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AGROBIODIVERSITY AND NUTRITION IN BOYACÁ, COLOMBIA:

A HISTORIC RELATIONSHIP OF IMBALANCE

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ABSTRACT

A large agricultural diversity should enable a healthy food culture in populations that produce it. In Boyacá, Colombia, over time, the opposite occurs. In that regard, the aim of this article is to show a general approximation to the relationship between the production of agrobiodiversity, food culture and some nutrition issues in Boyacá in two periods: the Pre-Hispanic time and the early years of the 21st century, which also displayed the role of education and public policy in human nutrition. In the Pre-Hispanic times there was a variety of food production rich in nutrients and consequently a healthy lifestyle, but dramatically altered when the Spanish arrived. Currently in Boyacá paradox exists: on one hand is one of the largest producers of nutritious agricultural species, at the same time it has the highest levels of child malnutrition, and pregnant and breastfeeding women; furthermore with poor crop yields, possibly, it is a consequence of the inappropriate use of soil, the absence of technologies, the lack of scientific and governmental strategic alliances, and the fragile educational actions. It is therefore necessary to develop strategic synergies between sectors and policies in agriculture, health, education and science, with the purpose to strengthen agricultural activity of the region and serving its vulnerable population.

KEYWORDS


Agricultural production, child malnutrition, education, food culture, public policy.

RESUMEN

Una amplia diversidad agrícola debería posibilitar una saludable cultura alimentaria en las poblaciones que la producen. En Boyacá, Colombia, a través del tiempo, parece ocurrir lo contrario. En ese sentido, el propósito de esta revisión es presentar una aproximación general de la relación entre la producción de la agrobiodiversidad, la cultura alimentaria y algunos aspectos de nutrición en Boyacá en dos momentos: la época prehispánica y los primeros años del siglo XXI, años en los que también se pretende visualizar el papel de la educación y las políticas públicas en la nutrición humana. En la época indígena se revela una producción de alimentos ricos en nutrientes, con una consecuente vida saludable, pero alterada drásticamente con la llegada de los españoles. Actualmente en Boyacá existe una paradoja: mientras es uno de los mayores productores de especies agrícolas nutritivas, a su vez posee los índices más altos de malnutrición infantil y en mujeres gestantes y lactantes, además de presentarse bajos rendimientos en cosechas, posiblemente por el inadecuado uso de la tierra, la ausencia de tecnologías, alianzas científicas, educativas y estatales. Planes de desarrollo y políticas en salud han intentado combatir esta situación con grandes inversiones, pero con resultados poco contundentes. Así, resulta necesario el desarrollo de sinergias estratégicas entre sectores y políticas en materia agrícola, salud, educación y ciencia, con el propósito de fortalecer la actividad agrícola de la región y atender a su población más vulnerable.

PALABRAS CLAVE

Producción agrícola, desnutrición infantil, cultura alimentaria, educación, política pública.



AGROBIODIVERSIDAD Y NUTRICIÓN EN BOYACÁ (COLOMBIA): UNA HISTÓRICA RELACIÓN DE DESEQUILIBRIO

INTRODUCCIÓN

Throughout history, the nutritional culture in the state of Boyacá has depended on the expression and consumption of the biodiversity in its territory. Precolonial indigenous societies had an excellent nutritional status attributed mainly to the cultivation and ingest of a wide variety of high nutritional value food. Unfortunately, during the Spaniard occupation this important legacy was banned.

Nowadays, Boyacá, with 45% of rural population (DANE, 2005), is one of the main agricultural production states (ICER, 2013) whose children (433,494 children, 34.5% of the total) (ICBF, 2013) has the highest state rate of malnourished children in the country, pregnant women and lactating are in similar condition (ENSIN, 2005). The improvement of this situation has been a priority for the National State Development Plans (Plan Nacional de Desarrollo de Colombia 2002-2006; 2006-2010; 2010-2014) and, to respond to this right of every nation and to be upon the level with the Millennium Development Goals (MDGs), regrettably little has been done.

Thus, it is intended to review the relation biodiversity-nutrition of Boyacá in pre-Hispanic times and currently, also, production and culture of the consumed quality of food and the nutritional status of the population. Moreover, in the present time, the importance of education, regulations, policies and projects in favor of nutrition are being emphasized.

PRE-HISPANIC PERIOD

In the Pre-Hispanic Period, Boyacá was occupied by the Muisca indigenous community (Gamboa, 2008; Pérez, 2001; Falchetti and Plazas de Nieto, 1973). Their lands were wealthy habitats: water sources, forests and fertile soil, providing ecological, agricultural, food and social conditions for the establishment of the Chibcha society, who adapted to the environment and accustomed the ecological landscape management and resources, with domestication of plants and animals (Rodríguez, 2001), to meet their dietary needs (Rodríguez, 1998) towards a balanced diet of protein, carbohydrates, vitamins and minerals (Rodríguez, 2006).

DIVERSITY OF FOOD CONSUMED IN THE PRE-HISPANIC PERIOD

The indigenous population afar from the coastal fluvial environments, settled the slopes of the mountain chains (Reichel-Dolmatoff, 1989), where they managed to sow and consume foods such as cereals (maize, quinoa, amaranth), legumes (kidney beans, broad beans, lupine), tubers as potatoes, parsnips, ibias (*Oxalis tuberosa*), cubios (*Tropaeolum tuberoso*), rubas (*Ullucus tuberosus*), and vegetables and various tropical fruits (Rodríguez, 2006).

PRODUCTION OF FOOD IN THE PRE-HISPANIC PERIOD

The topography of the region facilitated the change of one degree in temperature every hundred meters; forming climates which provided a complex ecosystem (García, 2012; Reichel-Dolmatoff, 1989) diversifying the cultivated products. The abundant water resources were another potential

condition to enhance this agriculture (Rodríguez, 1998; Reichel-Dolmatoff, 1989).

The most important foods sowed were corn, cultivated for 3500 years (Rodríguez, 1998) for human and animal consumption (Melgarejo, 2006; Zarkadas *et al.*, 1995; Reichel-Dolmatoff, 1989; Rodríguez, 1998), it was stored in farms with cassava, sweet potatoes, squash, peppers and coca; The corn was also used for dyeing blankets. As quinoa is a native and undemanding plant, grew between 2500 and 3500 m (FAO, 2011a).

The amaranth is a fast production and high performance plant in poor soils and rich in nutrients, which might grow in cold or warm climates (Omami *et al.*, 2006 in Garay *et al.* 2014). The kidney beans were probably ones of first domesticated species, which was planted among the corn, obtaining a high performance and quality of both foods. The potato was the most consumed tuber, although the ibias were first to be cultivated.

The agricultural terracing was a major technological advance that allowed intensive land use and erosion control; the Muisca used irrigation systems and, the "tacla" a multi-purpose tool which was used in agriculture for foot ploughing (Rodríguez, 1998). They permitted the soil to rest several years by weeding the fields, they also, cut and chopped branches of shrubs of unnecessary plants, leaving young trees free of weeds, to provide shade and evade soils damage by scorching, excessive rain or sun. They never set fire to fields or forests.

The phases of growth, flowering, harvest and consumption of plants were related to ceremonies

and lifecycle (Osborn, 1995). They used a technique of seeding association between grass and leguminous plants; sometimes they used creeping plants as well, improving the performance of the soil. (Rodríguez, 2006). As fertilizers they employed dried leaves, animal feces, domestic debris and weed ashes. (Rodríguez, 1998). They made use of the Chibcha calendar divided according to the different moon phases (Rodríguez, 1998). Today's Uwa tribe agricultural activities are planned through seeding schedules and cropping patterns (Osborn, 1995).

FOOD CULTURE IN PRE-HISPANIC PERIOD

The indigenous feeding customs was supplemented by animal and vegetable protein that was energizing, rich in vitamins and minerals (Rodríguez, 2006). Probably, they had a simplified food ecosystem (maize – cassava - kidney beans - pumpkin) (Reichel-Dolmatoff, 1989).

The diet also had animal's meat (pork, deer, lowland and mountain pacas, white-lipped peccaries, armadillos, foxes, spectacled bears, common agouties, nasuas, nasuellas, guinea pigs and other mountain animals), birds and fish. The indigenous did not domesticate large mammals (Rodríguez, 1998) or counted with hatcheries; to avoid extinction they had hunting grounds and season, especially during breeding (Rodríguez, 2006). They consumed some high protein content insects (75%), custom eliminated throughout the Spaniard Conquest time (Rodríguez, 1998).

The tribes employed different cooking techniques for their diet, they boiled, roasted, grilled and

preserved foods by smoking; they prepared arepas, envueltos, rolls and tamales. Corn was consumed tender or cob (Rodríguez, 2006). Quinoa was the favorite food for their ease of production and assimilation in a variety of dishes (Rodríguez, 1998). The leaves and seeds of amaranth were cooked or roasted (Rodríguez, 2006; 1998), but the Spanish eliminated its use to abolish idolatry (Rodríguez, 1998).

The kidney beans were consumed as a vegetable, both, pod and grain (Rodríguez, 2006), or combined with corn soups and potages (Rodríguez, 1998). The broad beans were fried with corn and peanuts. The ullucus consumed in salads and potages (Rodríguez, 2006).

Potatoes were nearly disappeared by the Spaniards but later, they were circulated again due to their climatic adaptability (Rodríguez, 1998; 2006). The ibias were put to dry at sunlight and afterwards sweetened to be consumed unaccompanied or in potages, similar with the cubios that were drank within "chicha" (Rodríguez, 1998).

The muiscas ate fruits and vegetables as well. They ate raw or cooked guascas as well; the sorrel was widely used for salads and as medicine. The fruits of cucurbits were used in stews, salads and as treats. Purslane was prepared in salads, potages and porridges. The tomato was consumed in salads and stews; the tree tomatoes were consumed as a fruit. The chili was served as a spice, in salads, sauces or grinded (Rodríguez, 1998).

During the Spanish colonization, especially by the intervention of religious communities, there were brought new seeds, such as: sprout crops, turnips, lettuces, spearmint,



parsley, onions, garlic, eggplant, spinach, cabbage, broccoli, Brussel's sprout, which adjusted well to the region (Carrillo, 1991).

NUTRITIONAL STATUS IN SETTLERS IN THE PRE-HISPANIC PERIOD

The settlements of the Andean region had no nutritional deficit and had no high population densities (Rodríguez, 1999); this condition varied according to the population dynamics of the animals that were consumed, in turn, it depended on the dynamics of the existing plants used for feeding (Rodríguez, 2006).

Upon arrival of the Spaniards, the natives produced and consumed food with enough nutrients,

suitable to prevent or cure diseases (Rodríguez, 2006), but they eliminated several foods and modified their diet, which undoubtedly caused them malnutrition (Rodríguez, 1998). Although in cases such as anemia, it is best explained by the over-reliance on maize, low in iron and rich in substances that reduce the body's ability to assimilate it (Rodríguez, 2006).

Their diseases were endemic as tuberculosis. The most affected population were children and women; The average of time in which native women gave birth was of 18 months and they had no preferential treatment during pregnancy; in nursing infants, which



was 3-6 months old had low protein and iron diet (Rodríguez, 2006). Epidemic diseases were brought by the Spaniards, who brought the natives to conditions of overcrowding, reduced the hygiene and increased the indigenous population direct contact with pathogens' transmitters existent in food and water.

The poor harvests caused them starvation and subsequent mortality. However, the development of agricultural biodiversity and climate adaptability, allowed them to improve their health (Rodríguez, 2006). Instead of drinking water, they drank beer that kept them fat and healthy (Rodríguez, 1998).

CURRENT BOYACÁ

Boyacá has diversity in food production, although the population nutritional status has been shown to be negative and without improvement. Next, it will be define the characteristics of the current nutritional status of the population in the state.

DIVERSITY AND FOOD PRODUCTION CONSUMED IN THE CURRENT BOYACÁ

Boyacá is one of the most agricultural productive states in the country (table 1) and provides the largest number of production units (smallholdings) (EVAS, 2009).

Table 1. Main foods harvested in Boyacá in 2009.

| USE | AGRICULTURAL PRODUCTION (TONS.) LIVESTOCK (%) | BOYACÁ'S PLACE IN THE NATIONAL RANKING* |
|----------------------------------|-----------------------------------------------|-----------------------------------------|
| AGRICULTURAL | 135.574 | 1 (22) |
| Transitorily & Fallow | 81.424 | 6 (22) |
| Maize | 33.543 | 9 (15) |
| Kidney beans | 10.515 | 7 (12) |
| Wheat | 8.293 | 2 (4) |
| Barley | 2.208 | 1 |
| Potato (Total) | 687.309 | 2 (7) |
| Potato (Direct consume) | 390.561 | 2 (7) |
| Potato (Industrial consume) | 296.748 | 2 (7) |
| Vegetables | 26.099 | 4 (13) |
| Black eyed pea | 26.365 | 3 (7) |
| Onion | 193.800 | 1 (4) |
| Broad bean | 10.501 | 2(3) |
| Tomato | 99.283 | 1 (11) |
| Permanent | 49.389 | 1(7) |
| Coffee | 3.973 | 14(14) |
| Sugar cane | - | - |
| Panela cane | 850.935 | 4(14) |
| Fruits | 98.268 | 1(14) |
| Apple | - | 1(14) |
| Peach | - | 1(14) |
| Plum | - | 1(14) |
| Cherry | - | 1(14) |
| Cocoa | 2.170 | 5(10) |
| Production units | 350.076 | 1 (22) |
| Weeds | 174.108 | 15 (22) |
| Pastures | 975.431 | 9 (22) |

Source: EVAS (2009); URPA (2012)

* The cipher inside the parentheses corresponds to total number of states taken as reference. The number outside means the Boyacá's place related to the first place state.

The cereals are crops of food and economic farmers' dependence; they seek to recover their production and consumption, especially quinoa; the wheat as the barley, in spite they are originally from Europe, they adapted to these climates and terrains achieving high production and consumption (EVAS, 2008).

The areas sown with cereals such as maize, wheat

and barley prevail with traditional and artisanal systems, with a certain level of technology; however, the constant is low performance in facing the most producer states (EVAS, 2008; ENA, 2009), this could be explained by the low technology and research available and applied.

The production of quinoa and amaranth have no official statistical reports in Boyacá; currently the "Red Agrosolidaria" makes efforts to recover the cultivation of quinoa in some municipalities as Soracá, the largest producer in the state (table 2) (González, 2012). It has made similarly, the department of Nariño through the project "Quinoa as an alternative crop, based on food security and its agro-industrial importance" (Cerón, 2001). This food was promoted by the FAO when it was determined by 2013 as the "International Year of Quinoa" (Bojanic, 2011).

Table 2. Quinoa Production in the province of Boyacá.

| YEAR | SOWED AREA (Ha) | PERFORMANCE (Kg/Ha) |
|------|-----------------|---------------------|
| 2008 | 1 | 800 |
| 2009 | 1 | 600 |
| 2010 | 2 | 600 |
| 2011 | 5 | 700 |
| 2012 | 10 | 600 |

Source: González (2012)

Beans and peas (another introduced foods), grown in most municipalities, replace areas that were originally sowed with cereals; also rotated with potato crops, which have significant production, performance, quality of seeds and applied technology (ENA, 2009; EVAS, 2008; EVAS, 2000).

Potato crops occupy the first place of agricultural production in Boyacá that generates rural employment and contributes to the local and regional economy. Its production and performance have increased over time by the adoption of new seeds and technologies; however, it is the chips industry which has provide sowing guarantee for the market and the price at harvest time, especially in industrial varieties, which have achieved higher performance by technological advances in irrigation, fertilizers and varied phytosanitary controls, although these pesticides have an important contribution to health detriment (ENA, 2009; EVAS, 2008; EVAS, 2000).

Among sowed vegetables, there are onions, tomatoes and carrots, presenting large productions, but low performance (ENA, 2009; EVAS, 2009). Talking about fruits, coffee is grown in several municipalities because of its adaptation to climatic and geographical



conditions (EVAS, 2008), but it has no productive representativeness (ENA, 2009). Cocoa production has increased in recent years by the impulse of "Acción Social" and "Familias Guardabosques" government programs (EVAS, 2008).

FOOD CULTURE IN CURRENT BOYACÁ

In middle of the desire of improve life expectancy, which has increased by 40% from 1909 to 1975, it also has been risked the fostering of animal protein consumption and decreased the consumption of vegetable, i.e. Cereals (Harris, 1989). Thus far in Boyacá, corn has always been essential in the diet of families living by countryside (EVAS, 2008).

According to Dewalt (1983), the quickest way to achieve improvements in dietary levels is by increasing the consumption of the resources that are exploited by families of rural customs (Harris, 1989). In Boyacá be required to retake the cultivation and consumption of the indigenous era. This occurs partly as reported by Galileo (2010), who collects recipes using quinoa in a publication called " Andean Tubers Cookbook " where local traditional knowledge on these species and their



value to be produced and kept as food cultural biodiversity, heritage of humanity (Barón *et al.*, 2010).

EDUCATION IN CURRENT BOYACÁ

Education is a key for the development of Colombia; it made significant progress in the last decade (PNUD, 2011). However, this is not reflected in the component "nutrition" in Boyacá, although the UNICEF reports an educational improvement in women in infant and adult ages (Estado Mundial de la Infancia, 2009); Further, to this genre is credited the responsibility or children's health, infancy, adolescence and their own.

In Colombia, there are university programs related to nutrition, but any directly in Boyacá (table 3). This could be an important address in the construction of public policies for the prevention of infant mortality (Montañez, 2010), for the low educative levels and poor training in production technologies was the first risk factor for feeble health status in 1410 potato growers (Ospina *et al.*, 2008); in addition, a better education showed to have an impact on weight and height in "mothers" of community homes (Gaviria y Palau, 2006).

Table 3. Programs and research groups in diverse universities of Boyacá related to health care.

| UNIVERSITY | EDUCATIVE LEVEL | PROGRAMS |
|--------------------------------------------------|-----------------|----------------------------------|
| Universidad Pedagógica y Tecnológica de Colombia | Graduate | Medicine |
| | | Nursing |
| | Postgraduate | Spec. In Food safety and Quality |
| Universidad de Boyacá | Graduate | Medicine |
| | | Physiotherapy |
| | | Nursery |
| | Postgraduate | Respiratory Therapy |
| | | Spec. in Epidemiology |

NUTRITIONAL STATUS IN CURRENT BOYACÁ

Malnutrition has been a cause of alarm and concern worldwide through various decades in various national and international institutions (FAO, 2011b; OMS, 2010). The FAO (2012) reports that undernourishment has declined in Colombia in recent decades, however, the range in which it is located is still high and far away from the proposed objectives of the Millennium Development Goals; according to the Encuesta Nacional de Situación Nutricional de Colombia (ENSIN) of 2005, the malnourishment indicator was 14%, although the FAO (2012) reported that it was 15% since 1990.

Meanwhile the population of Boyacá has insufficient food intake as cereals, fruits and vegetables, which could cause the existing chronic malnutrition and also, one of the causes of Chronic non communicable diseases in Tunja (Capital of Boyacá), which in 2007 caused 49.6% of morbidity and mortality (Epidemiological Bulletin, 2008); worldwide, is approximately 60% (OMS, 2010).

According to the ENDS (2005) Boyacá children under 23 months are in second place respect all Colombia because of low vegetable and excess of carbohydrates consumption, third place in deficient intake of vitamin A and in fifteenth place of vitamin C and calcium, eighth in deficient protein, zinc ninth and the last place of consumption of meat and legumes. The second in consumption of vegetables, not for the entire population who eat five servings of vegetables and fruits per day according to the OMS (2010), except school snacks shops that do not provide fruits or products containing vegetables, contrary in Tunja, where the sale of energy-dense products with low nutritional value prevails (Velandia *et al.*, 2011).

A similar situation happens in adults (ages from 25 to 44) who do not meet the recommended daily consumption of fruits and vegetables (Herrera *et al.*, 2012).

Based on the Encuesta Anual Manufacturera (2007), Boyacá consumed (sold) primarily chicken and hen meat, liquid whole milk, yogurt, cheese and soft drinks. It is more evident in the diets of potato growers which are based on carbohydrates, dairy or meat proteins, with few fruits and vegetables. The consequences of the imbalanced diet are evidenced by overweight and obesity in almost a third of the population, tied to a culture of high consumption of fermented beverages (guarapo and beer) (Ospina *et al.*, 2008).

There are several institutions and instruments that have information on the nutritional status of the population as the Instituto de Bienestar Familiar (ICBF, Boyacá), the Departamento Administrativo de Estadísticas (DANE), the Secretaría de Salud Departamental, the Sistema de Identificación de Potenciales Beneficiarios de Programas Sociales (SISBEN) and the Encuestas Nacionales de la Situación Nutricional en Colombia (ENSIN, 2005) (table 4).

Table 4. Diverse indicators of population's health in Boyacá (2005).

| INDICATOR | AGES | 2005% |
|-------------------------------|---------------|-------|
| Infant mortality | 10 | 20 |
| Stunted growth | 0 - 4 | 23.3 |
| Delayed growth | 05-sep | 23.4 |
| Early child anemia | 01-abr | 23.3 |
| Late child anemia | 05-dic | 28.8 |
| Exclusive breastfeeding stage | Early Infancy | 2.5 |
| Acute malnutrition | - | 4.8 |
| Chronic malnutrition | - | 14.6 |
| Obesity | 18 - 64 | 11.3 |
| Overweight | 18 - 64 | 36.1 |
| Protein deficiency | > 2 - 64 | 45.7 |
| Calcium deficiency | > 2 - 64 | 90.0 |
| Vitamin A deficiency | > 2 - 64 | 39.0 |

Source: ENSIN (2005)

Boyacá is ranked as the second state with chronic malnutrition (children in ages from 0 to 4) and stunting growth (children 5 - 9 years old), third in prevalence of delayed growth in children and teenagers (10 - 17 years old), fourth in obese adults (18 - 69 years old) but first in longer time of exclusive breastfeeding (ENSIN, 2005).

Further, the Rome Declaration on World Food Security (1996) designates that poverty causes food insecurity; bestowing the results of the MDGs for Colombia, the relationship between poverty of rural municipalities, which are about the 40% (table 5), child mortality and malnutrition was confirmed. According to the United Nations Development Program in Colombia (PNUD, 2011), it is necessary to make these areas as keystone of development. It was necessary to create a map of the 20 poorest municipalities (lower rate of

Unsatisfied Basic needs -UBN) (figure 1), with the largest quantities of registered crops there (figure 2) (Planeación Departamental, 2012); this demonstrates that they have efficient harvests, but apparently, their consumption is low.

Table 5. Goals achievement of the Millennium Development Goals (MDG) program by groups of municipalities according to the rurality index of Colombia.

| CATEGORIES | PEOPLE IN POVERTY NBI (TOTAL) | GROSS COVERAGE RATE IN MIDDLE SCHOOL. 2009 | MORTALITY IN CHILDREN UNDER 5 BY EACH 100 BORN. 2008 | INSTITUTIONAL BIRTH ATTENDANCE 2008 (%) |
|-----------------------------|-------------------------------|--------------------------------------------|------------------------------------------------------|-----------------------------------------|
| Urban Centers | 33,42 | 74,39 | 17,39 | 9100% |
| Intermediate Centers | 50,14 | 58,1 | 21,07 | 8500% |
| Highly Rural Municipalities | 74,66 | 27,52 | 39,09 | 7200% |

Source: PNUD, OMDL project based on official cyphers.



Figure 1. Map of Boyacá with the geographical distribution of the 20 municipalities with the major index of Unsatisfied Basic Needs (UBN). Source: Dirección de Sistemas de Información Territorial (2012).

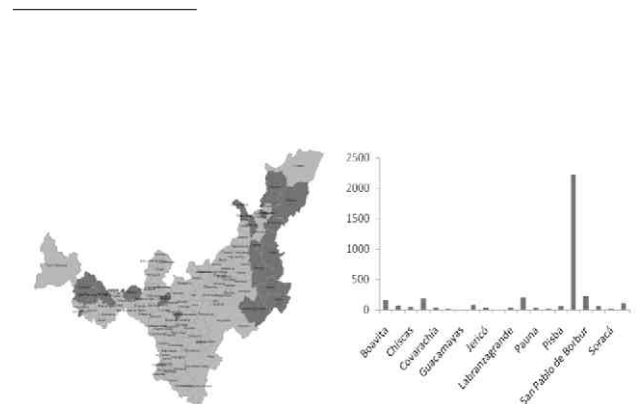


Fig 2a : Maize Crops

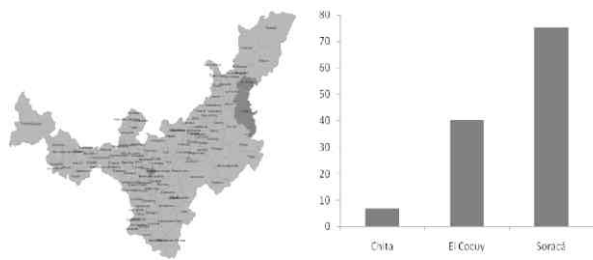


Fig 2b: Barley Crops

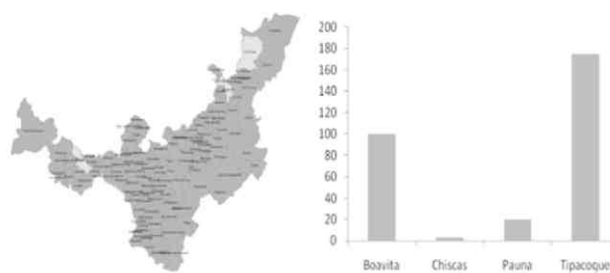


Fig 2f: Potato Crops

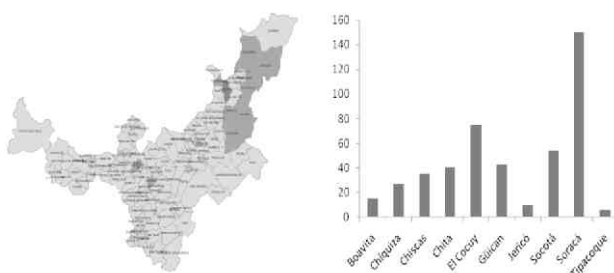


Fig 2c: Wheat Crops

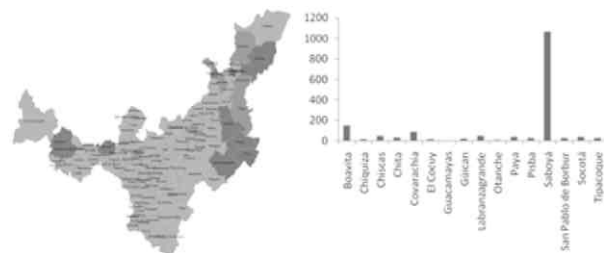


Fig 2g: Kidney bean Crops

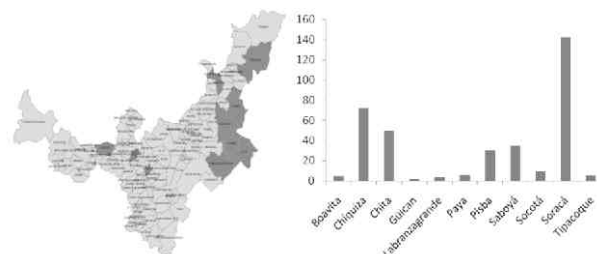


Fig 2d: Black-eyed pea Crops

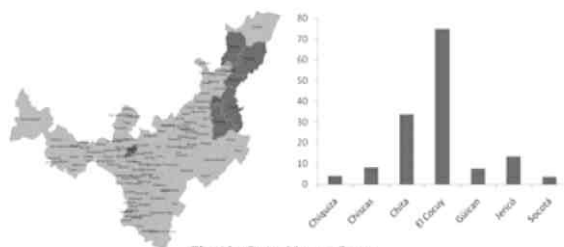


Fig 2h: Broad bean Crop

Source: Maps (right): Dirección de Sistemas de Información Territorial. 2012; Graphics (left) based on data provided by URPA (2012).

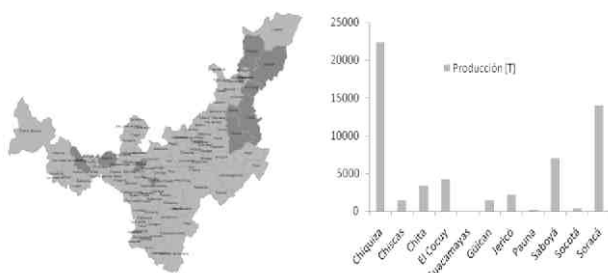


Fig 2e: Potato Crops

Figure 2 (a-h). Maps displaying the utmost sowings production for the state of Boyacá (2010) in the 20 municipalities with the major rate of Unsatisfied Basic Needs (UBN) in 2012 (Right). Production in Tons (T) (Left). Source: Maps (Right): Dirección de Sistemas de Información Territorial. 2012; Graphics (Left) based on data provided by URPA (2012).

REGULATIONS AND PUBLIC POLICIES IN CURRENT BOYACÁ

Food as a right is intended to propose its guarantee by the international regulations, constitutional or by the legal system; however, in Boyacá the reaction does not materialize (table 6 and table 7). Thus, there is no coherence between the speeches about of human dignity and freedom facing the violation of these (Gallardo, 2006).

Inside the formal framework, public policies are structured through various schemes, as the specific regulations, i.e. programs and projects or the sum total of them; classified and jointed depending on their dimension, span, and projection (Montañez, 2010).

Table 6. Policies that contribute to decrease malnourishing conditions in Colombia.

| INTERNATIONAL REGULATIONS ⁽¹⁻⁵⁾ | NATIONAL REGULATIONS | NATIONAL POLICIES | PLAN | PROGRAM IN BOYACÁ ⁴ |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|-------------------|-----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| Universal Declaration of Human Rights (1948), article 25 | Political Constitution of Colombia, 1991 | CONPES N° 2847. | Plan Nacional de Alimentación y Nutrición (PNAN, 1996-2005) | State Policy on Basic Attention |
| Foundation of the FAO, Food and Agriculture Organization of the United Nations (1965) | Constitutional Court, Auto 116, 2008 | CONPES N° 113 | Política Nacional de Seguridad Alimentaria y Nutricional (PSAN, 2006-2015) ² | |
| International Covenant on Economic, Social and Cultural Rights (1966), article 11 | Ley 100, 1993. Social Security System | CONPES N° 109 | Circular Externa No. 0018 (2004) | 1. Plan Alimentario Para Aprender - PAPA - ³ |
| International Covenant on Civil and Political Rights (1966), article 6 | National Development Plan (2002-2006; 2007-2010; 2011-2014) | - | - | 2. Red de Seguridad Alimentaria – ReSA |
| Universal Declaration on the Eradication of Hunger and Malnutrition (1974) | - | - | - | 3. Pregnant and lactating women program |
| The UN Convention on the Rights of the Child (1989), articles 24 y 27 | - | - | - | |
| Rome Declaration on World Food Security (1996) | - | - | - | 4. Comprehensive Care of Children and Family |
| World Food Summit Plan of Action (1996) | - | - | - | |
| The UN General Comment No. 12 of the Committee on Economic, Social and Cultural Rights (1999) | - | - | - | 5. Children's breakfast program |
| Millennium Declaration (2000) | - | - | - | 6. Implemtation of Clinical and Outpatient Nutritional Recovery Centres Program |
| The FAO Voluntary Guidelines to support the Progressive Realization of the Right to Adequate Food in the Context of National Food Security (2004) | - | - | - | |
| Optional Protocol to the International Covenant on Civil and Political Rights (approved in 2008, in ratification process) | - | - | - | 7. Supplementary foods |

Source: Las Políticas Públicas alimentarias en Colombia (2011)¹; Ruíz y Castiblanco, (2010)²; Cuervo (2009)³; Montañez (2010)⁴; The Principle to Right to Food and the International Commercial Contracts (2004)⁵.

Indeed, the formal recognition of the right to food in legal systems and public policies is not enough if it is not stated that: i) The content of the Right to Food and obligations of the nation; ii) The barriers to access and ensuring the right; iii) The strategies to be executed compliant the barriers and needs facing the right's satisfaction; iv) Putting into practice coherent actions on Human Rights; v) evaluation of the results taking the protection and guarantee of Human Rights as reference Figure 3 (Pérez *et al.*, 2010).



Figure 3. Process development and implementation of a Public Nutrition Policy.

Furthermore, the realization of the human right to food is influenced by the disconnection between public policies and Human Rights. This becomes more complex when its design, implementation and evaluation do not come from the recognition of a Human Rights approach (Pérez *et al.*, 2010).

Hence, the focus of a policy starts from the bringing together of Human Rights with Nation requirements, ensuring access to every person without any kind of discrimination (universality) and the complete and comprehensive satisfaction of each one of the Human Rights (interdependence and indivisibility of rights). Therefore, an emphasis to authorities is established, so departing from the strengthening of the link between Human Rights and public policies, apart from planning the access to food, identifying the actions that infringe the right to food, favoring the distribution, supply and proper nutrition (Quinche-Ramirez y Rivera-Rugeles, 2010).

Boyacá, highlighting the approach from Human Right to Food, especially because the challenges, obstacles and limitations of the Nation's programs. In this regard, it shall be considered each one of the national food and nutrition policies such as the Plan Nacional de Alimentación y Nutrición (PNAN, 1996-2005) and the Política Nacional de Seguridad Alimentaria y Nutricional (PSAN, 2006-2015), from each one of them the national and regional nutritional status is cognized.

In this sense, Ortíz *et al.*, (2006) provides a general explanation framework of the implementation of the national public policy, where it is stated that the five most important identified obstacles were: the dismantling of the current nutri-

Table 7. Some projects developed in Boyacá from the policies in nutrition.

| ENTITY | PROGRAM | LENGHT | AIM POPULATION | COST (MILLIONS COP) | MONITORING | |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------------------|------------|
| Instituto Colombiano de Bienestar Familiar ¹ | Hogares Comunitarios de Bienestar | Traditional Homes | 1988 - Present | Children from 0 to 59 months old. | 18.093.533.255 | Trimestral |
| | | Group Homes | 1987 - Present | | 112.788.808 | Trimestral |
| | | Multiple Homes | 2003 - Present | | 188.889.406 | Trimestral |
| | | Social Kindergardens | 2011 - Present | | - | Trimestral |
| | Children's Homes | 1970 - Present | - | - | Trimestral | |
| | Early and Late Infancy (Before, Children's Homes) | - | - | - | Trimestral | |
| | FAMI Homes | 2006 - Present | Children < 2 years old. Pregnant and breastfeeding women. | 2.279.822.814 | Trimestral | |
| | Desayunos Infantiles con Amor (DIA) | 2002- Present | Children <5 not in Children's Homes. | - | Without Nutritional Observing | |
| | School Feeding Program (School Restaurants) | 1988-Present | Children <5, to almost 18 years old. | - | Without Nutritional Observing | |
| | Outpatient Nutritional Recovery | - | Children < 5 years old with malnutrition | - | Trimestral | |
| Maternal and Child Health | - | Children < 2 years old, pregnant and breastfeeding women not in FAI program. | - | Without Nutritional Observing | | |
| Secretaría de salud, Gobernación de Boyacá ² | Programa de recuperación Nutricional ambulatoria: Programa de Amor y Nutrición - PAN | 6 months from children are in the program | Children that are almost 6 year old identified with acute or minor malnutrition, nutritional risk, food insecurity or other causes that may cause them undernourishment, in the 123 Municipalities. | - | - | |
| Secretaría de Salud, Gobernación de Boyacá ² | Protocolo de recuperación nutricional ambulatoria para gestantes con bajo peso o con riesgo nutricional en las ESE de la red pública en el departamento de Boyacá | 2009; from the inclusion to 7 months including lactation. | Pregnant diagnosed by a doctor or a nurse with low weight for gestational, pregnant women in with bio-psychosocial risk affecting her nutritional status. | - | - | |
| Gobernación de Boyacá, ICBF -regional Boyacá- y 123 Municipios ³ | Plan Alimentario Para Aprender (PAPA) | 2009 | 100 % of children in urban and rural areas, of all ethnic groups, registered in the educative system. Priorizing displaced and indigenous populations of levels 1 and 2 of the SISBEN. | - | - | |
| Gobernación de Boyacá ³ | Pregnant and Breastfeeding Women Program | - | - | - | - | |
| Gobernación de Boyacá ³ | Comprehensive Attention to Expectant Families | - | - | - | - | |
| Gobernación de Boyacá ³ | Children's Breakfast Program | - | - | - | - | |
| Gobernación de Boyacá ³ | Implementación de los Centros de Recuperación | 2009 | Children <5 years old with bundernourishment. | 2.075.000 | | |
| | Nutricional Clínicos y ambulatorios en los municipios priorizados por prevalencia de DNT | | | 1.871.000 | | |
| | | | | | | |
| Gobernación de Boyacá, Ministerio de protección social, Fondo de Naciones Unidas para la Infancia | Protección alimentaria y nutricional a familias con gestantes, lactantes y menores de 5 años en el departamento de Boyacá | - | Expecting families, breastfeeding, boys and girls <5 years old with nutritional alterations. | | | |
| Agencia Presidencial para la Acción Social y la Cooperación Internacional ⁴ | 17 proyectos Red de Seguridad Alimentaria - ReSA en Boyacá | Validity 2004-2010 | 40.098 families | 9,009,096,177 | | |
| | 17 proyectos Red de Seguridad Alimentaria - ReSA en Boyacá, Maíz y Frijol | | | 190,000,000 | | |

Source: ICBF (2013)¹; Secretaría de Salud de Boyacá, Guía Técnica y Administrativa (2009)²; Montañez (2010)³; Subdirección Seguridad Alimentaria y Nutrición, Departamento para la Prosperidad Social (2012)⁴.


tion policy among social, economic and agricultural policies; the lack of coordination between different government sectors; the administrative corruption; the distribution of resources inequity; and the lack of continuity of government's commitments. Finally, note that another major obstacle has been the lack of successful research results.

For Boyacá's particular case, the programs that have been developed are presented in table 7, however, there are not detailed approaches from the research to the study of these policies. It must be emphasized the works of Montañez (2010), who developed an analysis of local policies aimed to reduce infant mortality in Boyacá, concluding that the nutrition policies require special treatment from local authorities, departing from the creation of articulating policies on education, health, among others, which are incidental in mortality rates.

CONCLUSIONS

In Boyacá, from always there has been a culture of sowings and consumption of various nutritious foods, some of animal and vegetable origin, quinoa and amaranth are very important, which tended to disappear in the colonial era, which possibly brought on the malnutrition to the population. Currently, Boyacá is one of the largest producers of nutrient-rich foods; however, it is one of the states with the highest rates of malnutrition among children and women, which could be explained by the low educational culture and consumption of highly nutritional foods. Although there are various institutions and policies that seek to improve this situation, the state remains one of the poorest of the country with deficient proposals, execution and monitoring projects inside the agricultural and nutritional framework. Clearly, the need for alliances between government, universities and civil society is necessary to work in the development of strategies that facilitate a better productive state and a better nutritional status for Boyacá's population, especially in children and women.

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