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# **FOOD SECURITY AND NUTRITION IN SOMOTO, NICARAGUA**

EVALUATION OF FOOD SECURITY AND NUTRITION IN *LOS BARRIOS UNIDOS*

Scriptie ingediend door **Annelore De Boe** voor het behalen van het diploma Banaba Internationale  
Samenwerking Noord Zuid



# Food security and nutrition in Somoto, Nicaragua

Evaluation of food security and nutrition in *Los Barrios Unidos*

Annelore De Boe

## Abstract

This research focused on the food security and nutritional situation in the urban areas of Somoto, in Nicaragua. The state of food security in the urban areas (*Los Barrios Unidos*) was evaluated on the basis of availability, accessibility and utilization. To obtain more insight in the situation a combination of research methods was used: family visits with participatory observations, informal interviews and a dietary diversity questionnaire adapted from the Food and Agriculture Organization. Basic food products are available but the availability of various other foods is low. In general minor constraints were observed in obtaining physical access to food products. The results showed that the economical access in the *Barrios* is a moderate problem with a clear difference between the *Barrios*. Certain habits can have a negative effect on the absorption of micronutrients. Social factors that also determine food security are unemployment, adolescent pregnancy, *machismo* and school feeding programs. It is clear that a multi-dimensional approach is needed to enhance the food security and nutrition in Nicaragua.

Keywords: food security, nutrition, mothers and children, urban areas, Somoto/Nicaragua

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*“Nothing is impossible, the word itself says ‘I’m possible’!”*

*Audrey Hepburn*

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**Annelore De Boe**

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## MANAGEMENT SUMMARY

En este resumen primeramente hablamos de la definición de seguridad alimentaria y la situación en Nicaragua. A continuación, algunos aspectos del estudio a ser discutido. Finalmente resumimos las conclusiones principales de mi investigación y damos algunas recomendaciones.

### Seguridad alimentaria

Seguridad alimentaria existe:

*"cuando todas las personas tienen en todo momento acceso físico y económico a suficientes alimentos inocuos y nutritivos para satisfacer sus necesidades alimenticias y sus preferencias en cuanto a los alimentos a fin de llevar una vida activa y sana" (Cumbre Mundial sobre la Alimentación, 1996)*

La Seguridad alimentaria tiene 4 ejes importantes: la disponibilidad, el acceso, la utilización y la estabilidad. La seguridad alimentaria es un problema complejo.

La disponibilidad corresponde a la 'oferta' dentro del tema de seguridad alimentaria y esta a función del nivel de producción de alimentos, infraestructura y el comercio neto. La dimensión del acceso se relaciona con económico y físico a los alimentos. Una oferta adecuada de alimentos a nivel nacional o internacional en sí no garantiza la seguridad alimentaria a nivel de los hogares. La utilización normalmente se entiende como la forma en la que el cuerpo aprovecha los diversos nutrientes presentes en los alimentos. La estabilidad en el tiempo de las tres dimensiones anteriores es importante. Las condiciones climáticas adversas, la inestabilidad política o los factores económicos (el desempleo, los aumentos de los precios de los alimentos) pueden incidir en la condición de seguridad alimentaria de las personas.

### Seguridad alimentaria en Nicaragua

La Declaración de Roma sobre la Seguridad Alimentaria Mundial dice que todas las personas tienen el derecho a tener acceso a alimentos sanos y nutritivos, en concordancia con el derecho a una alimentación apropiada y con el derecho fundamental de que toda persona no padezca de hambre.

La Constitución de Nicaragua, aprobada en 1987, el artículo 63 enuncia el derecho del pueblo a estar protegido contra el hambre.

*Artículo 63. Es derecho de los nicaragüenses estar protegidos contra el hambre. El Estado promoverá programas que aseguren una adecuada disponibilidad de alimentos y una distribución equitativa de los mismos (Asamblea Nacional, Nicaragua).*

El Ley de Soberanía, seguridad alimentaria y nutricional (N° 693) (2009) tiene por objeto garantizar el derecho de todas y todos los nicaragüenses que cuenten con los alimentos suficientes, inocuos y nutritivos. Esto se está aplicando a través de diferentes programas: programas de alimentación

escolar, alimentos y educación nutricional, venta de productos básicos a precios justos, los programas de semillas y otros programas.

La seguridad alimentaria en Nicaragua es generalmente más relacionados con los problemas de acceso económico a los problemas de disponibilidad de alimentos.

En 2009 el 21% de la población nicaragüense vivía con US\$ 2 al día o menos y el 5,5% vivía en la pobreza extrema se define como US\$ 1.25 por día o menos. También hay que mencionar que las tasas de pobreza varían entre regiones. La incidencia de la pobreza en 2005 fue de 70% y 36% para la pobreza extrema en el departamento de Madriz. Según la OMS la prevalencia el retraso del crecimiento en niños menores de cinco años, que es una medida de la desnutrición crónica, cayó de 30% en 1990 al 23% entre 2006-2012 y el 5,7% de los niños tenían bajo peso. La mayor prevalencia de retraso del crecimiento se encuentra en los departamentos del norte, por ejemplo 35% en Madriz.

La seguridad alimentaria y nutricional es aceptado nacional y mundial como derecho básico de las personas. Un estudio cualitativo sobre seguridad alimentaria y nutricional cumple en este sentido con los objetivos de INPRHU.

### El estudio

La seguridad alimentaria y nutricional es un problema complejo que tiene que ver con problemas históricos, culturales, desnutrición, salud y comercio nacional y global. El FAO ha creado una guías sobre diversidad de dieta y memoria de alimentación de 24 horas para medir seguridad alimentaria al nivel hogar y individual. Esta guía es útil para analizar el acceso de los hogares y es una buena aproximación para la adecuación de la alimentación.

La meta del estudio fue obtener una visión sobre el estado de inseguridad alimentaria y nutricional en Los Barrios Unidos con enfoque en los Barrios (10, 14, 20 y 24). La idea era hacer un estudio para informar capacitaciones y talleres sobre nutrición y seguridad alimentaria. Los métodos para el análisis fueron cualitativos y una grande parte del estudio se basa en observaciones participativos para obtener datos.

La primera parte era una encuesta alimentaria de memoria de las ultimas 24 horas, la segunda una encuesta de diversidad de dieta y por ultimo una encuesta sobre practicas de lactancia materna. Dejamos con las mamás un diario de alimentos durante una semana para observar la dieta de la mamá. Una semana después hicimos una encuesta sobre la diversidad de la dieta de las mamás. Después con algunas familias regresamos para hacer preguntas de seguimiento y para clarificar dudas o inconsistencias en las encuestas.

El estudio tenía limitaciones que hay que tomar en cuenta. La encuesta no es estadísticamente significativa. Mi nivel de español puede haber sido una barrera. Por esta razón las encuestas se llevaron a cabo por dos hispanohablantes. Es importante tener en cuenta que la encuesta no indica la cantidad exacta de alimentos consumidos. Los criterios fueron en general no realizados en el caso de la edad de la mamá. La mayoría de las madres entrevistadas tenían menos de 25 años.

## Conclusiones

La diversidad alimentaria es una medida cualitativa que refleja el acceso de los hogares a los alimentos y al mismo tiempo una medida indirecta de la adecuación de micronutrientes del nivel individuo. Es importante mencionar de nuevo que un estudio de este tamaño con pocos recursos no es significativo estadísticamente. La meta del estudio fue para identificar cualitativamente las barreras de seguridad alimentaria y crear una visión en general sobre la situación de seguridad alimentaria y nutricional para ayudar el programa de desarrollo comunitario en el buen trabajo que hacen.

Las barreras mas grandes para obtener un estado de seguridad alimentaria son el desempleo, la educación, el embarazo temprano, hábitos de alimentar niños y la utilización de la comida.

Los productos básicos están disponibles en Somoto, aunque la disponibilidad de productos diversos es baja. Hay pocas oportunidades para conseguir vegetales, frutas y carne (de alta calidad) en los Barrios Unidos. Especialmente en los sectores 20 y 24 hay pocas oportunidades por causa de acceso económico, así como falta de recursos para guardar estos productos durante mas de uno o dos días.

La diversidad de dieta es baja en los Barrios 20 y 24 pero tampoco es muy alta en los Barrios 10 y 14. Muchas familias no comen muchas frutas y vegetales. Aunque hay consumo de carne, es muy probable que la cantidad de carne no es suficiente. Parece que la mayoría de los calorías vienen de almidones (arroz, tortillas...), azúcar y aceite. La comida básica consiste de arroz, frijoles, azúcar y aceite. Esto tiene como consecuencia que probablemente hay una falta de micronutrientes. El estudio ha demostrado que solo un poco de las familias consumen productos ricos en hierro y calcio. En el caso de la utilización de comida, hay unos hábitos que afectan la biodisponibilidad de los nutrientes. El consumo del café y la competición entre calcio y hierro son todos factores claves que disminuyen la absorción de nutrientes.

Todo esto tiene como consecuencia bajo peso no aunque probablemente sea obvio y puede existir malnutrición de micronutrientes. Lo cual tenía como consecuencia un retraso de talla en los niños y afecta negativamente el desarrollo cognitivo, emocional y mental. Por otra parte hay que señalar que habían personas y niños que tienen sobrepeso.

Sería importante hacer un estudio mas largo en los Barrios Unidos con una demográfica mas diversa y con mas recursos para confirmar las observaciones del estudio. La información sobre datos importantes del peso, talla, edad, situación social y económica.... de los Barrios Unidos falta, por eso es difícil decir con seguridad si hay malnutrición, retraso en la talla o otros problemas.

## Recomendaciones

La siguiente sección se da algunas recomendaciones para reducir los factores de riesgo para la inseguridad alimentaria y nutricional y para desarrollar intervenciones más eficaces.

Mejorar el acceso a frutas y verduras en los barrios unidos. Se necesita otro estudio o análisis para determinar opciones. Una opciones mencionada fue un mercado semanal en los Barrios Unidos de

productores de frutas y verduras. También se puede usar un mercado como opción de vender frutas y verduras o productos artesanales de las familias o comunidades.

Las huertas familiares son más importante para aumentar la seguridad alimentaria de los hogares. Las huertas familiares pueden aumentar la dieta de las familias con verduras y frutas. También son un método bueno para sensibilizar a las personas sobre temas de nutrición y la importancia de verduras y frutas. Es importante en este sentido que los talleres sobre huertas familiares incluyan temas sobre la nutrición y también que se aprovechen para sembrar verduras con alta densidad-nutritiva como verduras de hoja verde y verduras crucíferas y no de las verduras que ya existen en los Barrios Unidos (Tomate, chilltoma, cebolla).

También se pueden usar las huertas familiares para diversificar la dieta y sembrar vegetales que no se encuentran mucho en los mercados como okra, berenjena, fresa, albahaca, orégano, pak choi...

Se recomienda de capacitaciones para mujeres y hombres sobre embarazo temprano y en intervenciones para prevenir el embarazo. Fortaleciendo los programas sobre embarazo temprano y identificación de mamás jóvenes como grupo vulnerable. El embarazo temprano está asociado con muchos factores de riesgo para seguridad alimentaria, como baja educación, bajo nivel de salud de la mamá y bajo peso del bebé.

Proporcionar más capacitación en el nivel sobre temas de nutrición sería interesante. En general más información sobre la dieta en general es necesario, así dieta general para los individuos, dieta balanceada, la importancia de diversidad en la dieta, los diferentes grupos de alimentos y los micronutrientes. Otro tema importante es la alimentación para bebés y niños: la dieta adecuada para bebés y niños, la importancia de alimentación activa, hábitos buenos de alimentación para niños. También el micronutriente de hierro es importante porque el Centro de Salud en Barrio 18 mencionado. Anemia; como un problema importante en Los Barrios Unidos. Los sujetos que pueden ser tratados son la importancia del hierro para los niños y las mujeres, nutrientes que disminuyen la biodisponibilidad y nutrientes que ayudan la biodisponibilidad como Vitamina C, Vitamina A.

Dar seguimiento sistemático a los indicadores y variables identificadas en el estudio para poder observar cambios en la seguridad alimentaria y nutrición de la población de Los Barrios Unidos. Este incluye tomar talle y peso de los niños de una manera consistente para observar cambios.

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## LIST OF ABBREVIATIONS

ECLAC	Economic Commission for Latin America
FAO	Food and Agriculture Organization from the United Nations
FSLN	Frente Sandinista de Liberación Nacional
GHI	Global Hunger Index
INPRU	Instituto de Promoción Humana
INSS	National Social Security Institute
LAC	Latin and Central America
MDGS	Millennium Development Goals
PPA	productive food program
WFS	World Food Summit
WHO	World Health Organization

## INTRODUCTION

The countries of Latin America and the Caribbean, as the rest of the world, need to find ways to feed the increasing population with limited resources. The agricultural sector needs to be transformed in order to meet the growing food demand, rural poverty needs to be reduced and sustainable development needs to be kept in mind (IFAD, 2012; FAO, 2014a).

Food security can be linked to a sufficient supply of food or to a sufficient access to food supply. Poverty plays a determining role in the access to food. However the relationship between both indicators is not straight forward. Food security can also be affected by food prices, other social and economical factors, political situation and the occurrence of natural disasters. An inadequate diet may result from an imbalance in the availability of macronutrients or a lack of micronutrients (FAO, 2013a; FAO 2014a).

Food security is a complex concept that cannot be measured by one single indicator. Based on the definition, four dimensions of food security can be identified: food availability, economic and physical access to food, food utilization and stability over time as described in the first part – **conceptual framework**. Here the state of food security is discussed globally and on the level of Nicaragua.

In the second part – **the contextual framework** – a general outline of Nicaragua is discussed. Based on studies and insights from the literature social-economic factors important to situate and understand the problem of food security is reviewed. Since this research is focused on the urban areas in Somoto, also a small section is dedicated to Somoto and to the organization INPRU, *Instituto de Promoción Humana*, in collaboration with whom the research was conducted.

The used **methodology** was subsequently explained in the next part. To obtain more insight in the situation a combination of research methods was used: family visits with participatory observations, informal interviews and a dietary diversity questionnaire adapted from the Food and Agriculture Organization (FAO). An increasing dietary diversity defined here as the number of standardized food groups consumed over a 24-hour reference period is associated with an increased household food access and reflects an increased dietary quality at an individual level.

In the fourth part – **results** – the obtained data are analyzed according to the dimensions of food security, namely availability, accessibility and utilization.

In the final part – **conclusions and recommendations** – general conclusions and recommendations are formulated. Here the following research questions are provided with an answer. What is the general status of the food security in *Los Barrios Unidos*? How does availability, accessibility and utilization limit or influence this? What is the nutritional status of mothers and children? What is the role of social-economical factors in this respect?

This research is a first step to situate the general state of food security and nutrition in *Los Barrios Unidos*. Hopefully further data collection and monitoring is continued, allowing effective and efficient interventions in the future.

# CONCEPTUAL FRAMEWORK: Food security and nutrition

## 1. Food security

### 1.1 Definition and dimensions of food security

The concept of food security has evolved over time and was first defined in 1974 in terms of food supply. It referred to assuring availability and price stability at an international and national level. In 1983 the element of access was added to the definition referring to the balance between demand and supply. Also household and individual levels were included besides the nation and the international levels. Food security is now accepted as a complex and multidimensional concept. It can be used to determine people's general state of well-being (FAO, 2006; FAO, 2008a).

Food security is defined as followed:

*"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life"* (World Food Summit, 1996).

Four dimensions of food security can be identified based on this definition: food availability, food access, food utilization and stability over time. All four dimensions must be achieved simultaneously in order to realize food security (FAO, 2008b).

Food availability ('*sufficient food*') refers to the availability of sufficient quantities and quality foods and is determined by the level of food production, stock levels and imports, thus supply. However if a nation has an adequate supply of food this does not mean there is food security on the household level (FAO, 2006; FAO, 2008a).

Access to food ('*physical and economic access*') is linked to food prices, preparation facilities and the purchasing power of individuals (related to employment). Access refers to whether individuals have adequate resources for acquiring foods for a nutritious diet (FAO, 2006; FAO, 2008b). Economic access or in other words economic affordability is linked to disposable income, food prices and access to/provision of social support. Physical access is facilitated by the availability and state of infrastructure, food storage facilities, ... (FAO, 2013a). This domain links the food security concept to the reduction of poverty. However it is important to mention that if individuals have sufficient money (economic access) but markets have no food (availability) people are at risk of being food insecure (FAO, 2006; FAO, 2008b).

Food utilization ('*safe and nutritious food that meets dietary needs*') addresses the sufficient intake (quantity) and consumption of nutritious foods (quality). This is combined with food preparation, storage, feeding practices, sanitation and biological use. The latter determines the health status or nutritional well-being of individuals (FAO, 2006; FAO, 2008a).

Stability ('*at all times*') refers to the fact that the previous three domains should be stable over time and not affected negatively by natural, social, economic or political factors (FAO, 2006; FAO, 2008a).

### 1.2 Indicators for measuring food security

Food security is too complex to be captured with one single indicator, thus a set of indicators aims (Figure 1) to capture various aspects of food security. Many of these indicators are published by international organizations and are now combined in one database. Each food security dimension can be described by a combination of different indicators (FAO, 2013a). Some indicators such as the number of undernourished people, the prevalence of undernourishment in a population and anthropometric indicators look at food security as an outcome. Other indicators (poverty, availability, access, affordability, utilization and vulnerability) focus on the conditions that generate food insecurity (FAO, 2014a).

FOOD SECURITY INDICATORS	DIMENSION	
Average dietary energy supply adequacy Average value of food production Share of dietary energy supply derived from cereals, roots and tubers Average protein supply Average supply of protein of animal origin	AVAILABILITY	STATIC and DYNAMIC DETERMINANTS
Percentage of paved roads over total roads Road density Rail lines density	PHYSICAL ACCESS	
Domestic food price index	ECONOMIC ACCESS	
Access to improved water sources Access to improved sanitation facilities	UTILIZATION	
Cereal import dependency ratio Percentage of arable land equipped for irrigation Value of food imports over total merchandise exports	VULNERABILITY	
Political stability and absence of violence/terrorism Domestic food price volatility Per capita food production variability Per capita food supply variability	SHOCKS	OUTCOMES
Prevalence of undernourishment Share of food expenditure of the poor Depth of the food deficit Prevalence of food inadequacy	ACCESS	
Percentage of children under 5 years of age affected by wasting Percentage of children under 5 years of age who are stunted Percentage of children under 5 years of age who are underweight Percentage of adults who are underweight Prevalence of anaemia among pregnant women Prevalence of anaemia among children under 5 years of age Prevalence of vitamin A deficiency (forthcoming) Prevalence of iodine deficiency (forthcoming)	UTILIZATION	

Figure 1: Set of indicators to measure food security (FAO, 2013a)

### 1.3 Duration and severity of food insecurity

Both the duration and the severity of food insecurity have an impact on people's lives and are important factors to take into account when determining intervention methods (FAO, 2008a).

The duration of food insecurity can be defined as chronic or transitory food insecurity which are related to different causes and require different response measures. Chronic food insecurity refers to

a long-term condition in which minimum food requirements are not met. This often results from a prolonged period of poverty, low incomes and inadequate access to financial resources. Education and access to productive resources, also used to address poverty, can contribute to overcome chronic food insecurity. Transitory food insecurity on the other hand is temporary or for a short-term and related to a sudden drop or fluctuations in food availability or accessibility due to natural disasters, conflict, variations in food prices or household incomes. Response measures are more difficult in this cause due to the sudden occurrence and unpredictable nature. Seasonal food insecurity, an intermediate type, is when cyclical patterns of inadequate availability and accessibility occur (FAO, 2008a; FAO, 2008b).

When identifying the problem within food insecurity it is important to look at how severe the impact is on the overall food security and nutritional status. Different scales of severity have been developed to grade food insecurity. Due to the lack of a common scale, comparison and response to different food insecurity cases are difficult (FAO, 2008a; FAO, 2008b).

#### *1.4 The state of food security in the world*

This section describes the state of food security in the world with the focus on Latin and Central America, as Nicaragua belongs to this region.

##### 1.4.1 Poverty and hunger

The Global Hunger Index (GHI) combines three indicators into one score: the proportion of undernourished people<sup>1</sup>, the proportion of children younger than age five who are underweight and the mortality rate of children under five. A decrease in a country's GHI score indicates that the hunger situation is improved, while an increase indicates the opposite. Hunger on a global scale remains serious with 20 countries having levels of hunger that are alarming or extremely alarming. The global GHI dropped from 20.8 to 13.8 from 1990 to 2012 and 15 countries<sup>2</sup> reduced their GHI scores by 50% or more in this same period (Global Hunger Index, 2013).

Two targets have been established for reducing hunger. In 1996 World Food Summit (WFS) established a target to halve the total number of hungry people. In 2001 global community adopted the Millennium Development Goals (MDGs) which are to be met by 2015 with 1990 as baseline. With these goals nations worldwide commit to reduce extreme poverty and hunger and address development challenges (FAO, 2013a). The MDG hunger target aims to halve the proportion of hungry people in the total population.

Currently 842 million people or 12% of the world's population are undernourished, compared to 1015 million reported in 1990-1992 (Figure 2) (FAO, 2013a; FAO, 2013b). The prevalence of undernourishment provides an indication of the extent and distribution of hunger (FAO, 2014a). In

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<sup>1</sup> unable to meet the minimum dietary energy requirements

<sup>2</sup> among others Nicaragua with 61%

Latin America and the Caribbean the prevalence undernourishment is estimated at 7.9% (FAO, 2013a). There are however large differences within the region. Latin America has a prevalence of 7.1% whereas the Caribbean has one of 19.3% (FAO, 2013b).

Although progress is being made in the decrease of undernourished people, the rate of progress is assumed to be insufficient to reach the MDG hunger target. The WFS target, a more ambitious goal due to high rates of population growth, is globally out of reach. However several individual countries are still on track to reach the WFS target and 18 countries<sup>3</sup> already met the target in 2012 (FAO, 2013a; FAO, 2014a).

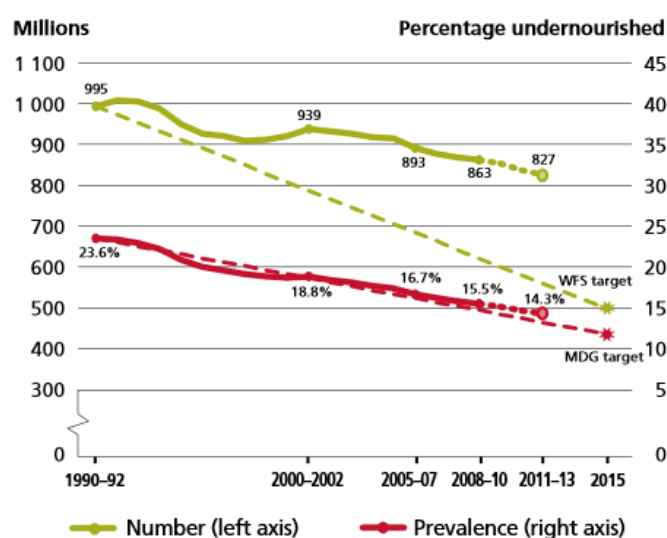


Figure 2: Prevalence of undernourishment en number of undernourished people in the world (FAO, 2013a)

Global incidence of extreme poverty was estimated at 24% in 2008 (FAO, 2013a). In Latin America and the Caribbean the population living in poverty decreased from 48% in 1990 to 31% in 2010 and extreme poverty from 22.6% to 12.1%. However between 2010 and 2012 reduction of extreme poverty largely stagnated and fell from 12.1% to 11.4% (FAO, 2013b; FAO, 2014a). This was related to the increases in food prices according to the Economic Commission for Latin America (ECLAC) (FAO, 2014a). Reducing poverty and hunger requires long-term efforts and the environmental, social, economic and political conditions that make people vulnerable vary depending on the country (FAO, 2013a).

It is important to realize poverty, hunger and malnutrition are related with food insecurity. High poverty levels generally go hand in hand with high levels of undernourishment (FAO, 2013a). Poverty is a major cause of nutritional problems in developing countries. However malnutrition can also exist where people are not poor and enough food can be accessed (Burgess & Glasauer, 2004). Although all hungry people are food insecure the opposite is not necessarily true (FAO, 2013a).

<sup>3</sup> among others Nicaragua

Undernourishment represents only a fraction of the global burden of malnutrition. Twenty five percent of the world's children are stunted, two billion people suffer from one or more micronutrient deficiencies and 1.4 billion people are overweight. Most countries are burdened by multiple types of malnutrition, possibly co-existing within the same department, household or individual (FAO, 2013c). In LAC overweight is increasing with prevalence of obesity of adults reaching 23% and 7% among children under the age of five years (WHO, 2014a; FAO 2013b).

#### 1.4.2 Availability

Supplying sufficient food to a population is necessary (but not enough) to ensure that people have adequate access to food. In developing countries the food supply has grown faster than the population, which means higher food availability per person. Also the dietary energy supply has increased faster than the average dietary energy requirement, resulting in higher levels of energy sufficiency. The dietary energy supply as a percentage of the average dietary energy requirements has risen nearly 10% in the last 20 years (FAO, 2013a). Referring to the fact that the gap between supply and demand is reduced or that supply exceeds the demand. Progress is evident in Latin America and the Caribbean with six countries having an average dietary supply index below 100 in 1992 whereas now only one country is still below the threshold (FAO, 2014a).

Also quality of diets, partly reflected in the decrease in share of dietary energy derived from cereals, roots and tubers, has improved since 1990 in most regions. In Latin America and the Caribbean, the percentage of the energy supplied from cereals, roots and tubers has gone from 43% (1990-1992) to 40% (2008-2010). Generally the availability (per capita) of fruits and vegetables, livestock products and vegetable oils has increased as well as protein availability per person. In Latin America and the Caribbean the average supply of protein per capita has increased from 68 grams per day to 82 grams per day between 1990 and 2010 (FAO, 2013a; FAO, 2014a).

#### 1.4.3 Accessibility

The improvements in economic access can be linked to the reduction of poverty and undernourishment. Countries with high levels of poverty tend to have high hunger levels. Food is a basic necessity, thus increasing incomes can help reduce hunger (FAO, 2013a). In general, poor households spend a large share of their incomes on food, making them vulnerable to sudden increases in food prices or losses of income. Access to food remains a major issue in region Latin America and the Caribbean (FAO, 2014a).

#### 1.4.4 Utilization

The extent to how well food is being utilized is partly reflected by anthropometric indicators such as stunting (too short for one's age), wasting (too thin for one's height) and underweight (too thin for one's age) all reflecting undernutrition. However improvements in stunting will only be visible over a longer period of time, whereas underweight<sup>4</sup> is more direct indicator with improvements in food

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<sup>4</sup> For this reason underweight is chosen as indicator in the MDGs.

access and availability more promptly registered. These indicators are used for children under the age of five years which are considered to be good approximation of the nutritional status of an entire population. The prevalence of stunting and underweight of children has decreased in all developing regions since 1990 (Figure 3). It must be mentioned that progress in food supplies and food access do not necessarily result in better food utilization and nutrition. This is because anthropometric indicators reflect not only the effects of hunger and food insecurity but also capture the consequences of poor health and diseases (FAO, 2013a; FAO, 2014a).

It must be mentioned that the nutritional future of a child begins with the mother's nutritional status prior to pregnancy. A chronically-undernourished mother is likely to give birth to an underweight baby, who may be stunted as a child and in turn give birth to malnourished baby (Unicef, 2012). Thus poor nutrition in the first 1000 days of a child's life (covering pregnancy and first two years) has irreversible consequences and should be the window of focus (Unicef, 2014).

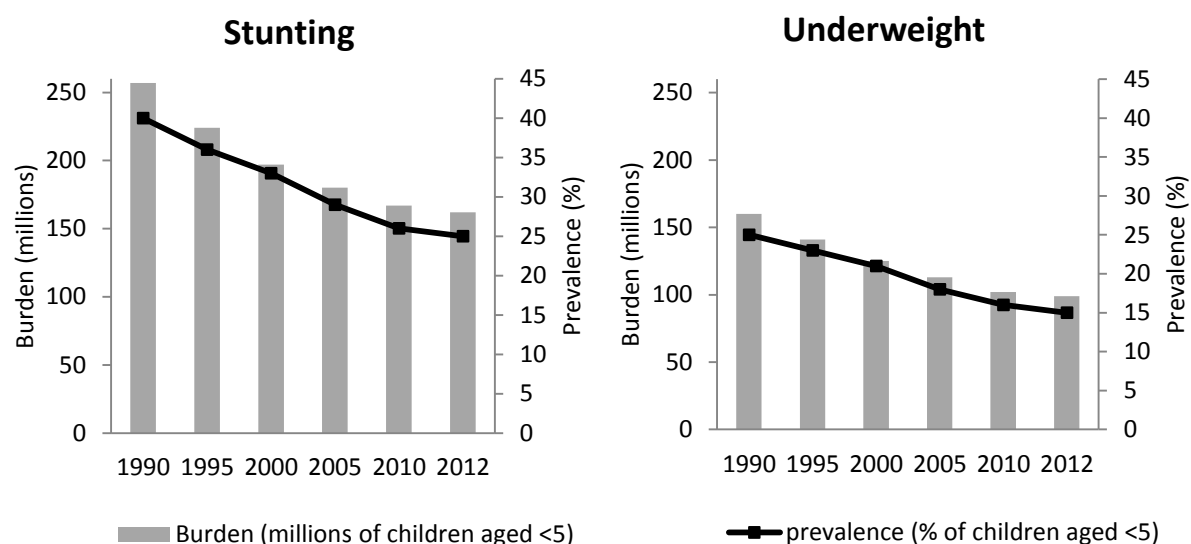


Figure 3: Burden and prevalence of stunting and underweight in the world (adapted from Unicef/WHO/World Bank, 2012)

Access to clean water is crucial for preparation of clean food and maintaining a good health. The MDG target to halve the proportion of the population without access to adequate safe drinking water was already reached in 2010 on a global level. However it must be kept in mind that progress is uneven across regions and even within countries between rural and urban areas (FAO, 2013a). In Latin America and the Caribbean 90% of the population has access to safe water (FAO, 2014a). At the global level, the MDG sanitation target has not yet been reached and is not likely to be achieved by 2015. Although access to improved sanitation has increased from 36% to 56% for the world's population in Latin America and the Caribbean, 18% of the population has no access to improved sanitation (FAO, 2014a).

Micronutrient deficiency (shortage of essential minerals and vitamins) affects approximately one-third of the world's population (Mason *et al.*, 2001). Micronutrients are needed in small doses to make enzymes, hormones and other components that regulate growth, development and functioning of the immune and reproductive systems (Unicef, 2003a). Vitamin A, iodine, iron and

folate are important micronutrients as sufficient levels are often not met. Vitamin A deficiency can cause blindness and weakens the immune system making children susceptible to common childhood diseases (Unicef, 2012). Iodine deficiency is the primary cause of learning disabilities and brain damage (Unicef, 2012). Deficiencies in folate result in low birth weight or birth defects such as spina bifida<sup>5</sup> (Unicef, 2003a). Iron requirements increase during pregnancy, breastfeeding and high-growth periods. Iron deficiency can lead to anemia which increases the risk of bleeding and overwhelming bacterial infection during childbirth (Unicef, 2012). Women with iron deficiencies may also give birth to premature babies or babies with a low birth weight whom may suffer from weakened immunity, learning disabilities and delayed physical development (Unicef, 2003b).

Breastfeeding is an important feeding practice with many implications on a child's further development. The World Health Organization and UNICEF recommend the following on breastfeeding:

*"Initiation of breastfeeding within the first hour after the birth; exclusive breastfeeding for the first six months and continued breastfeeding for two years or more, together with safe, nutritionally adequate, age appropriate, responsive complementary feeding starting in the sixth month" (Unicef, 2013a).*

Breastfeeding rates are no longer globally declining. However in developing countries 39% of children younger than six months are exclusively breastfed<sup>6</sup> and continued breastfeeding is only beneficial for 58% of children (Unicef, 2013a).

Breast milk is the initial source of nutrients and vital micronutrients an infant needs for normal growth during the first six months of life (Unicef, 2012). Breast milk also provides anti-bodies, enzymes and hormones which formula milk cannot (Unicef, 2003a; Unicef 2013a). Formula feeding may even be a dangerous alternative in unhygienic environments (Unicef, 2003b). Also solid, semi-solid and soft foods are often introduced too soon or too late. Children, although optimally breastfed during six months, can become stunted if they do not receive sufficient quantities of quality foods after this period (Unicef, 2005).

#### 1.4.5 Stability

Two important aspects of domain stability are food supply and food price stability. In recent years food supplies and food prices have known larger variability than normal. Climate change is often mentioned in the context of vulnerability in relation to food security. Changeable and unpredictable weather conditions have had effects on increasing food prices and variability. People particularly affected by these sudden changes are smallholder farmers and poor individuals. Therefore climate change will play an even more important role in the future (FAO, 2013a).

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<sup>5</sup> A fault in the spinal column in which one or more vertebrae fail to form properly which causes damage to the central nervous system

<sup>6</sup> This means the infant receives only breast milk and no other foods or beverages (not even water). However oral rehydration solution, medicines, vitamins and minerals are allowed. (WHO, 2010 indicators for assessing infant..)

## *1.5 The state of food security in Nicaragua*

The Global Food Security Index (GFSI) was developed in 2012 and attempts to measure the risks of food security in a country and ranks them according to their level. This index is based on three dimensions of food security: availability, access and utilization. According to this index Nicaragua is ranked 74<sup>nd</sup> of the 109 countries (Economist Intelligence Unit, 2014).

### 1.5.1 Poverty

Nicaragua is the second poorest country in Central America (IFAD, 2012). It is ranked 129th out of 187 countries in the Human Development Index (2012) (UNDP, 2013) and 22nd out of 78 on the 2013 Global Hunger Index (Global Hunger Index, 2013).

In 2009 21% of Nicaraguan population lived on 2 US\$ a day or less (*cfr.* 31.7% in 2005) and 5.5% lived in extreme poverty defined as US\$1.25 per day or less (*cfr.* 11.9% in 2005) (Plan Nacional, 2010). It must also be mentioned that poverty rates differ between regions (FAO, 2013a, FAO, 2014a). The incidence of poverty in 2005 was 70% and 36% for extreme poverty in the Department of Madriz, compared to respectively 19% and 3% in Managua (Dhur A., 2009). Also poverty in rural areas is much higher than in urban areas (63.6% versus 26.8%), with extreme poverty in rural areas up to five times higher prevalence than in urban areas (Plan Nacional, 2010; FAO, 2013a).

Some important demographical characteristics linked with poverty are age and gender of household head, education levels and size of households. For example female-headed households tend to be poorer than male-headed households, younger household heads are poorer, completion of primary or secondary education decrease poverty and large households are not as well-off (Dhur A., 2009).

Although higher levels of poverty are generally associated with higher levels of undernourishment, a one-on-one correlation between extreme poverty and hunger is not always true. Small amounts of money may help people escape extreme poverty, but not hunger. This can be related to households using their additional income to buy non-food items or shift to more expensive foods. Some of these changes may not contribute to an increase in energy intake or improve nutrition. In Nicaragua in 2005 12% of the population lived on US\$ 1.25 a day, while the prevalence of undernourishment was more than 25%. This was related with the fact that US\$ 1.25 on average bought 1459 kilocalories below the minimum daily dietary energy requirement of 1819. However 32% lived on US\$ 2 or less which is just over the extreme poverty line. US\$ 2 could buy 1792 kilocalories which was still lower than the minimum dietary energy requirement related to the higher prevalence of undernourishment (FAO, 2014a).

### 1.5.2 Food security throughout history

The Republic Nicaragua is a constitutional democracy, independent since 1838, and has known history of dictatorships, a revolution, domination/influence of the United States, a Contra-war and a series of natural disasters.

Since the establishment of Nicaragua the export sector has been favored to increase economic growth and foreign income. This strategy ignored domestic food production making Nicaragua become dependent on imported food and food aid.

After the 1979 civil war the Sandinista government (FSLN, same party as the present government) and president Ortega had a new economic vision that included 'food security'. Food production and small producers were a priority in their reform (HabibMintz, 2004). For example the *Empresa Nicaragüense de Alimento Básicos* (ENABAS) was established to facilitate distribution of basic foods and to offer better prices to small farmers and increase their standard of living (Enabas, 2014). International pressure, such as the US trade embargo, caused the government to fail (Biondi-Morra, 1993).

The establishment of trade liberalization after 1990 had again negative effects on farmers. The reduced access to agricultural resources and poor producer prices, which was stimulated by grain imports and food aid, made production more and more subsistence. Export crops, such as coffee and cotton, were given extra support in order to improve the economy by benefitting from global demand for these crops. Related to the stable GDP growth the strategy was termed successful. However the stagnant poverty rates, malnutrition and high debt levels showed that the growth was not sustainable. The national economy was vulnerable to export crop price changes in the global market, which was shown by the effects on the national economy when international coffee prices dropped. In 2004 the Nicaragua imported one-third of basic foods (HabibMintz, 2004).

In 2006 Daniel Ortega returned to power, however to achieve this he approved the law stating complete prohibition of abortion. In the next period Nicaragua has known relative economical stability and growth, and introduced social poverty reduction programs, such as Zero hunger (*Cero Hambre*). Since his re-election in 2006 Ortega did everything in his power to assure his next re-election. In 2011 Ortega was again elected president and the FSLN also obtained majority in parliament allowing them to solely change the constitution in the future. In 2013 new constitutional changes were adopted however it is not yet clear if or which implications these changes may have on food security in the future (Dobrzensky, 2003; Barahona Mejia, 2013).

### 1.5.3 Availability

Food security in Nicaragua is generally more related to the problems of economic access than food availability. However local physical isolation related to poor infrastructure and absence of markets can constrain food supplies (FAO, 2013a).

Food availability is being affected in recent years by various natural phenomena, as in the period 2008-2009 there was a drought (ACF-E, 2010). The policies for enhancing the agricultural productivity and thus increase food availability have contributed to the reduction of the prevalence of hunger, although poverty is still widespread (FAO, 2013a).

Basic grains, such as rice and corn, consumed by the majority of the population come from the domestic production with small amounts being imported. Also Nicaragua is a net exporter of beans. Generally since 1990 the food availability has increased steadily, as expressed by an increase in

average dietary energy adequacy, meaning the food supplies exceed the required amounts (FAO, 2013a).

The daily average protein supply increased from 46 grams per capita in 1990-1992 to 65 grams in 2007-2009 due to an increased supply of beans and vegetables (FAO, 2013a).

#### 1.5.4 Accessibility

Price fluctuations or income reductions can often be linked to switching behavior of consumers (becoming possibly food insecure). When food prices rise, people often shift from more expensive and nutritious foods to less expensive but often less nutritious foods. The dietary energy intake is mostly maintained but other forms of malnutrition increased (FAO, 2013a).

Poorer people are more vulnerable to price fluctuation as a larger amount of their income goes to the purchasing of food (see Figure 4). Poor families even spend more than half of their income on food and beverages (FAO, 2014a). Due to food price fluctuations Nicaraguan households moved from above calorie adequacy levels to below these levels. Policies and programs targeting the poorest households (rural and urban) are needed in the future to compensate for the energy deficiencies associated with food price increases (IFPRI, 2011).

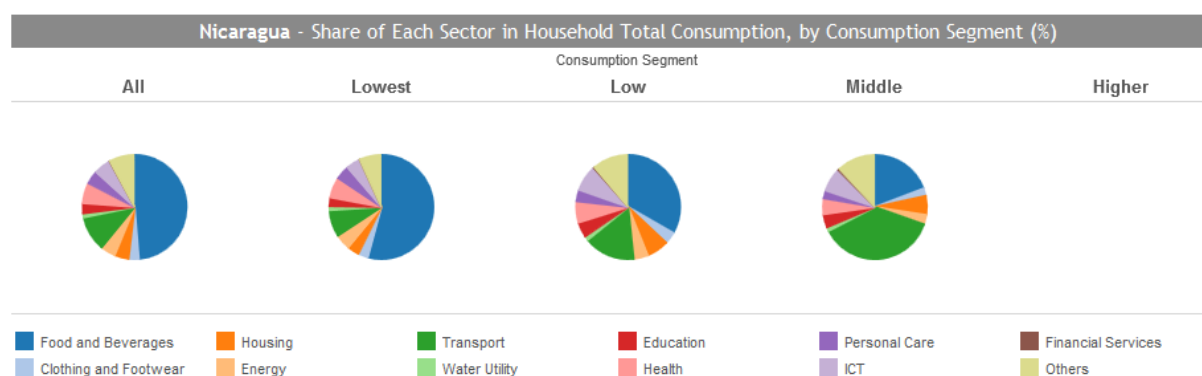


Figure 4: Share of each sector in household total consumption (%) (World Bank data, 2014)

According to the Nicaraguan government the minimum amount of money necessary to buy the basic shopping basket (*canasta básica*) in 2013 was C\$ 10982 or US\$ 440. Of this amount C\$ 6993 goes to food. Generally the income level of the poor does not enable them to cover the cost of their basic food and non-food expenses. The Nicaraguan minimum wages could only buy 61% of the food items in the basic shopping basket. With incomes being low hunger is a persistent, chronic problem (ACF-E, 2010; Valor de la Canasta Basica, 2013; Nestor, 2014).

In response to the high food prices the government established low-basic food/subsidized shops to provide basic food products at low costs (Dhur A., 2009).

#### 1.5.5 Utilization

In 2011 88.7% of households in urban areas used improved drinking water sources, whereas only 63.5% of rural households did (Plan Nacional, 2010). Slightly more than half (52.1%) of the total

population had access to improved sanitation facilities, with 37% in rural areas versus 63.2% in urban areas (Dhur A., 2009; Unicef, 2013b).

In Nicaragua 3.1% children younger than five years are estimated to suffer from vitamin A deficiency (FAO, 2013c). An option is to address these deficiencies by fortifying basic foods that most of the population eats, such as oils or flour. Many countries in Central America have had great success with sugar fortification (Mason *et al.*, 2001). Presumably due to salt iodization (Unicef, 2003b) the prevalence of iodine deficiencies in Nicaragua is negligible (FAO, 2013c). In Nicaragua 17% of children under the age of five years suffer from anemia (FAO, 2013c).

Between 2008-2012 in Nicaragua approximately 30% of the mothers breastfed their children exclusively up to six months of age (Unicef, 2013b).

#### 1.5.6 Stability

Due to its geological make-up and geographical location, Nicaragua is vulnerable to the impact of a series of natural phenomena such as hurricanes and earth wakes. These usually result in emergencies or disasters, causing physical, social and economic damage that can undermine the country's development. During disasters major resources are devoted to attending to the population affected, rehabilitation and reconstruction (Plan Nacional, 2010).

## 2. Right to food

Food security is also linked with human rights dimensions. The human right to food is recognized in a number of international instruments, such as the Universal Declaration of Human Rights (Knuth & Vidar, 2011; FAO, 2013a).

The formal adoption of the Right to Adequate Food by the World Food Summit in 1996 introduced a rights-based approach to food security (FAO, 2013a). This concept evolved to the point where nations developed guidelines to realize of the right to food. Although in theory food security can be achieved without legal measures (in contrast to the realization of the right to food as a right), the adoption of legally enforceable rights makes the future of food security more secure (Knuth & Vidar, 2011).

There are 56 countries whose constitutions recognize the right to food either explicitly (*e.g.* Nicaragua) or implicitly (*e.g.* Belgium). In another 51 countries the right to food is directly applicable through International agreements (Knuth & Vidar, 2011).

The Nicaraguan Constitution, adopted in 1987, Article 63 states the right of people to be protected against hunger. Also the role of the government to promote availability and fair access to food are mentioned.

*Article 63*

*It is the right of Nicaraguans to be protected against hunger. The State shall promote programs, which ensure adequate availability of food and its equitable distribution (Nicaragua's Constitution of 1987 with amendments through 2005).<sup>7</sup>*

Ten countries, including Nicaragua, have already adopted a framework law on the right to food or food security and another nine countries are in the process of drafting such a law (Knuth & Vidar, 2011).

In Nicaragua a Food and Nutritional Security and Sovereignty Law (No. 693) was approved in 2009. This law established the framework for food security and nutrition to protect and guarantee people's right to sufficient food and define the main policy areas to be addressed. This is being implemented through various programs: productive food program (PPA), school feeding programs, food & nutrition education, establishment of a food safety system, harvest and sale of basic products at fair prices, capitalization of poor rural households, loans to urban households, the seeds programs, health services networks and other programs (Plan Nacional, 2010).

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<sup>7</sup> Original Constitution article:

*Artículo 63. Es derecho de los nicaragüenses estar protegidos contra el hambre. El Estado promoverá programas que aseguren una adecuada disponibilidad de alimentos y una distribución equitativa de los mismos (Asamblea Nacional, Nicaragua).*

## CONTEXTUAL FRAMEWORK: Nicaragua

Nicaragua is the largest country in Central America with an area of 130370 square kilometers (FAO, 2014b). The country is divided into 15 departments and two autonomous regions on the Atlantic coast. The Pacific region, which covers 15.2% of the land area, has 58.2% of the population. The recent progress in Nicaragua can generally be related to a period of economic and political stability after several years of political instability, civil wars and economic uncertainty and a series of severe natural disasters. The short-term emergency aid has gradually been exchanged for long-term development and poverty targeting plans (FAO, 2013a). However Nicaragua remains the second poorest country in Latin and Central America (IFAD, 2012).

### 1. Demographics

The Nicaraguan population is presently estimated at six million with 50.5% of the total population female (ACF-E, 2010; FAO, 2014b). The average annual population growth was 1.3% between 2002-2012 (WHO, 2014b) and the life expectancy at birth was 74.3 years in 2012 compared to 64.2 year in 1990 (UNDP, 2013; FAO, 2014b). The population is predominantly young as 41.5% is younger than 15 years old, 53.8% is between the ages of 15 to 60 and the group older than 60 represents 4.6% (Vargas, 2010).

About 57.5% of the population lives in an urban setting (FAO, 2014a), which is lower than the Latin American average (Dhur A., 2009). The urban population in Nicaragua, in line with the global trend, is increasing. This is related to economic inequality between urban and rural areas, more educated women and more youth preferring a life in the city (FAO, 2014a).

The total fertility rate has declined since 1990 and is reported to be 2.5 children per woman, with large differences between rural (4.4) and urban (2.6) settings (Dhur A., 2009; Banco Central de Nicaragua, 2012). The fertility rate of adolescents in Nicaragua is the largest in Central America and one of the highest in the world. In Nicaragua a quarter of all births are to adolescent woman. Approximately half of the young women give birth before they reach the age of 20 (Lion *et al.*, 2009). About 31% of the households are headed by a woman (INSA & INEC, 2001).

### 2. Economy

Nicaragua's Gross Domestic Product (GDP) in 2012 was 11 billion (in US\$). The value added to the GDP by agriculture accounts for 19.2% of the GDP, the industry for 24.9% and services for 55.9%. The Gross National Income per capita (GNI) in 2012 was 1650 (in US\$) and the lowest in Central America (Banco Central de Nicaragua, 2012).

The participation of Nicaragua in the Central American Free Trade Agreement in 2006 increased access to international markets and increased exports to the United States (Dhur A., 2009; FAO, 2013a). This partially suppressed the effects of the occurred natural disasters and allowed the agricultural sector to start developing.

Also the broad and multi-sector approach of the Nicaraguan government includes programs that help farmers, households cope with effects of disasters (FAO, 2013a). Only 12% of the available land is cultivated (World Bank, 2008a) and agriculture is small scale and labor intensive and encounters constraints in raising productivity (Dhur A., 2009). Low incomes, low educational levels and limited access to credit result in low or non-existing adoption of more modern technologies. The Agro-Seeds Program (*Programa Agroalimentario de Semillas/PAS*) and Productive Food Program (*Programa Productivo Alimentario/PPA*) were developed by the government to have a long-term impact on earnings of households and increase their resilience to weather shocks (FAO, 2013a). The former promotes technology transfer and distribution of certified seeds. The latter, better known as Zero Hunger (*Cero Hambre*), provided 75000 poor rural households access to land, seeds, fertilizer and animals since 2007 (Plan Nacional, 2010).

The World Bank reported that the majority of the population (*i.e.* 90%) is net food consumers/purchasers (WorldBank, 2008b). Therefore income levels determine the amount and type of food that can be purchased. Nicaragua was also severely affected by increase in global food prices (Dhur A., 2009). As mentioned earlier the high food prices mostly affect the poor due to the larger share of their income used for purchasing of foods (63% food expenditure) and will have negative effects on the amount and quality of food consumed (Dhur A., 2009).

Since 2010 economic growth has increased again, which can be linked to increased exports, investments, and remittances in an environment of macroeconomic stability (Plan Nacional, 2010).

### 3. Employment

In 2012 the labor force participation of females was 47% whereas for males it was 80%. Approximately 58.2% of the Nicaraguan population is employed (UNDP, 2013; World Bank data, 2014) and 32.2% was employed in agriculture of total employment (World Bank data, 2010). The average annual employment growth between 2001 and 2005 was 4%.

The unemployment of 7.7% was reported in 2012 (World Bank data, 2014). Unemployment has been strongly correlated with poverty (World Bank data, 2008).

Child labor (7-14 years old) was reported to be 10.1% between 2000-2012 by FAO (FAO, 2014a), however the World Bank reported 31% child labor in 2010 (World Bank data, 2014).

Approximately 63% of all workers earn a living in the informal sector and have no social protection (ACF-E, 2010). Educational levels are associated with higher earnings (Dhur A., 2009). In Nicaragua on average 38% of households depend on one person to survive, so if this one person loses his/her job this means that three or four people will be without income (Núñez Salmerón, 2008).

The main sources of income of the Nicaraguan population were non-agricultural wage labor (32%), non-agricultural self-employment (17%), agricultural self-employment (15%), imputed rent (12%) and agricultural wage labor (11%). However depending on the poverty level different sources are more important (Dhur a., 2009).

In summary poor families will be almost entirely employed in the informal sector and insecure jobs, while in the higher income families dominate formal and better paying jobs. This creates inequality of opportunity and inequality of income distribution (Profiles de vida, 2010). Income inequality is difficult to resolve in the short time, programs supporting education and access to financial services for the poor. The Central Bank of Nicaragua reported that 20% of the poorest people in Nicaragua receive only 5% of the national income, while the richest 20% receives 54% of total national income (Díaz Rivas, 2009).

#### 4. Remittances

Migration is a common given in Nicaragua and is often linked with economic reasons and the need to look for alternative income opportunities. Approximately half of the Nicaraguan households receive remittances from family living in Costa Rica or the US. It has been shown that emigrants are often higher educated and increasingly urban females and not only agricultural laborers (Dhur A., 2009). The amount of remittances to Nicaragua has been increasing annually with an estimated 823 million US\$ in 2010 (Plan Nacional, 2010). Remittances were reported the country's second largest income flow after agricultural exports (Dhur A., 2009), accounting for 20% of the GDP (IFAD, 2012). However it must be mentioned that the real amount of remittances may be higher than the official number due to the remittances flowing through informal channels, such as the money or consumer goods given during home visits.

Remittances can have significant impacts on poverty and food security. Approximately 77% of the remittances are spent on immediate needs such as food, followed by clothing, housing and education (World Bank, 2008a). Greater household security is gained in this way as the sources of income are diversified. As such the decreased in frequency or amount of remittances due to global crisis's (e.g. 2007-2008) can have impacts on numerous levels (Dhur A., 2009).

#### 5. Social

Although progress was made in the area of inadequate housing (a reduction of 0.6 percentage points), this continues to be one of Nicaragua's most significant social challenges (Plan Nacional, 2010).

In 2007 the government strengthened the National Social Security Institute (INSS) in order to guarantee the health protection and social security rights of the insured and retirees. Parallel to the growth in employment social security coverage grew steadily. INSS recorded 534879 insured in 2010 an increase of 22% compared to 2006. The average pension in 2006 was C\$1212 per month and increased to C\$2951 in 2010 (Plan Nacional, 2010). It has been reported that large proportions of the Nicaraguan population are not insured, although individuals with insurance are 56% more likely to get medical treatment (World Bank, 2008a; Dhur A., 2009). The pension system in Nicaragua is not well developed. Elderly living in rural areas often benefit less than those living in urban areas. Also the amount of better-off retirees that are covered is reported to be higher than the coverage of poor retirees (Dhur A., 2009).

The principal instruments used to reduce inequality and poverty were social policies directed to strengthening the capabilities of the poorest families and helping to improve their standard of living (Plan Nacional, 2010). The Social Protection Network or *Red de Protección Social* implemented from 2000 until 2006 was a governmental program to address some of the poorest municipalities. This conditional cash transfer program included supplementing income to increase household expenditures on food, reducing primary school drop-out and improving the health care and nutritional status of children under age five. The program is reported to have resulted in a 5% drop in stunting for children after two years of implementation (Dhur A., 2009; FAO, 2013a).

The program *AMOR* promotes, defends and ensures the restoration of the rights of children, adolescents, the elderly and socially at-risk families and integrates them in education, health, sports, and culture (Plan Nacional, 2010).

In Nicaragua, as in most Latin American countries, a macho culture prevails. The Spanish word for this is *machismo*. This results in both positive and negative behavior. On the one hand the macho-man is a man of honor, respect, proud, dignity and responsibility to his family. On the other hand he is dominant, strong, sturdy and convinced that women are inferior. This 'sturdy' quality however can degenerate into aggression and violence. *Machismo* leads to the classical roll pattern in which women are responsible for the household and care of the children.

## 6. Education

The government reformed the educational system in 2006 from a rights perspective. This meant eliminating school autonomy (e.g. abolishing fees) and establishing free education for everyone (Plan Nacional, 2010).

Nicaragua has the second lowest education level in the Latin American and Caribbean with 78% of the population is literate (FAO, 2014a). In order to continue the task of eradicating illiteracy, Nicaragua continues to implement a series of different programs (Plan Nacional, 2010).

The enrolment and attendance ratios between 2008 and 2012 for primary and secondary are given in Table 1. Large differences between enrolment and attendance are visible (Unicef, 2013b).

Table 1: Enrolment and attendance ratios in Nicaragua between 2008 and 2012

	female	male
Enrolment primary education (%)	94.5	93.2
Attendance primary education (%)	69.5	71
Enrolment secondary education (%)	48.9	42.7
Attendance secondary education (%)	46.7	35.4

However only 54-62% of the students reached the 5th grade and approximately 72% of the population does not have a complete secondary education which can be linked to high drop-out levels and poor quality (World Bank, 2008a). Estimates of the World Bank indicate that Nicaraguans are expected to earn 10% more for every additional year of schooling (World Bank, 2008a). However many Nicaraguans do not attain a secondary education and thus earn wages below the poverty line. Although lack of access to facilities and financial constraints reflect important reasons for low

primary school attendance of poor children (Unicef, 2013b). The lack of interest, need to work and family-related constraints are becoming more important to explain low attendance among urban children (World Bank, 2008a). It is estimated that the enrolment rate to higher education reached 16.4% on the portion of students 18 to 23 years and 21.3% for the 20 to 24 years, when in 1995 the rates were respectively 8.8% and 11.4% (Plan Nacional, 2008).

An example of the Governments involvement in education is the school feeding program (Programa Integral de Nutrición Escolar/PINE). This program provides that children in preschools and primary schools receive lunch at school, thus maintaining their intake of food and encouraging continued attendance (Dhur A., 2009).

## 7. Health

The government restored the right to free health care in 2007 (Plan Nacional, 2010). In 2012 the government spending on health as percentage of GDP was 2.8. Per person the government spend 49.8 US dollar on health (Banco Central de Nicaragua, 2012).

Infant mortality was 21.3 deaths per 1000 live births in 2010-2012, slightly higher than the Latin American and Caribbean average of 19.4 (FAO, 2014a). However progress is being made as the average infant mortality was 50 in 1990 (Unicef, 2013b). The under-five mortality rate was 25.2 per 1000 live births in 2010-2012 (FAO, 2014b) and decreased by more than half compared to 66 per 1000 in 1990 (Unicef, 2013b). About 7.6% of infants were born with a low birth weight between 2008 - 2012 and the maternal mortality ratio was high with 95 for 100000 births in 2010 (Unicef, 2013b).

Immunization coverage is generally high, between 81-99% in 2012 (Dhur A., 2009; Unicef, 2013b). Anemia affects one-third of the children between the age one to five years old and prevalence's are higher in rural areas compared to urban areas (Dhur A., 2009). Respiratory illnesses are the most frequent with 19%, followed by 12% chronic illnesses and 7% diarrhea. Respiratory infections and diarrhea remain major causes of infant and child morbidity and mortality. Diarrhea can be associated with the low quality of drinking water and possibility a more limited awareness of good hygiene practices (Dhur A., 2009).

An important program is the '*AMOR a los más Chiquitos*' or 'Love for the Youngest Program' which provides prenatal care and opportunities for children to achieve healthy growth and development in their first five years of life through health promotion and early stimulation activities (Plan Nacional, 2010).

## 8. Nutrition

In Nicaragua malnutrition can be linked to access of food, child feeding practices, poor health and lack of education and sanitation (Dhur A., 2009).

In Nicaragua the prevalence of undernourishment decreased from 55.1% in 1990-1992 to 21.7% in 2011-2013 (Table 2). Thus between 2000 and 2007 Nicaragua achieved the MDG target of halving the

proportion of hungry people. However it must be mentioned that the prevalence of undernourishment remains high (FAO, 2013a).

Table 2: Values of total population, amount of undernourished people and prevalence of undernourishment in Nicaragua

	Total population (millions)	Amount of undernourished people (millions)	Prevalence of undernourishment (%)
1990-1992	4.2	2.3	55.1
2000-2002	5.1	1.6	31.2
2005-2007	5.5	1.4	25.5
2008-2010	5.7	1.3	23.1
2011-2013	6.0	1.3	21.7

According to the national survey from MINSA in 1998 12% of children under the age of five were underweight, 25% were stunted and 4% were underweight (World Bank data, 1999). Between 2000 and 2006 10% of children under five years old were underweight which included 2% severe cases (Dhur A., 2009). According to WHO the prevalence of stunting in children under the age of five, which is a measurement of chronic malnutrition, dropped from 30% in 1990 to 23% between 2006-2012 (FAO, 2013a; WHO, 2014b) and 5.7% of children (<5 years) were underweight (FAO 2013b; FAO, 2014a). The highest prevalence of stunting is found in the northern departments for example 35% in Madriz (INCAP, 2010). Large differences in nutritional level are observed depending on the geographic location and the amount of income. Also large differences exist between urban and rural areas with higher stunting levels in rural areas. Stunting (among children under the age of five) can also be linked to poverty. It can be concluded that higher levels of stunting occur among the extreme poor families (32%) with lower prevalence levels for poor families (22%) and even lower levels for non-poor families (11%) (World Bank data, 2008).

## 9. Somoto: area of research

Somoto is an average-size city of 15 000 inhabitants and the capital of the department of Madriz in the north of Nicaragua. Somoto can be described as a tranquil, countryside town surrounded by hills. Somoto is known today for its '*rosquillas*' or crusty baked corn based cookies and the '*Cañon de Somoto*'. This recent discovery in 2003 by Czech scientists brings a fair amount of tourism to Somoto. As everywhere in the streets of Nicaragua the informal economy in Somoto is dominantly visible. Fruit and vegetable stands, *fritangas* (street BBQ) and shoe polishers... shape the streets. Other (more formal) economic activities in the city consist of *pulperías* of small retailers, pharmacies, bakeries, *comedors* or eateries, bars, internet cafés, second-hand clothes shops and one supermarket.

The economical activities in the region are based on agriculture and livestock. Basic grains (maize, beans and sorghum) at subsistence level, agro-industrial crops (coffee and tabaco) and vegetables (cabbage, tomatoes, bell peppers) are grown. Chickens and pigs are mostly raised for consumption (ACF-E, 2010).

As mentioned earlier the percentage of stunting in the department of Madriz is higher than the national average, with 35% stunted and 9.6% severely stunted. 5.7% of the population in Madriz have underweight and 0.6% have severe underweight (INCAP, 2010).

The World Food Program's activities concerning food security and nutrition are concentrated in 42 municipalities, identified as the most vulnerable to food insecurity, in departments of Nueva Segovia, Madriz, Estelí, Jinotega, Matagalpa and the two autonomous regions at the Atlantic coast.

### *9.1 Instituto de Promoción Humana*

This investigation was performed at '*Instituto de Promoción Humana*' or INPRHU in Somoto, more specifically in collaboration with the project '*Programa de Desarrollo Comunitario*' of Community Development Program.

INPRHU is the oldest non-governmental organization in Nicaragua, founded in 1962 (according to the organization). INPRHU started its activities in Managua but in 1990 also became active in the departments of Madriz, Estelí, Bluefield and Nueva Segovia. INPRHU Somoto works around human rights, welfare of children, adolescents, families and communities in the department of Madriz. The three major programs at INPRHU are PRODER (Rural Development Program), PEAR (Alternative Rural Education Program) and PRODDHUM (Program for the defense of human rights). Projects under PRODER improve the economic, social and environmental developments in rural families and communities. PEAR tries to generate alternative technical education enabling community members to contribute to the economic development of their families and communities by diversifying production. PRODDHUM promotes human rights and strengthens the capacities and competences of their target groups.

The project '*Programa de Desarrollo Comunitario*' is part of PRODDHUM program in INPRHU. This Community Development program was started in 2006 and is funded by the Christian Children's Fund of Canada (CCFC). The program has as major goal to enhance/develop the general standard of living of children, adolescents... in the corresponding Barrios, '*Los Barrios Unidos*' (cf. *infra*). This improvement in standard of living and enhancing the empowerment of the community is generated by focusing on six domains: 1) defense and promotion of human rights, 2) strengthening community organization, 3) development of sustainable livelihood, 4) education, 5) health and nutrition and 6) water, sanitation and hygiene. Beside these domains the program also has a project called '*Patrocino*'. Children that participate in the Community Program are weighed and measured on a regular basis. This information is collected together with general information about parents, siblings, place of living, favorite topics...

## 9.2 Los Barrios Unidos

The investigation was preformed with families in 'Los Barrios Unidos' or The United Neighborhood in Somoto. These were formed in 1993 by the leaders of the different *barrios*<sup>8</sup> or sectors 10, 14, 15, 17, 18, 20 and 23. *Barrio* 24 was created in 2008 and entered the 'Barrios Unidos' that same year. These 8 urban neighborhoods are situated east of the city centre of Somoto and geographically separated from the centre by the river 'el Rio Coco' (Figure 5). Limited information is available concerning the *barrios*. According to the statistics of 2009 it was estimated that the eight *barrios* counted 4040 inhabitants. The number of people that were not able to read was 337. The *barrios* have access to roads in all weather conditions and their modes of transport are taxis, bicycle taxis or walking. The primary economic activity was some form of commercial activity engaged in agricultural and livestock products, some were professionals but not everyone had a job. All eight *barrios* contained cellular telephone communication lines. There were seven preschools, one primary school and one health centre in the 'Barrios Unidos'. Most families owned some form of sanitary provision and a large proportion had water and electricity at home (Rodriguez *et al.*, 2009).

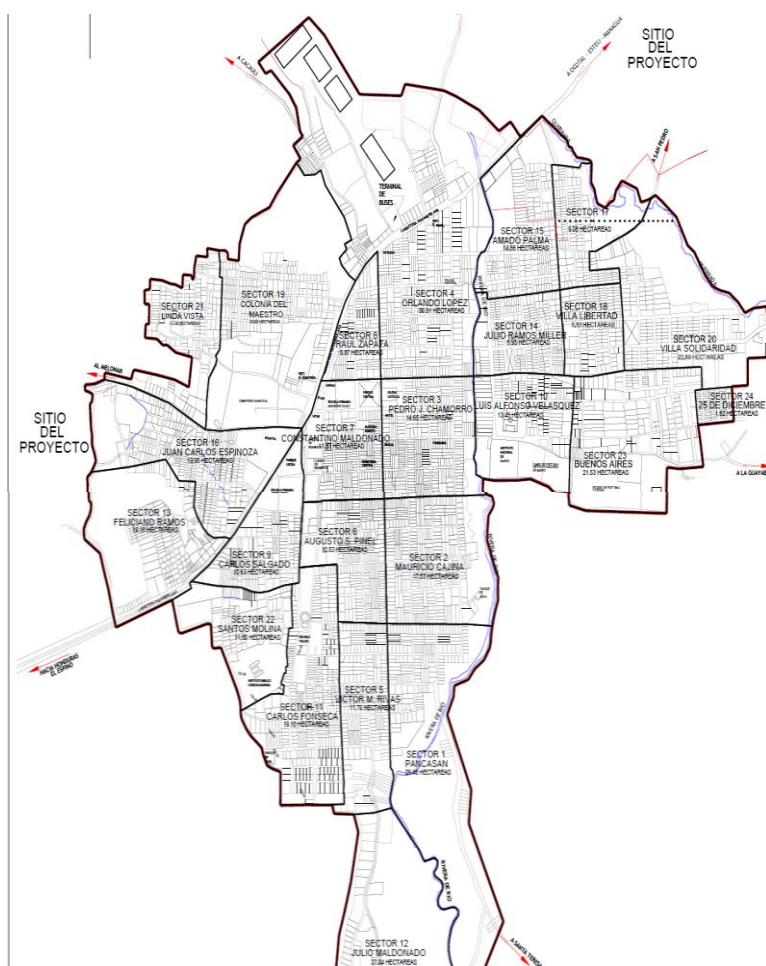


Figure 5: Map of Somoto with 'Los Barrios Unidos' (sector 10, 14, 15, 17, 18, 20, 23 & 24) to the north-east of the city centre

<sup>8</sup> Barrio, which can be defined as urban suburb, will be used throughout the document

## METHODOLOGY

To obtain more insight in the situation of *Los Barrios Unidos* concerning food security and nutrition a combination of research methods was used. A series of questionnaires, family visits with participatory observations and informal interviews were used. First the general scope of the research is discussed, followed by general constraints. In the last part an overview is given of the used questionnaires and the indicators that can be calculated.

As the Right to Adequate Food (or thus Food Security) is recognized as a human right, this research complies with the mission and vision of INPRHU Somoto. It especially complies with the following two values: (1) provide, as an essential component of human development, the education, freedom and constructive participation in order to empower the groups with whom we interact and (2) work for the defense and promotion of human rights, with a special focus in the most vulnerable groups.

### 1. General outlines

The investigation was conducted together with a CUSO International volunteer (Sarah Sax) who was also working in the INPRHU project '*Programa de Desarrollo Comunitario*'. Two local girls, studying social work, were asked to help conduct the questionnaires.

In total four *Barrios* were selected in dialogue with my project counterpart. The *Barrios* were selected based on the assumed wealth status, level of education and location. *Barrios* 10 and 14 are assumed to consist of wealthier and more (highly) educated families and are located closer to the city centre of Somoto (two *Barrios* on the boarder). *Barrios* 20 and 24 are assumed to consist of poorer and lower educated families and are located at the very end of *Los Barrios Unidos*.

A total of four families per *Barrio* were chosen, giving a total of sixteen families. The families were chosen based on a combination of three criteria's; the age of the mothers, the age of their child(ren) and the presence of a partner. Table 3 shows the four criteria combinations which were used. The purpose was to investigate one family for each combination in each *Barrio*. The *Barrio* leaders were asked to help provide families fitting the different criteria in their *Barrio*.

Table 3: The four combination criteria used to select the families for this investigation

Criteria 1	Mothers $\leq$ 20 years old without a partner with child(ren) $\leq$ 4 years old
Criteria 2	Mothers $\leq$ 20 years old with a partner with child(ren) $\leq$ 4 years old
Criteria 3	Mothers $\geq$ 25 years old without a partner with child(ren) $\leq$ 4 years old
Criteria 4	Mothers $\geq$ 25 years old with a partner with child(ren) $\leq$ 4 years old

In this investigation it was chosen to focus on mothers with children under the age of four. Children between the ages of zero and four are a vulnerable group to food insecurities and malnutrition. On the other hand '*El Programa de Desarrollo Comunitario*' monitors children in *Los Barrios Unidos* by recording weight and height. More insight in the children's diet and nutrition will help to monitor and to intervene in more appropriate ways.

It was chosen to visit the families at home in order to conduct the survey in a, for the mothers, familiar and safe environment. Another reason for visiting the families at home was the possibility to observe and interact with the families in their every day environment to obtain a feeling of the living conditions. Also this approach increased the accessibility and allowed an easier and more efficient way of working. If appointments would have been scheduled the possibility exists that mother would not be present because they forgot or other opportunities suddenly occurred. In order to make the questionnaire completely anonymous the families were coded with numbers and mothers are given pseudonyms, however the real *Barrios* numbers will be used.

Each family was visited three times in total during the course of the investigation. During the first visit the Dietary Diversity questionnaire and the Lactation questionnaire (*cf. infra*) were conducted for the children between the ages of zero to three years. Mothers were also asked during this visit to fill out the food diary for one week (starting the next day). These visits were conducted in the same duos and every duo visited two families (randomly assigned) in the particular *Barrio* on that particular day. Therefore personal observations of the first contact are only available for half of the families (two per *Barrio*). The first follow-up visit was used primarily to collect the food diaries and for informal conversations about fruits and vegetables. Each family was given an example of a fruit and vegetable dark yellow or orange in color as illustration of fruits and vegetables rich in vitamin A<sup>9</sup>. During the second follow-up visit the Dietary Diversity questionnaire was conducted for the mothers. The follow-up visits were conducted in one day (a weekday) and by Sarah Sax and the author.

## 2. General limitations and difficulties

Although encountering the mothers in their familiar and safe environments was a necessity for the participatory part of the investigation, it did bring some limitations for the questionnaires. Mothers were sometimes distracted because of children running around, neighbors asking questions... Also sometimes other women in the house (relative/neighbor/friend) would answer for the mothers instead.

One of the main difficulties I encountered during the survey was the communication in Spanish with the mothers. Two local girls were extremely helpful in explaining the purpose and objectives during the first visit and rephrasing questions when mothers didn't understand.

It must be mentioned that the families were provided by the *Barrio* leaders and the children were, in most cases, connected to the '*Patrocino*' project from INPRHU program. These families already receive a certain amount of support.

Socially desirable answers must always be kept in mind. Others might give answers which they think are expected of them. These answers will distort the results and conclusions. The *Barrio* leaders were not present during the visits to hopefully reduce the number of socially desirable answers. Also by

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<sup>9</sup> This was an initiative of the investigators themselves and personally financed.

coincidence both local girls helping with the questionnaires live in *Barrios* under investigation. It was taken into consideration that this could have effects such as making the mothers feel more comfortable and creating a more confidential atmosphere, however effects such as making mothers more skeptical and being less honest about gravities of situations were also possible. The impact of these things are however difficult to evaluate.

Also during the actual data collecting period (March-April) the program '*Programa de Desarrollo Comunitario*' was confronted with whether they would continue to exist after April. This resulted in certain limitations during the last weeks of my investigation.

### 3. Utilized Methods

#### *3.1 Dietary Diversity Questionnaire*

The Dietary Diversity Questionnaire from the Food and Agriculture Organization (FAO) is a qualitative measure of food consumption which can be used to evaluate household access to foods and give an approximation for nutrient sufficiency for individuals.

The questionnaire consists of two parts a i) 24-hours recall and ii) a Dietary Diversity Table listing sixteen different food groups (Appendix 1).

In this case the survey was used to collect information both at a household and individual level. Individual data was collected for children between the ages of 0 to 48 months and their mothers. In all cases the mothers answered the Dietary Diversity Questionnaire.

##### 3.1.1 Administration of the Questionnaire

First the interviewers are introduced; the reason and the objectives of the investigation are explained. Second it is emphasized that the investigation has the purpose of collecting data, is completely anonymous and has no implications of any kind for the families. The questionnaire was normally started by asking a few questions to create a respondent profile (age, education, employed, number of people living in the house...). Then the respondent was asked to recall all the foods (meals and snacks) and beverages which were consumed yesterday during the day and night at home and outside the house. It is asked to start with the first item consumed yesterday and to continue throughout the day. The interviewer writes down the foods in the appropriate columns of the 24-hour recall table (Appendix 1). When the recall is complete the interviewer fills out the dietary diversity table (Appendix 1) by writing '1' if an item from that food group was consumed. The interviewer then asks about snack, foods added (*e.g.* sugar in coffee) and ingredients for mixed dishes.

### 3.1.2 Dietary Diversity Scores

The information collected by questioning the mothers which food groups they consumed the day before are used to calculate two different scores.

The Household Dietary Diversity Score (HDDS) gives information on a household's economic access of variety of food groups. The questionnaire covers all people living under the same roof and sharing meals. The questionnaire includes all food prepared inside the home and consumed inside or outside the home and all foods purchased outside but consumed inside the home. The foods purchased and consumed outside the home are not include as the respondents may not know this for all the members in the household (FAO, 2010). A higher HDDS or increase in dietary diversity has been associated with household food security and their socio-economical status (Hoddinott & Yohannes, 2002)

The questionnaire on the individual level gives information on the individual diet quality or nutrient adequacy. The individual is questioned and all foods consumed inside or outside the home are of interest (FAO, 2010). For women this score is called the Women's Dietary Diversity Score (WDDS).

The information collected by questioning the mothers which food groups their child consumed yesterday are used to calculate three different scores. The first one is the Minimum Dietary Diversity (MDD) which indicates the proportion of children which consumed four or more food groups. Breast milk is not counted because the indicator is meant to reflect the quality of the complementary food diet (WHO, 2010). The second is the consumption of iron-rich or iron-fortified foods and the third is the consumption of vitamin A rich or vitamin A fortified foods.

### 3.1.3 Analyzing the Dietary Diversity Data for adults

There is no international consensus on which food groups are included in the scores and further research may indicate changing the proposed groups in the current guidelines.

The HDDS is calculated based on the twelve food groups proposed by FANTA (Swindale & Bilinsky, 2006) and the WDDS is calculated based on nine food groups proposed by The Women's Dietary Diversity Project (Arimond *et al.*, 2010). The food groups used to calculate HDDS and WDDS are shown in Table 4 and Table 5. The score range for HDDS is situated between 0-12 and for WDDS this is between 0-9.

Table 4: Food groups from the Dietary Diversity Questionnaire used to calculate HDDS

Question number(s)	Food group
1	Cereals
2	White tubers and roots
3,4,5	Vegetables <sup>1</sup>
6,7	Fruits <sup>2</sup>
8,9	Meat <sup>3</sup>
10	Eggs
11	Fish and other seafood
12	Legumes, nuts and seeds
13	Milk and milk products
14	Oils and fats
15	Sweets
16	Spices, condiments and beverages

<sup>1</sup> Combination of Vitamin A rich vegetables and tubers, Dark green leafy vegetables and Other vegetables.

<sup>2</sup> Combination of Vitamin A rich fruits and Other fruits

<sup>3</sup> Combination of Organ meat and Flesh meat

Table 5: Food groups from the Dietary Diversity Questionnaire used to calculate WDDS

Question number(s)	Food group
1,2	Starchy staples <sup>1</sup>
4	Dark green leafy vegetables
3,6	Other vitamin A rich fruits and vegetables <sup>2</sup>
5,7	Other fruits and vegetables <sup>3</sup>
8	Organ meat
9,11	Meat and fish <sup>4</sup>
10	Eggs
12	Legumes, nuts and seeds
13	Milk and milk products

<sup>1</sup> Combination of Cereals and White roots and tubers

<sup>2</sup> Combination of Vitamin A rich vegetables and tubers and Vitamin A rich fruits

<sup>3</sup> Combination of Other fruits and Other vegetables

<sup>4</sup> Combination of Flesh meat and Fish and seafood

When analyzing the Dietary Diversity Scores it is important to keep in mind that the diet may change across seasons and that the score does not give an indication of the quantity of foods consumed. The variety in urban and semi-urban settings may be greater than rural settings due to the easier accessibility of food markets which have adequate supplies.

The percentage of households or individuals that consume vitamin A or iron rich foods can be calculated using the data from the questionnaire. Table 6 shows the food groups of interest for calculating indicators representing vitamin A or iron consumption. The indicators are calculated by adding the number of households or individuals that consumed any of the food groups for the particular micronutrient and dividing by the total sample size and multiplied by one hundred to obtain results in percentages.

Table 6: Food groups from the Dietary Diversity Questionnaire used to calculate Vitamin A and iron consumption indicators

Micronutrient	Question number(s)	Food group
Vitamin A	<i>Plant-based food groups:</i>	
	3	Vitamin A rich vegetable and tubers
	4	Dark green leafy vegetables
	6	Vitamin A rich fruits
	<i>Animal-based food groups:</i>	
	8	Organ meat
	10	Eggs
	13	Milk and milk products
Iron	8	Organ meat
	9	Flesh meat
	11	Fish and seafood

### 3.1.4 Analyzing the Dietary Diversity Data for children

Minimum Dietary Diversity (MDD) is calculated according to seven food groups shown in Table 7. The MDD indicator is calculated by adding the number of children that consumed four or more food groups and dividing by the total survey size. The same food groups as in Table 6 are used to calculate the indicators for the consumption of iron rich and vitamin A rich food groups with fortified food products taken into consideration for both calculations.

Table 7: Food groups used to calculate Minimum Dietary Diversity

Question number(s)	Food group
1,2	Grains, roots and tubers
12	Legumes and nuts
13	Dairy products <sup>1</sup>
8,9,11	Flesh foods <sup>2</sup>
10	Eggs
3,4,6	Vitamin A rich fruits and vegetables
5,7	Other fruits and vegetables

<sup>1</sup> Milk, yogurt, cheese and milk powder but no mother milk

<sup>2</sup> Meat, fish, poultry and organ meat

### 3.1.5 Other considerations

The questionnaire was used since it is not culture, population or location specific. However changes needed to be made to adapt the questionnaire to the local context. The questionnaire was translated to Spanish and the food groups were adapted to reflect locally available foods. Consumption of fortified foods is included in this questionnaire particularly to obtain more information on the consumption of iron and vitamin A. The adaptation of the survey was done based on informal

conversations with project employees, own experience in host family and informal contact with *Barrio* leaders.

A 24-hours recall period was chosen in accordance with the FAO and FANTA guidelines (FAO, 2010) (Swindale & Bilinsky, 2006). It is easier for the respondent and fewer mistakes are assumed to be made when recalling the consumed foods. However it must be mentioned that a 24-hours recall is not an indication of one's dietary habits since it represents only 'snapshot' in time.

It is important to keep in mind that the obtained consumption patterns may not reflect the typical diet on holidays or during periods of celebrations. Therefore it was chosen to question all the respondents during one week from Tuesday to Friday.

### 3.2 Lactation Questionnaire

Mothers were asked to answer a series of questions (Appendix 2) about lactation practices and introduction of solid foods. Due to time limitations this questionnaire was unable to be adapted and retested. The questions did create room for some informal conversations with the mother on breast feeding practices (*cf. infra*).

During the investigation it was concluded that this part of the methodological framework needs to be changed if future research is done. The definitions need to be more clearly communicated to the respondents and questions need to be changed. In future investigations the questionnaire should be set up in a way the data can be used to calculate the core indicators for assessing infant and young child feeding practices (WHO, 2010).

### 3.3 Food Diary

To gather more detailed information on the nutrient adequacy in the diet, dietary habits and to be able to calculate the daily intake of calories, mothers were asked to keep food diaries for one week. During this week (Monday - Sunday) they were asked to record (write down or draw) all the food items, meals, snacks and beverages they consumed. This was recorded in a table structured according to breakfast, lunch and dinner and snacks in between (Appendix 3). The mothers were asked to list down the food items as well as quantities (*e.g.* teaspoons, tablespoons, cups). For mixed dishes a list of ingredients was asked and also food items added to other foods (*e.g.* sugar in coffee) were asked to be reported.

Originally the food diaries would be collected, revised and after the necessary adjustment the mother would be asked to record their diets for a second week. However due to time limitations and the presence of a celebrative week (*i.e. Semana Santa*) in the actual investigation period it was not possible to collect representative data (*cf. supra*) for a second week. Instead during the follow-up visits the mothers were asked for more details and clarification where necessary.

It was taken into consideration that a certain amount of mothers might not fill out the food diaries for whatever reason. The biggest problem was asking for quantities. It was not clear whether mothers were not able or not willing to communicate about portions. Due to general lack of portion

sizes the food diaries were evaluated as a qualitative instrument to evaluate dietary habits instead of using the data to make an estimation of the daily calorie intakes/dietary energy.

### *3.4 Participatory observations*

Participatory observation was used to gain more insights in the feeding habits, state of nutrition, home situations... During the home visits in the *Barrios* the behavior/habits/attitude of the mothers, children and other people in the house were observed. However the visits were never very long, one to three hours. My host family, with whom I lived five months, was also observed in their eating habits and diet as both children were between zero and four years old.

Also the preschool in *Barrio 20* was visited multiple times. Here the preparation of meals, eating practices were observed and week menus were discussed. The interactions with the children were often hard due to the language barrier and the fact that the children often talk very fast and unclear and did not want to repeat their answer again.

It was important to keep in mind to tell the people that I was observing and that was why notes were being taken. Especially the children were always very curious to what I was writing down. It was so obvious to read down what you see without making a judgment or interpretation based on your own reference framework. My presence might have an effect on my surroundings.

### *3.5 Informal interviews*

The objective of these conversations was to get more insight in own observations and obtain more details on certain topics from knowledgeable people such as a doctor in the health center in *Barrio 18* and a dietitian from ngo '*Instituto de Formación Permanente*' or INSFOP. Due to the fact that the informal interviews were not recorded and literally written down, it was not always evident to represent the real content through my personal notes. Also for political reasons it was sometimes impossible to go and talk to certain people.

## RESULTS

To obtain more insight in the food security and nutrition situation in the *Barrios Unidos* a combination of research methods was used as mentioned in the previous part. Collecting detailed data on food access and individual dietary intake can be time consuming, expensive and require technical expertise. Dietary diversity is a qualitative measure that reflects household access to food and it is an indirect measure for the adequacy of micronutrients. Out of the questionnaire, indicators (e.g. HDDS, WDDS, MDDC) can be quickly calculated to get an overview on the state of food security and nutrition.

The original criteria to choose the participating families were ignored or not achieved. For example the age of most mothers was under 25 years, making the comparison of families on basis of the criteria is not possible. In one case, one of the Barrio leaders asked the mother to change her age to meet the requirements of the survey.

### 1. Availability

As mentioned earlier food availability can be related to levels of food production, stock levels, imports and thus the supply-side of food security. At the household level, the dimension of food product availability is situated in a specific region (i.e. department Madriz) and/or city/town (i.e. Somoto). The economical activities in this region are based on agriculture and livestock.

In the department of Madriz basic grains (maize, beans and sorghum), agro-industrial crops (coffee and tobacco) and vegetables (cabbage, tomatoes, and bell peppers) are grown. Chickens and pigs are mostly raised for consumption and not for cash (ACF-E, 2010; PNUD, 2012). INPRHU mentioned maize and livestock as the two most important products in Madriz and only a small amount of vegetables are produced (Field notes, 04/03/2014).

During my six months stay it became clear that in general the commercial availability of high quality vegetables and various agricultural products, such as green leafy vegetables, nuts, grains (other than rice and maize) and legumes (other than red beans), is low in the city of Somoto. This general problem can be linked with the lack of diversity in the agricultural sector that exists in the department of Madriz. Although other legumes can generally not be bought, some family farms cultivate white or black beans for own consumption. Farmers don't often sell these legumes as people don't have the culture/are not accustomed to eat them and therefore won't buy them. On the other hand the fact that these legumes are not generally available prevents people to try them (Anabella, field notes, 26/03/2014). It must be mentioned that some merchants do sell chickpeas, black beans and various other products, such as whole wheat bread and olive oil.

Generally a larger availability of food and non-food products can be found in the supermarket in Somoto however most of the families in the *Barrios* buy their food from small independent retailers or *pulperías*, roadside stands and the market in Somoto centre. The availability in the *pulperías* in the *Barrios* is rather limited, consisting mainly of the basic staple foods (rice, pasta, beans and sugar), cooking oil and various processed foods (soda, chips, sweets). The availability of vegetables is limited

to tomatoes, onions, bell peppers and sometimes plantains, whereas fruits are hardly ever sold. Two *pulperías* were found selling cucumbers, bananas and plantains (Field notes, 02/04/2014). Another factor that may be linked to the lower food availability in the *Barrios* is the fear of the merchants to get robbed. Gabriella, a *Barrio* leader, mentioned that it is unsafe to sell things here, as the man who sells fresh fish was robbed by youngsters (Field notes, 28/03/2014). However during an encounter with a woman in *Barrio* 20 who was selling a small amount of vegetables, this was not mentioned as a problem (Field notes, 2/04/2014).

It can be concluded that basic food products are available in Somoto although the availability of various other food products is low, whereas the availability in the *Barrios* in general is very low.

## 2. Accessibility

Access to food (both physical and economic) is linked to availability and state of infrastructure, food storage facilities, food prices and purchasing power of individuals (related to employment). Both physical and economical accessibility were investigated and are discussed below.

### 2.1 Physical accessibility

In general in the *Barrios* minor constraints were observed in obtaining physical access of food products. Although roads are not always paved, they remain rather accessible for vehicles in all weather conditions. Taxis drive between the *Barrios* and Somoto center. The distance between the *Barrios* and the city of Somoto is approximately one to four km making the center accessible on foot.

In the city center of Somoto a variety of retailers are present: bakeries, pharmacies, *pulperías*, street stands, a fresh food market and a supermarket (Pali). In the *Barrios* however there is no food market or supermarket, only small *pulperías* are present. In these *pulperías* basic food products (e.g. rice, beans, sugar, and salt), processed foods (e.g. soda, sweets, chips, instant soup) and sometimes vegetables can be found. Fruits and meat are hardly ever accessible.

Thus if people only buy food products in the *Barrios* there is a limited access to a variety of foods. Several reasons were given by families why they were not able to make the trip to the city center: caring for young children, personal physical problems, lack of time and lack of taxis going to the city center<sup>10</sup>.

### 2.2 Economical accessibility

An indication for a household's economic access to a variety of food groups can be expressed by the Household Dietary Diversity Score (HDDS). For the HDDS no minimum quantities of food intake are implemented below which foods are considered as not consumed. The score (ranging from 1 to 12)

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<sup>10</sup> Taxis are available in the city. They only drive to the *Barrios* to drop people off but generally drive straight back to the center (where there is more business). This leaves a small window of opportunity for people in the *Barrios* to take a taxi to the city.

reflects the economic access and therefore small quantities of consumed food also reflect a certain ability to purchase that food item. A higher HDDS (or increase in dietary diversity) has been associated with household food security and their socio-economical status (Hoddinott & Yohannes, 2002).

From four different *Barrios* (10, 14, 20 and 24) 16 households participated in the investigating. Figure 6 shows the number of households (in percentage) and the amount of food groups they consumed on a total of 12 food groups (these 12 food groups were used to calculate HDDS, see Methodology). Approximately 50% of the households consumed 8 of the 12 food groups. The percentage of households consuming less or more than 8 food groups is almost equal. These results suggest that the economic accessibility in the *Barrios* is moderate.

Number of food groups consumed by households (%)

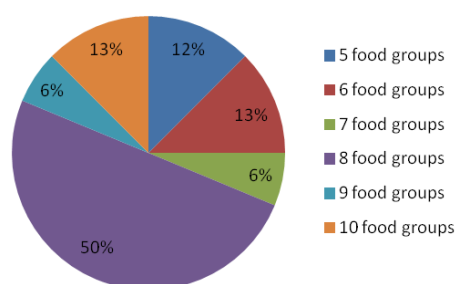


Figure 6: Percentage of households with the same HDDS

The results were grouped per *Barrio* to evaluate if there were differences in economic access between *Barrios*. The average number of the food groups consumed by the families of a *Barrio* is shown in Figure 7. In *Barrio* 10 and 14 more food groups could be consumed than in *Barrio* 20 and 24. This higher HDDS in *Barrio* 10 and 14 can thus be linked to higher diversity of foods and a better situation in terms of economic access.

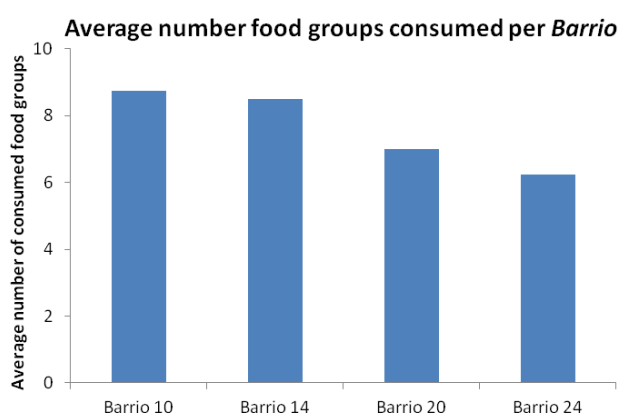


Figure 7: The average HDDS for Barrio 10, 14, 20 and 24

The assumption from INPRU (as mentioned in the methodology) about the differences between the four investigated *Barrios* appears to be seen in the results above. *Barrio* 10 and 14 were assumed to consist of wealthier and more (highly) educated families whereas *Barrio* 20 and 24 were assumed to consist of poorer and lower educated families. Looking at the education of the mothers it can be

seen that in the *Barrios* able to consume a broader range of food products the women have higher education levels. In *Barrio* 10 and 14 all mothers had at least a secondary education and in some cases have a university degree or will achieve one in the future. In *Barrio* 24 mothers only attained an elementary education and here the least food groups were consumed. Observation during the home visit gave a presumable indication of the family's wealth. In *Barrios* 10 and 14 in contrast to 20 and 24 more families had a stereo, television, table and chairs, stone floor instead of dirt floor and a gas stove instead of wood for cooking (Field notes, 18-21/03/2014).

Most mothers mentioned that they buy food to consume it the same day. The possibility of buying a larger amount of food for a longer period of time can be linked to the amount and stability of financial resources (cash). One mother from *Barrio* 24, working in the informal sector (selling food on the street) pointed out that her daily wage influenced the food that is bought. Due to her insecure income the family lives day by day: "*sobrevivir el día*"<sup>11</sup> (Sandra, Field notes, 20/03/2014). On the other hand in *Barrio* 14 a mother mentioned that her family buys food for one week. In her family (consisting of five people) two members have a secure job foreseeing the family of a stable income (Anabella, Field notes, 19/03/2014). In this respect it is important to mention that most households in the *Barrios* are large (an average of eight people) but only a small amount of members obtain an income, resulting in a large dependency (number of people in a household depending on the same income). In *Barrio* 20 for example a household of 12 people depends on only two people for an income (Field notes, 2/04/2014). It can be concluded that, besides the amount, stability of income and the high dependency ratio, the possibility of food storage also plays a role in the purchasing habits.

Food prices play an important role in relation to economic access as a large amount of income is used to buy food. In Nicaragua poor people spend more than half of their income on food (WB data, 2014). The prices of some basic products in the *pulperías* in the *Barrios* were stated to be more expensive compared to prices in the city center (e.g. price of rice in the city center: C\$ 8-9/Libra<sup>12</sup>; price in the *Barrios*: C\$ 12-13/Libra) (Field notes, 21/03/2014). For this reason most families buy food products on a regular base at the market in the center to increase their purchasing power. When prices increase, coping strategies are reducing the amount of food consumed or switching between food items. Switching behavior takes place from more expensive, more nutritious to less expensive but also less nutritious food. The latter allows consumers to maintain their dietary food intake but increase the risk of micronutrient deficiencies.

### 3. Utilization

Food utilization addresses the sufficient intake (quantity) and consumption of nutritious foods (quality). This is combined with food preparation, storage, feeding practices and sanitation.

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<sup>11</sup> Survive the day

<sup>12</sup> One libra is approximately 450 gram

### 3.1 Nutritional status of mothers

On the individual level the used questionnaire gives information on the individual diet quality or nutrient adequacy. The individual is questioned about all foods consumed, both inside and outside the home. For women this score is called the Women's Dietary Diversity Score (WDDS). A higher WDDS can be associated with an increase in dietary quality. When determining the WDDS food groups consumed in amounts of approximately one tablespoon/15 grams or less should not be included in the score (Arimond *et al.*, 2010; FAO, 2010). However this was not always easy to determine. WDDS ranging from 1 to 9 is represented in Figure 8 expressed as percentage of women consuming a certain amount of food groups. The majority of the women consumed a total of 5 food groups (35%) and 23% consumed slightly more than half of the total amount of food groups. This reflects a rather moderate to low dietary quality. On the other hand 36% of the women consumed only 2, 3 or 4 food groups, resulting in a low dietary quality. *Barrios* 20 and 24 contained lower WDDS whereas *Barrios* 10 and 14 consisted of women consuming a larger amount of food groups. These results show a similar trend as for the HDDS (*cf. supra*), showing less dietary diversity (economic access) for families in *Barrios* 20 and 24. Although low dietary qualities were observed, no visual signs of underweight were observed for the participating women. Monotonous diets based mainly on energy dense, micronutrient poor starchy foods often meet the daily energy requirements but contribute to inadequate micronutrient needs (Kennedy *et al.*, 2010).

Number of food groups consumed by women (%)

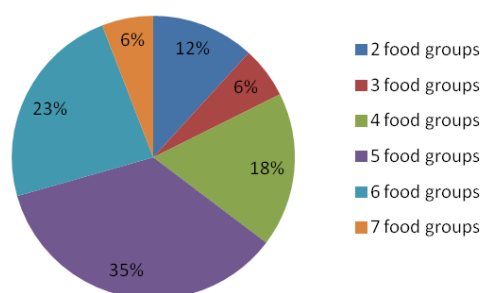


Figure 8: Percentage of women with the same WDDS

Proportion of women consuming food groups defined as rich in vitamin A, iron and calcium are shown in Figure 9. Although consumption of iron or calcium rich foods was rather low, approximately 80% of the women consumed foods rich in vitamin A. The high frequency of vitamin A consumption for women may be linked to the regular consumption of plantains which are a typical element of the Nicaraguan diet and rich in vitamin A. It must be mentioned that these results do not automatically reflect adequate amounts of micronutrients (*cf. recommended daily allowance*). Further research (*e.g. blood analysis*) on this subject would be necessary in order to evaluate the real intake of these micronutrients.

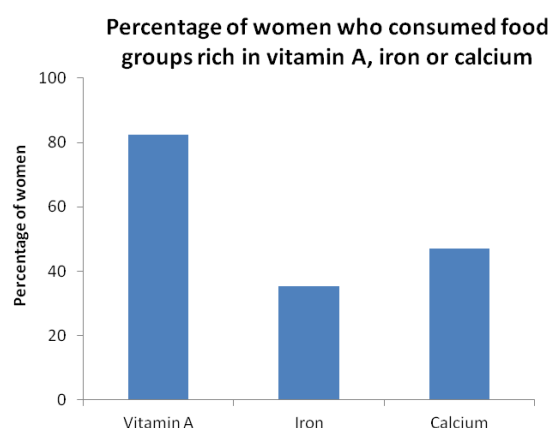


Figure 9: Percentage of women who consumed food groups rich in vitamin A, iron or calcium

The 24-hours recall method generally gives no information on the dietary habits. For this reason mothers were asked to record their daily meals during one week. These food diaries (data not shown) indicate that rice and/or beans were eaten daily by all families. Almost all families consumed sweet food items or added sugar to beverages. It is not unusual for a meal to consist of rice, pasta and tortillas. Vegetables are mainly restricted to onions and bell peppers, used in the preparation of '*gallo pinto*' (rice and beans). In this respect it was often mentioned that vegetables are not seen as a main part of the meal and people just don't have the culture of consuming vegetables (Field notes, 14/02/2014). When the diet is more diversified, cheese/cream or meat is generally added to the meal. It was also noticed that the breakfast of many mothers consisted of a cup of coffee and a sweet bread or *rosquillas* (corn based cookies). Although the food diaries gave some valuable information about food habits of the people in the *Barrios*, information concerning quantities of foods was not able to be obtained. These food habits are also reflected when evaluating the frequency of which food groups were consumed by different families (Table 8). It must be mentioned that green leafy vegetables were not consumed by any of the families.

Table 8: Frequency of consumed food groups

High frequency consumed food groups (10 families or more)	Medium frequency consumed food groups (5-10 families)	Low frequency consumed food groups (4 families or less)
Cereals	Fruits	White roots and tubers
Vegetables	Milk and milk products	Eggs
Legumes	Flesh meats	Vitamin A rich fruits
Oils and fat		Fish and seafood
Sweets		Organ meat
Condiments		Dark green leafy vegetables (0)

These observations are in line with the results from INCAP (2005) showing the contribution of food groups to the total energy content. These results showed 51.9% of energy coming from cereals, 9.8% from animal-source foods, 6.0% from vegetables and fruits and 32.3% from other food groups in the region of Matriz. It is concluded that the majority of the families consumed a rather monotonous diet, which was based mainly on energy dense and micronutrient poor food items.

### 3.2 Nutritional status of children

For children (between six months and four years) the Minimum Dietary Diversity (MDD) is calculated according to 7 food groups (*cfr.* Table 7), an indication of the quality of their diet. A minimum of 4 groups is used as threshold. This is because if a child eats at least 4 food groups it is likely to eat at least one animal-source food and one fruit or vegetable along with the basic staple groups. In Figure 10 the results are shown for determining the general dietary quality of the participating children. The majority of children receive 4 food groups or more. This could lead to the conclusion that the quality of the children's diet is moderate to good. However this is in contrast to the dietary quality of the mother (*cfr. supra*). It can be mentioned that one of the four children that consumed less than 4 food groups lived in *Barrio 20* and three of the children lived in *Barrio 24*. These results can be linked to the HDDS, which was lower for *Barrio 20* and 24, indicating less dietary diversity in those *Barrios* (*cfr. supra*).

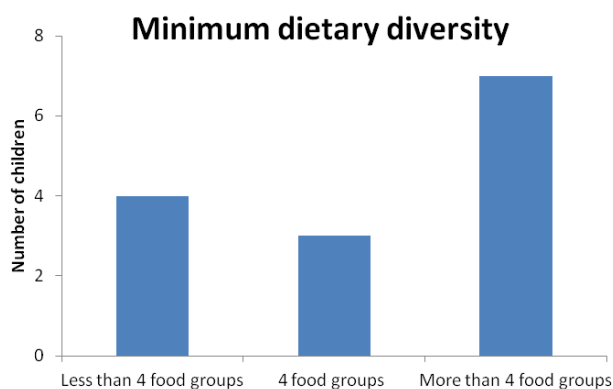


Figure 10: Number of children consuming less than 4, 4 or more than 4 food groups

The percentage of children consuming vitamin A and iron rich foods were also determined (Figure 11). In this case a distinction was made between consumption with and without milk (breast milk and/or formula milk). This makes it possible to distinguish between on the one hand micronutrients required only from food items and on the other hand micronutrients from food items and formula milk. These results show that a great amount of children receive milk (breast milk and/or formula milk). The reasonable difference between iron and vitamin A intake with and without milk suggests that milk plays an important contribution to the intake of micronutrients.

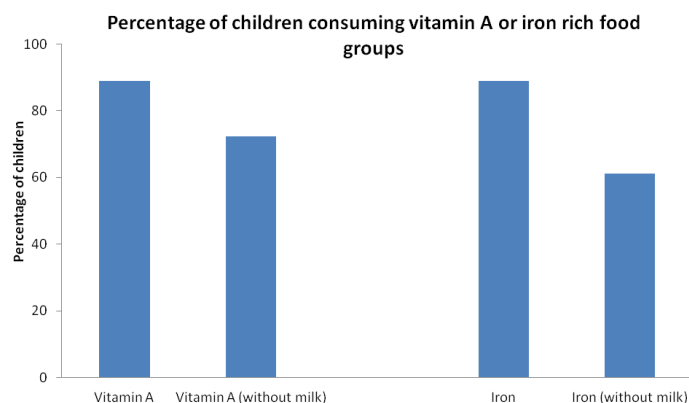


Figure 11: Percentage of children consuming vitamin A and iron rich food groups with or without milk (breast milk and/or formula milk)

It can be mentioned that calcium may have a negative effect on iron absorption by the body. This may be important when consuming fortified foods, such as formula milk. It is possible that if children are given formula milk at the same time as the foods, that this affects the amount of iron that can be absorbed. The bioavailability of iron can also be improved with the presence of anti-oxidants, such as vitamin A and C. Also the presence of non-dairy derived protein (meat) can improve the utilization of iron (NutriNet, 2006; EUFIC, 2010).

The habit of giving coffee to small children is common in the *Barrios* as in much of Nicaragua. For most families this was not considered as a problem. Some families explained that coffee consumption of children was regulated to one cup a day (Field notes, 18-21/03/2014). Coffee consumption can have negative health effects on people who suffer micronutrient deficiencies (Ruel & Levin, 2000). It was estimated that a cup of coffee consumed with a meal reduces iron absorption by up to 60% (NutriNet, 2006).

### 3.3 Child feeding practices

There were generally limited differences mentioned in food consumed by children and adults. During the home visits there seemed to be little awareness of the presence of different dietary needs of children under four years old (Field notes, 02/04/2014).

At home and in preschool there is little supervision while children have their meal and there is rarely an attempt to encourage the child to finish the meal (Field notes, 28/02/2014). This is rather consistent with observations from older studies done in Nicaragua on perceptions regarding breast feeding. A study in some neighborhoods of Managua showed that mothers think a child of around the age of one year old should be able to feed itself (Engle *et al.*, 1996). Active feeding behavior for children under two years of age was reported to be important as it supports children who start eating solid foods to develop good eating habits and to ensure that children eat a balanced diet (Engle *et al.*, 1996). It must be mentioned that the occurrence of exclusive breast feeding in the first six months of a child's life in the *Barrios* is low. Many mothers combined breast feeding with formula milk. This could be linked to governmental officials, teachers... getting six months free formula milk (Field notes, 21/03/2014). Formula-feeding poses many practical challenges for mothers, including ensuring the formula is mixed with clean water, the dilution is correct, sufficient quantities of formula are available and the feeding bottles can be adequately cleaned (Unicef, 2013a). Babies do not need liquids other than breast milk, not even water, in the first six months as breast milk contains everything a baby needs even in very hot climates (Unicef, 2013a). However mothers introduced natural fruit juices before the age of six months. Since these juices contain very high amounts of sugar these practices could lead to overweight. Two children in the *Barrio* were observed with weight problems (Field notes, 20/03/2014 and 02/04/2014). The World Health Organization describes exclusive breastfeeding from birth to six months of age as one of the ways to help prevent early child overweight. Obesity in childhood can be associated with a wide range of serious health complications (WHO, 2014b).

## 4. Other social factors

### 4.1 Unemployment

Unemployment is an important factor that affects the nutritional status of families in the *Barrios Unidos*. Unemployment was one of the first-mentioned factors when asking about conditions concerning food security in the *Barrios*. It was observed that only 4 of the 18 mothers were employed. Two mothers worked in the formal and two in the informal sector. In general, the problem is 'there are no jobs' (Field notes, 14/02/2014). Even many people with skills and/or basic education did not find jobs. Unemployment is a problem itself and a cause of other social problems affecting food security.

Unemployment affects the quantity and quality of food that can be purchased. Unemployment and the link with low purchasing power of households prevent people from buying food in bulk in advance (*cf. supra*). In general studies have demonstrated that there is a positive correlation between employment of women and health indicators of their children, such as growth retardation. One study showed that working women had fewer parasites, a higher protein-calorie intake and lower prevalence of anemia. That is important as a mother's health is directly correlated to the health of their children (Lamontagne *et al.*, 1998).

It must be noticed that the type of employment was reported to affect the nutritional status of children. Women who worked in the formal economy affected the nutritional status of their children in a positive way while women working in the informal sector had mixed results in how they affected the health of their children (Ruel *et al.*, 1998).

Unemployment particularly affects the quality of food that families can buy. A study in 1999 showed that almost 40% of the population in Nicaragua did not have economic access to basic food that meets the dietary needs (Meade & Rosen, 2002). Typically cheaper products are products with a high energy density but low-nutrient density (*cf. supra*).

### 4.2 Adolescent pregnancy

Many studies have illustrated the bond of teenage mothers with malnutrition and growth retardation in children. Adolescent pregnancy reduces the future prospects of women on social, educational and economical level. Young mothers are often poor and due to early pregnancy this situation is often worse. Teenage mothers are often single and are extra burdened. Many young girls leave school due to pregnancy, resulting in reduce of their economical chances and opportunities in the labor field (Bergland *et al.*, 1997)

Young mothers are often not fully physically developed to have children and do not have a stable emotional, economic and psychological base to support a child (Field notes, 14/02/2014).

In this study there was correlation between the age of the mother when she had her first child, the household socio-economic status, dietary diversity and low birth weight. 41% of the mothers gave birth to her first child before the age of 18. Unicef reported that 28% of women in Nicaragua give birth before the age of 18 years old (Unicef, 2013b). The mothers who had their first child under 18 years old tend to be poorer and have babies with lower birth weight. Infants of low birth weight have

shown low cognitive, emotional and social development (Pelto, 2000). Figure 12 shows that mothers who receive their first child before the age of 18, generally consume less food groups than mothers who were older when receiving their first child. This reflects a less diverse diet and smaller household economic access for younger mothers.

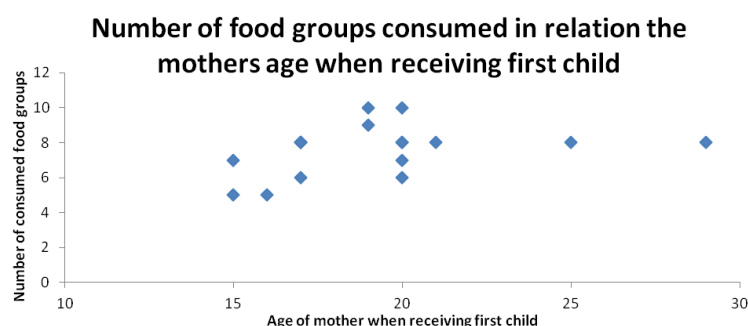


Figure 12: Number of food groups (representing HDDS) consumed in relation to the mothers age when receiving first child

The age of the young mother can be seen as an indicator of food insecurity in the *Barrios*. There is a cycle in which the young mothers who suffer from malnutrition are more likely to give birth to a child with low birth weight, whom in turn may give birth to a malnourished baby (Unicef, 2013b).

### 4.3 Machismo

Many aspects in the Nicaraguan society, as in many Latin and Central American countries, can be linked to *machismo*. A *machismo* male shows both positive and negative behavior. In this respect a *machismo* male is a man of honor, respect, dignity and with a large responsibility towards his family. On the other hand he is dominant, sturdy and strong. However these negative characteristics can easily result in violence and aggression. Men see women as inferior and are convinced that they need to take all important decisions. The women are passive, dependent and obedient. They are responsible for the household and the care of the children (Temmink, 2005).

*Machismo* in the *Barrios* was mentioned in relation with food insecurity within a household. If a man and woman have children, but the woman also has children from a previous relationship, the man will tend to give more food, money to his own children. This creates a different status of food security in a household (Rodriguez, Field notes, 14/02/2014).

The *machismo* culture causes the classic domestic role to be dominantly present. Women care for the children, shop for food and prepare the meal. In this respect women have a key role in achieving food and nutrition security at the household level. Women take care of all household members in general and in particular for younger children (INCAP, 2010). Besides making food available and accessible, people (and women in particular) need to be supported to make healthy dietary choices. Promoting behavior changes through nutrition education and information campaigns within an environment that also addresses household sanitation has proven effective (FAO, 2013c).

#### 4.4 School feeding program

The government of Nicaragua has established school feeding programs throughout the country. This program provides that children in preschools and primary schools receive lunch at school, maintaining their intake of food and encouraging continued attendance (Dhur A., 2009). The preschools in *Barrio* 14, 20 and 24 are compared as some mothers pointed out children consume a fairly large amount of food at school. Large differences can be observed between the three preschools. The preschool in *Barrio* 20 has a kitchen, where a young woman is in charge of the cooking. However in *Barrios* 14 and 24 there is no kitchen, making the school dependent on parents and *Barrio* members to cook for the children. All three preschools receive support from the governmental School Feeding Program. This program donates a certain amount of rice, beans, cereals, corn and cooking oil per child attending the preschool. The support consists of mainly basic food staples and does not contain vegetables or fruits of any kind. In the preschools of *Barrios* 14 and 24 the children do not eat breakfast but only lunch. The preschool in *Barrio* 20 has additional support from Aldeas Infantiles SOS which offers an additional variety of products: cheese, vegetables, fruits and meat. The children in this *Barrio* receive breakfast, lunch and two snacks at the preschool. Although the children are not supervised when eating and teachers in the classrooms don't really actively encourage children to eat (Field notes, 28/02/2014) a lot of effort goes to setting up a balanced and varied diet. The preschool in *Barrio* 24 was previously supported by Aldeas Infantiles SOS, however due to mismanagement the organization withdrew the support (Field notes, 18/03/2014). This results in a major setback for enhancing food security and nutrition for the children of this *Barrio*.

## CONCLUSIONS AND RECOMMENDATIONS

### 1. General conclusions

The aim of this research was to collect data about the situation concerning food security in *Los Barrios Unidos*. Availability, accessibility and utilization are here the subjects of focus.

Basic commodities (rice, beans and maize) are available in Somoto although the availability of various other food products (such as green leafy vegetables and other legumes) is low. Local retailers in the *Barrios* offer a select variety of basic food products, making the availability in general very low.

In general in the *Barrios* minor constraints were observed in obtaining physical access to food products. This can be linked to the presence of infrastructure, means of transport and the small distance (1 to 4 km) between the *Barrios* and the center of Somoto.

The results showed that the economical access in the *Barrios* is a moderate problem. A clear difference between the *Barrios* was observed. In the *Barrios* where mothers attained a higher level of education and families were observed to be better-off, more food groups could be consumed. Being able to consume more food groups reflects a higher dietary diversity and thus a better economical accessibility. Food prices, the amount and the stability of income, the number of people in the household depending on this income and the possibility of food storage play a role in the purchasing habits and economic access.

In general mothers consume an inadequate variety of food items. They obtain their daily energy quantity (mostly from cereals, beans, oil/fat and sugar) but lack sufficient quality of food. The main element in their diet is energy dense but micronutrient poor food. In contrast the quality of the children's diet seemed moderate to good. Milk (breast milk and/or formula milk) presumably contributes to the intake of micronutrients. Certain habits can have a negative effect on the absorption of micronutrients. There were generally limited differences mentioned in food consumed by children and adults. At home and in preschool there is little supervision while children have their meal. The World Health Organization describes exclusive breastfeeding from birth to six months of age as one of the ways to help prevent early child overweight.

Other social factors that determine the food security are unemployment, adolescent pregnancy, *machismo* and school feeding programs. Unemployment is an important factor that affects the nutritional status of families in the *Barrios Unidos*. Unemployment is a problem itself and a cause of other social problems affecting food security. Adolescent pregnancy reduces the future prospects of women on social, educational and economical level. There is a cycle in which the young mothers who suffer from malnutrition are more likely to give birth to a child with low birth weight, whom in turn may give birth to a malnourished baby. Due to the phenomena of *machismo* women have a key role in achieving food security and nutrition at the household level. Therefore it is important to educate women about nutrition and making healthy dietary choices. School feeding programs have a positive influence on the food intake of the children in the *Barrios*. However more attention should go to the diversification of the served meals.

## 2. Recommendations

This part gives some recommendations to improve the food and nutrition security in the *Barrios Unidos* and to develop more effective interventions by the *Programa de Desarrollo Comunitario*.

In general it can be mentioned that a community-centered approach should be applied in all causes. This increases the community participation in the design and further throughout the implementation and the monitoring. The aim should be to empower people to be able to improve own household food security and nutrition.

An idea is to improve access to fruits and vegetables in the *Barrios*. However other studies or analysis are needed to determine the possible options. One option mentioned was a weekly market in the *Barrios Unidos* of mainly fruits and vegetables. The market can also be used by the families in the *Barrios* or surrounding communities to sell their products (food products, handcrafts...) and generate an income.

Home gardens are important to increase food security of households and can increase the family diet with vegetables and fruits. Promoting home gardens is seen as a key element by FAO in combating micronutrient deficiencies through the production and consumption of appropriate foods. It is a good way for sensitizing people about macro- and micronutrients and the importance of vegetables and fruits. Workshops in the garden give the possibility to talk about topics such as nutrition, sustainability... Another advantage is planting vegetables which are nutritiously dense (such as green leafy vegetables) and not vegetables which already exist in the *Barrios Unidos* (e.g. tomatoes, bell peppers, onions). The gardens can be used to diversify a family's diet and grow vegetables that are not generally found at the market such as okra, eggplant, basil, oregano and pak choi. The home garden can also result in an increased purchasing power due to savings on the food bill and income generated from the sale of garden products.

Adolescent pregnancy is associated with many social, economical and health related consequences and risk factors for food security, such as low education, low level of mother health and low birth weight. Training on adolescent pregnancy and early interventions to prevent adolescent pregnancy is recommended for both women and men. Strengthening programs on pregnancy and early identification of young mothers as a vulnerable group are extremely important.

Providing more training on the level of nutrition would be interesting. More information about the general diet for individuals, a balanced diet, micronutrients, the importance of dietary diversity and different food groups is necessary. Another important topic is food for babies and children: the right diet, the importance of active feeding and good eating habits.

The health center in *Barrio 18* mentioned anemia as a major problem which is related to iron deficiency. In this respect educating people about the role, the types and the importance of micronutrients, their occurrence in various food items and their recommended daily requirement is of interest.

### 3. Future research

As information on the *Barrios Unidos* is limited to non-existing, further general data collection should be a main goal in order to intervene in an effective and efficient way in the future.

It would be interesting to perform a larger study in the *Barrios Unidos* with a more diverse population, more resources to obtain statistically representative results and confirm or disconfirm the observations of the present study.

Future research and approaches should consist of more systematic monitoring of the indicators in this study but also of new indicators to be identified in the future. This monitoring will allow changes to be observed concerning food security and nutrition of the population in the *Barrios Unidos*. Measuring and weighing the children in a consistent and accurate way should be included to observe changes and signs of malnutrition.

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## APPENDIX 1: Dietary diversity questionnaire

**Proyecto:**

**Desarrollo Comunitario**

**EJES: Seguridad Alimentaria**

Criterio 1. Mujeres menores de 20 años sin esposo, con niños menores de 4 años.

Criterio 2. Mujeres menores de 20 años con esposo, con niños menores de 4 años.

Criterio 3. Mujeres mayores de 25 años sin esposo, con niños menores de 4 años.

Criterio 4. Mujeres mayores de 25 años con esposo, con niños menores de 4 años.

### **Información general:**

Responsable:

Barrio o Sector:

Fecha:

### **Criterio :**

No. de personas que viven en el hogar: 0-4 años \_\_\_\_ 4-18 años \_\_\_\_ más de 18 años \_\_\_\_.

Edad (mes) de personas menores de 4 años:

Peso del bebe después del parto:

Edad de la mujer cuando tenía su primer hijo:

Edad de mujer ahora:

Educación:

Empleo:

Edad de los padres de la mama cuando tuvieron la mama:

### **Importante:**

- La encuesta es voluntaria, toda la informacion queda anonima, y la encuesta no tiene ningun impacto a su participacion en las actividades de INPRHU. Eso no es una evaluacion!
- La informacion ayudara a INPRHU mejorar sus actividades y servicios en los Barrios Unidos. Por eso, es muy importante que las familias nos digan las repuestas verdaderas, no las repuestas que creen que queremos oír.
- La investigacion trata de la seguridad alimentaria. El enfoque es en el acceso, disponibilidad, consumo y utilizacion de los alimentos con el enfoque en niños y niñas de 0 hasta 4 años.

### **Encuesta alimenticia de 24 horas**

Describa los alimentos (comidas y refrigerios) que comió o bebió el niño o la niña ayer por el día y por la noche, tanto en casa como fuera de casa. Comience con la primera comida o bebida que tomó por la mañana.

Anote todos los **alimentos y bebidas** mencionados. En caso de que se mencionaran platos mixtos, pregunte por la lista de ingredientes.

Cuando el encuestado haya terminado, pregunte sobre las comidas y refrigerios que no haya mencionado.

Desayuno	Refrigerio	Almuerzo	Refrigerio	Cena	Refrigerio

Cuando el entrevistado acabe de enumerar cuanto recuerda, rellene los grupos de Alimentos de acuerdo con la información recopilada. Para cada uno de los grupos de Alimentos no mencionados, pregunte al entrevistado si consumió algún alimento del grupo.

	Grupo de alimentos	Ejemplos	SI=1 NO=0
1	CEREALES	Maíz, arroz, pasta, trigo, sorgo, y cualquier otro alimento en grano o elaborado con ellos (p.ej., pan, cereal, avena...)	
2	RAÍCES Y TUBÉRCULOS BLANCOS	papas blancas, yuca, malanga	
3	TUBÉRCULOS Y VERDURAS RICOS EN VITAMINA A	zanahoria, calabaza, chilltoma roja, pipián, plátano o otro ayote que son de color naranja dentro + <i>otras verduras ricas en vitamina A disponibles localmente</i>	
4	VERDURAS DE HOJA VERDE OSCURO	verduras de hoja verde oscuro, incluidas las silvestres + <i>hojas ricas en vitamina A disponibles localmente como las hojas de remolacha, las hojas de yuca, espinacas</i>	
5	OTRAS VERDURAS	otras verduras (p.ej., tomate, cebolla, pepino, apio, chayote, aguacate...) + <i>otras verduras disponibles</i>	
6	FRUTAS RICAS EN VITAMINA A	mango maduro, melón, papaya madura, melocotón, naranja, y los frescos naturales con estas frutas + <i>otras frutas ricas en vitamina A disponibles localmente</i>	
7	OTRAS FRUTAS	otras frutas (p.ej., piña, cákala, mango verde...) y los frescos naturales con estas frutas	
8	CARNE DE VÍSCERAS	hígado, riñón, corazón y otras carnes de vísceras o alimentos a base de sangre	
9	CARNES	carne de res, cerdo, cordero, cabra, conejo, carne de caza, pollo, pato, otras aves	
10	HUEVOS	huevos de gallina, pato, pintada o cualquier otro tipo de huevos	
11	PESCADO Y MARISCOS	pescado o marisco fresco o seco	
12	LEGUMBRES, NUECES Y SEMILLAS	frijoles rojos, frijoles secos, arvejas secas, lentejas, nueces, semillas o alimentos elaborados con ellos	

13	LECHE Y PRODUCTOS LÁCTEOS	leche, queso, crema, cuajada, yogur y otros productos lácteos	
14	ACEITES Y GRASAS	aceite, grasas o mantequilla añadida a los alimentos o usada para cocinarlos	
15	DULCES	azúcar, miel, gaseosa, jugo con azúcar, productos dulces como chocolates, caramelos, galletas y pastel	
16	ESPECIAS, CONDIMENTOS Y BEBIDAS	especias (pimienta negra, sal, ajote), condimentos (salsa de soja, salsa picante), café, té, bebidas alcohólicas	
	<b>OTROS</b>		
17	¿Tomó productos fortificados?	NIDO, Leche envasada, cereales fortificados/corn flakes, jugo en carton, pastillas multivitaminas y mencionar las marcas de los productos	
18	Nivel individual	¿Tomó el niño algo (comida o refrigerio) FUERA de casa ayer?	

## APPENDIX 2: Lactation questionnaire

### Preguntas sobre la lactancia

	¿El niño está tomando leche materna ahora?	
<b><u>Si el bebé no está amamantando</u></b>		
1.1	¿Amamantó al bebé?	
1.2	¿Amamantó al bebé exclusivamente? ¿Hasta qué edad?	
1.3	¿A cuántos meses se introdujo alimento solido?	
1.4	¿Qué alimentos sólidos se le daba al bebé?	
1.5	¿Qué alimentos líquidos se le daba al bebé?	
1.6	¿Hubo algunas restricciones de comida especial para el bebé?	
1.7	¿Hubo algunos alimentos específicos que se le dieron al bebé?	
1.8	¿Le dio nido al bebé?	
<b><u>Si el bebé está amamantando</u></b>		
2.1	¿Amamanta al bebé exclusivamente?	
	<b><i>Si el bebé no está amamanta exclusivamente pero está amamantando</i></b>	
3.1	¿Recibe el bebé alimento en forma sólida o líquida diferente a las otras personas de la casa? ¿De qué forma?	
3.2	¿Cuáles son los primeros alimentos sólidos que recibe el bebé?	
3.3	¿A cuántos meses se introduce alimento solido?	
3.4	¿Qué alimentos sólidos se le dio al bebé?	
3.5	¿Qué alimentos líquidos se le dio al bebé?	
3.6	¿Hubo algunas restricciones de comida especial para el bebé?	
3.7	¿Hubo algunos alimentos específicos que se le dieron al bebé?	
3.8	¿Le dio nido al bebé?	

*Exclusivamente significa: Leche materna (incluyendo leche extraída o de nodriza). Permite que el lactante recibe reciba SRO (Sales de Rehidratación Oral), gotas, jarabes (vitaminas, minerales, medicinas) pero no cualquier otra cosa.*

## APPENDIX 3: Food diary

### Diario de los alimentos (una semana)

Familia:

Barrio:

Edad:

Género:

De personas que viven en su casa; relación con usted (p.ej. madre, padre, hermano, hermana, niño, niña...) y edad:

Por favor, describa todos los alimentos (comidas y refrigerios) que comio o bebio en esta semana.

<b>Lunes</b>						
	Desayuno	Refrigerio/ merienda	Almuerzo	Refrigerio/ merienda	Cena	Refrigerio/ merienda
<b>Martes</b>						
	Desayuno	Refrigerio/ merienda	Almuerzo	Refrigerio/ merienda	Cena	Refrigerio/ merienda
<b>Miércoles</b>						
	Desayuno	Refrigerio/ merienda	Almuerzo	Refrigerio/ merienda	Cena	Refrigerio/ merienda
<b>Jueves</b>						
	Desayuno	Refrigerio/ merienda	Almuerzo	Refrigerio/ merienda	Cena	Refrigerio/ merienda

Viernes						
	Desayuno	Refrigerio/ merienda	Almuerzo	Refrigerio/ merienda	Cena	Refrigerio/ merienda
Sábado						
	Desayuno	Refrigerio/ merienda	Almuerzo	Refrigerio/ merienda	Cena	Refrigerio/ merienda
Domingo						
	Desayuno	Refrigerio/ merienda	Almuerzo	Refrigerio/ merienda	Cena	Refrigerio/ merienda