countries for the final calculation of FSvI. In this section the results for only 20 countries (LA region) are analysed. However, the international position of each country can be consulted in Annex 1.

Over the next sections, calculations of each pillar are explained, particularly the number of indicators that each one includes. Each indicator was treated according to its perceived contribution to FSv as positive, in which case the standardized indicator as explained in methodology section is added, or as negative, in which case its complement (1- standardized indicator) is added. Missing indicators were treated as 0.

6.1 Access to Resources (Pillar 1)

The calculation of Pillar 1 of Food Sovereignty Index ($FSvI_{P1}$) includes 17 indicators detailed on Table 2.

As explained in the methodology section, the final index was calculated by simple average of the standardized indicators as follows:

$$FSvI_{P1} = \frac{1}{17}\sum_{n=1}^{17} I_n \qquad \forall n,\ I_n \in [0,1]$$

We considered four years spread along a fifteen-year time window. There are no trend variations on this pillar. Uruguay always remained on the first position of the regional ranking for this pillar; conversely, Haiti was by far, the occupier of the last position for the four year period, followed by Dominican Republic that showed an average of 0,15 points more (Table 3 and Figure 5). For the case of Uruguay, its position reflects both the high level maintained in all categories and the availability of data in 15 of the 17 indicators considered for the calculations. Haiti, on the contrary, has been penalized by both the poor value of its indicators and its lack of data available (12 of 17 indicators, the same as Dominican Republic).

Table 2 - Pillar 1: Access to Resources (P_1)

Category	Indicator	Code	Transformation	Sign
Basic Infrastructure & Services (P1C1)	Rural Access Index (% of rural population with access to roads in all seasons)	P1C11_RAI	Max-min	Positive
	Rural household access to electricity (%)	P1C12_RAE	Max-min	Positive
	Total net enrolment ratio in primary education, both sexes (%)	P1C13_PRI-EDU	Max-min	Positive
	Proportion of rural population using an improved sanitation facility (%)	P1C14_R-HEALTH	Max-min	Positive
	Proportion of rural population using an improved drinking water source (%)	P1C15_R-WATER	Max-min	Positive
Land, Forest & Marine Resources (P1C2)	Agricultural area (hectares per person)	P1C21_AGR-AREA	Max-min (log)	Positive
	Cultivated area (hectares per capita - agricultural population)	P1C22_CUL-AREA	Max-min (log)	Positive
	GINI Land Index	P1C23_GINI-LAND	Max-min	Negative
Animals (P1C3)	Domestic mammals per rural inhabitant (except pack animals)	P1C31_DOM-MAM	Max-min (log)	Positive
	Poultry animals per rural inhabitant	P1C32_SMALL-ANI	Max-min (log)	Positive
	Pack animals per km^2 of agricultural area	P1C33_PACK-ANI	Max-min (log)	Positive
Water (P1C4)	Total internal renewable per capita (m^3 / inhabitant / year)	P1C41_INT-RNEW-W	Max-min (log)	Positive
Industrial Machinery (P1C5)	Number of agricultural tractors per 1000 hectares of agricultural area	P1C51_AGR-TRAC	Max-min (log)	Positive
	Number of combine harvesters - threshers per 1000 hectares of agricultural area	P1C52_COM-HARV	Max-min (log)	Positive
	Number of milking machine per 100 cattle	P1C53_MILK-MACHINE	Max-min (log)	Positive
Capital Stock (P1C6)	Capital stock in agriculture per agricultural inhabitant income (constant 1995 USD per worker / current USD per agricultural inhabitant)	P1C61_CAP-STOCK	Max-min (log)	Positive
Access to Seeds (P1C7)	Food and medicine biodiversity (number of species)	P1C71_FOOD-MED	Max-min (log)	Positive

Figure 5 - $FSvI_{P1}$ for Latin American Countries

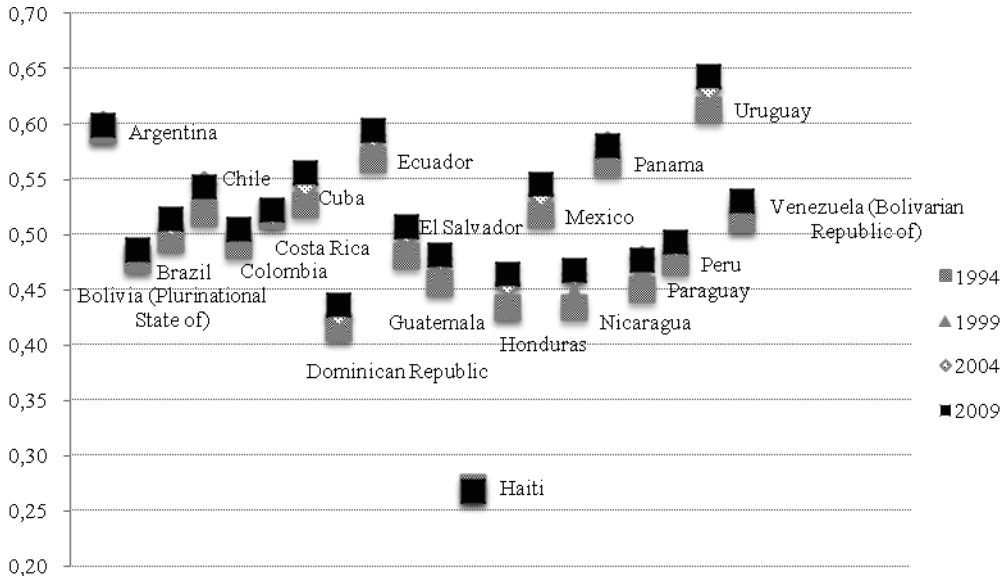


Table 3 - $FSvI_{P1}$ and Regional Ranking

Country	1994		1999		2004		2009	
	Position		Position		Position		Position	
Argentina	2	0.59	2	0.60	2	0.60	2	0.60
Bolivia (Plurinational State of)	13	0.48	14	0.48	14	0.48	14	0.49
Brazil	10	0.50	10	0.50	10	0.51	10	0.51
Chile	7	0.52	6	0.53	6	0.54	7	0.54
Colombia	11	0.49	11	0.50	12	0.50	12	0.50
Costa Rica	6	0.52	8	0.52	9	0.52	9	0.52
Cuba	5	0.53	5	0.53	5	0.55	5	0.56
Dominican Republic	19	0.42	19	0.42	19	0.43	19	0.44
Ecuador	3	0.57	3	0.58	3	0.59	3	0.59
El Salvador	12	0.48	12	0.49	11	0.50	11	0.51
Guatemala	15	0.46	16	0.46	16	0.48	15	0.48
Haiti	**20**	**0.27**	**20**	**0.27**	**20**	**0.27**	**20**	**0.27**
Honduras	18	0.43	18	0.44	18	0.46	18	0.46
Mexico	8	0.52	7	0.52	7	0.54	6	0.55
Nicaragua	17	0.43	17	0.44	17	0.46	17	0.47
Panama	4	0.56	4	0.57	4	0.58	4	0.58
Paraguay	16	0.45	15	0.46	15	0.48	16	0.48
Peru	14	0.47	13	0.48	13	0.49	13	0.49
Uruguay	**1**	**0.61**	**1**	**0.62**	**1**	**0.63**	**1**	**0.64**
Venezuela (Bolivarian Republic of)	9	0.51	9	0.51	8	0.53	8	0.53
Min		0.27		0.27		0.27		0.27
Max		0.61		0.62		0.63		0.64
Average		0.49		0.50		0.51		0.51

Seven categories integrate this pillar; all of them deal with accessibility to resources: Infrastructure and basic services, natural resources (land, animals, water, and seeds), machinery and capital.

Haiti had the worst performance[12] in the first category: "Basic Infrastructure and Services", as a reflection of their lack of investment in the sector over the years which has been the key reason of its delay in public services. Haiti is considered a poor country, according to the World Bank (WB), Haitians had in 2009 USD 1.180 GNI-PPP (Gross National Income in Purchase Power Parity)[13]; only 8.3% that of Argentineans which figure was of USD 14.230 GNI-PPP, and which has the highest GNI-PPP of the whole LA region (Table 4). On the other extreme lies the case of Uruguay, which shows the best performance and a continuous increasing tendency due to foreign investment, principally from China, one of the main importers of Uruguay's agricultural products.[14]

Table 4 - GNI per capita, PPP (current international USD)

Country Name	2009
Argentina	14.230
Chile	13.290
Mexico	13.650
Uruguay	12.550
Panama	12.210
Venezuela, RB	12.410
Costa Rica	10.830
Brazil	10.230
Colombia	8.780
Dominican Republic	8.390
Peru	8.270
Ecuador	7.590
El Salvador	6.380
Paraguay	4.450
Guatemala	4.600
Bolivia	4.510
Honduras	3.720
Nicaragua	2.610
Cuba	N/A
Haiti	1.180

Source: World Bank Data

Category two: "Land, Forest & Marine Resources", is formed using indicators related to land access and distribution. Argentina led this category, showing a stable performance during the fifteen-year analysis; and Dominican Republic was at the bottom of the ranking. There were not relevant changes in the trend of the countries.

[12] It is important to notice that data do not include the 2010 earthquake's damages since last data is from 2009.
[13] Current prices
[14] http://archivo.presidencia.gub.uy/sci/noticias/2010/08/2010082503.htm

Table 5 - GINI Coefficient for Land Distribution

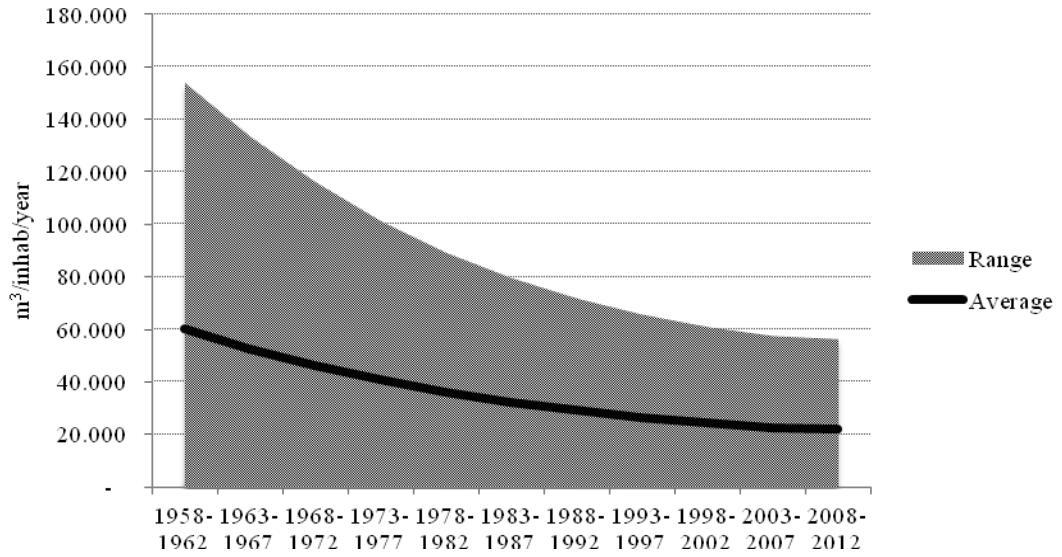
Country	Survey Year	GINI (%)
Brazil	1996	85
Chile	1997	91
Colombia	2001	80
Ecuador	1999/2000	80
Nicaragua	2001	72
Panama	2001	52
Uruguay	2000	79
Venezuela	1997	88

Source: FAO Statistical Yearbook 2010

There is, however, a generalized issue that affects the region in general; a high degree of inequality in land distribution was reflected in the GINI coefficient (Table 5). The FAO only reported data for 8 countries; yet the reported GINI coefficient for LA countries is very high. Land concentration has been an issue in this region since the period of the Spanish Colony, being the indigenous, the African descendants and the women the more affected (CEMLA, 2009).

Uruguay led the category three: "Animals", with standardized indicators slightly above the remaining of the countries (in average 0,05 points above). The rest of the countries reported data between 0,5 and 0,6 approximately, i.e. all 20 countries report data above world average.

Figure 6 - Total Internal Water Renewable Per Capita in LA region



Source: AQUASTAT

There is just one indicator regarding category four: "Water access" in which available internal water per capita from renewable sources is presented. In this category all countries were above 0,7, which could indicate they are in good condition in this regard. Nonetheless, a worrying fact is that water

availability per capita has been declining dramatically in the last 50 years in the region (Figure 6). Since 1958, water availability from internal water resources in LA countries has decline 63 percent. The small farmers are the most affected by this scarcity, because their lack of ability and monetary resources restrain them to secure water rights and to invest in more efficient technology (CEPAL, 2009).

The possible effects of climate change in the region are still a matter of speculation; further research on this topic would provide valuable input to better address this category. There is also scarce data on water distribution within LA countries, particularly in those with increasing deserted areas.

In category five: "Industrial Machinery", we considered the number of agricultural tractors, harvesters and milking machines in operation in each country, relativized by its work potential (agricultural hectares or existing animals). Argentina led this category, showing a stable trend over time, followed by Brazil. At the bottom were Bolivia, Peru and Haiti.

Category six: "Capital Stock in agriculture", showed a drop in almost every country since 1999. Following LA's context, this could be explained by the financial crises suffered by some countries (e.g. Ecuador, Chile and Argentina), which could have been extended to the entire region. For the past two periods, Chile reported the best indicator: 0,64, and El Salvador and Costa Rica the worst: 0,39 and 0,37 respectively.

Finally, in category seven: "Availability of seeds", there were only seven countries that reported data. Peru had the best performance by far, which means that is the most diverse country regarding food and medicine seeds.

6.2 Productive Models (Pillar 2)

For pillar 2 calculations incorporated 29 indicators, detailed on Table 6 below, these were divided into eight different categories, all of them related to the required inputs for production models. In this pillar Bolivia occupies the first position and Cuba the last for the four years window (Table 7 & Figure 7). The latter could be explained by the gap of information; it only provided 19 indicators out of the 29 considered.

Category one is about characteristics of the population, particularly rural and agricultural population. It was led by Haiti, and followed by Guatemala and Bolivia; this obeys mainly to the fact that these three countries showed better gender equality on agricultural work. On the last positions were Venezuela, Uruguay and Argentina. Despite of this country ranking, it is important to note that all countries portrayed a negative trend on this category. This could be the reflection of the few agricultural workers, gender inequality and peasant emigration to the cities that characterizes the region.

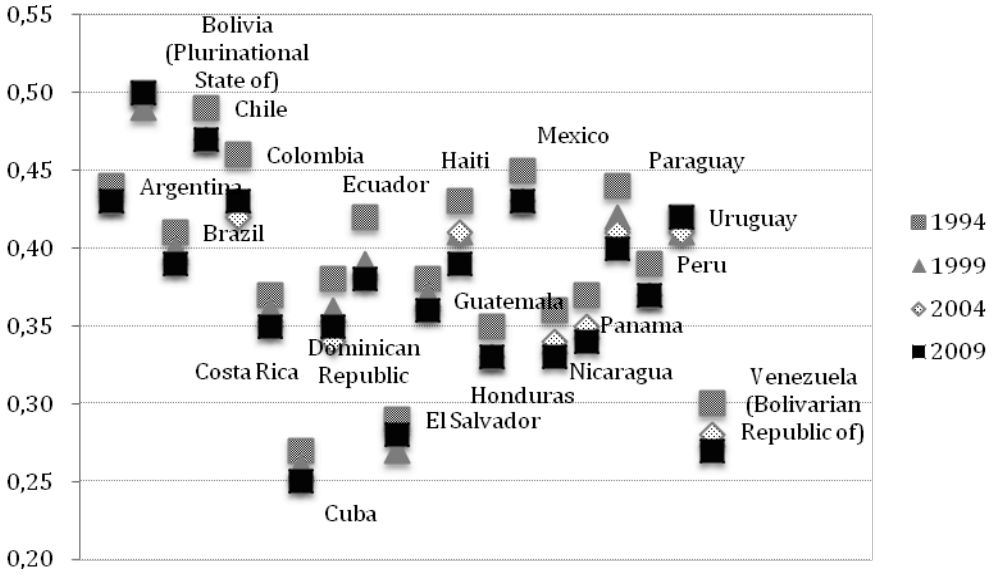
Table 6 - Pillar 2: Productive Models (P_2)

Category	Indicator	Code	Transformation	Sign
Population & Employment (P2C1)	Rural population (% of total population)	P2C11_R-POP	Max-min	Positive
	Agricultural population (% of total population)	P2C12_AGR-POP	Max-min	Positive
	Total economically active population in agriculture (% of total employment)	P2C13_ECO-POP	Max-min	Positive
	Female economically active population in agriculture (% of total female employment)	P2C14_ECO-F-POP	Max-min	Positive
Land Use (P2C2)	Permanent crops (% of agricultural area)	P2C21_PERM-CROP	Max-min	Positive
	Meadows and permanent pasture (% of agricultural area)	P2C22_PERM-PAST	Max-min	Positive
	Forest area (% of agricultural area)	P2C23_FORS-AREA	Max-min	Positive
	Flooded area by irrigation and natural form (% of agricultural area)	P2C24_FLOOD-AREA	Max-min	Negative
	Temporal crops (% of agricultural area)	P2C25_TEMP-CROP	Max-min	Positive
	Temporary meadows and pastures (% of agricultural area)	P2C26_TEMP-PAST	Max-min	Positive
Production (P2C3)	Production of cereals per person (kg/person)	P2C31_CER-PROD	Max-min (log)	Positive
	Production of meat per person (kg/person)	P2C32_MEAT-PROD	Max-min (log)	Positive
	Production of fruit per person - excluding melons (kg/person)	P2C33_FRUIT-PROD	Max-min (log)	Positive
	Fishery production per person (kg/person)	P2C34_FISH-PROD	Max-min (log)	Positive
	Forest harvest rate (extraction as a % of volume forest)	P2C35_FORS-HARV	Max-min	Negative
Agricultural Inputs (P2C4)	Intensity of the total fertilizer use (tons / hectare of cultivated area)	P2C41_FERT-USE	Max-min (log)	Negative
	Intensity of total pesticides use (tons / hectare of cultivated area)	P2C42_PEST-USE	Max-min (log)	Negative
	Substance use for seed treatment - fungicides and insecticides (tons/hectare of cultivated area)	P2C43_SUBS-USE	Max-min (log)	Negative
	Total actual renewable water resources withdrawn by agriculture (%)	P2C44_RENEW-AGR	Max-min	Positive
Polluting Emissions And Natural Resource Degradation Due to Production (P2C5)	Water pollution, food industry (% of total BOD emissions)	P2C51_WPOL-FOOD	Max-min	Negative
	Water pollution, paper and pulp industry (% of total BOD emissions)	P2C52_WPOL-PAP	Max-min	Negative
	Land degradation due to the agricultural activities (% of total area)	P2C53_DEGR	Max-min	Negative
	Percentage of area equipped for full control irrigation salinized (%)	P2C54_SAL-AREA	Max-min	Negative
	Primary forest extent (% of forest area)	P2C55_PRI-FORS	Max-min (log)	Positive
Economic Characteristics (P2C6)	Poverty headcount ratio at rural poverty line (% of rural population)	P2C61_R-PHCR	Max-min	Negative
	Value added in agriculture (% of GDP)	P2C62_VA-AGR	Max-min	Positive
Agroecology & Sustainable Production (P2C7)	Conservation agriculture area (% of cultivated area)	P2C71_CONS-AGR	Max-min	Positive
	Organic agricultural area (% of total agricultural area)	P2C72_ORG-AGR	Max-min	Positive
	Forests Certified by FSC (% of total forest area)	P2C73_FSC	Max-min	Positive

Table 7 - $FSvI_{P2}$ and Regional Ranking

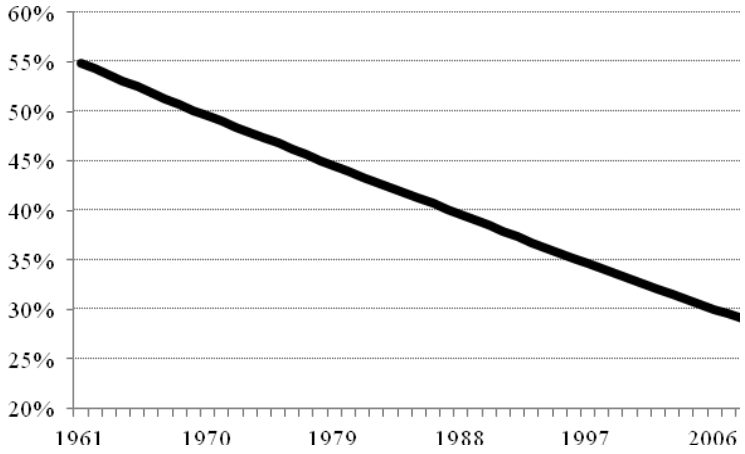
Country	1994		1999		2004		2009	
	Position		Position		Position		Position	
Argentina	6	0.44	5	0.43	4	0.43	3	0.43
Bolivia (Plurinational State of)	**1**	**0.50**	**1**	**0.49**	**1**	**0.50**	**1**	**0.50**
Brazil	10	0.41	9	0.40	9	0.39	8	0.39
Chile	2	0.49	2	0.47	2	0.47	2	0.47
Colombia	3	0.46	3	0.43	5	0.42	5	0.43
Costa Rica	15	0.37	14	0.36	14	0.35	13	0.35
Cuba	**20**	**0.27**	**20**	**0.26**	**20**	**0.25**	**20**	**0.25**
Dominican Republic	13	0.38	13	0.36	15	0.34	14	0.35
Ecuador	9	0.42	10	0.39	10	0.38	10	0.38
El Salvador	19	0.29	19	0.27	18	0.28	18	0.28
Guatemala	12	0.38	12	0.37	12	0.36	12	0.36
Haiti	7	0.43	8	0.41	8	0.41	9	0.39
Honduras	17	0.35	17	0.33	17	0.33	16	0.33
Mexico	4	0.45	4	0.43	3	0.43	4	0.43
Nicaragua	16	0.36	16	0.34	16	0.34	17	0.33
Panama	14	0.37	15	0.35	13	0.35	15	0.34
Paraguay	5	0.44	6	0.42	6	0.41	7	0.40
Peru	11	0.39	11	0.37	11	0.37	11	0.37
Uruguay	8	0.42	7	0.41	7	0.41	6	0.42
Venezuela (Bolivarian Republic of)	18	0.30	18	0.28	19	0.28	19	0.27
Min		0.27		0.26		0.25		0.25
Max		0.50		0.49		0.50		0.50
Average		0.40		0.38		0.38		0.37

Figure 7 - $FSvI_{P1}$ for Latin American Countries



Since its beginning, the industrial revolution carried out a phenomenon of emigration from the countryside to the city, landless farmers and entire rural families in search of new opportunities. This phenomenon, known as "rural exodus", was accentuated during the Green Revolution expansion, where technology and chemicals began to replace the craftsmanship of the farmers, pushing them away from their jobs. Latin America hasn't escaped this phenomenon; on the contrary, rural population has declined severely over the past 50 years. In 1962 rural population was 55% of the total population (average of LA countries), by 2010 it had decreased to only 28% according to FAOSTAT (Figure 7). Dominican Republic and Haiti are the most affected countries in this matter; they declined on the same period 38% and 37%, respectively. As of 2011, Nicaragua is the country with the biggest proportion of rural population: 43%.

Figure 8 - Rural Population as Percentage of Total Population (Latin America's Average)



Source: FAOSTAT

The second category describes land usage. In this category, countries did not show any variation throughout the four-year period, perhaps due to the short time window. All the countries of the region maintained levels between 0,4 and 0,65. Venezuela showed the higher indicator, while Uruguay showed the lower.

Production efficiency has been in the center of discussions, especially after the food crisis of 2008 where enough food was produced but people with hunger increased substantially despite of that fact. As mentioned before, LA has historically produced maize and wheat, but over the past years has been one of the main soybean producers. According to FAOSTAT and FISHSTAT databases, the region concentrates 8% of the world production for cereal, 15% of the meat production and 11% of the fish production (see category 4 in pillar 3). Brazil is the main producer of the first two products mentioned, and Peru on the latter.

Category three measures, precisely, production. In this category LA countries positioned themselves above 0,6 over the years, which means that they all have good production capacity.

The forth, the fifth and the seventh categories are straightly related: chemicals, pollution, natural resources degradation, agroecology and sustainable production respectively. Up to a certain point, these three categories reflect how the production models in the region are interacting with the environment.

Category 4 reflects the use, often excessive, of fertilizers, pesticides and fungicides in agriculture. We can see that there is no country in the region that demonstrates a clear leadership on these indicators, and surprisingly we see a clear downward trend, i.e. in international comparisons more chemicals are used in LA's agricultural model than in the rest of the world. Bolivia is the only country that showed a growing path, this is most probably due to its policies in favor of FSv's proposal.

Category 5 shows the huge range of ecological disasters in the region. Countries like Venezuela, Peru, Brazil and Dominican Republic showed little degradation of resources, practically nonexistent. While countries like El Salvador, Cuba and Panama reflected the lowest indicators in the region, below 0,4.

The sixth category is strongly linked with the characteristics of the population described in the first category. This category presents the economic characteristics of agriculture and its workers. Two important indicators were considered here: Poverty headcount ratio of rural poverty line (Table 8) and agricultural value added (percentage of the Gross Domestic Production, GDP). Countries results were widely different: Uruguay and Chile led the category with indicators above 0,4 and Haiti appeared at the bottom of the rank with indicators close to zero.

One of the main contradictions of the dominant models has to do with how poverty, and hence, food insecurity is concentrated in the rural population, when, paradoxically, these people is closer to food production areas. Table 8 below shows how countries like Haiti 88 percent of its rural population, which represents 63 percent of total population, survives with less than 2 USD. Guatemala and Bolivia present similar cases.

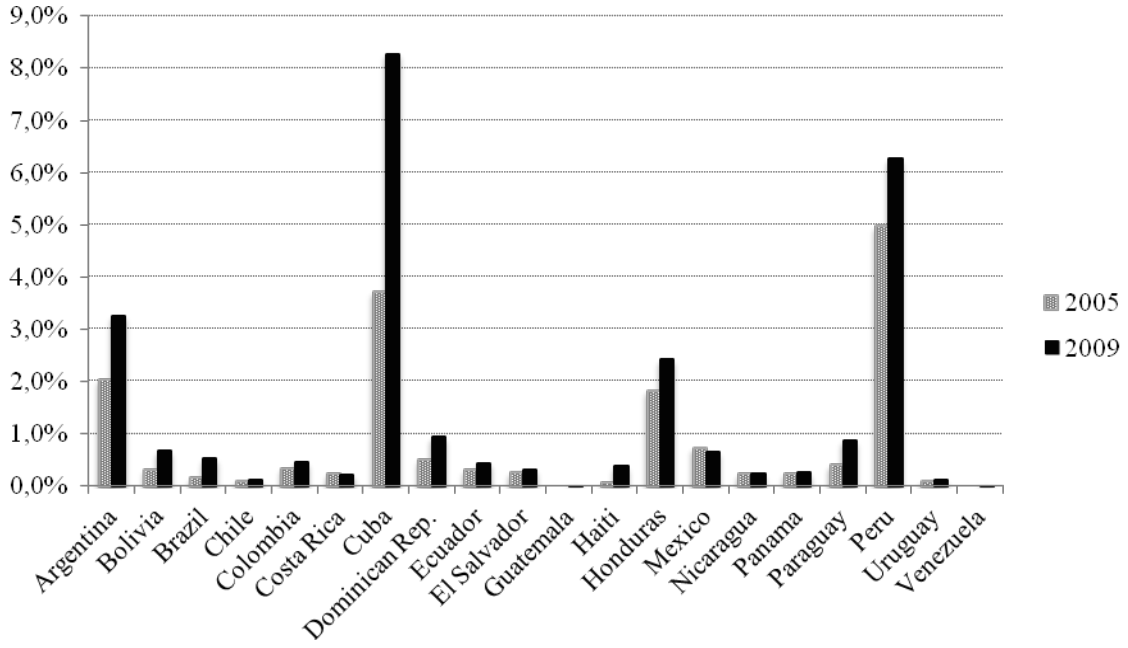
Table 8 - Percentage of Rural Population Below the Poverty Line for Selected Countries

Country	Year	% Below Poverty Line	% of Rural Population
Bolivia	2007	77.30	34,9
Colombia	2010	50.30	24,9
Costa Rica	2009	23.00	36,1
Dominican Republic	2006	57.10	33,6
Ecuador	2009	57.50	33,7
El Salvador	2009	46.50	36,2
Guatemala	2006	70.50	52,4
Haiti	2001	88.00	63,1
Honduras	2010	65.40	48,4
Paraguay	2009	49.80	39,1
Peru	2010	54.20	23,1

Source: World Development Indicators (WDI) and FAOSTAT

As mentioned above, Category 7 contemplates an alternative production model; it shows the trend towards agroecology and sustainable agriculture. In this regard, countries show a rather unclear trade, mostly stable, with the exception of Argentina, Uruguay and the Dominican Republic, who gave an important leap from 2004 to 2009 in their organic production (See Figure 8 below).

Figure 9 - Percentages of organic agricultural area



Source: www.organic-world.net

6.3 Transformation and Marketing (Pillar 3)

Pillar 3 combines 15 indicators (Table 9) in four different categories. Indicators in this category refer primarily to country circumstances on international markets, and its agroindustrial model. FSv seeks to promote the development of local markets in order to supply the population of the area, favoring local producers. However, given the lack of country-level data that would allow us to reflect upon this specific situation, we took some proposed indicators that make references to international trade.

Overall the leading countries were: Peru in 1994 and Panama the following years. Panama's leadership position can be explained because of the great trade flows that receive every year as a result of boat transit through the Panama's Channel. Conversely, at the bottom of this pillar's ranking appeared Haiti, followed by Venezuela and Dominican Republic (Table 10 & Figure 10).

Table 9 - Pillar 3: Transformation and Marketing (P3)

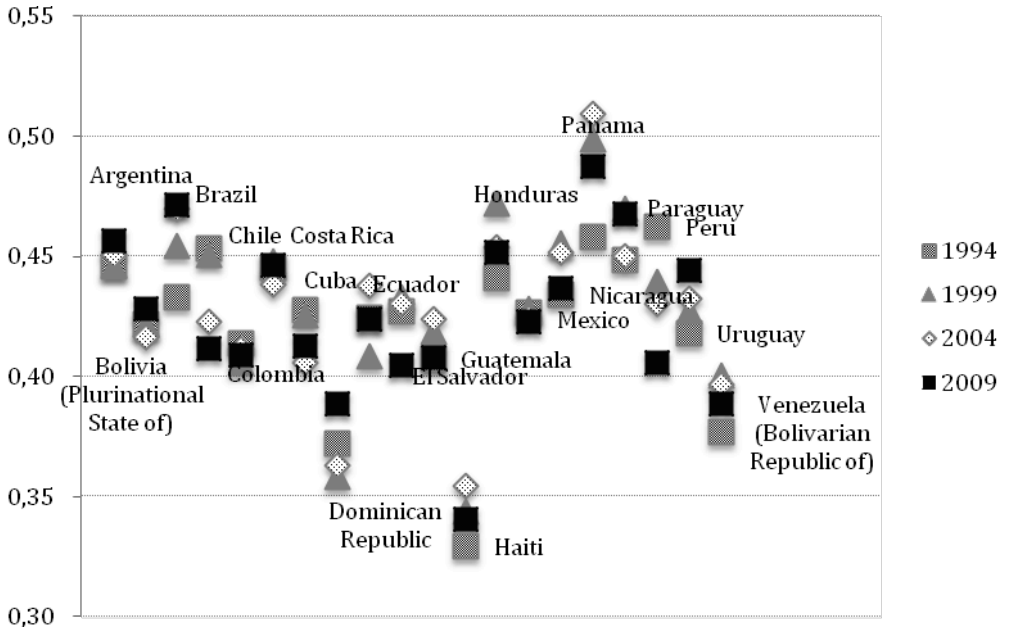
Category	Indicator	Code	Transformation	Sign
International Trade (P3C1)	Agricultural raw materials exports (% of merchandise exports in dollars)	P3C11_RAW-EXP	Max-min	Negative
	Agricultural raw materials imports (% of merchandise imports in dollars)	P3C12_RAW-IMP	Max-min	Negative
	Food exports (% of merchandise exports in dollars)	P3C13_FOOD-EXP	Max-min	Positive
	Food imports (% of merchandise imports in dollars)	P3C14_FOOD-IMP	Max-min	Negative
	Fishery imports (% of imports, in dollars)	P3C15_FISH-IMP	Max-min	Negative
	Fishery exports (% of exports, in dollars)	P3C16_FISH-EXP	Max-min	Positive
	Imports of forest products (% of imports, in dollar terms)	P3C17_FORS-IMP	Max-min	Negative
	Exports of forest products (% of exports, in dollar terms)	P3C18_FORS-EXP	Max-min	Positive
Purchasing Price Of Farmers (P3C2)	Price paid to farmers in terms of dollars per ton of the five products with more production in the country (% of income per agricultural inhabitant)	P3C21_PRICE-PAID	Max-min	Positive
Industrial Production And Manipulation (P3C3)	Food, beverages and tobacco (% of value added in manufacturing)	P3C31_VA-MANF	Max-min	Positive
	Percentage of top 3 food groups in terms of production quantity	P3C32_TOP3-PROD	Max-min	Positive
Positioning In The Global Production Of Food Resources (P3C4)	Cereal production (% of world production)	P3C41_CER-PROD	Max-min	Positive
	Meat production (% of world production)	P3C42_MEAT-PROD	Max-min	Positive
	Fishery production (% of world production)	P3C43_FISH-PROD	Max-min	Positive
	Concentration of top 3 export agricultural products (% of total export in dollars)	P3C44_CONC-EXP	Max-min	Negative

The first category of this pillar evaluates international trade in Latin America. That is why it is not surprising that the region is moving almost as a group, mainly due to the multiple Free Trade Agreements signed between countries of the region; some of them even include free-mobility agreements in specific regions. Indicators maintained on average a positive trend (applicable to almost all the countries); varying between 0,5 and 0,7 over the past years.

Table 10 - $FSvI_{P3}$ and Regional Ranking

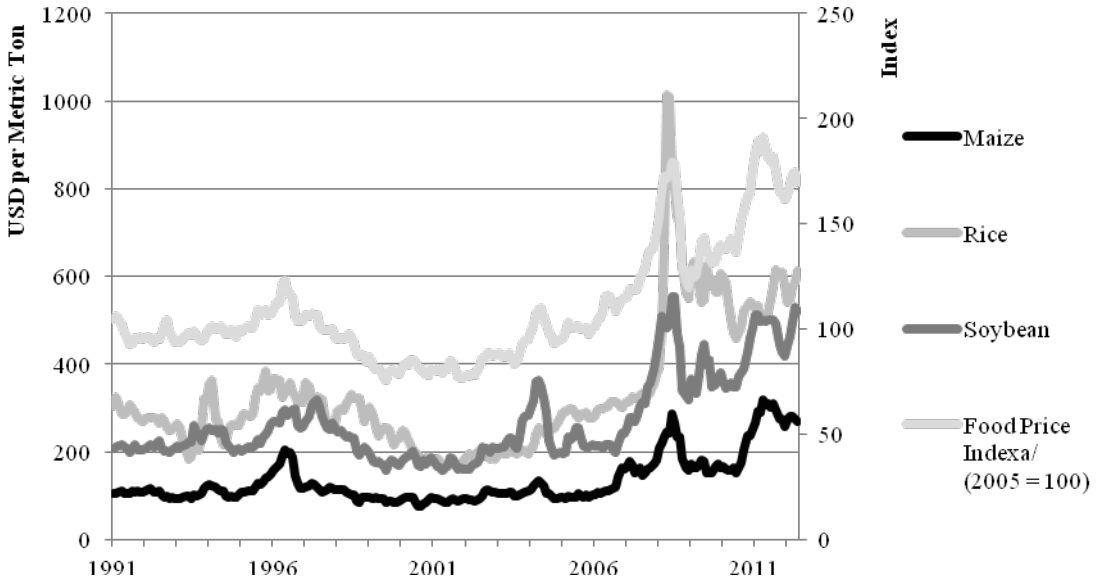
Country	1994		1999		2004		2009	
	Position		Position		Position		Position	
Argentina	5	0.45	8	0.45	5	0.45	4	0.46
Bolivia (Plurinational State of)	14	0.42	14	0.42	15	0.42	9	0.43
Brazil	9	0.43	5	0.45	2	0.47	2	0.47
Chile	3	0.45	6	0.45	14	0.42	13	0.41
Colombia	16	0.41	17	0.41	16	0.41	14	0.41
Costa Rica	6	0.45	7	0.45	7	0.44	6	0.45
Cuba	10	0.43	13	0.43	17	0.41	12	0.41
Dominican Republic	19	0.37	19	0.36	19	0.36	18	0.39
Ecuador	13	0.42	16	0.41	8	0.44	10	0.42
El Salvador	11	0.43	10	0.43	11	0.43	17	0.40
Guatemala	17	0.41	15	0.42	13	0.42	15	0.41
Haiti	**20**	**0.33**	**20**	**0.34**	**20**	**0.35**	**20**	**0.34**
Honduras	7	0.44	2	0.47	3	0.45	5	0.45
Mexico	12	0.43	11	0.43	12	0.42	11	0.42
Nicaragua	8	0.43	4	0.46	4	0.45	8	0.44
Panama	2	0.46	**1**	**0.50**	**1**	**0.51**	**1**	**0.49**
Paraguay	4	0.45	3	0.47	6	0.45	3	0.47
Peru	**1**	**0.46**	9	0.44	10	0.43	16	0.41
Uruguay	15	0.42	12	0.43	9	0.43	7	0.44
Venezuela (Bolivarian Republic of)	18	0.38	18	0.40	18	0.40	19	0.39
Min		0.33		0.34		0.35		0.34
Max		0.46		0.50		0.51		0.49
Average		0.42		0.43		0.43		0.43

Figure 10 - $FSvI_{P3}$ for Latin American Countries



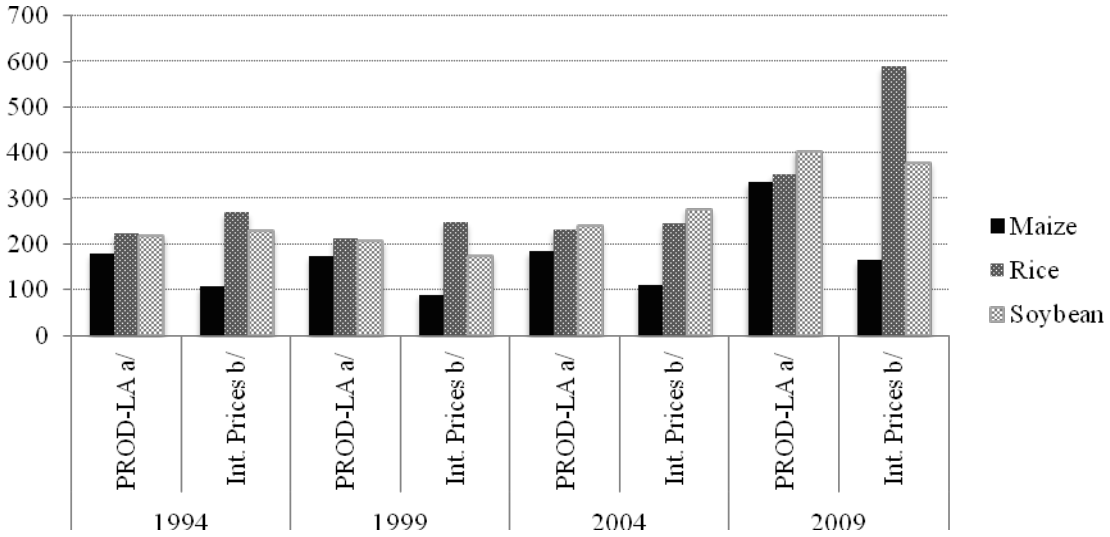
The second Category measures the purchase price paid to farmers for each ton of the three main products in the country. This indicator is particularly important given the volatility of international food prices of the last decade, which has affected particularly small producers (Figure 11) and restrained economic access to food. The speculative character of the food crisis of 2008 is reflected in the short-term peak of prices (Rubio Vega, 2010). This peak was repeated in 2011, according to the Food Price Index.

Figure 11 - International Prices of Basic Cereals



Source: International Monetary Fund (IMF). a/ Food Price Index includes cereal, vegetable oils, meat, seafood, sugar, bananas, and oranges price indices.

Figure 12 - Price per Ton Paid to the Producer in LA and International Prices



Source: IMF for international prices and FAOSTAT for prices paid to producers. a/ Year average; b/ LA countries' average.

When comparing international prices (defined as the price that final consumer pays) against prices paid directly to the producer, differences are evident (Figure 12 above). This is a reflection of the distortions of the international markets, speculations made in agribusiness, dumping practices and companies' profit spread.

Regarding LA countries, the indicators show that there is a generalized decrease in the price paid to the producer during 2004. El Salvador presents the worst scenario, dropping its value by half in the period of study. In contrast, after the food crisis of 2008 Panama showed a recovery path, and increased substantially the price paid to producers.

Categories 3 and 4 reflect food production and export concentration respectively. Indicators in those categories could be interpreted as country vulnerability to international markets. According to these indicators, Cuba presented the higher value for Category 3, although it showed an important decrease in 2004. Brazil led the ranking for Category 4, and Paraguay was on the bottom of the list. Argentina presented an interesting increasing trend through the years.

6.4 Food Security and Food Consumption (Pillar 4)

We incorporated 21 indicators on pillar 4 (Table 11) and spread them into 5 categories, all of them emphasize some sort of food insecurity in the region. According to CEMLA (2009) in 2003 there were 52 million people suffering from hunger in the region, and this figure is expected to increase in lieu of the food crises of 2008 and 2011. In order to fight this situation, the institution proposed six main areas of action: 1) improvement of economic and physical access to food; 2) investment in infrastructure (education, water and roads); 3) promotion of anti-cyclical policies including the fostering of commerce and the strengthening of institutions; 4) investment in technology, training and hygiene aiming to protect food safety; 5) food aid with particular matter on pregnant woman and children, and 6) promotion of healthy food habits.

All these proposals are intended to ensure safe access to food, but fail to deal with the means of production of such food. That is, strengthen the technical side of food production and supply, as discussed in the introduction to this work.

FSc is strongly correlated with the wealth of the counties, since it refers mainly to economic access to food. In this sense, the overall results of the pillar were no surprising: Chile (0,89) is the country with greater FSc and Haiti is the country with the lowest (0,28). As expected, this rank is maintained for the first category of this pillar: "Food Scarcity" where Haiti is the most affected country in the region, presenting a high ratio of undernourishment to total population (57% in 2007, see Table 13).

Gauthier (2008) resumes in one sentence the situation face by Haiti: "*Haiti has been hard hit by the global food crisis, which has culminated in riots all over the country, five people dead, gunshot*

victims, an attempt to invade the National Palace, and the removal from office of the Prime Minister just weeks ahead of the upcoming International Donor Conference in Port-au-Prince."

Table 11 - Pillar 4: Food Security and Food Consumption (P4)

Category	Indicator	Code	Transformation	Sign
Food Scarcity (P4C1)	Prevalence of undernourishment in total population (%)	P4C11_UNDERNOUR	Max-min	Negative
	Children under 5 moderately or severely underweight (%)	P4C12_CHILD-U5	Max-min	Negative
	Food deficit of undernourished population (kcal/person/day)	P4C13_DFCT-FOOD	Max-min (log)	Negative
	GINI coefficient for food consumption (dietary energy consumption)	P4C14_GINI-FOOD	Max-min	Negative
Food & Nutrients Consumption (P4C2)	Deviation in ideal food consumption by food group (%)	P4C21_DEV-FOOD	Max-min (log)	Positive
	Deviation in meat based protein intake per day (%)	P4C22_DEV-MEAT	Max-min	Negative
	Dietary energy consumption (kcal/person/day)	P4C23_ENRGY-CONS	Max-min (log)	Positive
	Dietary protein consumption (g/person/day)	P4C24_PROT-CONS	Max-min (log)	Positive
	Dietary fat consumption (g/person/day)	P4C25_FAT-CONS	Max-min (log)	Positive
Buying Effort (P4C3)	Share of food consumption expenditure in total household consumption expenditure (%)	P4C31_SHARE-FOOD	Max-min	Negative
External Food Dependency (P4C4)	Cereal import (% of cereal production volume)	P4C41_CER-IMP	Max-min	Negative
	Cereal export (% of cereal production volume)	P4C42_CER-EXP	Max-min	Positive
	Meat import (% of meat production volume)	P4C43_MEAT-IMP	Max-min	Negative
	Meat export (% of meat production volume)	P4C44_MEAT-EXP	Max-min	Positive
	Fishery import (% of fishery production volume)	P4C45_FISH-IMP	Max-min	Negative
	Fishery export (% of fishery production volume)	P4C46_FISH-EXP	Max-min	Positive
	Share of food aid in total consumption (%)	P4C47_AID-FOOD	Max-min	Negative
	Seed import as a ratio of seed export (volume)	P4C48_SEED	Max-min (log)	Negative
Vulnerability in Food Consumption (P4C5)	Concentration of top 3 food groups in consumption of energy (%)	P4C51_CONC-ENRGY	Max-min	Negative
	Concentration of top 3 food groups in consumption of protein (%)	P4C52_CONC-PROT	Max-min	Negative
	Concentration of top 3 food groups in consumption of fat (%)	P4C53_CONC-FAT	Max-min	Negative

Table 12 - $FSvI_{P4}$ and Regional Ranking

Country	1994		1999		2004		2009	
	Position		Position		Position		Position	
Argentina	2	0.64	3	0.63	3	0.62	3	0.61
Bolivia (Plurinational State of)	18	0.49	18	0.48	19	0.48	19	0.46
Brazil	3	0.63	2	0.63	2	0.68	2	0.67
Chile	**1**	**0.68**	**1**	**0.66**	**1**	**0.69**	**1**	**0.69**
Colombia	7	0.59	10	0.57	5	0.60	6	0.59
Costa Rica	10	0.57	12	0.55	12	0.57	12	0.56
Cuba	17	0.49	14	0.51	14	0.54	15	0.53
Dominican Republic	16	0.51	19	0.45	17	0.52	18	0.48
Ecuador	9	0.58	8	0.58	11	0.58	10	0.57
El Salvador	15	0.51	13	0.53	13	0.56	11	0.57
Guatemala	14	0.52	16	0.49	18	0.50	17	0.50
Haiti	**20**	**0.32**	**20**	**0.30**	**20**	**0.28**	**20**	**0.28**
Honduras	13	0.53	15	0.50	16	0.53	16	0.52
Mexico	11	0.57	7	0.58	6	0.60	5	0.60
Nicaragua	19	0.48	17	0.48	15	0.54	14	0.53
Panama	5	0.60	5	0.58	8	0.59	7	0.59
Paraguay	8	0.58	9	0.57	7	0.59	8	0.58
Peru	12	0.56	11	0.57	4	0.60	4	0.61
Uruguay	6	0.60	4	0.59	10	0.58	9	0.58
Venezuela (Bolivarian Republic of)	4	0.62	6	0.58	9	0.58	13	0.56
Min		0.32		0.30		0.28		0.28
Max		0.68		0.66		0.69		0.69
Average		0.55		0.54		0.56		0.55

Figure 13 - $FSvI_{P4}$ for Latin American Countries

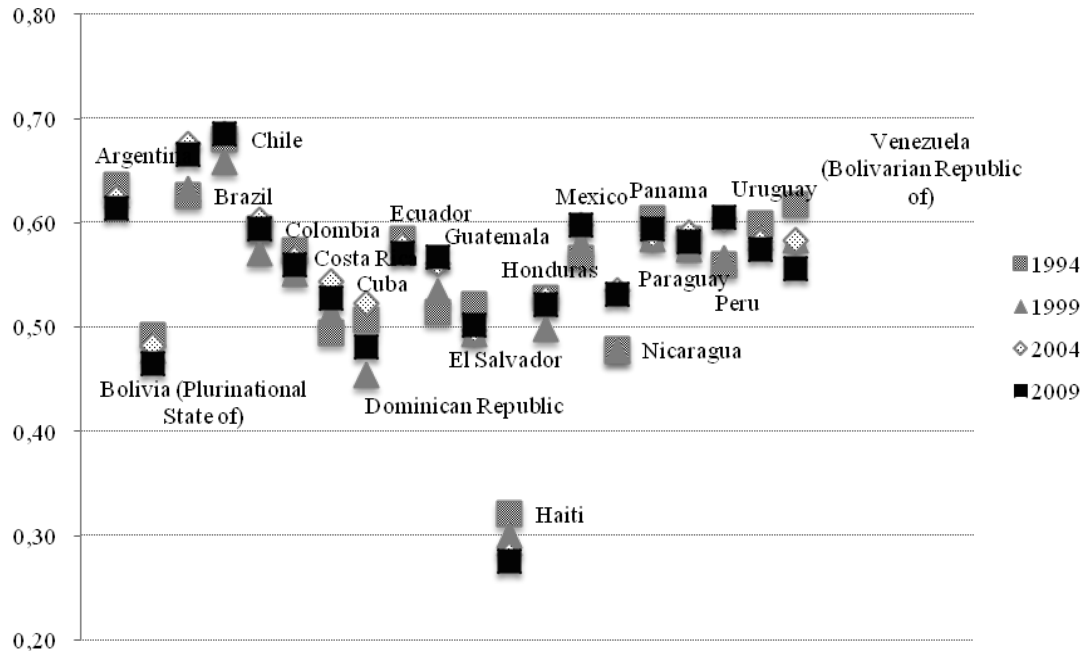


Table 13 - Prevalence of Undernourishment in Total Population (%)

Country	1990-1992	1995-1997	2000-2002	2005-2007
Argentina	—	—	—	—
Bolivia (Plurinational State of)	29	24	22	27
Brazil	11	10	9	6
Chile	7	—	—	—
Colombia	15	11	10	10
Costa Rica	—	—	—	—
Cuba	6	14	—	—
Dominican Republic	28	26	25	24
Ecuador	23	16	17	15
El Salvador	13	12	7	9
Guatemala	15	20	22	21
Haiti	63	60	53	57
Honduras	19	16	14	12
Mexico	—	—	—	—
Nicaragua	50	38	25	19
Panama	18	20	19	15
Paraguay	16	10	10	11
Peru	27	21	18	15
Uruguay	5	—	—	—
Venezuela (Bolivarian Republic of)	10	14	13	8

Source: FAO Statistical Yearbook

In Category 2, two new indicators were introduced: deviation in ideal food consumption by food group and deviation in meat base protein intake per day, both expressed in percentage. These two indicators are based on the same idea: to penalize countries with higher deviations from what it is considered as optimal consumption. In the first case, optimal consumption is base on the food pyramid presented by the United States Agricultural Department.[15] In the second case, optimal meat consumption is base on the figures presented by the Institute of Medicine of the National Academies (2005).[16] Specific notes on these indicators can be found on Appendix 1. On this category, Argentina occupied the leadership position and Haiti is again in the last place.

Category 3 represents buy efforts, i.e. the proportion of the household income on food. Haiti is in the last position. According to FAO Food Security Statistics Division, as of 2000 Haitian families spent 57,7% of their family income in food. In contrast, Brazilian families, which led this category, only spent 19.8% of their family income (Table 14).

[15] http://www.cnpp.usda.gov/Publications/MyPyramid/OriginalFoodGuidePyramids/FGP/FGPPamphletSpanish.pdf
[16] http://www.nap.edu/openbook.php?isbn=0309085373

Table 14 - Food Consumption Expenditure

Country	Year	Share (%) of food consumption exp. in total household consumption exp.
Argentina	2004	33.4
Bolivia (Plurinational State of)	2004	38.8
Brazil	2008	19.8
Chile	2006	22.5
Colombia	2006	27.4
Costa Rica	2004	30.61
Dominican Republic	2007	37
Ecuador	2005	30.6
Guatemala	1998	37.1
Haiti	2000	57.5
Mexico	2008	29.2
Nicaragua	2005	44.5
Panama	2008	30
Peru	2005	31.8
Venezuela, Bolivarian Republic of	2005	38.3

Source: FAO Food Security Statistics

In category 4, international commerce in volume (tons) was measured, in order to determine: on the one hand, country dependence on foreign sources of food imports and food aid, and on the other, whether the country policies favor local consumption over exports. Again, Haiti is on the most vulnerable position given the food aid received. Uruguay is leading this category; however, this does not necessarily imply that it is on a less vulnerable position. As it turns out, Uruguay strengthens its relative position on this category because it is one of the main exporters of meat. Further research and analysis are needed to determine vulnerability in foreign sources. This is a first step towards approaching this matter.

Finally, in category 5 we measured the concentration of energy, fat and protein sources. This category seeks to determine whether population's diet is well diversified. According to CEMLA (2009), the most common problem in the region is the micronutrient-deficiency (anemia), characterized mainly by the lack of iron, which is present in over 50% of the population in several LA countries, and affects one in every three children under five years. Peru and Paraguay showed the better-diversified diet on the region, while Argentina the worst due to its diet rich in meat proteins.

6.5 Agrarian Policies (Pillar 5)

Before the analysis of Pillar 5, some methodology notes must be remarked:

- Three indicators mentioned on Table 15 were not included on the calculation for the purpose of this work due to time restrictions: Noncash general government expenditure on agriculture, forestry, fishing and hunting (national currency), and Noncash general government expenditure on agriculture, forestry, fishing and hunting (% of agricultural value added) for

the first category; and Total support estimate (TSE) (€ millions) in the second. Discussions on methodological details for these three indicators continue; and we remain optimistic that these three indicators will be included in future calculations of FSvI.

- Lack of important information for non-OECD (Organization for Economic Cooperation and Development) countries is another issue on this category. Because of this LA countries have only on average 7 out of 13 indicators.
- We decided to remove Mexico and Brazil from category two, since both countries present extreme data that alter results for the remaining countries, particularly after the so called "Tequila Crisis" suffered by Mexico in 1995.

As expected, this pillar was leaded by Mexico and Brazil, as OECD only publishes information for both of them (and Chile). Dominican Republic and Venezuela share the last position (Table 16 & Figure 14) mainly due to the lack of indicators; each country presents 5 and 4 indicators, respectively.

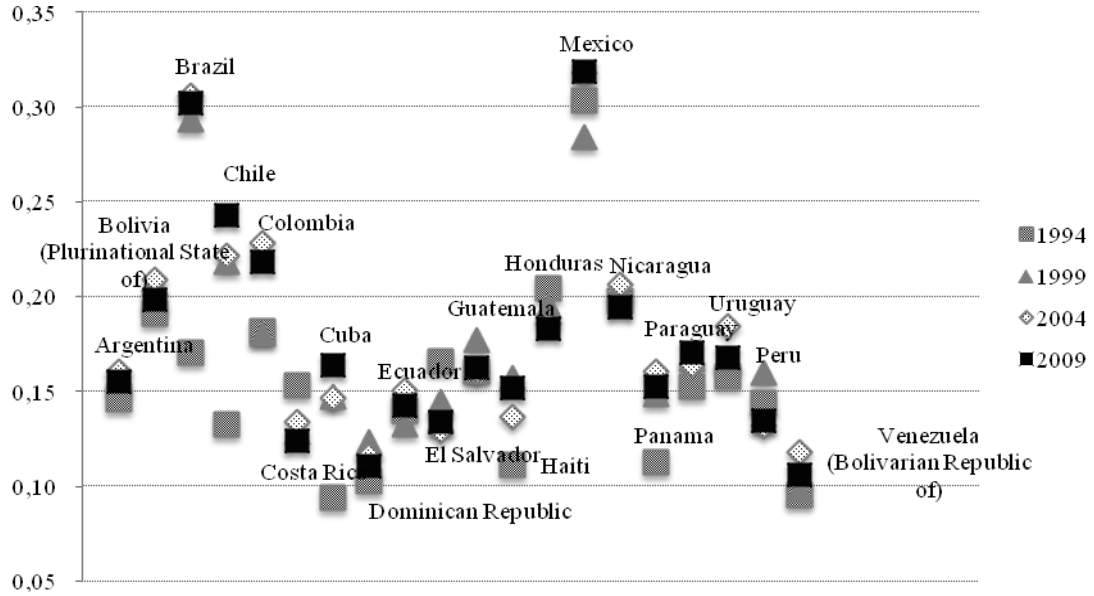
Table 15 - Pillar 5: Agrarian Policies (P5)

Category	Indicator	Code	Transformation	Sign
Governmental Expenditure (P5C1)	Noncash general government expenditure on agriculture, forestry, fishing and hunting (national currency)	P5C11_GOV-NC	Max-min (log)	Positive
	Noncash general government expenditure on agriculture, forestry, fishing and hunting (% of agricultural value added)	P5C12_GOV-VA	Max-min	Positive
	Public agricultural R&D expenditures (% of agricultural GDP)	P5C13_PUB-R&D	Max-min	Positive
Distribution Of Governmental Expenditure on Agricultural Support (P5C2)	Total support estimate (TSE) (€ millions)	P5C21_TSE	Max-min (log)	Positive
	Producer support estimate (PSE) (% of value of production)	P5C22_PSE-VALUE	Max-min	Positive
	Producer support estimate (PSE) (% of TSE)	P5C23_PSE-TSE	Max-min	Positive
	Consumer support estimate (CSE) (% of TSE)	P5C24_CSE-TSE	Max-min	Positive
	Estimation of general services support agriculture (GSSE) (% of TSE)	P5C25_GSSE-TSE	Max-min	Positive
Official Development Assistance Dedicated to Agriculture (P5C3)	ODA received or contributed to agriculture, forestry and fishing ($ million, current prices)	P5C31_ODA-GEN	Max-min (log)	Positive
	ODA received or contributed to agrarian reform ($ million, current prices)	P5C32_ODA-REFORM	Max-min (log)	Positive
	ODA received or contributed to agriculture, forestry and fishing in the form of donation ($ million, current prices)	P5C33_ODA-DON	Max-min (log)	Positive
Tariffs Related to International Trade of Agricultural Products (P5C4)	Final bound simple average for agricultural products	P5C41_FBS-TRFF	Max-min	Positive
	MFN (Most Favored Nation) tariff, simple average for import duties for agricultural products	P5C42_MFN-TRFF	Max-min	Positive
	Trade weighted average tariffs for agricultural products	P5C43_TWA-TRFF	Max-min	Positive

Table 16 - $FSvI_{P5}$ and Regional Ranking

Country	1994		1999		2004		2009	
	Position		Position		Position		Position	
Argentina	12	0.15	11	0.16	10	0.16	12	0.16
Bolivia (Plurinational State of)	4	0.19	4	0.21	5	0.21	5	0.20
Brazil	6	0.17	**1**	**0.29**	2	0.31	2	0.30
Chile	15	0.13	3	0.22	4	0.22	3	0.24
Colombia	5	0.18	7	0.18	3	0.23	4	0.22
Costa Rica	10	0.15	18	0.13	16	0.13	18	0.12
Cuba	**20**	**0.09**	15	0.15	14	0.15	10	0.16
Dominican Republic	18	0.10	19	0.12	**20**	**0.12**	19	0.11
Ecuador	14	0.14	17	0.13	13	0.15	15	0.14
El Salvador	7	0.17	16	0.14	18	0.13	17	0.13
Guatemala	8	0.16	8	0.18	12	0.16	11	0.16
Haiti	17	0.11	13	0.16	15	0.14	14	0.15
Honduras	2	0.20	6	0.20	7	0.19	7	0.18
Mexico	**1**	**0.30**	2	0.28	**1**	**0.32**	**1**	**0.32**
Nicaragua	3	0.20	5	0.21	6	0.21	6	0.19
Panama	16	0.11	14	0.15	11	0.16	13	0.15
Paraguay	11	0.15	10	0.17	9	0.16	8	0.17
Peru	9	0.16	9	0.17	8	0.18	9	0.17
Uruguay	13	0.14	12	0.16	17	0.13	16	0.13
Venezuela (Bolivarian Rep. of)	19	0.10	**20**	**0.10**	19	0.12	**20**	**0.11**
Min		0.09		0.10		0.12		0.11
Max		0.30		0.29		0.32		0.32
Average		0.16		0.17		0.18		0.18

Figure 14 - $FSvI_{P5}$ for Latin American Countries



As explained above for the first category, we had initially contemplated three indicators; however, two of them were temporarily removed. Accordingly, we only analyzed the indicator on Public Agricultural R&D Expenditures. For this indicator Uruguay presented the highest values, but it also showed a declining trend. Many other countries reported values close to zero that we interpret as a reflection of the lack of R&D investment in the region.

The second category refers to governmental support to agriculture. Since OECD is the main source, the only available data in this category are the one for Mexico, Brazil and Argentina, and thus we could not make a comparative analysis.

The third category offered more complete data. This category presents Official Development Assistance (ODA) in to agriculture, forestry and fishing. Bolivia, Honduras, Peru and Ecuador led this category as the main receivers of agricultural ODA. Venezuela and El Salvador were on the last positions (Table 17).

Table 17 - Official Development Assistance (ODA) in Agriculture, Forestry and Fishing

Country	**2000** USD millions	**2010** USD millions
Argentina	1.21	39.11
Bolivia	89.55	140.18
Brazil	15.12	231.56
Chile	2.42	2.27
Colombia	63.86	115.00
Costa Rica	10.32	2.37
Cuba	5.57	9.12
Dominican Republic	9.45	19.81
Ecuador	7.92	43.84
El Salvador	13.32	11.79
Guatemala	18.96	47.45
Haiti	18.01	77.78
Honduras	46.37	76.11
Mexico	3.79	22.97
Nicaragua	35.45	67.70
Panama	0.54	5.14
Paraguay	2.47	23.39
Peru	18.95	83.29
Uruguay	1.04	2.30
Venezuela	0.31	0.37

Source: Development Assistance Committee (DAC-OECD)

Finally, category four shows tariffs associated with international commerce. These indicators remained stable through the four-year time window. Colombia and Mexico led this category, showing less international barriers for commerce. Chile and Peru shared the last position on the list.

6.6 Food Sovereignty Index (FSvI), comparison with other indexes

As previously stated several other Indexes have been developed to measure a series of crucial issues related to the matter of food, poverty and the like. Some of the most widely known are: Human Development Index (HDI), Food Security Index (FSI), Environmental Performance Index (EPI) and Democracy Index (DI).

Each of these offer relevant information to analyze particular situations, but the majority have failed to cover the wide array of factors that the FSvI does, this particular advantage provides the FSvI with flexibility since it is possible to decompose the index into its constituent parts in order to better analyze its underlying factors; additionally, as discussed in the methodology section it is possible to grant the FSvI with differential weightings depending on the issues that the analysts wish to stress.

In the case of the EPI, the data used to establish such Index is not available thus constraining its utility to the merely use of such index as a ranking device. Moreover, this index is strictly focused on environmental topics and thus provides limited information on other relevant issues of human rights.

The HDI, covers education (as measured by the degree alphabetization, means of the use of schooling and expected years of schooling), live expectancy and Gross National Income per capita (GNI). Again these measures are specific to aspects that are considered fundamental to endow quality of life but fail to incorporate other relevant aspects such as access to food.

The DI strictly focuses on the level of democracy among existing countries it categorizes such levels as follows: Full democracies, flawed democracies, hybrid regimes and authoritarian regimes. It provides a rank and an overall score. This Index is useful when dealing with topics strictly related to the subject of democracy and may provide analysts with a valuable tool to revise correlations between democracies and other topics that may be perceived to be related. In the case of the FSvI this Index is positive correlated with the Democracy Index (see Table 18 below), however, further research is needed to establish a theoretical connection and a statistical relation in time.

Finally, the FSI, was developed by the Economist Intelligence Unit and is constructed using over 25 indicators which are plugged into the categories of: affordability, availability, nutritional quality and food safety. Our view is that while this Index can be complementary to the FSvI, it falls short in providing key information on issues such as production models and agrarian reforms which are covered by the FSvI.

Table 18 below shows that all the indexes here presented are positively correlated with the FSvI, yet not strongly so. We believe that the additional information portrayed by the FSvI accounts for this and permits to consider it a valuable measure to assess progress in food production and supple relative to a group or region.

Table 18 - Indexes Comparison and correlation with FSvI

	FSvI 2012	FSI 2012	EPI 2012	DI 2011	HDI 2011
Chile	0.48	73.23	55.34	7.54	0.80
Brazil	0.47	73.42	60.90	7.12	0.72
Mexico	0.46	70.55	59.23	6.93	0.77
Argentina	0.45	74.23	56.48	6.84	0.80
Uruguay	0.44	70.82	57.06	8.17	0.78
Panama	0.43	75.6	50.29	7.08	0.77
Colombia	0.43	74.12	62.33	6.63	0.71
Ecuador	0.42	70.81	60.55	5.72	0.72
Paraguay	0.42	72.99	52.40	6.4	0.66
Bolivia (Plurinational State of)	0.41	67.12	54.57	5.84	0.66
Peru	0.41	70.93	52.08	6.59	0.72
Costa Rica	0.40	77.69	69.03	8.1	0.74
Nicaragua	0.39	73.56	57.94	5.56	0.59
Honduras	0.39	72.92	49.11	5.84	0.62
Guatemala	0.38	73.8	52.54	5.88	0.57
Cuba	0.38	64.02	56.48	3.52	0.78
El Salvador	0.38	67.62	51.88	6.47	0.67
Venezuela (Bolivarian Republic of)	0.37	63.41	55.62	5.08	0.74
Dominican Republic	0.35	64.45	52.44	6.2	0.69
Haiti	0.29	48.71	41.15	4	0.45
Correlation		**0.74228**	**0.55297**	**0.68607**	**0.74037**

Source: Author base on different sources.

In such table is also possible to observe that the countries that adopted FSv proposals in their laws are not yet better off than those that have not adopted such proposals. However, it can be noted that the category of progressive countries (as defined above), which includes Argentina, Brazil, Paraguay and Uruguay tended to perform in the top tercile (except for the case of Paraguay which is located in the median of the list). We acknowledge; however, that the adoption of the FSv proposals is relatively recent (Bolivia in 2007, Ecuador in 2010 and Venezuela in 2008; Fernández Such and Rivera Ferre, 2011) and that it is still too soon to observe progress in those countries; we, thus, remain confident that further research on this topic will provide more optimistic results.

7 Conclusions

FSvI is a simple average of the indices of each of the pillars. Due to the vast topics that each pillar covers, individual analysis of the index does not provide more information than that which can be obtained from the pillars-base analysis. Therefore, the main objective of FSvI is to allow an international ranking (presented on Appendix 2) to permit comparisons among countries.

As part of the purpose of this work, we used FSvI to assess whether those countries that include FSv's proposal on their laws (Post-Neoliberal Countries, PNC) differ somewhat from other LA countries (Table 19 & Figure 15).

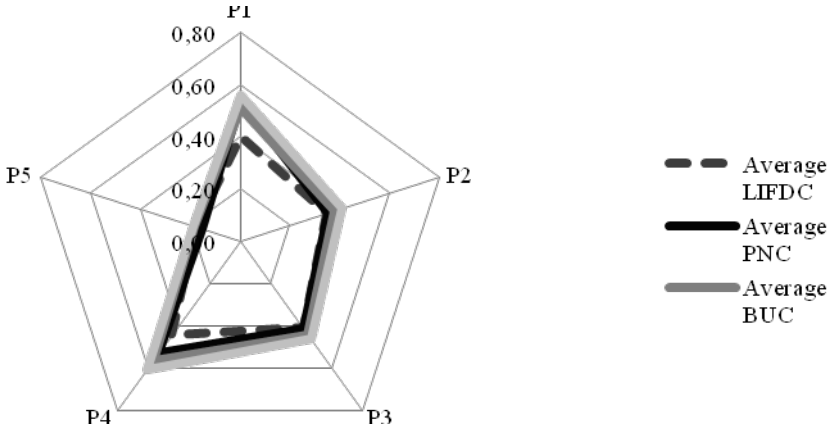
Table 19 – 2009 Country Groups Results

	P1	P2	P3	P4	P5
Average LIFDC [a/]	0.40	0.35	0.41	0.44	0.18
Average PNC [b/]	0.54	0.35	0.41	0.53	0.15
Average BUC [c/]	0.51	0.38	0.44	0.56	0.18
Average PC [d/]	0.56	0.41	0.46	0.61	0.19

Notes: a/ Low-Income Food-Deficit Countries (LIFDC): Haiti, Honduras & Nicaragua. b/ Post-Neoliberal Countries (PNC): Bolivia, Cuba, Ecuador and Venezuela. c/ Business as Usual Countries (BUC): Chile, Colombia, Dominican Republic, El Salvador, Guatemala, Panama, Peru, Costa Rica and Mexico. d/ Progressive Countries (PC): Argentina, Brazil, Paraguay and Uruguay.

It was expected that PNCs that have openly supported the FSv's proposal and have included it in its laws, policies and programs, obtain a higher FSvI compared to those, which were not doing so. Results, however, show a minimal difference in favor of PCs and BUCs over the five pillars. The only group that is clearly at a disadvantage with the other three on the five pillars is LIFDCs. LIFDCs consist of those countries with the strongest problems of hunger, low-income average (wealth) and the social and political instability: Haiti, Nicaragua and Honduras.

Figure 15 - 2009 Country Groups Results by Pillars



The lack of key information regarding specific FSv processes, such as the lack of indicators to measure the development of local food markets in the Pillar 3 and missing indicators in Pillar 5, did not permit a full analysis by groups of countries. Moreover, FSv legal framework recognition in countries is but recent (Bolivia in 2007, Ecuador in 2010 and Venezuela in 2008; Fernández Such and Rivera Ferre, 2011); in this sense our time threshold could not reflect the effects. In any case, this work just represents the first approach of FSvI and further research is needed to improve it.

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Annex 1: FSvI International Ranking

Country	1994	1999	2004	2009	Country	1994	1999	2004	2009
United States of America	1	1	1	1	Lithuania	95	91	47	44
Norway	2	2	2	2	India	20	36	39	45
Turkey	5	10	7	3	Ecuador	35	43	44	46
Germany	4	5	3	4	Bulgaria	68	65	81	47
France	3	3	4	5	Russian Federation	49	37	53	48
Denmark	9	7	6	6	Morocco	45	42	46	49
China	16	4	5	7	Croatia	64	58	51	50
Ireland	7	6	8	8	Paraguay	44	38	52	51
Spain	11	14	11	9	Uganda	62	62	49	52
New Zealand	6	9	10	10	Lebanon	58	49	55	53
Netherlands	8	8	9	11	Guyana	71	74	60	54
Chile	13	12	13	12	Albania	54	46	56	55
Finland	24	11	14	13	Romania	75	79	86	56
Brazil	31	19	12	14	Luxembourg	89	50	50	57
Canada	12	17	16	15	Pakistan	42	72	61	58
Mexico	14	23	20	16	Bolivia (Plurinational State of)	43	45	54	59
Sweden	28	16	18	17	Cyprus	96	83	48	60
Slovenia	55	44	21	18	Israel	77	47	59	61
Belgium	30	18	22	19	Peru	56	57	57	62
Austria	25	13	15	20	Jamaica	63	52	66	63
United Kingdom of GB and Northern Ireland	10	15	17	21	Indonesia	41	71	63	64
Switzerland	18	20	23	22	Ghana	50	51	58	65
Ukraine	21	22	19	23	Armenia	99	77	69	66
Greece	19	24	27	24	Philippines	60	61	68	67
Argentina	15	21	25	25	United Republic of Tanzania	83	80	65	68
Poland	39	39	24	26	Malaysia	48	55	64	69
Estonia	32	33	26	27	Namibia	65	59	75	70
Australia	26	26	29	28	Costa Rica	53	64	74	71
Italy	27	29	30	29	Tunisia	76	63	70	72
Uruguay	23	27	34	30	Jordan	57	54	73	73
Kazakhstan	17	32	32	31	Egypt	87	76	77	74
Japan	29	28	28	32	Georgia	92	78	71	75
Thailand	22	25	31	33	Kyrgyzstan	47	68	82	76
Republic of Korea	46	41	33	34	Senegal	51	69	67	77
Latvia	61	56	45	35	Republic of Moldova	73	66	78	78
Portugal	38	34	38	36	Botswana	74	75	83	79
South Africa	40	30	36	37	Sri Lanka	69	67	72	80
Viet Nam	36	35	37	38	Iceland	52	53	62	81
Panama	37	31	35	39	Belarus	78	92	92	82
Colombia	33	40	40	40	Nicaragua	97	85	76	83
Belize	34	48	42	41	Kenya	66	89	80	84
Czech Republic	72	70	43	42	Fiji	67	73	79	85
Hungary	70	60	41	43	Honduras	80	82	85	86

Country	1994	1999	2004	2009	Country	1994	1999	2004	2009
Iran (Islamic Republic of)	106	105	87	87	Kuwait	130	123	130	130
The former Yugoslav Republic of Macedonia	84	84	84	88	United Arab Emirates	117	121	127	131
Slovakia	114	120	89	89	Burundi	134	140	129	132
Malawi	79	90	95	90	Serbia	163	162	160	133
Malta	125	118	93	91	Turkmenistan	140	142	137	134
Guatemala	88	87	94	92	Lesotho	128	128	133	135
Cuba	115	100	100	93	Sao Tome and Principe	142	130	141	136
Bangladesh	86	93	91	94	Vanuatu	145	143	147	137
Bosnia and Herzegovina	93	95	99	95	Cameroon	136	125	138	138
Myanmar	111	106	103	96	Cape Verde	135	131	140	139
Sudan	94	86	90	97	Antigua and Barbuda	146	153	143	140
Trinidad and Tobago	113	103	96	98	Mauritania	132	137	132	141
El Salvador	102	102	98	99	Samoa	141	141	135	142
Azerbaijan	108	97	88	100	Angola	150	148	142	143
Swaziland	118	107	108	101	Benin	138	151	145	144
Madagascar	59	88	102	102	Congo	143	147	146	145
Syrian Arab Republic	100	108	110	103	Seychelles	151	135	136	146
Zambia	101	114	109	104	Libya	139	139	139	147
Cambodia	104	119	104	105	Timor-Leste	149	146	151	148
Niger	112	117	120	106	Central African Republic	137	136	156	149
Suriname	82	96	107	107	Sierra Leone	158	157	155	150
Zimbabwe	85	81	105	108	Saint Kitts and Nevis	155	150	149	151
Venezuela (Bolivarian Republic of)	98	98	97	109	Bahamas	144	152	148	152
Nepal	116	115	112	110	Grenada	153	156	144	153
Mali	122	127	124	111	Guinea Bissau	147	158	153	154
Algeria	120	113	106	112	Dominica	159	145	157	155
Tajikistan	90	112	111	113	Barbados	152	149	150	156
Gambia	81	94	117	114	Uzbekistan	156	155	152	157
Mauritius	91	99	101	115	Togo	157	159	159	158
Ethiopia	124	122	118	116	Saint Lucia	148	154	154	159
Mongolia	107	101	113	117	Chad	154	144	158	160
Rwanda	126	138	121	118	Saint Vincent and the Grenadines	161	166	161	161
Gabon	109	104	114	119	Brunei Darussalam	164	167	163	162
Guinea	133	134	126	120	Liberia	162	168	169	163
Lao People's Democratic Republic	110	116	116	121	Maldives	168	161	162	164
Solomon Islands	103	110	119	122	Comoros	172	163	165	165
Burkina Faso	129	126	134	123	Democratic Republic of the Congo	169	172	166	166
Mozambique	119	111	123	124	Eritrea	160	160	168	167
Yemen	123	133	128	125	Iraq	174	173	173	168
Côte D'Ivoire	105	109	115	126	Bhutan	166	164	164	169
Dominican Republic	121	132	125	127	Oman	170	170	167	170
Nigeria	127	124	131	128	Haiti	165	165	170	171
Saudi Arabia	131	129	122	129	Papua New Guinea	171	169	171	172

Country	1994	1999	2004	2009
Qatar	175	174	174	173
Somalia	173	176	175	174
Democratic People's Republic of Korea	167	171	172	175
Tonga	176	175	176	176
Djibouti	178	178	177	177
Kiribati	177	177	178	178
Afghanistan	180	181	179	179
Bahrain	181	180	180	180
Montenegro	182	182	182	181
Equatorial Guinea	179	179	181	182
Tuvalu	183	183	183	183
Singapore	184	184	184	184
Micronesia (Federated States of)	185	185	185	185
Marshall Islands	186	186	186	186
Andorra	187	187	187	187
Palau	188	188	188	188
Liechtenstein	189	189	189	189
Nauru	190	190	190	190
San Marino	191	191	191	191
Monaco	192	192	192	192
South Sudan	193	193	193	193

Note: Countries were ordered base on 2009 rank.

Annex 2: Transformation of Indicators

Code	Name of Indicator	Original Name in Reference Study	Modifications & Calculations	Justification	Source of Modifications
P1C22_CUL-AREA	Cultivated area (hectares per capita - agricultural population)	Arable land (hectares per capita - agricultural population)	In the previous study (Ortega-Cerda and Rivera-Ferre, 2010), the source of this indicator was shown as GLIPHA. However, in GLIPHA, source of this data is mentioned as FAOSTAT. Time-series of the data is from 1995 to 2007, but it is available from 1980 until 2009 in FAOSTAT. Thus, FAOSTAT has been selected as a source due to the availability of more data. The indicator is calculated by dividing "Arable Land (1000 Ha)" by "Agricultural Population (1000)".	As it is mentioned in modifications, the reason of changing the source was availability of more data. On the other side, dividing indicator by agricultural population results in a more comparable indicator as the effect of size difference among countries was removed.	FAOSTAT
P1C31_DOM-MAM	Domestic mammals per rural inhabitant (except pack animals)	Domestic mammals per rural inhabitant	The three packing animals of the indicator **1.3.3**, which are asses, horses and mules, have been removed.	Asses, horses and mules are included in indicator **1.3.3**. To prevent data repeating, these three animals have removed from the indicator **1.3.1**.	FAOSTAT
P1C51_AGR-TRAC	Number of agricultural tractors per 1000 hectares of agricultural area	Number of agricultural tractors per 1000 hectares of agricultural area	World Development Indicators (WDI) has been determined as a new source of the "number of agricultural tractors".	FAOSTAT has two indicators one of them with the same name of the one in WDI and the other "number of agricultural tractors, total". The "total" does not have data. The other one has more data than the "total" but not as much as the one from WDI. Thus, the indicator of WDI was selected as a source.	World Development Indicators & Global Development Finance (WDI & GDF, 27 September 2011)
P1C53_MILK	Number of milking machines (per 100 cattle)	Number of milking machines	There are two types of data for the machinery in FAOSTAT, machinery and machinery archive. In this indicator, these two resources have been combined. The main source of data is "machinery archive", but all data for all of the countries after the year 2003 comes from "machinery" part. The unit of the indicator "number of cattle" is originally "Head" in FAOSTAT. However, the unit is determined as "100 Head" in this indicator.	The reason of combining two sources of FAOSTAT was availability of more data. On the other side, dividing indicator by number of cattle results in a more comparable indicator as the effect of size difference among countries was removed.	FAOSTAT

Code	Name of Indicator	Original Name in Reference Study	Modifications & Calculations	Justification	Source of Modifications
P1C61_CAP-STOCK	Capital stock in agriculture per agric inhabitant income (constant 1995 U.S. $ per worker /current US$ per agric inhabitant)	Capital stock in agriculture (constant 1995 U.S. $ per worker)	The indicator "capital stock in agriculture (constant 1995 U.S. $ per worker)" has been relativized by "income (current US$ per agric inhabitant)". To obtain "income per agric inhabitant", two indicators have been used which are called "agriculture, value added (current 1000 US$)" from WDI and "agricultural population (1000)" from FAOSTAT. The constant price of Capital Stock was based on the year 1995. However, the unit of the indicator "agriculture, value added" from WDI has been chosen as "current 1000 US$"; since, constant price of it was based on year 2000. Moreover, it was divided by agricultural population (1000) and the final unit (US$ per capita) has been obtained. As some of the data years of Capital Stock were not one year such as "1989-1991", the average of these years (for ex. 1989, 1990 and 1991) was taken to calculate income per agric inhabitant with same years of capital stock.	The reason of dividing original indicator by income (current US$ per agric inhabitant) was to obtain a more comparable indicator in which the level of capital stock due to being a developed or a developing country does not lead extreme differences among countries.	WDI & GDF (27 September 2011) and FAOSTAT
P1C71_FOOD-MED	Food and medicine biodiversity	…….	In the source document, there is a data, which is called "Cultivar/Variety/Accession Name". This data contains all different species of each country. To determine the diversity in terms of species, these different names have been counted for each country to obtain a number that represents their food and medicine biodiversity.	Two indicators of this category, market of seed license (% with respect to seeds traded) and market share of top 10 companies in the field of seed license (% of patented seeds) restrain to construct a quantitative analysis in order to compare the countries as they are common for all countries which makes them inconvenient for the empirical comparison of the Food Sovereignty. Thus, this new indicator has been involved into this category.	INFOODS Food Composition Database for Biodiversity, version 1.1, FAO, 2011
P2C23_FORS-AREA	Forest area (% of agricultural area)	Forest Area (km2)	The unit of Forest Area has been changed from km2 to 1000 Ha. Also, it is divided by agricultural area (1000 Ha).	The reason of changing the unit of forest area from "km2" to "1000 Ha" was to obtain same unit of agricultural area (1000 Ha). On the other side, dividing indicator by agricultural area results in a more comparable indicator as the effect of size difference among countries was removed.	FAOSTAT

Code	Name of Indicator	Original Name in Reference Study	Modifications & Calculations	Justification	Source of Modifications
P2C24_FLOOD-AREA	Flooded area by irrigation and natural form (% of agricultural area)	Flooded area by irrigation and natural form	Since the data of this indicator "flooded area by irrigation and natural form (1000 Ha)" could not be found, it has been determined to sum 4 other indicators of AQUASTAT which are respectively "flood recession cropping area non-equipped (1000 Ha)", "cultivated wetlands and inland valley bottoms non-equipped (1000 Ha)", "area waterlogged by irrigation (1000 Ha)" and "area waterlogged not irrigated (1000 Ha)". After obtaining the indicator by this summation, the new indicator has been divided by "agricultural area (1000 Ha).	As it is mentioned in "modification & calculations" part, the reason of summing 4 indicators of AQUSTAT was to obtain missing data of the original indicator. On the other side, the reason of dividing new indicator by agricultural area (1000 Ha) was to obtain a more comparable indicator as the effect of size difference among countries was removed.	AQUSTAT
P2C25TEMP-CROP	Temporary crops (% of agricultural area)	……	It is a new indicator in which temporary crops (1000 Ha) has been calculated as a percentage of agricultural area (1000 Ha).	……	FAOSTAT
P2C26TEMP-PAST	Temporary meadows and pastures (% of agricultural area)	……	It is a new indicator in which temporary meadows and pastures (1000 Ha) have been calculated as a percentage of agricultural area (1000 Ha).	……	FAOSTAT
P2C34_FISH-PROD	Fishery production per person (kg / person)	Fish Production (tons / year)	The unit of this indicator has been changed. In the previous work (Ortega-Cerda and Rivera-Ferre, 2010), it was in terms of "tons per year". However, the actual indicator is in terms of "kg per capita" like other indicators of production category (3rd category of pillar 2).	The reason of changing the unit of fish production from "tons / year" to "kg per capita" was to obtain a more comparable indicator as the effect of size difference among countries was removed.	FISHSTAT & FAOSTAT
P2C35_FORS-HARV	Forest harvest rate (extraction as a % of volume forest)	Forest logging rate (extraction / forest volume)	There is no structural change in this indicator. The modification was needed since the extreme value of Egypt that was 178%. This value has been adjusted as the possible maximum value, 100%.	As the unit of this indicator is %, it is not logical to have a value greater than %100, since extraction volume cannot be greater than forest volume. As a result, the value of Egypt has been adjusted as the possible maximum value, 100%.	GEO Data Portal

Code	Name of Indicator	Original Name in Reference Study	Modifications & Calculations	Justification	Source of Modifications
P2C55_PRI-FORS	Primary forest extent (% of forest area)	Natural forest area (thousand hectares)	This indicator was called natural forest area in the previous work (Ortega-Cerda and Rivera-Ferre, 2010) and its unit was "1000 Ha". However, the actual indicator has been changed as "primary forest extent (1000 Ha)" indicator of GEO Data Portal in which this indicator is defined as "a forest where there are no clearly visible indications of human activities and the ecological processes are not significant disturbed and composed of indigenous trees, and not classified as forest plantation". Moreover, this indicator was relativized by "forest area (1000 Ha)" indicator of FAOSTAT.	In this study, the source of all forest and related indicators is almost GEO Data Portal. As the definition that is mentioned in modification part shows that this indicator is the closest one to natural forest area. The reason of dividing primary forest extent by forest area was to obtain a more comparable indicator as the effect of size difference among countries was removed.	GEO Data Portal & FAOSTAT
P3C16_FISH-EXP	Fishery exports (% of exports, in dollars)	Seafood exports (% of exports, in dollar terms)	There is no structural change in this indicator. The modification was needed since the extreme value of Vanuatu was greater than 200%. Vanuatu has been extracted from the list of countries in this indicator.	As the unit of this indicator is %, it is not logical to have a value greater than %100, since fish export value cannot be greater than total export value of a country. However, the value of Vanuatu was too high to adjust it to 100% as the example of Egypt in indicator P3C35. As a result, Vanuatu has been extracted to prevent data distortion.	FISHSTAT & FAOSTAT
P3C21_PRICE-PAID	Price paid to farmers in terms of dollars per ton of the five products with more production in the country (% of income per agricultural inhabitant)	Local currency price paid to farmers per ton of the five products with more production in the country	The price unit of indicator has been changed from local currency to dollars ($). Income per agricultural capita has been calculated as it is mentioned in the indicator P1C61.	The price unit of original indicator was local currency. However, as the actual has been divided by income (current US$ per agric capita), the currency unit of indicator has been determined as dollars ($). The reason of dividing original indicator by income (current US$ per agric capita) was to obtain a more comparable indicator in which the parity differences among the currencies do not affect the indicator.	WDI & GDF (27 September 2011) and FAOSTAT

Code	Name of Indicator	Original Name in Reference Study	Modifications & Calculations	Justification	Source of Modifications
P4C21_DEV-FOOD	Deviation in ideal food consumption by food group (%)	Food consumption by food group (g / person / day)	The indicator has been replace for "deviation in ideal food consumption by food group (%)". The word ideal refers to ideal food pyramid of World Health Organization (WHO) in which there are 4 scales of food groups. First scale with 50% ideal consumption rate contains "bread, cereals, rice and pasta". Other groups are defined as "fruits and vegetables" with 30% (2nd scale), "animal products" with 15% (3rd scale) and "sugar and fat" with 5% (4th scale). From the "Food consumption quantities (g/person/day)" indicator of FAOSTAT (Food Security Indicators), "cereals - excluding beer, starchy roots and pulses" have been included in scale 1, "vegetables, fruits - excluding wine and spices" in scale 2, "treenuts, meat, milk - excluding butter, eggs, fish-seafood, offal" in scale 3 and "oilcrops, vegetable oils, animal fats and sugar & sweeteners" in scale 4. Consumption rates have been calculated for each scale and absolute difference in percentage from ideal rates have been summed which shows the total deviation for each country. On the other hand, the food groups "alcoholic beverages" and "stimulants" were not suitable for none of the scales and they have been extracted from the indicator. The calculation was held in four phases which were respectively to sum the food groups of the same scale, to find % of scales to the grand total of that country, to find the absolute value of "deviation" of a country from each ideal scale % of WHO and to sum these deviations (each has absolute value) for each year. Finally, countries with higher value means the countries with higher deviation from ideal, which is bad in terms of principles of food sovereignty.	The original indicator "food consumption by food group (g / person / day)" was not a suitable indicator to make a comparison among the countries, as the optimum value for food consumption by food group was not defined.	FAOSTAT & http://www.cnpp.usda.gov/Publications/MyPyramid/OriginalFoodGuidePyramids/FGP/FGPPamphletSpanish.pdf

Code	Name of Indicator	Original Name in Reference Study	Modifications & Calculations	Justification	Source of Modifications
P4C22_DEV-MEAT	Deviation in meat based protein intake per day (%)	…….	The indicator "share in total dietary protein consumption (percent)" of FAOSTAT was included in previous study (Ortega-Cerda and Rivera-Ferre, 2010) and has been used as a database to create this new indicator called "deviation in meat based protein intake per day (%)". First of all, the percentage of meat based protein intake per day has been calculated for each country. Then, deviation of each country from the ideal ratio 35% (18 gr. protein intake from ideal daily meat consumption 90 gr. (McMichael, 2007) was divided by ideal daily protein intake amount 52 gr. (Canadian Dietary Reference Intake guidelines, 2008)). Later, to obtain final indicator value, each deviation range was multiplied by a higher coefficient as deviation is greater (deviations until 5% were multiplied by 1, the ones between 5% - 14,99% were multiplied by 2,5 and the ones with 15% and greater deviations were multiplied by 5.).	Difference between in meat consumption level between developed and developing countries is remarkable (some exceptions exist among developing countries with overconsumption due to their comparable advantage in meat production, e.g. Argentina, Uruguay... etc.). Although it seems that meat consumption gets higher as development level gets higher, there are several studies which shows that overconsumption of meat leads problems for human health, environment and ecological balance. As a result, this new indicator has been created to show the deviation level of each country from the ideal "meat based protein intake per day (%)".	McMichael et al. (2007) Food, livestock production, energy, climate change and health. The Lancet 370: 1253-1263 & FAOSTAT
P4C23_ENRGY-CONS	Dietary energy consumption (kcal / person / day)	Dietary energy consumption (cal/person/day)	Two indicators of FAO exist with the name "daily energy intake". The one from Statistic Division is in terms of "kcal / person / day". On the other hand, the one from Yearbook (2010) is in terms of "cal / person / day". However, the values of countries in these two different indicators are very similarly to each other. Thus, one of them should be selected as a data source and the indicator of Statistic Division of FAO which was in terms of "kcal / person / day" has been determined as the actual indicator since its unit was more realistic.	The existence of two different indicators with almost same numbers but with different units of same reliable source (FAO) leaded a conflict about the unit of indicator. As a result the one with "kcal" have been selected since the daily energy intake of a person with that range of values (between 1500 & 3800) should be in terms of kcal.	FAOSTAT
P4C24_PROT-CONS	Dietary protein consumption (g/person/day)	Dietary protein consumption (g/person/day)	Two different data source of FAO exist for this indicator: Statistic Division and Yearbook (2010). The data of these two database has been merged (the values of 2005-2007 were same in the both source and this makes the combination possible).	As having more data is better to compare the countries, the combination mentioned in "modification & calculations" part, has been realized for this indicator.	FAOSTAT

Code	Name of Indicator	Original Name in Reference Study	Modifications & Calculations	Justification	Source of Modifications
P4C25_FAT-CONS	Dietary fat consumption (g/person/day)	Dietary fat consumption (g/person/day)	Two different data source of FAO exist for this indicator: Statistic Division and Yearbook (2010). The data of these two databases has been merged (the values of 2005-2007 were same in the both source and this makes the combination possible).	As having more data is better to compare the countries, the combination mentioned in "modification & calculations" part has been realized for this indicator.	FAOSTAT
P4C32_CPI-FOOD	Consumer Price Index. Food	Consumer Price Index. Food	The data of capital of some countries were taken into consideration as the data of country by looking at the ratio of population of capital (UNDP). If the ratio is higher than 30%, the data of capital is accepted as represented of the country. Also, the data of countries whose index year is different from 2000 was extrapolated until 2000 and it was converted in relation to the ratios as the index year was 2000.	As having more data is better to compare the countries, the modification mentioned in "modification & calculations" part has been realized for this indicator.	International Labour Organization (ILO)
P4C41_CER-IMP	Cereal import (% of cereal production volume)	Percentage of cereal imports about food production (volume)	Source of this indicator was " FAOSTAT, Food Balance Sheets" in the previous study (Ortega-Cerda and Rivera-Ferre, 2010). The data source has been changed as "FAOSTAT, Trade". Moreover, countries with zero production in all the years were excluded from the list since denominator of the indicator was "production quantity (1000 tones)".	As it is mentioned in "modification & calculations" part, source of this indicator was " FAOSTAT, Food Balance Sheets" in the previous study (Ortega-Cerda and Rivera-Ferre, 2010). However, the data source has been changed as "FAOSTAT, Trade" since obtaining long time series data was very difficult due to data supply structure of "FAOSTAT, Food Balance Sheets".	FAOSTAT
P4C42_CER-EXP	Cereal export (% of cereal production volume)	Percentage of cereal exports about food production (volume)			
P4C43_MEAT-IMP	Meat import (% of meat production volume)	Percentage of meat imports about food production (volume)			
P4C44_MEAT-EXP	Meat export (% of meat production volume)	Percent of exports of meat about food production (volume)			

Code	Name of Indicator	Original Name in Reference Study	Modifications & Calculations	Justification	Source of Modifications
P4C48_SEED	Seed import as a ratio of seed export (volume)	……	This new indicator was based on import and export quantity of three different kinds of seeds: flower seeds, vegetable crops seeds and field crops seeds. Then, import and export quantities were summed among them. Final indicator value was obtained by dividing total sum of import quantity by total sum of export quantity. However, the countries that do not have any export quantity got the value of Latvia (which has highest import/export ratio under normal circumstances) to obtain worst value (it is a negative indicator) for the countries that do not have export quantity value without distorting the values of other countries.	As, it is mentioned before, two indicators of sub-category 1.7 "Access to Seeds" (Ortega-Cerda and Rivera-Ferre, 2010) were excluded from FSvI due to their structure, a new indicator has been created about the seed topic. However, it was observed that including this new indicator into sub-category 4.5 "External Dependence on Food" was more logical rather than including it into 1.7 "Access to Seeds".	ISF, International Seed Federation
P4C51_CONC-ENRGY	Concentration of top 3 food groups in consumption of energy (%)	Share in total dietary energy consumption (percent)	The three indicator of sub-category 4.3 "Dietary Composition" of previous study (Ortega-Cerda and Rivera-Ferre, 2010) "habits of consumption of major food groups, food energy, protein and fat (percent)" has been modified and they were put in a new sub-category which is called 4.6 "Vulnerability". These indicators belong to "food consumption pattern of main food groups" which are celled "share in total dietary energy, protein and fat consumption (percent)". New form of indicators has been calculated by summing the percentage of top 3 food groups in consumption pattern of the countries and they are called "concentration of top 3 food groups in consumption of energy, protein and fat".	The reason of modifying these three indicators was that they were not suitable indicators to make a comparison among the countries as the optimum value for share of main food groups were not defined.	FAOSTAT
P4C52_CONC-PROT	Concentration of top 3 food groups in consumption of protein (%)	Share in total dietary protein consumption (percent)			
P4C53_CONC-FAT	Concentration of top 3 food groups in consumption of fat (%)	Share in total dietary fat consumption (percent)			
P5C21_SUPPEST	Total support estimate (TSE) (€ mn)	Total support estimate (TSE) (€s)	The unit of this indicator in the previous work (Ortega-Cerda and Rivera-Ferre, 2010) was in terms of euros (€s). However, the actual indicator's unit has been changed as million euros (€ mn).	The reason of change in the unit of indicator is that the source of data (OECD Database) shows the indicator with same unit and also this unit is visually more presentable.	OECD Statistics

Code	Name of Indicator	Original Name in Reference Study	Modifications & Calculations	Justification	Source of Modifications
P5C31_OFFDEVASS	ODA received or contributed to agriculture, forestry and fishing ($ million, current prices)	ODA received or contributed to agriculture ($ million, current prices)	The production sector of Official Development Assistance (ODA) in which the flow is realized was only "agriculture" in the previous work (Ortega-Cerda and Rivera-Ferre, 2010). However, the sector of actual indicators has been determined as "Agriculture, Forestry, Fishing, Total". On the other hand, Republic of Korea is seen as donor and recipient country in different years. As flow of assistance is more important, the both data type of Republic Korea has been merged as one data in these two indicators.	The reason of adding other production sectors (forestry and fishing) was that it was determined that they also should be involved in FSvI.	OECD Statistics
P5C33_OFFDEVASS-DENO	ODA received or contributed to agriculture, forestry and fishing in the form of donation ($ million, current prices)	ODA received or contributed to agriculture in the form of donation ($ million, current prices)			
EU countries in Pillar 5 (Additional)	…….	…….	In pillar 5, the data of EU countries was shown as "European Union" in the data sources like OECD. Individual data of the countries of EU have been calculated by using the data of "Balance current subsidies & taxes" in "Farm Accounting Data Network" section of Agriculture, European Commission. The percentages of each country in each year have been determined and these ratios were used to obtain individual data of EU countries from grand total "European Union" data.	As it is mentioned in "modification & calculations" part, the data of EU countries was shown as "European Union" in the data sources of pillar 5 like OECD and IMF. However, the countries of EU should have data individually as FSvI is being calculated for each country.	Agriculture and Rural Development, Farm Accounting Data Network. European Commission