

Food and Nutrition Security in Post-Conflict Zones: The Case of the Montes de María sub-region in the Colombian Caribbean

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Abstract

A review was made of the most recent research on food security and post-conflict in the sub-region of the Montes de María located in the Colombian Caribbean. The present review article has the peculiarity to analyze qualitatively the scientific literature available in the databases Science Direct, Scielo, Redalyc and official Web pages, using as search words: food security, post-conflict, violence. Relevant information was obtained related to the proposed objective, which is presented in the following sections: world and national context of food security, institutional strengthening program, food self-consuming programs, factors generators of food insecurity, context of food and nutritional security in the mountains of María, and finally the present and future challenges.

Keywords: Food security, Post-conflict, Violence

INTRODUCTION

For the above, Food security is a subject of high interest at present, and its conceptual meaning is not always homogeneous, therefore we will address some definitions of two institutions of great value to clarify the concepts, it is the Organization of the United Nations for the Food and Agriculture- FAO and the National Planning Department of Colombia – DNP [1].

"There is food security when all people, at all times, have physical and economic access to sufficient nutritional food and safely, in order to meet their dietary needs and food preferences for an active and healthy life" [2].

National Food Security "refers to the sufficient and stable availability of food, access and timely and permanent consumption thereof in quantity, quality and safety by all people, under conditions that allow their proper biological use, to lead a healthy and active life [3].

While it is true that in the two previous definitions there are points in common in aspects related to timely and permanent

consumption by all people, the concept expressed by FAO gives greater emphasis to "physical and economic access" to food, aspect not evidenced explicitly in the definition of the National DNP [4].

On the other hand it is important to bear in mind, the Declaration of Rome (1986) [5]: this affirms "the right of every human being to have access to nutritious and safe food", consistent with the right to adequate food and the fundamental right of all human beings to be free from famine [6].

The debate on availability and access to food is not foreign to our country and particularly to the Montes de María sub-region, since it has been indicated that "Colombia is a country, where there is enough quantity for its population to be overfed", but the reality is that "even in cases where the theoretical availability allows to cover the established needs, this fact in no way ensures an equitable distribution for the consumption of the entire population" [7].

The matter clearly shows that when the population or a large part of it does not have the minimum income to satisfy their basic food needs, there are no real conditions of access to food despite their sufficient availability, a situation that makes it more regrettable when there are no self-supply alternatives [8].

However, as already indicated at the beginning of this work, the FAO defines a good condition of food security as the situation in which all people at the same time have economic and physical access to sufficient, safe and nutritious food to cover the dietary needs and food preferences for an active and healthy life [9]. Therefore, the previous concept includes aspects of quality and quantity.

There are three aspects implicit in this definition of FAO [10]:

- Availability, access and stability.
- Availability: refers to having enough food supply to cover the consumption needs.
- Access: It refers to the power of acquisition, given that even with supplies of first quality food, many people are still hungry because they are poor and are unable to produce or buy the food they need.

- **Stability:** It refers to the sustainability of supply and access, since if the food needs are covered by means of non-renewable natural resources or degrading the environment, there is no guarantee of food security in the long term, ie stability of supply and access is not ensured.

It is also important to consider additional concepts such as the following:

- **Food self-sufficiency:** means the ability of a nation to cover the maximum possible number of food needs, in such a way that the dependence on imports is minimized.
- **Food self-dependence:** It takes into account the possibilities of international trade (imports) and means ensuring the maintenance of a certain level of domestic food production as long as the importation of the world market is necessary. The problem of dependence in the market is the uncertainty of supplies and the prices of world markets.
- **Food sovereignty:** emphasizes the right of each country to autonomously define national agricultural policies and the right to protect and regulate the national agricultural economy in order to achieve sustainable growth levels to protect the right to food of the entire population. The most important differences between this concept and the concept of food security are that the former emphasizes the coverage of the population's food needs, separating this aspect from agricultural productivity, as well as from international trade. Many NGOs and social movements have adopted the most complex definition of food sovereignty in the sense of protecting and promoting the activities of small farmers.
- **Protein quality:** Is the ability to provide the requirements of nitrogen and essential amino acids of an organism. A balanced protein or high quality, contains the essential amino acids in proportions corresponding to human needs
- **Functional food:** They are those that independently of providing nutrients, have been scientifically proven to provide a better state of health and wellbeing, they also have a preventive role since they reduce the risk factors that cause diseases.
- **Balanced diet:** the diet that provides adequate energy quantitatively, allows the maintenance or attainment of ideal weight and provides all vitamins and minerals in amounts not less than 2/3 of the Recommended Dietary Contributions – ADR.

WORLD AND NATIONAL CONTEXT OF FOOD SECURITY

The world context in which Food Security is debated has as its background poverty and "hunger in the world". In this regard, FAO has regularly presented the report of hunger in the world, expressing it in schemes such as the one shown below [11].

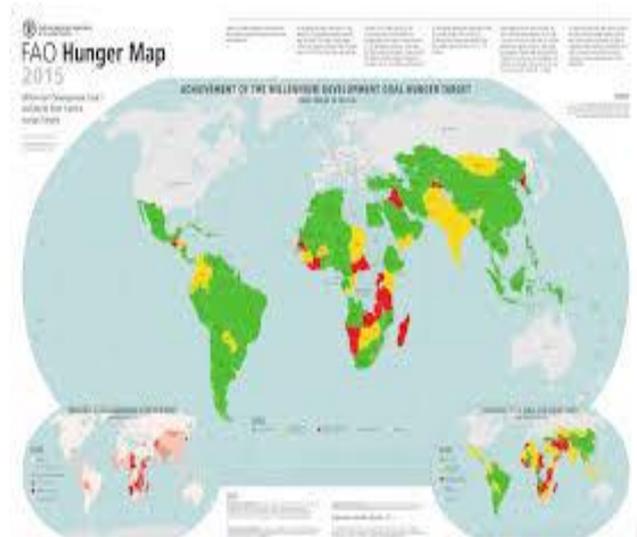


Figure 1: FAO map of world hunger

Why the interest of FAO in the topic of Food Security in the World?; The interest for the Food Security in the last years has not been a matter imposed by the "fashion" of a subject, on the contrary it has become evident by the worry in the whole world so that the governments review their plans of use of soil and food security so that millions of poor farmers and fishermen in the world can be prevented from being seriously affected [12].

Even the Human Development Report of the United Nations Development Program named nutrition as an issue within the context of human rights. In this regard, the aforementioned report expresses with clear clarity that "a decent level of life, sufficient nutrition, Health care, education, decent work and protection against calamities are not simply development goals, they are also human rights [13].

In the same document reference is made to the work carried out by the IFPRI (International Food Policy Research Institute) in which it is described that in 1995, 167 million children under the age of five in the world were malnourished and there is no reason to think that number have decreasing current trends [14]. Therefore the report strongly points out that "malnutrition causes a good part of the suffering and constitutes a violation of the human rights of children"

Productivity and environmental deterioration: This aspect that relates food security and environmental deterioration call attention worldwide since it has been evidenced that "The processes of environmental deterioration reduce the productivity and the value of the planet's natural resources" [15].

In this sense, it has become clear that the land, water and the irrigation problems associated with the latter constitute, among others, key production factors to ensure food security, as Ramírez and collaborators affirmed in the document entitled "Guidelines for the Food security: challenges and perspectives " In fact, environmental deterioration puts food security at risk, and food quality decreases, whether due to

contamination, lack of essential soil nutrients, excess or lack of water, or the climate for optimum food development [16].

Should we worry about Food Security in Colombia?: The answer to this question goes hand in hand with the knowledge of the state of food security in Colombia, which implies the analysis of indicators that allow us to know if it deserves to be alarmed about it [17]. An important aspect is chronic malnutrition in children under 5 years of age, whose tables illustrate us in this regard we present subsequently [18]:

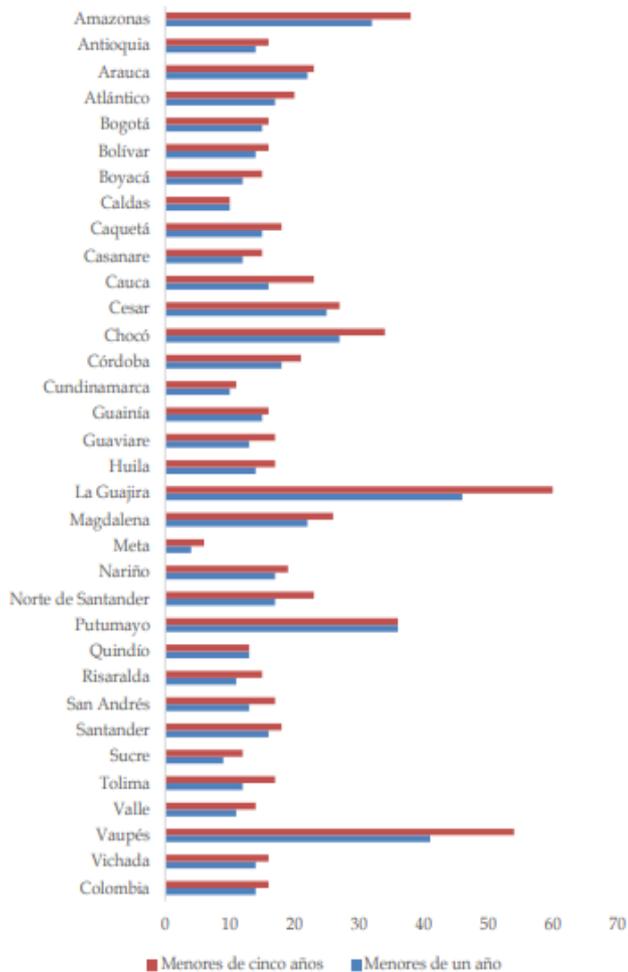


Figure 2: Infant mortality by department and age in 2015

As can be seen, while it is true that the national average is at 13.5%, what is worrisome is that the subregion Bolívar, Sucre, Córdoba reaches an unworthy and rather horrifying 18.5%, which together with the Cauca subregion Nariño (24.5%) place us on par with areas of sub-Saharan Africa from the nutritional point of view for this indicator [19].

On the other hand, the sub-region of Bolívar, Sucre, Córdoba, in which the Montes de Maria are immersed, has an average that is far from the average reported for nations of the Caribbean area such as the Dominican Republic, Trinidad and Tobago and Cuba whose prevalence is one digit [20].

How is the Food Security policy structured and developed in our country?

To address this aspect of the work we must bear in mind that the National policy for food and nutrition security is expressed through the Ministry of Social Protection, which together with the Colombian Family Welfare Institute ICBF regularly present the results of the evaluation of the so-called National Plan of Food and nutrition [20].

These two entities: the Ministry of Social Protection and the ICBF, are responsible for jointly defining the nutritional and nutritional problem of the Colombian population, in terms of morbidity and mortality due to nutritional diseases themselves and other diseases associated with them. They also have functions and objectives aimed at implementing nutrition and food programs, adjusting them to the needs, conditions and resources of each region; this in harmony with the National Development Plan. In the case of the ICBF in particular, it is also their duty to supervise, control and evaluate these nutrition and food programs [21].

Another entity that intervenes in this issue at the national level is the Presidential Agency for Social Action and International Cooperation entity that is responsible for channeling national and international resources to implement all social programs that depend on the Presidency of the Republic and that They serve vulnerable populations affected by poverty, drug trafficking and violence. In this sense, the Agency executes the RESA Program - Network of Food and Nutrition Security, whose objective is to promote productive projects for the generation of food for self-consumption [22].

The national food security strategy; among the most significant programs within the National Food Safety Strategy we can highlight the following:

INSTITUTIONAL STRENGTHENING PROGRAM

Objectives of the Program are [23]:

- Strengthen the processes of planning, coordination, measurement, control, monitoring and evaluation of food and nutrition security.
- Improve decision making and equity in social spending, by strengthening identification systems for beneficiaries and the creation of information systems.
- Strengthen the instances of coordination and coordination of actions in food and nutrition security.
- To ensure that institutions adopt a comprehensive and multisectoral vision for food and nutrition security and have political, technical and support bodies, with purposes, tasks and clearly differentiated tasks, to transform the situation of food and nutrition security.
- Increase the efficiency of state interventions in favor of food and nutrition of the Colombian population

The program has the following projects that develop it; Institutionalization project of food and nutrition security in territorial entities: which aims to promote the preparation of

departmental, district and municipal plans for food and nutrition security, and incorporate them into development plans, multi-year investment plans and Territorial Planning Plans (POT).

Project Information and monitoring system; Create the food and nutrition security observatory (OSAN), which can be designed and oriented based on the already developed systems such as the Food Insecurity and Vulnerability Information and Mapping System (FIVIMS), the Food and Nutrition Surveillance System (SISVAN) and the AGROCADENAS observatory.

Participation and social and community organization; Train and organize groups with leadership capacity, in order to ensure adequate participation and citizen oversight in the development and implementation of programs and projects, and for the formation of support networks that articulate, control and monitor consumption, health, access and distribution of food within the population.

Project Design of instruments and tools for Food and Nutritional Security; The objective of this project is to have instruments and tools that facilitate the processes of planning, coordination, measurement, control, monitoring and evaluation of actions related to food and nutrition security.

Scientific research and development project; In partnership with universities and research centers, maintain current information on the factors that intervene in the nutritional and nutritional situation of the Colombian population, in order to contribute to improving availability, access, quality and safety, consumption and biological use of food and therefore the nutritional and nutritional status of the population.

As we can see, there is a national strategy with programs and projects in which food and nutrition security actions can be framed for the Montes de Maria sub-region. Now, although it is true that specific actions are already being carried out, it is not clear whether there are departmental plans where the policy is drawn up for the specific promotion of information and monitoring systems for food and nutrition security in the municipalities that make up the regions. Montes de Maria as well as the stimulation to the investigation in the nutritional field and of the raw materials agroalimentarias that provides the subregion, aspect this last that would assure a level of suitable knowledge and of contribution of information for the decision making in the socio-economic field.

FOOD SELF-CONSUMING PROGRAMS

The objectives of the Program are [24]:

- Minimize the vulnerability and food instability of displaced population and small peasants affected by violence, through actions that allow them to produce their food.
- Guarantee the availability and permanent food access to displaced population and vulnerable peasants.
- Improve the nutritional situation of the rural poor affected by violence. ENT

Use of food; the program has the following projects that develop it:

Project of Return of displaced families: Whose goal is to provide integral support to families who return to their places of origin, who have been displaced by violence and terrorist acts or threats.

Food Safety Network Project, RESA: Whose goal is to establish food security projects through production for self-consumption for the benefit of small agricultural producers vulnerable or violated by violence.

FACTORS GENERATORS OF FOOD INSECURITY

The Rome Declaration indicates that poverty is the biggest cause of food insecurity. The eradication of poverty is considered of vital importance to improve access to food. Conflicts, terrorism, corruption and environmental deterioration also contribute significantly to food insecurity. It is shown that, when poverty decreases, so does famine.

Food insecurity and poverty; Poverty can be addressed as a fundamentally descriptive concept, which refers to deprivation, deprivation, which can be measured by household incomes or their unsatisfied basic needs, or by a combination of both types of indicators [25].

Poverty is not an isolated or "marginal" phenomenon but is reproduced simultaneously with wealth, in the global framework of the reproduction of the so-called "social relations".

We see then that because of the existing connection between food insecurity and poverty, it is fundamental to analyze the different modes of insertion in the labor market, the forms of domestic organization, participation in social programs (state or linked to non-governmental organizations), etc., but it is also essential, as noted by Eguía (2004) [26], the approach of the symbolic aspects, that is, the meanings and valuations of the inhabitants of the territory about these same phenomena.

It is important to note that world food security is determined by the productivity of the methods used by the poorest farmers and the purchasing power of the poorest consumers [27].

Another aspect that has been evident is that economic growth is not enough to reduce poverty levels, this is more noticeable in countries where the number of the poor population is high. In countries where initial inequalities are high, the poor population must be provided with access to resources (land, water, etc.), markets, technologies, and institutional programs. Therefore, the objective of reducing poverty requires that more concrete actions focused on poor farmers be developed [28]. Many of the population suffering from food insecurity live in rural areas and their subsistence is related to agriculture [29]. However, the products of poor farmers are generally excluded from high value-added markets due to the scarcity of access to these resources [30].

The factors that we can consider relevant in relation to food security are:

- Land occupation
- Small scale agriculture
- Trade, Markets and subsidies
- Lack of water

Land occupation; It is estimated that 80% of the land in developing countries belongs to 3% of the population [31]. The United Nations Development Program [32] affirms that it is not the type of occupation but security and equity in access to resources that together determine whether land reform will lead to development sustainable both from the ecological and socioeconomic criteria.

In the case of our country, drug trafficking and the armed actors of the conflict have caused problems for the food security of the country, because directly or indirectly they have contributed to intense processes of land grabbing for purposes other than food production, increasing the displacement of the peasant population, which together with the environmental deterioration due to illicit crops and their fumigation, have destructured the peasant and traditional indigenous economies. These factors affect the possibility of expanding the areas for the production of food under minimum conditions of profitability and have been distorting the value of land [33].

Trade, market and subsidies; The commercial aspect is significant for food security in countries like ours that are committed to achieving trade agreements where there are some preventions for the eventual impact on the agricultural sector. In this same aspect, it has been reported that industrialized countries have about three quarters of both imports and global exports of agricultural products [34].

Forecasts for the future show that developing countries will be increasingly dependent on imports of staple foods [35]. Some authors emphasize the fact that the globalization of markets leads to more instability and not necessarily to economic growth [36]. The poor would benefit most from the liberalization of markets if they had equitable access to markets and resources [37, 38]. This is not clear in depressed areas such as those of the Colombian Caribbean, if we bear in mind that the arrival of imported food products can ensure their availability but not necessarily their access.

Lack of water; It has been pointed out that agriculture consumes 70 percent of the freshwater extracted annually [39], while the remaining 30% is oriented towards industry and human supply [40]. Globally, 50% of the available water resources are easily in use. By the year 2030, this percentage is expected to increase to 64%, which means that there will only be 20% of the total water available.

The shortage of water is not only related to the insufficient quantity available of the liquid but also to the poor management of the aquifer resources, as well as the inadequate access to them. It has been estimated that to ensure

food security it would be necessary to increase irrigated agriculture in developing countries by 40 million hectares, however, increasing the availability of water is not such a simple task. It is necessary to implement an adequate water management. In that order of ideas, the reduction of rural poverty in a concrete way requires a greater distribution and allocation of water to increase the production of basic foods, this aspect for an area like the Montes de María is of great importance.

We see then that food insecurity is fostered by the following structural aspects:

- Restricted property of the land
- Little or no support for small crops
- Difficulties of access to local markets and few marketing channels
- Inadequate water management

To all these aspects we should add the scarce level of research studies on food security and nutritional aspects for a specific area, which consequently originates low levels of basic knowledge and information, necessary for an adequate decision making and guidance of public politics.

CONTEXT OF FOOD AND NUTRITIONAL SECURITY IN LOS MONTES DE MARIA

The Montes de María is made up of 15 Municipalities: 7 from the Department of Bolívar and 8 from Sucre, Republic of Colombia. The Municipalities of Sucre are: Sheep, San Onofre, Chalán, Colosó, Morroa, Toluviejo, Los Palmitos and San Antonio de Palmito. Those of Bolívar are: Maria la Baja, San Juan Nepomuceno, San Jacinto, El Guamo, El Carmen de Bolívar, Zambrano and Córdoba (Tetón). In this territory there are around 72,500 families [41] with immense problems of poverty and exclusion factors that have fueled the conflict in the region in recent years [42].

Similarly, recent research reports that by 2005 only 50% of daily cash needed to meet the daily needs of the families of the Montes de María sub-region families, families that according to the DANE census of 2005 were integrated by approximately 4.56 people. However, the same document DANE reports that the population in Montes de María was then 336,434 inhabitants of which 55% resided in the urban area and 45% were located in the rural part. For 2005 it was estimated that 59.7% of said population had unsatisfied basic needs - NBI, which would correspond to a number of 198,714 people [43].

Another important aspect of the area is the use of the territory found that for the year 2005 the area cultivated in Montes de María was 372,746 hectares, of which 293,423 (79%) were dedicated to pasture for extensive livestock and only 79,323 (21%) hectares were dedicated to the different permanent and transitory crops [44].

In this same sense, we must bear in mind that households in the condition of displacement are subject to the presence of events that can significantly affect the dietary and nutritional

conditions of their members, as is the case of sectors of the Montemariana population. Therefore, it is necessary to carry out studies to identify trends in food consumption and the search for agro-food sources rich in proteins and iron of high biological value as well as other functional components of the native plants of the subregion [45].

However, to address the food security of a region, it is also determined by the food culture of its inhabitants and by the nutritional quality of the different products that are produced in the region [46]. The nutritional quality of a food is a fundamental aspect for an optimal nutritional development of people and especially of the child population that shelters the sub-region of Montes de Maria [47].

Taking into account the basic nutrients (carbohydrates, proteins and lipids), it is observed that in the Montes de María there is a range of products that provide these nutrients, and that if they supply in adequate formulations, the nutritional quality of the food consumed would be guaranteed [48].

Among the food products that stand out in the Montes de María which are sources of basic nutrients we have; Yam, sesame, corn, yucca, plantain, beans, beans and others such as avocado, passion fruit, and melon, with the highest yield being yam, avocado and sesame seeds [49]. All these products in fact also constitute agri-food raw materials of great significance for the processes of technological transformation for the elaboration of processed foods of greater added value [50].

CHALLENGES PRESENT AND FUTURE

Actions to be promoted for the Montes de Maria area:

1. Promote in the Montes de Maria region the adoption of Food and Nutritional Security as a strategic axis for the development of the region and the overcoming of Poverty.
2. Encourage research on food and nutrition security in the subregion, in order to have a base of information and knowledge that enables correct decision-making.
3. Strengthen the integration between the institutions of the social, academic, economic and agricultural sectors to boost the articulation of actions, as well as the development of networking to achieve food and nutrition security, beyond a simple discussion table, which allow the integration of multisector actions
4. Promote regional articulation plans with Regional Plan of Food and Nutritional Security, which is not conceived as a sum of independent and parceled Municipal Plans.
5. Establish indicators to measure and compare the food and nutrition situation of the communities settled in the Montes de Maria region.
6. Strengthen information systems and collect more resources for scientific research and development in the field of food and nutrition security.

7. Carry out forums or meetings with the territorial entities, unions, universities, national entities, social organizations, in order to contribute participatively to the structuring of a Food and Nutritional Security Plan for the Montes de Maria area.

REFERENCES

- [1] FAO. Propuesta de estrategia e instrumentos para mejorar la seguridad alimentaria en Colombia. FAO 2004
- [2] C. Severiche, E. Gómez and J. Jaimes, As the basis of environmental education and culture strategy for sustainable development, *Telos*, 18 (2016), 266–281.
- [3] DNP- Programa de Seguridad Alimentaria y Nutricional, 2008
- [4] J. Jaimes, Y. Marrugo and C. Severiche, Tóxicos en el Ambiente y la Seguridad Alimentaria, *Revista Cap & Cua*, 6 (2014), 16 – 23.
- [5] A. Alvis, C. Vélez, H. Villada and M. Rada. Análisis Físico-químico y morfológico de almidones de ñame, yuca y papa y determinación de la viscosidad de las pastas, *Información Tecnológica*, 19((2008), 19-28.
- [6] Declaración de Roma (1986)
- [7] Instituto Colombiano de Bienestar Familiar. ICBF: Hoja de balance de alimentos colombianos 1991, Capítulo sobre adecuación de la disponibilidad. Bogotá, Julio 30 de 1993.
- [8] J. Jaimes, I. Rios and C. Severiche, Nanotecnología y sus aplicaciones en la industria de alimentos, *Revista Alimentos Hoy*, 25 (2017), 51 – 76.
- [9] Y. Marrugo-Ligardo, C. Severiche-Sierra and J. Jaimes-Morales, Development of a Food Product Type Based Sauce Eggplant (*Solanum melongena*), *International Journal of ChemTech Research*, 10 (2017), 567-571.
- [10] P.P. Miranda-Villa, Y.A. Marrugo-Ligardo and P.M. Montero-Castillo, Functional Characterization of Bean Zaragoza Starch (*Phaseolus lunatus* l) and Quantification of the Resistant Starch, *Tecnológicas*, 30 (2013), 17-32.
- [11] FAO. Propuesta de estrategia e instrumentos para mejorar la seguridad alimentaria en Colombia. FAO 2004
- [12] Y. Marrugo, E. Torregroza and P. Montero, Nutritional potential of three Zaragoza bean (*Phaseolus lunatus* l) cultivars and their in vitro digestibility estimation, *Journal of the Faculty of Agronomy*, 29 (2012), 314–326.
- [13] DNP- Programa de Seguridad Alimentaria y Nutricional, 2008
- [14] Y. Marrugo, P. Montero and M. Duran, Nutritional Evaluation of Protein Concentrates of *Phaseolus lunatus* and *Vigna unguiculata*, *Technological*

- Information, 27 (2016), 107-114
- [15] I. Baldiris, Y. Marrugo, C. Severiche-Sierra, J. Jaimes-Morales, W. Fong, L. Vargas, E. Bedoya and H. Cohen, Delayed Organoleptic Maturation of Tomato Development of a scalded meat product Variety Milano (*Lycopersicum esculentum* Mill) Using Gibberelina, *International Journal of ChemTech Research*, 10 (2017), 1032-1037.
- [16] L. Bezzola, P. Canziani and S. Isely. Las presiones de la globalización sobre la seguridad alimentaria, la sociedad y el medio ambiente. IV Encuentro Nacional de Docentes Universitarios Católicos. Buenos Aires Argentina, 2007.
- [17] Y. Marrugo, C. Blanco, C. Severiche and J. Jaimes, Effect of Acetylation of Bean Starch Zaragoza (Phaseolus lunatus) Red Variety on its Functional Properties, *International Journal of ChemTech Research*, 10 (2017), 506-514.
- [18] Y. Marrugo, C. Vargas, C. Severiche, J. Jaimes and E. Bedoya, Evaluation of the Functional Properties of Bean Starch Zaragoza (Phaseolus lunatus) White Variety in a Food Type Sausage, *International Journal of Engineering and Technology*, 9 (2017), 3674-3679.
- [19] Y. Marrugo, P. Montero and M. Duran, Functional properties of protein concentrates of Phaseolus lunatus and Vigna unguiculata, *Vitae*, 19 (2012), S403-S405.
- [20] Y. Marrugo, I. Rios, C. Martínez, C. Severiche and J. Jaimes, Elaboración de un alimento tipo compota utilizando como espesante el almidón del frijón Zaragoza (Phaseolus lunatus), *Revista De Investigación Agraria Y Ambiental*, 8(2017), 119 – 125.
- [21] Y. Marrugo, D. Ramirez, N. Trujillo, C. Severiche and J. Jaimes, Development of a scalded meat product added with modified bean starch Zaragoza (Phaseolus lunatus) red variety, *Contemporary Engineering Sciences*, 10 (2017), 1473-1483.
- [22] A. Olapade, Y. Babalola and O. Aworh. Quality attributes of fufu (fermented cassava) flour supplemented with bambara flour, *International Food Research Journal*, 21 (2014), 2025-2032.
- [23] J. Jaimes, A. Acosta, C. Severiche, Y. Marrugo and E. Bedoya, Evaluation of the Functional Properties of Prosopis juliflora Protein Concentrate Obtained by Different Methods, *International Journal of Engineering and Technology*, 9 (2017), 3841-3847.
- [24] I. Diaz, M. Ahumado, E. Bedoya, L. Ballesteros, C. Diaz, C. Severiche and A. Torregraza, Effect of transpiration in post-post-state condition on the agroindustrial quality of Chrysobalanus icaco L fruit variety, *Contemporary Engineering Sciences*, 10 (2017), 1517 – 1527.
- [25] A. Gutiérrez, Herramientas teórico-metodológicas de un análisis relacional para los estudios de la pobreza. *Ciencia, Docencia y Tecnología*, 35(2007), 15-33.
- [26] A. Eguía, Pobreza y reproducción familiar: propuesta de un enfoque para su estudio, en: Cuaderno CRH, Universidad Federal de Bahía, 17(2004), 79-92.
- [27] FAO, 2002a. World agricultura: towards 2015/2030.
- [28] IFAD, 2001: Report on rural Poverty. www.ifda.org
- [29] FAO, 2002b. The state of food insecurity in the World 2002.
- [30] Oxfam, Northern agricultural policies and World poverty: Will the Doha “development round” make a difference?. Paper to be presented at the Annual Bank Conference of Development Economics May 15-16, 2003.
- [31] T. Leahy, Food and the enviroment. Published in “The social appetite” edited by John Germov and Laurel Williams (Oxford), 1997
- [32] FAO, 2002c. Trade and food security.
- [33] Programa de las Naciones Unidas para el Desarrollo (PNUD): Informe de desarrollo humano 2000. Tercer Mundo Editores, Bogotá, 2000.
- [34] OECD. Agricultural Policies in Emerging and transition economies, Paris, 2000.
- [35] J. Jaimes, J. Torres, C. Severiche, Analysis of the quality of a scalded meat product made with Prosopis juliflora flour, *Ingenium*, 9 (2015), 21-28.
- [36] J. Stiglitz, Conference at the Social Forum, Bombay. On press. 2004
- [37] F. López and J. García, Desertification in the arid and semiarid mediterranean regions: A food security issue. NATO Security through Science Series Environmental Security. William G. Kepner, Jose L. Rubio. Fausto Pedrazzini, eds. Springer. Printed in the Netherlands, 2006.
- [38] FAO. Agriculture, trade and food security: Issue and options in the WTO negotiations from the perspective of developing countries, volume 11, Case studies, Rome: FAO. 2000^a
- [39] M. Ramirez, Lineamientos para la seguridad alimentaría: retos y perspectivas. *Revista Economía y Desarrollo*, 2002
- [40] A. Sagarduy, Water management in agricultura. III Conference on techno the human development organized by ISF (Engineers without borders). Spain, 2003.
- [41] Documento CONPES SOCIAL 91
- [42] D. Menco, El desarrollo social en los Montes de Maria" en Observatorio de la Economía Latinoamericana, 83, 2007.
- [43] C. Acevedo, Los Montes de María: Región, conflicto armado y desarrollo productivo. *Memorias: Revista Digital de Historia y Arqueología desde el Caribe*,

18(2012), 279-285.

- [44] F. Maza, G. Herrera and T. Jiménez, Palma de aceite y seguridad alimentaria en el Caribe colombiano: el caso del municipio de María la Baja, Bolívar, Revista Palobra, 17(2017), 122-143.
- [45] F. Maza, Diseño de políticas públicas para la transformación de las prácticas agrícolas de la región del Canal del Dique y Zona Costera-Colombia-. Universidad de Cádiz, 2016.
- [46] A. Daniels, La transformación de la estructura productiva de los Montes de María: de despensa agrícola a distrito minero energético. En Memorias. Revista Digital de Arqueología e Historia desde el Caribe, 29 (2016).
- [47] A. Daniels and A. Múnera, Los Montes de María. Región, conflicto y desarrollo productivo, Instituto Internacional de Estudios del Caribe-Universidad de Cartagena. Editorial Antropos (2011), 16-20.
- [48] Observatorio de Cultura Política, Paz, Convivencia y Desarrollo de los Montes de María – Sistema de Información Territorial. Línea Base. En: www.sitmma.org. Instituto Internacional de Estudios del Caribe Universidad de Cartagena. Cartagena, (2014).
- [49] Observatorio de Cultura Política, Paz, Convivencia y Desarrollo de los Montes de María – Sistema de Información Territorial. En: www.sitmma.org. Instituto Internacional de Estudios del Caribe, Universidad de Cartagena. Cartagena, (2016).
- [50] E. Torregroza, Y. Marrugo and A. Bermudez, Estudio comparativo del potencial nutricional de las variedades de maíz amarillo (*Zea maíz*): mejorada ICA V-109, Híbrido H-5423 y criollo regional, Revista Ciencias e Ingeniería al Día, 2 (2004).