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# Local Production-Based Dietary Supplement Distribution in Emerging Countries: Bienestarina Distribution in Colombia

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## **ABSTRACT**

*The production and distribution of Bienestarina to the vulnerable population of Colombia is one of the strategies of the Colombian Institute of Familiar Wellness (ICBF) to fight malnutrition, especially among children. This case is a good example of establishing food security and social improvement logistics that merits particular attention. The chapter presents an analysis of the Bienestarina supply chain based on the four elements: steering, organization, development, and financial issues. First, an overview of social improvement logistics and the Bienestarina context is provided. Second, theoretical frameworks related to the case are presented. Third, the case is described on the basis of the proposed analysis framework. Finally, generalization issues and conclusions allow the authors proposing the first characterization of social improvement logistics.*

## **INTRODUCTION**

Food safety is one of the commitments which the Colombian government wants to ensure as a right of people (Dirección Nacional de Planeación, 2007). Indeed, the government must help the part of the Colombian population who is under malnutrition (i.e. due to nutrient deficiencies in their food), where children are considered as the most affected. Malnutrition of children generates several problems such as lack of concentration, and energy, decreased learning ability, and general delay in physical and mental

development, among others (Cuevas García, 2005). To fight malnutrition, different strategies can be implemented by national and regional entities (Food and Agriculture Organization of the United Nations [FAO], 2010). Since several initiatives focus on bringing unused food to the most sensible families (Maldonado & Moya, 2013) or on increasing families revenues, others (mainly in Latin America) deploy dietary complements or enriched food production-distribution systems addressed to those families.

In this context, the main products used to fight malnutrition are based on flours mixtures obtained from cereals that can be locally produced. Indeed, the rates of local (at least national or regional) production for those products are high (Rozo, 2000). However, several reports state that the distribution systems related to those products present deficiencies. It is important to consider those systems in a supply chain management perspective, in order to identify the main processes but also observe the evolutions of the integrated supply-production-distribution chain.

Over 30 years, Colombia has been implementing the strategy to improve food consumption of high nutritional value through the production and distribution of food complement based on mixtures of plant origin with high nutritional content, which is called Bienestarina. The purpose of this complement is to arrive in time to children, young, elderly, poor families, ethnic groups, and other population who require sufficient nutrients which their basic food do not provide sufficiently. Production and distribution of Bienestarina to the vulnerable population of Colombia is one of the strategies of the Colombian Institute of Familiar Wellness (ICBF) to combat malnutrition, especially among children.

The aim of this chapter is to investigate the current state of the Bienestarina logistics process from a supply chain viewpoint and focus on social aspects of logistics which are not related to commercialization of a product but to make it available to sensible populations. The authors start from the theoretical framework of the four pillars of the viability of a logistics project (Gonzalez-Feliu, Malhéné, Morganti, & Morana, 2014) and examine them in the case of the Bienestarina distribution network in Colombia.

This chapter is organized as follows. First, the background and context of the research are presented. Then, the methodological issues are provided. After that, the main results of the research are summarized and discussed. In the conclusion section, practical implications of those results and further developments are proposed.

## **BACKGROUND**

Food security is a major issue since decades and takes a special interest in developing countries, where malnutrition and hunger are one of the first causes of mortality (Valdes, 1981; Reutlinger, 1986). However, food security is in general in competition to the industrialization and performance-making of productive systems and agro-industrial developments of such countries, mainly related either to feed developed countries or to produce non-food agricultural and agro-industrial products, such as biofuels (Ewing & Msangi, 2009) and textile fibers (Fortucci, 2002), among others. In opposition to the development of such industries, the needs of local inhabitants to nourish and develop themselves, in seeking higher welfare status, feeds the public debate on the place of social improvement in the economic and sustainable development of a country (Braun & Kennedy, 1994).

The issue of social improvement is a major strategic point in emerging countries. Indeed, with the high levels of poverty and malnutrition that characterize those countries, one of the main objectives of governments, along with economic development, is an improvement of the quality of life of people. Moreover, those countries receive particular attentions of non-governmental organizations (NGOs)

and other humanitarian organizations. Although humanitarian logistics is a popular subject of research (Kovács & Spens, 2007, 2009; Holguin-Veras, Jaller, Van Wassenhove, Pérez, & Wachtendorf, 2012; Holguin-Veras, Wachtendorf, Jaller, & Jefferson, 2013), it focuses on emergency response logistics and post-disasters organization, with a low scientific interest for social improvement logistics. Indeed, the first statement on the importance of logistics in supporting social improvement is found in Orbell and Dawes (1993). After that, only a few works deal with logistics contributing to the social improvement. To the best of the authors' knowledge, Stock (1990) was the first who emphasized the poor contribution of logistics research in relation to social welfare. Adivar, Atan, Sevil Oflaç, and Örtten (2010) focus on the notion of the value chain for social improvement and welfare. Finally, Maldonado and Moya (2013) show the importance of combining social improvement policies with reverse logistics in developing and improving food banks actions and logistics schemes. Those authors identify different ways to reduce hunger and malnutrition, as, for example, development of food banks, different ways of increasing incomes or reducing food acquisition costs, or free distribution of dietary complements of different nature and actions.

According to the FAO (2010, 2011), deployment of the actions on improvement dietary composition of daily meals in families belonging to sensible population is crucial to their development since they decrease hunger and malnutrition. To this fact, an initiative called Latin America and the Caribbean without Hunger was launched by the FAO (2011). In this initiative, several types of stakeholders and actions were deployed. From this initiative, it was concluded that several measures could be implemented to combat malnutrition (Maldonado & Moya, 2013). The initiatives may be aggregated into five major categories:

1. Primary economic improvement: in this category, the authors included initiatives that allow the families' income increase to purchase basic food and nutritional elements. The main initiatives in this category are subsidies and income transfer actions. Those initiatives are related to financial transfers, without direct relation to logistics.
2. Cost reduction to increase accessibility to food: initiatives in this category aim to reducing the cost of basic foods for sensible groups of populations by giving income not to families but to vendors in order to make basic foods less expensive for beneficiaries. The most known examples in this category are subsidies to retailers, tax exemptions, or programs of free (or cheaper) basic baskets. Anyway, those initiatives do not have (or little) impact on logistics and freight transportation. They can indirectly increase logistic flows of retailers but do not need to deploy specific distribution channels and supply chains.
3. Food access initiatives: they aim to increase access of sensible groups of population to basic food by providing them a set of basic products. In this category, the initiatives are more heterogeneous, and the main examples are the programs on delivering healthy food to hospitals, nurseries, and schools, deployment of social retailers (which have a specific logistics based on reverse flow collection), food banks, or distribution of dietary complements to families. In all those cases, specific supply chains are needed (or improvements of existing channels to take into account reverse flows or new products). They have a direct impact on supply, production, and distribution flows.
4. Education and monitoring initiatives: this category includes all initiatives that support and promote good habits, but also those that aim to steer and follow the risk of families and sensible groups of the population regarding malnutrition. They are, like categories 1 and 2, not directly related to logistics.

5. Promotion and development of self-production: the last, but not the least, the category is related to those actions that help families in sensible groups of population to satisfy some part or entire of their nutritional needs by themselves by providing them the agricultural resources (or access to them) to develop self-production. Although both creation and distribution of those resources need a logistical organization (sometimes being specific to those initiatives), the focus of this category is not on the distribution of products but on promotion their production for self-consumption.

As seen above, from those five categories of initiatives, two of them are related to logistic issues, but only one directly deploys specific logistic channels with an aim to distribute products in order to help sensible groups of populations, not to make profits. This chapter focuses on one of the initiatives in this category, i.e. distribution of dietary complements. The authors focus on this strategy for two reasons. The first is that it is one of the main practical solutions for emerging countries to reduce malnutrition. The second is that it has received small attention in the scientific literature.

Moreover, the case of Bienestarina in Colombia (a public-supported dietary complement addressed to children, mothers, and other inhabitants of sensible groups of the population) has received a particular attention recently (Palacios, Morana, Gonzalez-Feliu, & Devia, 2016; Peñaloza, Palacios, & Gonzalez-Feliu, 2016). The present chapter synthesizes those works and proposes a systemic vision of the distribution system of Bienestarina in relation to local production and development of local economies.

In Colombia, the government, via the Colombian Institute of Family Welfare (Instituto Colombiano del Bienestar Familiar, or ICBF), developed a series of programs to combat malnutrition by providing the families with the highest risk in terms of their dietary complement, mainly addressed to childhood. Indeed, since 1976, the ICBF produces the Bienestarina product as a dietary complement of high nutritional value as a strategy to strengthen the fundamental right to food security in the country (Dirección Nacional de Planeación, 2006). In early 2013, the ICBF launched the Bienestarina Más program, which proposed an improved product reformulation (Presidencia de la República, 2013), aimed at vulnerable Colombian population, especially among children. This product benefits children, teenagers, pregnant women, mothers, different ethnic groups, families, and seniors belonging to levels 1 and 2 of the System for the Selection of Beneficiaries for Social Programs (SISBEN), the Colombian national system for identification of beneficiaries of social subsidies (Peñaloza et al., 2016). It classifies people according to their socio-economic level into six levels, where level 1 is for homeless people and extreme poverty, while level 6 is the highest level of affluence.

The importance of this research is based on the fact that in recent years there have been irregularities in the management of Bienestarina involving distribution processes, product traceability, lead time distribution to the beneficiary (end consumer), among others. One example is the case of product expiration, according to *El Nuevo Siglo* (2013). 190 expired product packages were reported in the period of January-June 2012. Moreover, opposing European and North complementary food, which is based on extraction and biochemical products, Bienestarina and other Latin-American dietary complements are based on flours. The particularity of Colombian Bienestarina is that almost all flour is of domestic origin, which promotes national production and ensures a basic level of food safety (for example, Colombian corn cannot be of transgenic nature by law).

The program is entirely steered by the ICBF, a public body which directly depends on the Colombian Ministry of Social Protection. Moreover, it has the particularity that the product is entirely produced in Colombia and then distributed by a combined network of national and regional facilities, showing an

important contribution to local food production and distribution. For those reasons, the authors propose to describe the case of Bienestarina following a deductive case study methodology and focusing on the description of the distribution logistic network.

## **MAIN FOCUS OF THE CHAPTER**

### **Theoretical and Methodological Framework**

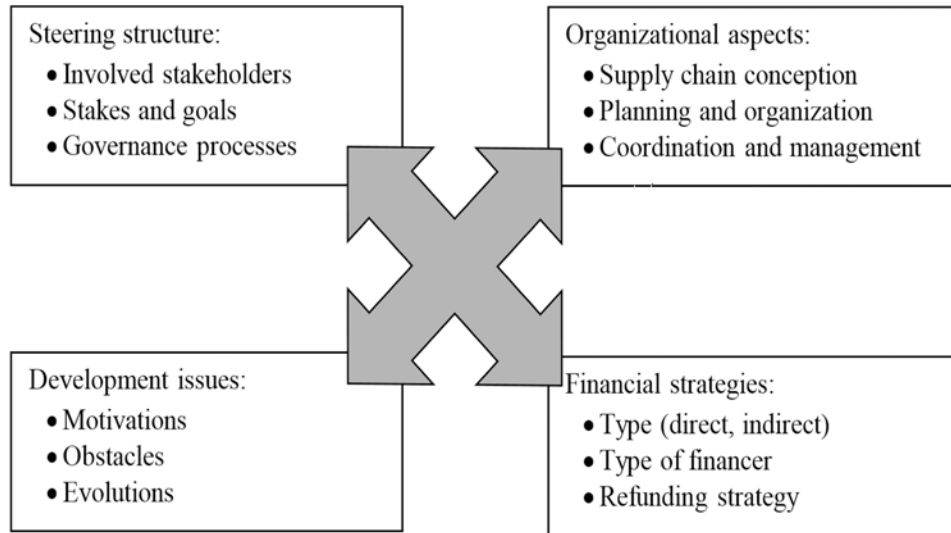
There are many frameworks to identify and characterize supply chains. Among the most known are the SCOR model (Supply Chain Council, 2008) and the Supply Chain characterization framework by Lambert, Cooper, and Pagh (1998). The first model represents various echelons of supply chain and main categories of the processes, the processes themselves, related needs, and main tasks derived from those needs and resources of companies. The second is a global conceptual representation which includes a structure of supply chain, its main stakeholders, and its technical and managerial components (Lambert, 2001).

Those models are mainly related to business and intra-organization logistics but remain the valid tools to examine supply chain management in organizations of any type. However, they focus on logistic processes and other associated activities only, completed at private and contractual levels only. An alternative to those frameworks can be found in industrial and system engineering, where a framework to examine the viability of industrial system can be related to four main elements: steering, organization, development, and financing (Gonzalez-Feliu, Taniguchi, & d’Arcier, 2014). The authors identified those four elements on a structure-based and economic viability goal for urban logistics initiatives, proposing the first analysis framework of urban freight distribution that addressed those four elements. The authors aim to extend this framework to food distribution, by re-defining the four elements as follows:

1. Steering structure defines various stakeholders involved in steering and monitoring the deployment of food distribution systems, as well as their relations and communication processes. Different actions aimed at consultation and main tools for steering are also included in this category.
2. Organization of the process is the set of elements that allow the distribution system to be conceived and designed, as well as to ensure its daily operations. In other words, this category defines the organization and management of the whole distribution chain and its related processes.
3. Development of the distribution system is the way in which the system has spread and/or evolved during the period from its starting point to the situation when it is operational. Therefore, it is important to focus on the actions performed and constraints to which the distribution system is a subject to better understand its evolution.
4. Financial strategies need to be addressed as well. Although in private systems those strategies are well set in advance and once the system is operated, it is clear how the investments will be refunded, but not so clear in public-based systems. Moreover, it is important to know who finances and pays for the system (mainly in social improvement logistics systems) to better understand the other three components.

From those four elements, the authors orient the analysis of the Bienestarina distribution to define its organizational model, as summarized in Figure 1.

Figure 1. Proposed framework for defining social improvement logistics systems  
 Source: Adapted from Gonzalez-Feliu, Malh  n  , Morganti & Morana (2014)



The case study has been developed via the collection of secondary and primary data to first characterize the distribution system (more details on the data collection and analysis for the characterization of the system is found in Pe  aloza et al. (2016)), completed by the second data collection operation, mainly on the basis of interviews to the ICBF. Those data have been aggregated and synthesized following the theoretical framework above to build the deductive case study presented below.

## The Proposed Case Study

In order to relate the theoretical framework proposed above to practice, the authors aim to develop the case study of Bienestarina distribution. Over 30 years, Colombia has been implementing the strategy to improve food consumption of high nutritional value through the production and distribution of food complements based on mixtures of plant origin with high nutritional content. This product, called Bienestarina, is addressed to populations under danger of malnutrition. In other words, the purpose of the production and distribution of this complement is to arrive in time to children, young, elderly, poor families, ethnic groups, and other population who require sufficient nutrients which their basic food do not provide sufficiently. Production and distribution of Bienestarina to the vulnerable population of Colombia is one of the strategies of the ICBF to combat malnutrition, especially among children.

This food complement, which is constituted of a mixture of flours of vegetable origin, such as corn starch, wheat, rice, soy, and milk powder, is a highly enriched source of calories, carbohydrates, proteins, natural fats, calcium, vitamins A and C, and other nutrients. It is a reinforcement to attack the problems of child malnutrition as a dietary complement and should not replace the basic food or breast milk. Bienestarina is also used as an input in the preparation of different foods such as cakes, cookies or bread, among others, which are also aimed at the target population in the different programs of the ICBF. The nutritional information about the current form of Bienestarina is presented in Table 1.

*Table 1. Nutritional information for Bienestarina (per 100 g portion)*

<b>Component</b>	<b>Content</b>
Energy (kcal)	360
Carbohydrates (g)	64.79
Protein (g)	20.145
Fat (g)	3.082
Total dietary fiber (g)	1.806
Calcium (mg)	700
Phosphorus (mg)	550
Iron (mg)	14.1
Vitamin A (UI)	2,000
Vitamin C (mg)	45
Niacin (mg)	7.3
Thiamine (mg)	0.5
Riboflavin (mg)	0.6
Vitamin B6 (mg)	0.9
Folic acid (mg)	160
Vitamin B12 (mg)	1.4
Zinc (mg)	8.3

Source: Colombian Institute of Familiar Wellness, 2009

The Bienestarina program was launched in 1976 by the Colombian Ministry of Social Protection (Dirección Nacional de Planeación, 2006). After that, a research on different vegetal mixed formulations, the first Bienestarina formulation, was produced and distributed in 1976. In 1989, the process of flour pre-cooking was deployed and operated. Other changes, including the ones in the formulation and the raw materials used, were introduced in 2000, 2002, 2004, and 2013. All those evolutions implied important changes in the production chain but not in the distribution one. Indeed, the distribution system is strongly dependent on the nature and activity of the subcontractor.

The entity in charge of programming, selling (to collective bodies), and managing the production and distribution of Bienestarina is the ICBF, and this for all programs. However, there are different programs and functions, and the ICBF is not able to manage every process by its own. It is why the logistic operations (for the entire supply chain of Bienestarina) are subcontracted to a private company. This subcontract is made by a public concession. Since December 2007, the ICBF granted the concession to the Industrias Del Maiz S.A. Corn Product Andina (IDM) Company, which deployed a branch, named Ingredion, which manages production and distribution of Bienestarina and other foods of high nutritional value.

The most recent program launched in 2013 is Bienestarina Más, which proposed an improved product, mainly enriched with vitamins and other essential elements. The ICBF defines the number and locations of beneficiaries, together with public bodies. Indeed, the ICBF defines a yearly production which is derived from a number of “credits”. Those credits have to be acquired by public entities (mainly municipalities, but also nurseries, hospitals, or other public institutions) who define a number



of beneficiaries according to the number of credits acquired. Then, the ICBF plans a demand (making the Bienestarina supply chain being on pulled flows steering mode) and its characteristics (a type of products, quantities, and frequencies).

Knowing the demand, Ingredion is in charge of the production, which implies supply of raw materials and entire distribution process. Final destinations of the distribution process steered by Ingredion are delivery points where executing units (in general, operators in charge of bringing Bienestarina to beneficiaries) pick up the required demand.

Currently, the subcontractor (Ingredion S.A.) has two production plants, one located in Sabanagrande (Atlantico region, in the north of Colombia, near Barranquilla on the Atlantic side of the country) and Cartago (Valle region, in the west of the country, near Pereira and between Bogotá and the Pacific Ocean). The main raw products needed to produce Bienestarina are corn starch, wheat, rice, soy, and milk converted into milk powder before being mixed with other ingredients. All raw products are derived from national producers, which implies local processing and manufacturing for flours and milk powder, as well as for additives. Although it would be possible to use raw products issued from non-Colombian producers to make flours and additives, the specifications for the subcontracting impose criteria of quality, proximity, and reactivity which promote local production. However, taken into account the geography of Colombian agriculture, “local” production needs to be considered at a macro-regional level. This is also the case of milk powder, where production needs to be local to ensure the freshness of milk taken into account the need of not adding conservatives. From each production macro-region, local manufacturers produce flours and milk powder and supply them to the Bienestarina mixing plants to produce the final product.

Due to the location of the two plants, and the current number of beneficiaries (about 9 million inhabitants (Peñaloza, Palacios & Gonzalez-Feliu, 2016) spread on the entire territory of the country), the ICBF uses a division in eight macro-regions, according to the issues of regional distribution programs and operating costs of logistic, as shown in Figure 2.

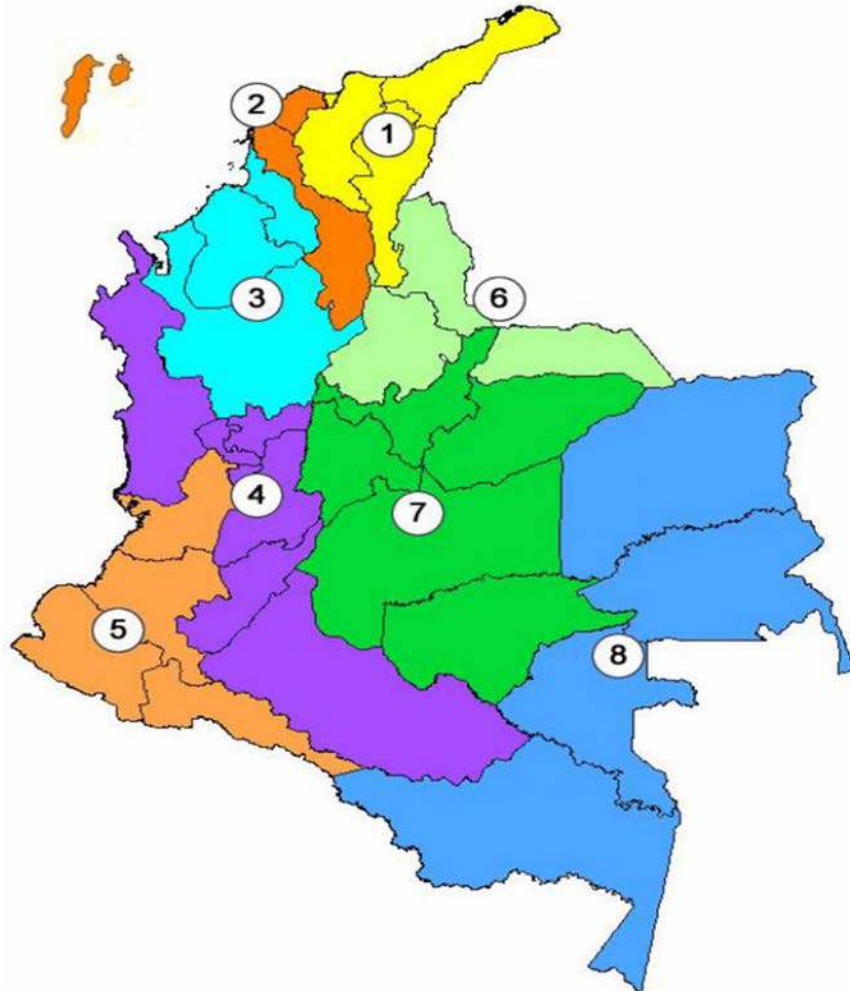
To each macro-region, a number of first-tier warehouses (called primary distribution points by the ICBF) is associated. Those warehouses have the function of reception and managing the inventories to distribute the assigned beneficiaries for the entire macro-region. The demand management is made by the ICBF in function of the number of credits bought by public entities at each final destination, and then the monthly production and distribution plans. However, the inventorying operations take place at first-tier warehouses to ensure a higher inventorying capacity and a better reactivity, taken into account the geography of Colombia.

After preparing the commands in regional warehouses, the products are transported to second-tier facilities, which are called delivery points and are the interface between the distribution system and the executing units that deliver the product to the beneficiaries. There is approximatively a set of 5,000 delivery points, spread throughout the country. The Bienestarina supply chain uses different mechanisms and means of transportation (land, air, and sea) to bring a product to the remote parts of the country and achieve full coverage of the territory, as shown in Table 2.

From the delivery points, products are either delivered to the executing units or those units go to the delivery points to pick up the commands. Those units are in charge of distribution of the products to the beneficiaries. Each unit has a set of beneficiaries that are assigned to it and a weekly distribution plan. Depending on a type of the beneficiaries (hospitals, nurseries, households, etc.), demand is either shipped or collected by a beneficiary. This final echelon of the chain is difficult to be steered since no traceability exists after the executing units pick up the goods. A recent study of the Universidad Nacional de Colombia shows that the production and distribution chain until the executing units result on negligible

Figure 2. Division of logistic distribution macro-regions (MR)

Source: Peñaloza, Palacios & Gonzalez-Feliu, 2016



product loses. However, the interviews of a selected number of representatives of the executing units made the authors to identify some dysfunctions in this last echelon. The first is that several beneficiaries do not collect the products systematically, and a reassignment is not expected by the plans. The second is a non-negligible rate of self-consumption of the products, mainly those not claimed by the beneficiaries. The third is a difficulty to have an in-deep centralized knowledge of the entire final distribution system (an information system had not been implemented when the case study was constructed), which do not allow to have a complete product traceability. Moreover, local press reports some unfair practices, like using the product to feed farming animals instead of the population under malnutrition, but those practices have not been observed and confirmed (since they are made by a set of executing units and, being illegal, are hidden to any surveying action). However, in order to improve the efficiency of this last echelon and the entire supply chain, the ICBF has recently deployed an information system (which comes in full operation in 2017) and contributes to several research projects with Colombian leading universities.

Table 2. Logistic information about the Bienestarina distribution process in Colombia

Macro-region	Regional warehouse	Number of delivery points	Main transport modes
1	La Guajira	24	Land
	Cesar	238	Land, River
	Magdalena	279	Land, River
2	San Andrés	12	Land, Sea
	Atlántico	295	Land
	Bolívar	350	Land, River
3	Sucre	13	Land, River
	Córdoba	47	Land
	Antioquia	359	Land
4	Caquetá	31	Land, River
	Risaralda	44	Land, River
	Quindío	44	Land
	Chocó	115	Land, River, Sea
	Caldas	119	Land
	Tolima	177	Land
	Huila	188	Land
5	Putumayo	9	Land, River
	Nariño	72	Land, Sea
	Cauca	97	Land, River, Sea
	Valle	341	Land, Sea
6	Arauca	17	Land, River
	Santander	150	Land
	Norte de Santander	397	Land
7	Casanare	44	Land
	Guaviare	47	Land, River, Air
	Meta	124	Land, River, Air
	Boyacá	156	Land
	Cundinamarca	185	Land
	Bogotá	626	Land
8	Guainía	2	Land, River, Air
	Vaupés	7	River, Air
	Amazonas	9	Land, River, Air
	Vichada	14	Land, River, Air

Source: Authors' elaboration from Colombian Institute of Familiar Wellness (2009)

Although the Bienestarina powder is the main product under distribution, there are other products provided to the beneficiaries. There is liquid Bienestarina (with three flavors) based on milk also produced and distributed. Moreover, some artisanal products are also produced locally. Indeed, some primary distribution points and executing units are engaged in the manufacture of food products using Bienestarina as an ingredient (cakes, biscuits, juices, etc.). Those products which need Bienestarina powder are produced locally and mainly use local agricultural products (fruits but also some flours and sugar cane products) resulting in the development of local industries. Beneficiaries of the product have a possibility to go to the executing units or corresponding primary distribution points to receive the product, just as the executing units has to go to the primary distribution point to receive the product, as shown by the purple arrows in Figure 2 with opposite way to the regular supply chain.

To summarize, the Bienestarina supply chain can be characterized as follows. The authors define the longitudinal structure of Bienestarina supply chain as shown in Figure 3. The Bienestarina supply chain counts six echelons when considering various steps from raw material (RM) suppliers to final consumers (beneficiaries):

- Only one echelon is related to the suppliers since the factories do the complete production process, so the suppliers provide the factories with raw materials only, without any industrial transformation before arriving at the factories. The only exception to this statement is that of vitamins and oligo-elements, which can be acquired from specific industrial producers.
- One echelon is related to production, although it could be decoupled in other three echelons: one for flour production, one for Bienestarina powder production (resulting in the mix of different flours, with the addition of vitamins and oligo-elements), and the third, when applicable, related to the production of elaborated products with the addition of Bienestarina. Currently, two main types of elaborated products are proposed: enriched liquid milk and cookies.
- Three echelons are related to the distribution system, which shows the importance and main place of the distribution system in the overall Bienestarina supply chain.
- The last echelon is related to the beneficiaries.

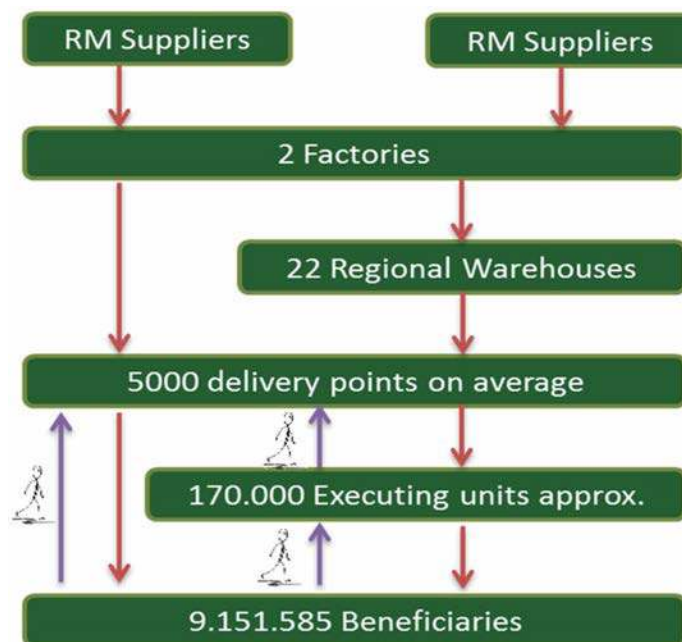
In order to illustrate the proposed characterization framework, the authors synthesized the four planning elements (steering, organization, development, and financing) (Table 3).

This exploratory overview of the Bienestarina system shows that the Bienestarina logistics follows a supply chain management structure, but there are substantial differences with respect to commercial logistics chains. The steering of the supply chain is ensured by the customer (the ICBF and the end-consumer (beneficiaries) are not customers). The rates of beneficiaries are established by the ICBF with local authorities (customer of the customer), adding a complex commercial/use chain with little impact on supply chain organization and steering. However, the logistics operations need to be ensured, and although there is not an evident relation between the service quality and the satisfaction of the consumer, the steering organization (ICBF) evaluates the global satisfaction of the system.

But is this system a specificity of Bienestarina or Colombian context? To give a preliminary set of elements to the discussion, the authors propose to explore other three systems: two in Mexico and one in Peru.

Figure 3. Scheme of Bienestarina distribution chain

Source: Authors' own elaboration based on Colombian Institute of Familiar Wellness (2009)



## SOLUTIONS AND RECOMMENDATIONS

This product, exclusive of Colombia and developed and distributed under welfare programs of the Colombian Ministry of Familiar Protection, cannot be found in any other country. However, the logistics system presents similarities to other products and programs in the world. For example, in Mexico, two similar programs exist. The first is LICONSA which is aimed at production and distribution of a nutritionally-improved milk. It is not free, but its price is much lower than those of classical milk. The product is mainly distributed to sensible population locations. The second program is DICONSA which is a public company that produces and distributes flour (mainly of corn, but other variants are also produced) to public restaurants (mainly nurseries, schools, and hospitals).

The LICONSA program was established in 1944 with the objective of increasing supply of milk by ensuring of its good quality and affordable prices for the population in a vulnerable situation.

Taking into account the results of this work and comparing them with the analysis of the logistics processes of the LICONSA supply chain (Mexican nutritional enriched-milk), some differences and similarities have been found.

Differences:

- Percentage of population served is 5.97% in Mexico and 19.14% in Colombia. In Colombia, 1 out of 5 citizens is served, while in Mexico, only 1 out of 20 citizens, respectively.
- In Mexico, the LICONSA distribution process is supported by the use of the geographic location system (SISGE). This system allows an optimization of a sale point location, in order to be more efficient in terms of delivery time, distance, routes, among others.

Table 3. *Synthesis of planning elements in the Bienestarina supply chain*

Methods and structures	Steering structure	Organizational aspects	Development issues	Financial elements
<b>Planning and control methods</b>	The system is entirely steered and planned by the ICBF. Ingredion adjusts and executes those plans.	The entire supply chain is planned and controlled by Ingredion following global planning methods.		
<b>Workflow and activity structure</b>		SCM is made by Ingredion. Operations are managed by Ingredion, and only follow-up reports for yearly updating of the contract are made by the ICBF. Local agriculture at the national level is promoted.	Supply chain activities were firstly managed by the ICBF, then subcontracted. From 2007, the current system is implemented.	The service is paid by public entities through the beneficiary tickets to the ICBF, which then uses the funds to finance the supply chain costs
<b>Organization structure</b>		ICBF is a very hierarchical structure with many departments. Ingredion is more specialized but also has a hierarchical structure.	The organizational structure has not been strongly evolved over the years	
<b>Information and communication structure</b>	There is no traceability system. The steering of the supply chain is decentralized. The information exchange between the ICBF and Ingredion concerns monthly and yearly indicators of quantities delivered.	Exchanges on a number of beneficiaries between the ICBF and Ingredion, linear structure following the supply chain structure for internal transactions.		
<b>Product flow structure</b>		6-echelon supply chain: raw material suppliers, production plants, regional warehouses, delivery points, executing units, and beneficiaries	Number and variety of products and diversity of flows grow. The structure is similar for all of them.	
<b>Management methods</b>	Management is facilitated by Ingredion. Vertical management seems to be predominant.	Executing units are mono-personal or very small structures (no need of strong management methods); plants and warehouses use classic SCM methods.	Management has evolved over the last years towards the adoption of international SCM standards.	
<b>Power and leadership structure</b>	ICBF is a "customer" configuration since it purchases services from Ingredion.	The supply chain has a very decentralized leadership structure which embarrasses the identification of dysfunctions and improvement opportunities.		
<b>Risks and rewards structure</b>	Risks are forecasted by the ICBF, but operational issues are steered and managed by Ingredion.	No rewards structure has been identified. Main risks are related to transport/traffic conditions, ruptures in raw materials, production problems and losses/bad use of products in the different echelons of the supply chain.		Risks are assumed by Ingredion but can be shared with the ICBF.
<b>Culture and attitude</b>	The decentralized steering and the lack of traceability have an impact on losses at the final levels.		With the increase of information about the system, collective conscience and solidarity have increased.	Not all public authorities have the same sensibility to promote the system and buy services.

Source: Authors' own elaboration

- Similarities:
- Production and distribution processes are managed by the public entities (the ICBF in Colombia and the SEDESOL in Mexico) which are in charge of ensuring the well-being of the population.
- Beneficiaries are the people who are in the conditions of food vulnerability.
- The last mile distribution is similar. There are established final points (sale points, executing units) which are the ones that have contact with the target population.

The authors could also establish a parallel with DICONSA (a flour-based product similar to Bienestarina, also for Mexican families) or with the Peruvian Glass of Milk program (Programa Vaso de Leche) (Ministerio de Desarrollo e Inclusión Social, 2013), which both aim to distribution of nutritionally-enriched menus, mainly for breakfasts or pre-dinner meals, to schools. In both cases, the main difference is that the beneficiaries are not families, but public entities, making the product traceability higher and the process easier to monitor and plan. However, in all four cases, the authors observe similar patterns, related to the four elements defined above. More precisely:

- On the financing viewpoint, all those systems start from public concern and need public support. However, the percentages of public financing capacity, as well as the mechanisms of refunding or distributing funds, are not standardized. However, it is clear that an efficient organization is needed to ensure the good use of those funds.
- On the development viewpoint, their evolution depends on that of the beneficiaries. In other words, those systems have a vocation to support the nutrition development of families. More they contribute to this nutritional development, fewer products are needed. The disappearance of those supply chains as useless would be a consequence of the good use and deployment of the food distribution systems for social improvement. However, this final stage is far to arrive, but the evolution in the number and nature of beneficiaries is a good indicator of the global performance of the social improvement logistic schemes.
- On the steering viewpoint, those systems are promoted and guided by public entities, mainly in the form of yearly or multi-yearly plans. The way those plans are actuated and deployed depends on the national (or regional) context, but in general, the logistics management is made by the experts who act as subcontractors of the public entity. The role of public authorities is to monitor the subcontractors, finance the distribution system, and verify correct actuation of the yearly plans.
- Finally, the organization of the supply chain seems to be a consequence of the other three elements. Different choices can be made, but Bienestarina is following an integrated supply chain with the consequent management choices, steered by a subcontractor. This seems to be the case of LICONSA, DICONSA, and Programa Vaso de Leche, so the first statement that can be induced is the need of deploying efficient and integrated supply chains even if there is no product to sell and no economic value. However, the social value of social improvement of supply chains is clearly identifiable, and in a context of limited resources and high needs in terms of malnutrition reduction, this efficiency seems crucial.

## **FUTURE RESEARCH DIRECTIONS**

All four initiatives seem to incite the use of local producers and are based on the extraction and transformation of raw products which are cultivated or produced in a country. However, the details on the contribution of such systems to local production economics need to be studied further.

The work completed by the authors remains preliminary. A wider comparison with other initiatives existing in Latin America and a qualitative interview-based analysis on key stakeholders of the Bienestarina supply chain would give more evidence on the characteristics of social improvement supply chains and define the main analysis framework of those systems. Moreover, further researches should be focused on traceability and operations management in order to identify the major critical points of the Bienestarina supply chain and propose management guidelines to improve their efficiency and sustainability.

## **CONCLUSION**

The ICBF program of Bienestarina is considered one of the main actions to combat the problems of malnutrition in Colombia, which demonstrates reductions in the rates of chronic malnutrition and underweight (Colombian Institute of Familiar Wellness, Instituto Nacional de Salud, Profamilia, Ministerio de Protección Social, & DANE, 2010). This is why it is important to characterize the supply chain deployed to bring Bienestarina just in time and making compliance with the fundamental rights of the vulnerable population. For the crucial contribution of logistics to reach the main objectives of the Bienestarina plans, this case is a good example of social improvement logistics.

Via adaptation of the analysis framework of Gonzalez-Feliu et al. (2014) to Bienestarina, and a synthetic comparison of this system to similar social improvement logistics initiatives in Latin America, the authors have defined the main patterns of agroindustrial-based social improvement logistics and highlighted the importance of logistics efficiency in non-economically deployed logistics networks.

The authors observe that the logistics chain of Bienestarina presents particularities with respect to commercial logistics (by the fact that the end consumer is not the customer who pays for the product), resulting in the central role of the public entity managing and contracting the logistics system. The operator is making a service (close to that of commercial logistics, with lower costs), but the indicators for evaluating the performance of this supply chain seem different (since the customer's satisfaction is not measured, and instead the capacity of reaching families is preferred as the main measure of satisfaction). On the other hand, and with respect to humanitarian logistics in disasters, the urgent nature of distribution and suffering is perceived differently. The aim of social improvement logistics is to improve the quality of life in a medium-long term, whereas that of humanitarian logistics in disasters is to reduce suffering as quickly as possible.

Without entering to compare in-depth those three types of logistics, the authors observe that social improvement logistics seems to have particularities that make it different from other humanitarian logistics and commercial logistics. This chapter gives a first analysis by applying a combined analysis framework but remains exploratory. More in-depth analyses will be required to characterize social improvement logistics. Moreover, the question of evaluation, then of deploying suitable dashboards, on the line of current works for urban logistics (Gonzalez-Feliu & Morana, 2014; Morana & Gonzalez-Feliu, 2015) specific to dietary complement supply chains for social improvement would be an important future development of this research.



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## KEY TERMS AND DEFINITIONS

**Bienestarina Program:** A production-distribution program of a dietary complement, called Bienestarina, steered by the Colombian government (more precisely, the Colombian Institute of Familiar Welfare (ICBF)) to fight malnutrition on sensible populations.

**Commercial Logistics:** A set of techniques and methods dealing with planning, design, and support of business operations that deal with procurement, purchase, inventory, warehousing, distribution, and transportation, among others, in order to bring a product or service to its final user.

**Dietary Complement:** A product intended for ingestion that contains a “dietary ingredient” intended to add further nutritional value to the diet. A dietary complement is ingested alone (or diluted with water) and aims to supply to deficiencies in diets by substitution to traditional foods on only the concerning elements, like some vitamins or minerals). Dietary complements may be found in many forms such as tablets, capsules, soft gels, gelcaps, liquids, or powders.

**Dietary Ingredient:** One or any combination of the following substances: vitamins, minerals, herbs (or botanical products), amino acids, concentrates, metabolite, constituents, or extracts. It can be used to complement diets and meals.

**Humanitarian Logistics:** A set of logistics operations deployed to react to emergencies (natural or human-based), and which follow a completely different logic than commercial logistics.

**Social Improvement Logistics:** A set of logistics operations developed to improve the social status of populations, which are of lower urgency than those of humanitarian logistics but follow aims and issues which remain different than those of commercial logistics.

**Supply Chain Management:** An integrated management strategy that includes the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities, from the extraction of raw materials to the delivery at the retailers’ or end- consumers’ locations, and including all the different stages.