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LITERATURE REVIEW

Food security and livestock: The case of Latin America and the Caribbean

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Abstract

Diego I. Rodríguez, G. Anríquez, and J.L. Riveros. 2016. Food security and livestock: The case of Latin America and the Caribbean. Cien. Inv. Agr. 43(1):5-15. The main hurdle to achieving food security in Latin America and the Caribbean is the inability of many poor families to access the foods necessary for a healthy diet, in a context in which food prices and family incomes are fundamental determinants. Animal husbandry plays a key role in the food security of the region, providing products rich in high-quality proteins and micronutrients and is vital for millions of households that depend on livestock for their livelihoods to generate income and have access to basic services. Furthermore, the production and trade of livestock products contributes to the stabilization of the food supply, acting as a buffer during economic crises and disasters both at the individual and community levels. Small farm agriculture is especially important in this scenario, given that most of the production of foods of animal origin depends on this sector and that the majority of the 47 million people who suffer from hunger in our continent live in rural areas. In this complex scenario, a good understanding of the interrelations between food security and the livestock sector, both at the national and household level, is fundamental for the design and implementation of policies that strengthen family livestock production as an essential pillar in regional food security.

Key words: food policies, food security, Latin America, livestock, malnutrition, rural livelihood, small farm agriculture.

Introduction

The evolution of the concept of food security in the last 30 years reflects the changes in official thinking (Clay, 2002; Heidhues *et al.*, 2004). This concept was created in the mid-1970s, aiming

to ensure the availability and the national and international stability of the prices of basic food commodities. In 1983, the analysis of the Food and Agriculture Organization (FAO) was concentrated on access to foods, which led to a definition based on the equilibrium between the supply and demand of foods for food security (FAO, 1983). This definition was revised so that the analysis of food security also included persons and their

households, as well as regions and countries. In 1986, the World Bank Report on poverty and food (World Bank, 1986) had a great influence; it concentrated on the temporal dynamics of food security (Clay, 2002). The definition generated in the World Food Summit in 1996 gave more strength to the multi-disciplinary nature of food security and included food availability, access to food (physical and economical), use of foods and the stability of the supply (Jones *et al.*, 2013).

Currently, the focus on livelihoods is central to the development programs of international organizations, which are increasingly applied in emergency contexts and include the concept of vulnerability and how to confront and manage the associated risks. This integration decreases, to an extent, the importance of the relation between food security, famine and bad harvests, and the analysis of food insecurity as a social and political product is gaining ground (Devereux and Maxwell, 2001).

The ethical and the human rights dimensions of food security have gained increased attention; however, the right to food is not a new concept—it was originally recognized in the 1948 Declaration of Human Rights of the United Nations. The formal adoption in 1996 of the right to adequate alimentation was a landmark by paving the way toward a focus on food security based on rights. Currently, more than 40 countries have included the right to food in their constitutions, and FAO estimates that 54 more countries may include this right (McClain-Nhlapo, 2004). The most widely accepted definition of food security states that people should have at all times physical, social and economic access to sufficient innocuous and nutritious foods to have a healthy and active life (IICA, 2013).

According to FAO (2006), food security assumes that four interrelated conditions or “dimensions” are fulfilled:

- Availability, the existence of a sufficient quantity of adequate quality food for all inhabitants.

- Access, understood as people’s access to the rights and resources necessary to acquire appropriate, nutritive foods compatible with their culture and lifestyles.
- Use, the conditions that ensure the biological use of foods to achieve a state of nutritional well-being that satisfies physiological needs.
- Stability, in terms of both availability and access to adequate food at all times.

According to FAO (2011a), to fulfill the objectives of food security these four dimensions should be present simultaneously. When they are not, a state of food insecurity exists, which may be divided into two main scenarios:

- Chronic food insecurity, which is present in the long term or persistently; this scenario occurs when persons do not have the capacity to satisfy their minimum food needs for a prolonged period and is the result of poverty, lack of funds and limited access to productive or financial resources.
- Transitory food insecurity, which is temporary and short-term; this scenario occurs when there is a rapid decrease in the capacity to produce or to access a sufficient quantity of food to maintain a good nutritional state and is the result of short-term shocks and fluctuations in the availability of and access to foods, including factors such as year-to-year variation in national food production, food prices and/or home income.

In the analysis of food security, it is not enough to know the duration of any particular problem (i.e., drought); it is also necessary to know how severe the impacts of this problem are on food security and the problem’s impact on people’s nutritional state. This knowledge will help determine the nature, extension and urgency of the help that the affected population needs (FAO, 2005).

Food security analysts have developed a number of “scales” or “phases” to “describe” or “classify” food security, one of which is the measurement of undernourishment. One option is to establish the relation between the severity of the food deficit and how far food consumption falls below a minimum dietary threshold (generally approximately 2100 kilocalories per capita per day). This is the approach followed by FAO in its measurement of hunger, defined as undernourishment, which refers to the proportion of the population whose dietary energy consumption falls below this threshold (Stamoulis and Zezza, 2003). There are still 842 million people who are hungry, that is, who do not have access to sufficient food to have an active and healthy life; thus, the hunger problem still awaits a definite solution.

In Latin America and the Caribbean, there are 47 million people in situation of undernourishment (FAO 2013). However, there are good reasons to feel optimistic about these people’s struggle against hunger and malnutrition. With one year still to go before the Millennium Development Goals deadline, hunger-related targets should be met. In this respect, 16 countries (Argentina, Brazil, Chile, Colombia, Guyana, Honduras, Mexico, Nicaragua, Panama, Peru, Venezuela, Barbados, Cuba, Dominica, Dominican Republic and Saint Vincent and the Grenadines) have now accomplished the so-called goal 1C (between 1990 and 2015, reduce the percentage of people who are hungry by half), which has earned these countries recognition from FAO, while various other countries have made important progress. It is not unreasonable to believe that the current generation of Latin Americans will be the first to see hunger eradicated in the region (FAO, 2013). Of course, there are important differences in the region, as shown in Table 1; the countries most affected by this scourge are Haiti (49.8%), Guatemala (30.5%), Paraguay (22.3%), Nicaragua (21.7%) and Bolivia (21.3%) (FAO, 2013).

However, another source of malnutrition that affects the region, obesity, is spreading like a

pandemic, affecting 23% of adults and 7% of pre-school children. Obesity is a serious public health problem, considering its close relationship to “chronic non-transmissible diseases” such as cardiovascular illnesses, diabetes, cancer and chronic respiratory diseases, which together are responsible for 63% of world mortality (FAO, 2013).

Livestock in Latin America and the Caribbean

The growth of the livestock industry in Latin America and the Caribbean (LAC) has brought great economic benefit to the region and could also benefit small producers (FAO, 2014a). At the same time, however, the growth of this industry may also produce detrimental, complex and undesired consequences. Animal husbandry contributes substantially to the economic well-being of poor families in rural zones of many developing countries of LAC. Furthermore, a crucial indicator of the growth and development of rural communities and the progress in the economic well-being of poor families is the growth of the production and consumption of products of animal origin. The LAC region continues to show advances. The production of meat and milk in the region has increased rapidly over the last decade, led by poultry meat. Poultry production in LAC nearly duplicated in one decade (2001-2011), increasing faster than in the USA and the rest of the world. Although more moderately, the production of bovine meat and milk and pork also increased by more than one-third over this same period, much more than that observed in the USA or the world mean. Additionally, the LAC region has recently had greater participation in the production of meat from cattle, sheep and poultry than the USA and almost the same growth in milk production as the rest of the world (FAO, 2014b). In the LAC region, the sector is generating job opportunities and income that is multiplying along the entire supply chain, from producers to processors, transporters, retailers, wholesalers, exporters and related industries. Altogether, this growth will contribute to improving food and

Table 1. Estimation of the prevalence (%) of sub-alimentation in Latin America and the Caribbean.

	1990-1992	2000-2002	2011-2013
Latin America and the Caribbean	14.7	11.7	7.9
Caribbean	27.6	21.3	19.3
Antigua and Barbuda	15.9	42.0	13.9
Bahamas	9.5	6.0	5.6
Barbados	<5	5.0	<5
Cuba	7.8	<5	<5
Dominica	<5	<5	<5
Dominican Republic	32.5	21.0	15.6
Granada	17.5	31.0	18.7
Haiti	62.7	52.9	49.8
Jamaica	10.1	7.0	8.6
Saint Kitts and Nevis	14.2	18.3	10.2
Santa Lucia	12.8	11.8	12.2
San Vicente and The Grenadines	20.1	12.9	5.5
Trinidad and Tobago	12.4	12.9	7.6
Latin America	13.8	11.0	7.1
Argentina	<5	<5	<5
Belize	9.6	8.1	6.4
Bolivia (Estado Plurinacional de)	33.9	28.6	21.3
Brazil (Estados Unidos de Brasil)	15.0	12.5	6.9
Chile (República de Chile)	9.0	<5	<5
Colombia	20.3	13.2	10.6
Costa Rica	<5	<5	8.2
Ecuador	26.4	21.2	16.3
El Salvador	15.3	8.9	11.9
Guatemala	16.9	25.4	30.5
Guyana	22.0	7.7	5.0
Honduras	22.0	16.6	8.7
Mexico	<5	<5	<5
Nicaragua	55.1	31.2	21.7
Panama	23.3	25.0	8.7
Paraguay	20.2	12.5	22.3
Peru	31.6	22.0	11.8
Surinam	17.5	17.7	10.2
Uruguay	7.6	<5	6.2
Venezuela (República Bolivariana de)	12.8	16.8	<5

Source: FAO (2013).

nutritional security and to reducing poverty in the region (OCDE/FAO, 2012).

The growing international trade of meat and milk products in LAC and the increase in the price of fodder are manifestations of the pressures that globalization exerts on the livestock markets of LAC. These globalization pressures carry potential benefits and threats for the small producers of the region. The potential benefits include more opportunities in foreign markets for livestock products and the rapid expansion of access to less expensive and more efficient inputs (Otte *et al.*, 2005). Globalization also introduces pressure to modernize, invest in new technolo-

gies, adopt more efficient management systems, and form alliances; otherwise the markets face extinction due to growing world competition. As a consequence, small producers are confronted with these changes as threats, given that their importance in national supply chains may dissipate over time, while large transnational companies take over the markets if, as usually occurs in these cases in which small producers lack the capital, access to credit, and knowledge to enhance their production processes. However, it is likely that new employment opportunities generated outside of animal husbandry will be an important benefit of globalization for small producers, especially for those who want to

migrate, either regionally, nationally or even internationally (Otte *et al.*, 2005).

Without adequate policies, mechanisms and systems focused on livestock production as a means to reduce poverty, the economic benefits of the livestock industry of LAC may only benefit a small group of livestock companies and leave small producers impoverished and even more isolated and more dependent than before on an almost entirely subsistence system. In particular, policies and programs are required to integrate small producers into the chain of livestock supply of the region to allow them to advance more easily from subsistence systems to diversified and mixed production schemes (Otte *et al.*, 2012). In summary, we may affirm that the growth of the livestock industry may contribute to reducing poverty in the region, but such a reduction requires public policies that ensure investments in infrastructure, more capacity-building activities and the availability and adoption of new technologies for everyone to have access to the benefits.

Food security in Latin America and the Caribbean

The situation of food security in LAC is not explained by agro-food variables exclusively. Latin America and especially the Caribbean are characterized by profound differences between and within countries but especially by the marked and persistent inequality in income distribution, high unemployment and high levels of poverty and illiteracy (FAO, 2013). Thus, for example, according to data gathered by ECLAC in 2011 29.4% of the population of Latin America lived in poverty, whereas Brazil, Colombia, Guatemala, Honduras and the Dominican Republic showed a Gini index above 0.55. This coefficient is a measure of the concentration of income among the individuals of a region or a given period; the index takes values from 0 to 1, where 0 indicates that all individuals have the same income and 1 indicates that one individual has all the income (IICA, 2013).

Poverty more strongly affects the rural areas of Latin America, where the levels of rural poverty double those of urban poverty (24.2% and 49.8%, respectively) (Schejtman, 2008). Low incomes of families limit their stable access to healthy foods in adequate quantity and for all its members. This situation is reflected in the levels of malnutrition or subnutrition of the population, especially in the 0-5 year age group (IICA, 2013).

The limitations in the availability of food and the conditions of social exclusion and inequality that make real access to foods difficult for poor families has led the International Food Policy Research Institute (IFPRI) to develop a “World Hunger Index”. According to this index, some countries of Latin America and the Caribbean have a “moderate” status, including Ecuador, El Salvador, Guyana, Honduras, Nicaragua, Panama, Paraguay, Peru, Surinam and Trinidad and Tobago, whereas Guatemala and the Dominican Republic have a “serious” status and Haiti an “alarming” status (International Food Policy Research Institute *et al.*, 2012).

Small-scale and family farmers, who exploit a small amount of land (variable according to the national context) and produce a minimum amount of surplus for commercialization, constitute the majority of the food producers in LAC. Farm production is the only or main source of income for these families, who have little or no external labor sources, with labor mostly provided by family members. In Latin America this group includes approximately 14 million small farm producers, representing 30-60% of the farming and forest area of the countries, with an associated population of close to 60 million people (Schejtman, 2008). These producers generate an important percentage of the national product, create an even larger portion of total jobs and generate income that has a positive effect on the local economy; however, they are vulnerable to market crises and/or price instability. A good example is the volatility of food prices observed since 2008, which has sent many of these producers into poverty

again, with important setbacks in the efforts of countries to fulfill the Millennium Development Goals, including the goal of halving the number of people who are hungry in the world between 1990 and 2015 (IICA, 2013).

Raising the productivity of agriculture is fundamental for economic growth, reducing poverty and food security. Many economic studies have confirmed that an increase in agricultural productivity has positive effects for the poor population through at least three main mechanisms: It decreases the prices of foods for consumers, increases the income of producers and helps the growth of the rest of the economy through a multiplier effect as it increases the demand for other goods and services (Alston *et al.*, 2000). Agricultural growth reduces poverty to a greater extent than growth in other sectors (Timmer, 1988; Gallup *et al.*, 1997; Datt and Ravallion, 1998; Anríquez and López, 2007), which is explained by a number of factors. First, world poverty is mostly concentrated in rural areas that depend on farming (three-fourths of the world's poor population lives in rural areas); second, the growth of agricultural production decreases the prices of foods, allowing for increased access; and third, this growth increases the income of farmers and farm workers, who have mean salary levels below those of non-agricultural workers (FAO, 2012). Recent studies suggest that the growth of the farming sector may also promote broader economic growth (Pica *et al.*, 2008). For example, in countries with low income and few resources (not including sub-Saharan Africa), the index of growth represented by the Gross Domestic Product (GDP) produced by the growth of agriculture reduces poverty five times more than an identical GDP expansion driven by non-agricultural growth; in the Sahel, agricultural growth is 11 times more effective. Finally, another fundamental element is that increasing the income and productivity of farmers creates new markets and increases the demand for non-agricultural products (FAO, 2012).

Small farmers may also contribute to this growth (Delgado *et al.*, 2008). For example, in an agricul-

tural sector with a large proportion of the labor force employed on small farms, the increase in the productivity of the land and the labor force generates a rapid reduction in poverty, as has been recently illustrated by East and South-East Asia. China reduced its poverty very rapidly in the 1980s to the middle of the 1990s based on a period of strong agricultural growth, characterized by relatively equitable access to agricultural land and to human capital (Ravallion, 2009). Additionally, it has been estimated that 90% of the milk and 70% of the ruminant meat in the world, as well as one-third of pork, poultry and eggs, are produced in small-scale farm systems. In these cases, livestock often generates up to one-third of the income of the farm, thus contributing notably to the livelihood, food and nutritional security of the poor rural population (Costales *et al.*, 2007). However, if we intend to sustainably reach the potential of the livestock sector in promoting growth and reducing poverty, we must respond to a series of important public policy questions and challenges (FAO, 2009a).

To achieve food security in the future, world agriculture faces the challenge of increasing its production by 70% towards 2050 and making it accessible to satisfy the food demand of a population, which is expected to reach 9 billion by this year, of whom 723 million will be living in Latin America and the Caribbean (Nelson *et al.*, 2011; FAO, 2012). However, world agriculture will have to confront serious limitations such as the scarce availability of land and water, climate change and extreme events such as natural catastrophes (Huang *et al.*, 2011).

With the information presented here and given that LAC produces three times more food than it consumes (García, 2008) and has high indices of obesity, i.e., 23% of adults and 7% of pre-school children (FAO, 2013), the greatest obstacle to reaching food security in the region may be considered to lie in the access to sufficient income to buy food. Thus, food prices, along with family incomes, are the fundamental factors that will

determine the access of the vulnerable population to the minimum requirements of healthy food. Animal husbandry plays a fundamental role in this context because of its supply of protein and macronutrients to combat chronic malnutrition as a means of subsistence for a vast population of small producers and as a concrete alternative for overcoming poverty in rural sectors.

The role of livestock in food security

The livestock sector is fundamental for food security not only at the household level, for small producers who depend directly on livestock to obtain food, income and services, but also at the national level, by providing consumers access to food of high nutritional quality. In this context, animal husbandry plays important and distinct roles in the four main pillars of food security: availability, access, stability and use (FAO, 2009a).

Availability refers to the physical reserve of sufficient food in a given place: foods that are acquired from home production, local markets or through imports. Family systems and extensive grazing that depend on waste products and non-cultivable land contribute decisively to food availability, hence contributing to national food security. Access refers to the capacity of people to obtain food. Although foods may be physically present in an area, they may not be accessible if the population does not have the purchasing power to buy them. Intensive farming systems are an important source of secondary animal foods accessible for consumers. By making efficient use of resources, these systems provide abundant foods at reduced prices, which contributes to the availability of foods and access to them, thus making a contribution to national food security. The importance of this sub-sector will continue to increase as the demand for meat products does as well in the coming years, driven by growing incomes in the region (FAO, 2009a).

Most rural homes, including the poorest, have livestock. Livestock contributes directly to the availability and access of foods of these small producers, generally in a complex manner. Occasionally, small producers consume home production directly, but frequently they prefer to sell eggs or milk at a high price to buy basic foods at lower prices. Livestock plays an important indirect role that is fundamental to supporting food security by increasing incomes and hence contributing to poverty reduction (Quisumbing *et al.*, 1995). The sale of livestock products allows poor homes to have more income; however, this does not always result in an improvement in nutrition, which will also depend on whether it is the man or the woman responsible for controlling the additional income generated. In summary, the nutrition of families will improve as long as the increase in income is accompanied by a more diverse diet (FAO, 2011b). This link between small-scale production of animals and animal products and the rural poor highlights the contribution of the sector to food security at the household level by improving availability and access.

The third dimension of food security, adequate use, is especially important with respect to products derived from animals. Studies have shown that products of animal origin are an excellent source of high-quality proteins and essential micronutrients such as B vitamins, and oligoelements of high bio-availability such as zinc and iron. Bio-availability is especially important for mothers and very young children, who have difficulty in obtaining a sufficient quantity of micronutrients from vegetable-based diets. A small quantity of foods of animal origin may provide the necessary micronutrients for maternal health and the physical and mental development of very young children (OMS/FAO/UNU, 2007). This food security link is of particular importance for poor and vulnerable households, for which markets many times cannot provide these micronutrients, either because of their absence or the inadequacy of incomes.

Stability is the fourth dimension of food security. Livestock contributes to the food security of rural households by making an important contribution to the stability of food availability and access. This link is established by the fact that, from an economic perspective, livestock is a capital good, a store of wealth and a safety net of particular importance for those who have imperfect access to financial markets (as is the case for most rural poor). Livestock may be used as collateral to obtain credit, be sold to obtain income or may be consumed directly in times of crisis. Livestock can dampen the impact of negative household-level economic shocks such as unemployment, injury or illness to productive members. Livestock also provide energy and fertilizer for soil and have a controlling effect on diseases in farming systems, thereby contributing to overall farm productivity and thus to food security (Nakiganda *et al.*, 2006).

Livestock and food availability

Although the problems of hunger and malnutrition in the region do not stem from the scarcity or insufficient availability of foods, but rather from a lack of economic access that many households face (FAO, 2013), it is very important to emphasize the role that livestock production, especially from small producers, plays in food availability in the region. Small producers, face many hurdles to developing livestock activities, such as little modernization, low investment capacity, limited access to markets and great vulnerability to droughts and periodic animal diseases. In spite of these limitations, small producers' participation is important in different countries of the region. In Brazil, for example, family agriculture (FA) provides 58% of the milk, 50% of the poultry, 59% of the pork and 30% of the beef consumed in the country. In Argentina, FA represents 71% of all farming exploitation; 81% of these families have animal production (MINAGRI, 2012) and small producers provide 33% of dairy animals, 19% of beef cattle, 25% of goats, 62% of sheep and 49% of pork (PROINDER, 2003). In Uruguay,

77.4% of animal producers (cattle and sheep) are family producers, who account for 24% of cattle and sheep production for slaughter. In Ecuador, FA produces 70% of the pork and 82% of the sheep meat (CINVE, 2011). In Colombia, it is estimated that small farmers produce 40% of the milk consumed in the country, and the egg production is estimated to be 3 million units daily, which supplies approximately 70% of the rural area (CINVE, 2011). Altogether, these numbers suggest that livestock plays an important role in the incomes of poor families in the region, consequently contributing to their food security by improving food availability and access.

Analyzing these production figures by category, FA production of cow milk in the region (3.1 million producers without considering Argentina, Chile or Uruguay) makes an important contribution estimated to be 50 liters daily per farmer (Galetto, 2011). The predominant types of pork production in the region are backyard (hogs for consumption in the home or sale to neighbors or local open-air markets) and family (fewer than 20 females), except in Argentina, Chile and Uruguay, where industrial producers dominate (Díaz, 2012).

In summary, we may assert that animal production, especially family production, plays a very important role in food availability: Raising animals on their own land is one of the main sources of protein for rural families and provides an important share of their income, as discussed in the following section.

Livestock and rural livelihoods

The number of poor people who depend on livestock as the main source of livelihood is not known with certainty, but the most commonly used figure is 977 million (Livestock in Development, 1999). Livestock is fundamental to the livelihood of the poor and is an integral part of farming systems, to which livestock contribute by increasing the productivity of farms and providing a continuous

flow of foods and income for households. However, the role and the contribution of livestock to livelihoods in developing countries goes beyond production for the market or direct consumption. Livestock also fulfills other important functions, such as providing employment for the farmer and members of the family (Sansoucy, 1995); acting as a store of wealth (CAST, 2001) and as a type of insurance (Fafchamps and Gavian, 1997) in contexts in which financial markets are usually missing; contributing to gender equality by offering labor opportunities to women; recycling waste products and crop residues or those of agro-business (Steinfeld, 1998); improving the structure and fertility of the soil (de Wit *et al.*, 1997); and reducing the load of insects and weeds (Pelant *et al.*, 1999). The residues of livestock may also serve as an energy source for cooking and thus contribute to food security, liberating resources from fuel use. Livestock may also have cultural importance: The possession of livestock may constitute the basis for observing religious customs, such as different forms of sacrifice or the use of parts of animals in certain ceremonies (Ashdown, 1992; Horowitz, 2001). These animals may serve to establish the status of the farmer; for example, more animals may indicate higher status among peers (Birner, 1999).

The database of the Rural Income Generating Activities (RIGA) of FAO (FAO, 2009b), which compiled the information from nationally representative household surveys conducted in 14 countries, showed that 60% of rural households possess livestock; this finding is coherent with previous results. For example, Delgado *et al.* (1999) studied 16 countries to compare the dependence of “very poor” and “not so poor” families on income derived from livestock. The authors concluded that the majority of poor rural families depend to a varying extent on livestock to obtain their income (5-25%) and that the “not so poor” households depend much more (10-38%) on income derived from livestock. By contrast, Quisumbing *et al.* (1995) concluded that in many cases the poor population obtains more income

from livestock than wealthier households because they can exploit community resources for grazing and thus maintain very low production costs.

In LAC, approximately 64.5% of the population dedicated to agriculture derives part of its livelihood from the animal sector, occupying up to 84.5% of the area dedicated to farming (FAO, 2014a). For example, in Ecuador, where family agriculture represents 88% of the productive units and occupies 41% of the total cultivable land, it has been estimated that 69% of producers obtain more than 30% of their farming income from animal-related activities (Díaz, 2012). In the coastal zone in particular, 22% of the income of family subsistence farms (FSA) is derived from live and slaughtered livestock. In Chile, 11-14% of agricultural income corresponds to livestock. In Nicaragua, large animals provide 30-35% of the income of FSA (FAO/BID, 2007). However, family farms more specialized in livestock obtain 92.6% of their farming income from the production of mostly milk and cheese. In Mexico, it is estimated that livestock income represents 14% of the income of FSA without land, 9% of the income of FSA with land, and 16% of the income of family agriculture systems specialized in livestock (FAO/BID, 2007).

Livestock production continues to constitute one of the main survival strategies in rural Latin America; as previously mentioned, livestock plays an important role in the generation of income that provides access to other products and basic services. Livestock therefore represents a fundamental element in the development of the region.

Livestock and nutrition

The *per capita* energy consumption derived from animal products follows income patterns. In the region, dietary energy from animal sources increased from 300 to 500 Kcal person⁻¹ day⁻¹ between 1961 and 2005 (Díaz, 2012). However, this consumption is low in a number of Carib-

bean countries that are below the regional mean, including Surinam (277 Kcal person⁻¹ day⁻¹), Trinidad and Tobago (346 Kcal person⁻¹ day⁻¹), Jamaica (429 Kcal person⁻¹ day⁻¹), Haiti (109 Kcal person⁻¹ day⁻¹), Guyana (375 Kcal person⁻¹ day⁻¹) and Belize (409 Kcal person⁻¹ day⁻¹). Central American countries, with the exception of Mexico, display below-average consumption of calories of animal origin; levels are especially low in Guatemala (178 Kcal person⁻¹ day⁻¹), Nicaragua (246 Kcal person⁻¹ day⁻¹) and El Salvador (287 Kcal person⁻¹ day⁻¹). In South America, there is high consumption of calories of animal origin in Argentina (793 Kcal person⁻¹ day⁻¹), Uruguay (636 Kcal person⁻¹ day⁻¹), and Brazil (603 Kcal person⁻¹ day⁻¹); and low consumption in Bolivia (330 Kcal person⁻¹ day⁻¹), Ecuador (396 Kcal person⁻¹ day⁻¹), Paraguay (324 Kcal person⁻¹ day⁻¹) and Peru (216 Kcal person⁻¹ day⁻¹) (Díaz, 2012). The average share of proteins of animal origin (out of total proteins) in the region is 41.7%, which is below the OMS recommendation (above 50%). Moreover, the majority of countries in the region have less intake of foods of animal origin than the minimum recommended intake. Exceptions include Argentina (57.7%) and some countries of the Caribbean. Consumption levels are lowest in Cuba (23.6%), Guatemala (24%), Haiti (15.3%) and Nicaragua (26.4%) (FAO, 2009a).

A program of collaborative research on nutrition in three parallel longitudinal observational studies in different ecological and cultural zones of the world, Egypt, Kenya and Mexico, has reported on the strong connection between the ingestion of foods of animal origin and adequate body growth, better cognitive functions and greater physical activity in children, better pregnancy outcomes, and reduction in the morbidity of

diseases (Neumann *et al.*, 2003). Even in small quantities, foods of animal origin may have an important function in improving the nutritional state of low-income households by correcting macro- and micro-nutrient deficiencies, especially in children, nursing babies and pregnant women. For example, small quantities of meat provide easily absorbable iron and facilitate the absorption of iron of plant origin (Bender, 1992), which also helps to prevent anemia. Meat and milk are good sources of vitamin B12, riboflavin and vitamin A; meat also provides zinc, and milk provides calcium (Table 2). By adding small quantities of foods of animal origin to the diet of malnourished children, it is possible to increase the children's energy and cognitive capacity (Neumann *et al.*, 2010). For example, it has been estimated that iron deficiency affects 1.6 billion people around the world (WHO, 2008) and hampers the intellectual development of 40-60% of children in developing countries (UNICEF, 2007). According to a report produced by a number of organizations in 2009, anemia due to iron deficiency during pregnancy is associated with one-fifth of total maternal mortality globally (Micronutrient Initiative, 2009).

It is clear that improving access to foods of animal origin by promoting farming activities, together with nutrition education campaigns, may thus be considered a strategic intervention to avoid the vicious circle of poverty–micronutrient deficiency–malnutrition (Demment *et al.*, 2003). The analyses of livestock-related interventions and their role in the improvement of nutrition and the reduction of poverty, although limited, show that livestock may have an important function in human nutrition and health and in the reduction of poverty in developing countries (Randolph *et al.*, 2007).

Table 2. Micronutrients provided by foods of animal origin.

Nutrient	Source	Consequences of its deficiency
Vitamin A	Milk, liver, fish oil and egg yolk	Lack of growth, development problems, vision problems, immunological deficiencies and maternal mortality
Iron	Meat and fish have heme iron (helps the absorption of non-heme iron)	Pre-school children: problems of growth, cognitive and immunological development School children: problems in performance in school Adults: lower work capacity and maternal mortality
Zinc	Meat and fish	Complications in pregnancy, low birth weight, immunological deficiencies, maternal and infant mortality and morbidity
Calcium	Milk and fish (with “bones)	Rickets
Riboflavin	Milk, viscera and eggs	Lesions in growing skin, pain and burning in mouth and tongue, corneal vascularization, photophobia, boca y lengua, vascularización corneal, queilosis, angular stomatitis angular, glossitis, anemia and neuropathy
Vitamin B12	Foods of animal origin are the only source, except for a few algae	Megaloblastic anemia and demineralizing disorders of the central nervous system

Source: Randolph *et al.* (2007).

Resumen

Diego I. Rodríguez, G. Anríquez y J.L. Riveros. 2016. Seguridad alimentaria y ganadería: el caso de América Latina y el Caribe. Cien. Inv. Agr. 43(1):5-15. La principal limitante para lograr la seguridad alimentaria en América Latina y el Caribe radica en la imposibilidad de muchas familias pobres de acceder a los alimentos necesarios para sostener una alimentación saludable, donde los precios de los mismos y los ingresos de los hogares son factores fundamentales de este proceso. La ganadería juega un rol clave en la seguridad alimentaria de la región, aportando en la disponibilidad de alimentos ricos en proteína de alto valor y micronutrientes, siendo clave para las millones de familias que dependen del ganado como medio de subsistencia para generar ingresos y acceder a servicios básicos. Adicionalmente, la producción y comercialización de productos ganaderos favorecería la estabilización del suministro de alimentos, al actuar como un amortiguador de las crisis económicas y los desastres naturales tanto a nivel individual como comunitario. La agricultura familiar es especialmente importante en este escenario, dado que gran parte de la producción de alimentos de origen animal depende de este sector y dado que la mayoría de los 47 millones de personas que sufren de hambre en nuestro continente viven en la ruralidad. En este complejo escenario, la interrelación entre seguridad alimentaria, ganadería y agricultura familiar resulta fundamental para diseñar e implementar políticas y medidas que fortalezcan la producción pecuaria familiar como pilar esencial en la seguridad alimentaria regional.

Palabras clave: Desnutrición, ganadería, Latinoamérica, pequeña agricultura, políticas alimentarias, seguridad alimentaria, vida rural.

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