Evaluation of the Sovereignty and Food and Nutrition Security of families in the rural communities of La Concepción municipality, department of Masaya in the period from May to December of the year 2015

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ABSTRACT

To evaluate Food and Nutritional Sovereignty and Security in the rural communities of the Municipality of La Concepción, a descriptive, correlational and analytical, prospective and transversal research was carried out. From the results obtained, it was concluded that: 1) The main socioeconomic characteristics under study: in the heads of households, the male sex stands out with 58.13%, with a low level of schooling with 36.9% in primary education. 90% of them have active employment, although with low incomes of C$4,346.38 per month. 2) The main associations between the variables of production, income, and consumption, occur between consumption of basic grains and the number of people in the

household, it was demonstrated a significant correlation between the number of people in the household and the consumption of rice, beans, sugar, oil, eggs, onion, potatoes, green banana. 3) A low positive, but significant, the correlation was established between the production and consumption of red beans. 4) The ANOVA between production and income variables showed significant differences. The ANOVA on citrus production for the different communities did not show significant differences. 5) The MANOVA for the consumption pattern carbohydrate showed that consumption between rural communities has significant differences, with a $p=0.022$. For the protein consumption pattern, the MANOVA showed that consumption between rural communities has no significant differences with a $p = 0.209$.

INTRODUCTION

Nicaragua has been affected by conditions that limit the development of the population, taking into account that the SSAN has a multisectoral and multidimensional approach, the articulation of actors in this area has been notable and important to contribute to the reduction of Food Insecurity and Nutritional (InSAN as in Spanish). Masaya has a chronic malnutrition rate of 13% according to the Nicaraguan Survey of Demography and Health (ENDESA, 2011/2012). On the other hand, Nicaragua has 14.6% of extremely poor, in the rural area 26.6% are extremely poor and in the urban area, they are 63.3% according to the household survey on the measurement of the standard of living 2009 (EMNV, 2009).

The territory of La Concepción is characterized by having high rates of agricultural production and this is linked to income, but adverse factors could be decreasing production and therefore their income causing a rise in the prices of food products and this triggers a diversity of problems, where the most affected population suffers from extreme poverty. This problem that crosses the regions of the said municipality is related to the pillars of Food and Nutrition Sovereignty and Security (availability, access, consumption, quality and food safety and use or biological use of food).

This study focused partially on three pillars of the SSAN, such as the access that families have to basic and nutritious food demanded by the basic basket (23 food products) through their income and production, as well as the availability of these families concerning family income and their own food production, and otherwise their consumption. On the other hand, the study developed the experience of knowing the feeding status of the rural families in which they are located and being able to compare in different rural communities of the same municipality to be able to see where there is greater vulnerability and therefore see the problems that these have, both in production and income.

MATERIALS AND METHODS

The main objective was to "Evaluate Food and Nutrition Sovereignty and Security: Production, Income, and Consumption, of families, in the rural communities of the Municipality of La Concepción, Department of Masaya in the period May-December 2015". According to the methodological design the type of study is descriptive, according to the method of study is observational (Piura, 2006). According to the classification of Hernández, Fernández and Baptista 2006, it is correlational. According to the time of occurrence of the facts and the registration of the information, it is prospective, due to the period and sequence of the study, it is transversal and according to the analysis and scope of the analytical results of cause-effect (Canales, Alvarado and Pineda, 1996).

The implementation of the probabilistic sampling for the estimation of the population mean was highlighted, *using the Simple Random Sampling method*, taking as the main variable the number of people in the household, the sample size required to estimate μ with the limit of estimation error B, was 160 households (Scheffer, Mendenhall & Ott, 1986). For the statistical analysis, descriptive and inferential techniques were implemented that included the use of Pearson's parametric correlation and univariate statistical models, ANOVA and LSD, and multivariate, ACP and MANOVA (Lambda de Wilks).

RESULTS AND DISCUSSION

Socio-economic characteristics in the context of the SSAN, of the families in the communities under study.

Based on the estimator $\bar{X}$ of the average number of people in the household, in the piloting of this investigation, it was determined that it is 5 (Table 1), which coincides with the number of persons per house occupied, according to the 2005 census figures (INIDE, 2006). 37% of the heads of households have their last year of primary school approved, the majority of them (51%) being married (Tables 2 and 3).

Table 1. Descriptive statistics of the number of people who make up the household					
	N	Mínimum	Máximum	Mean	Standard deviation
Number of people at home	160	1	11	5.06	1.9

Table 2. Schooling of the household head

Schooling	Frequency	Percentage
Illiterate	29	18.1
Elementary	59	36.9
Hihgschool	50	31.3
University	22	13.8
Total	160	100.0

Table 3. Marital status of the household head

	Frequency	Percentage
Married	82	51.3
De facto Union	41	25.6
Single	30	18.8
Widowed	4	2.5
Divorced	3	1.9
Total	160	100.0

According to ENDESA 2007, Masaya has an employment rate of 52.9%, however, in the 18 rural communities of this research, an employment rate of 90% of the heads of households with a current active labor situation was confirmed (Table 4).

Table 4. The sector in which the head of household works

		Frequency	Percentage	Valid percentage
Valid	Private	44	27.5	30.6
	Public	23	14.4	16.0
	Free-lance	77	48.1	53.5
	Total	144	90.0	
Lost	90.0	16	10.0	

Table 4. The sector in which the head of household works			
	Frequency	**Percentage**	**Valid percentage**
Total	160	100.0	
Valid percentage: its calculation does not take into account the lost			
Lost: these are data that are not included in the category of the variable			

Correlations between production, income, and consumption, in the context of the SSAN that occurs in the communities under study.

98% of rural families acquire food on their own, and they do not lack food during the three meal times per day (Table 5).

Table 5. The source which supplies the food they consume		
Sources by which their food has been supplied	**Counting**	**Table n %**
Government	1	0.6%
Family	7	4.4%
NGO	2	1.3%
By their own	157	98.1%
Table of n %: independent percentage of each category		

In these communities not much meat is consumed, 37% of the population does not consume beef, pork 49% of the population does not consume it. About the consumption of fish meat, 67% of people do not consume it. Poultry meat has the highest consumption, only 33%, it consumes it sometimes (Table 6).

Table 6. Frequency of their family consumes the following foods											
		Never		Rarely		Sometimes		Almost daily		Dialy	
		Counting	%	Counting	%	Counting	%	Counting	%	Counting	%
Basic Foods	Rice	0	0.0%	0	0.0%	1	.6%	2	1.3%	157	98.1%
	Been	2	1.3%	0	0.0%	10	6.3%	8	5.0%	140	87.5%
	Sugar	0	0.0%	0	0.0%	5	3.1%	2	1.3%	153	95.6%
	Oil	1	.6%	0	0.0%	3	1.9%	1	.6%	155	96.9%
Carnes	Beef	59	36.9%	35	21.9%	60	37.5%	5	3.1%	1	.6%
	Pork	78	48.8%	37	23.1%	43	26.9%	2	1.3%	0	0.0%
	Poultry	30	18.9%	25	15.7%	53	33.3%	44	27.7%	7	4.4%
	Fish	107	66.9%	26	16.3%	22	13.8%	3	1.9%	2	1.3%

In the municipalities under study, 51.3% of the population surveyed are active agricultural producers (Table 7) and of these 81% lack technical training to improve their agricultural production (Figure 1).

Figure 1. Heads of producing households that have been trained.

On average, the household has an income of C$ 6,559 per month, on average 2 people contribute to the household income. However, relating the monthly income of families to the basic food basket, which is made up of 23 products with a value of C$ 8,489.86, according to INIDE April 2016, this reveals that in rural communities they do not reach their income to obtain the basic food basket (Table 7).

Table 7. Descriptive statistics of family income					
	n	Minimum	Maximum	Mean	Standard deviation
Total monthly income at home C$	160	500.00	108000.00	6559.3750	9629.32691
How many people contribute to the family income	160	1	7	1.83125	1.14497466

The consumption of basic grains (rice and beans), sugar, oil, eggs, onions, potatoes, green plantains, and cabbage, has had positive and significant correlations, with respect to the number of members in the household, that is to say, that the need is greater of feeding, rice and beans are still missing in the homes of the rural communities under study (Table 8). The families that most dedicate themselves to the planting of beans, with this they sustain since of the production they consume the beans in their homes (Table 9).

Table 8. Pearson Correlation Matrix between food consumption and the number of people in the household		
The average number of people in the household		Number of people in the household
Rice consumption (lb)	Pearson correlation	0.38**
	Sig. (bilateral)	0.000
	N	160
Been (lb) monthly consumption	Pearson correlation	0.34**
	Sig. (bilateral)	0.000
	N	158

Table 8. Pearson Correlation Matrix between food consumption and the number of people in the household		
The average number of people in the household		**Number of people in the household**
Sugar (lb) weekly consumption	Pearson correlation	0.24**
	Sig. (bilateral)	0.002
	N	160
Oil (lt) weekly consumption	Pearson correlation	0.29**
	Sig. (bilateral)	0.000
	N	158
eggs (doz) weekly consumption	Pearson correlation	0.17*
	Sig. (bilateral)	0.04
	N	133
White onions (unit) weekly consumption	Pearson correlation	0.18*
	Sig. (bilateral)	0.02
	N	151
Potatoes (unit) weekly consumption	Correlación de Pearson	0.32**
	Sig. (bilateral)	0.001
	N	112
Green plantain (unit) weekly consumption	Correlación de Pearson	0.29**
	Sig. (bilateral)	0.001
	N	116
Cabbage (unit) weekly consumption	Correlación de Pearson	0.45**
	Sig. (bilateral)	0.000
	N	69
**. The correlation is significant at the 0.01 level (bilateral).		
*. The correlation is significant at the 0.05 level (bilateral).		

Table 9. Pearson Correlation Matrix between production and consumption.			
Average amount consumed	**Total yearly production**	**Red been (q)**	**Black been (q)**
Been (lb) weekly con-sumption	Pearson Correlation	.379*	.709
	Sig. (bilateral)	.043	.291
	N	29	4

Cause-effect relationships between the main variables of production, income, and consumption, in the context of the SSAN that occurs in the communities under study.

It was observed that in the monthly income of families for each community, there is a group of communities with higher incomes than others (not greater than C$ 17,562), such as the group of communities of Carlos Fonseca and Camilo Ortega, standing out for their high family income; the second group corresponds to the communities of Panama, Rigoberto López Pérez and Roa Padilla; as well as the third group corresponds in the Triumph of Sandino, Palo Solo, Las Gradas, Temoá, San Ignacio, Los Moncadas, Sandino and Pikín Guerrero. The following group of communities is among those with the lowest income compared to the aforementioned: German Pomares and Santiago. In the community July 19 and Cruz de Mayo, and finally the community that has the lowest income with respect to the previous ones is Loma Negra. In other words, 13 communities have very low income (not less than C$ 3,212) based on the other communities (Table 10 and 11).

Table 10. Analysis of the Variance for the variable Income					
F.V.	**SC**	**gl**	**CM**	**F**	**p-value**
Model.	6.31	17	0.37	3.44	<0.0001
Community	**6.31**	**17**	**0.37**	**3.44**	**<0.0001****
Error	15.34	142	0.11		
Total	21.65	159			
The income variable was transformed Log_{10}					

Table 11. Test LSD de Fisher Alfa=0.05 DMS=0.31002 *Error: 0.1080 gl: 142*			
Community	**Mean**	**n**	**E.E.**
Loma Negra	1737.8	8	0.12 A
Cruz de Mayo	2570.3	8	0.12 A B
19 de Julio	2951.2	10	0.10 A B
Santiago	3162.3	11	0.10 A B C
German Pomares	3235.9	10	0.10 A B C
Pikín Guerrero	3801.9	10	0.10 B C
Sandino	3890.5	8	0.12 B C
Los Moncadas	4073.8	10	0.10 B C
San Ignacio	4168.7	8	0.12 B C
Temoá	4168.7	8	0.12 B C
Las Gradas	4365.2	8	0.12 B C
Palo Solo	4466.8	10	0.10 B C
Triunfo de Sandino	4677.4	9	0.11 B C
Roa Padilla	6165.9	8	0.12 C D
Rigoberto López Pérez	6309.6	8	0.12 C D
Panamá	6309.6	8	0.12 C D
Camilo Ortega	11220.2	9	0.11 D
Carlos Fonseca	12022.6	9	0.11 D
Mean with a common letter are not significatively different (p > 0.05) *The value of mean is the monthly home income in Córdobas (Antilog base 10, real average)*			

Citrus production in this area is presumed to be high, according to the data obtained, the ANOVA test carried out in the communities (Carlos Fonseca, Pikín Guerrero, Rigoberto López Pérez, Santiago and Triunfo de Sandino), was demonstrated with **p = 0.8372** , that the communities produce citrus fruits equally (sweet orange, sour orange, sweet lemon and acid), with a general average of 3400, 6250, 1090, 2595 and 6147, respectively. This confirms the

data of the National National Human Development Plan (PNDH), where citrus is ranked fourth as the item that occurs most in La Concepción. On the other hand, the National Agricultural Census (CENAGRO, 2001), shows that La Concepción contributes 50% of citrus production in the department of Masaya (Table 12).

Table 12. Analysis of the Variance for the "Annual citrus production"					
F.V.	SC	gl	CM	F	p- value
Model.	0.78	4	0.20	0.35	0.8372
Community	0.78	4	0.20	0.35	**0.8372ns**
Error	8.29	15	0.55		
Total	9.07	19			

The variable yearly citrus production was transformed Log_{10}

In this research two types of consumption were defined for the communities under study, these are **carbohydrates** (rice, beans, tortillas, pinolillo, pasta, bag bread, potatoes, and green plantain) and **proteins** (beef, pork, poultry, fish, milk, eggs and dried cheese). It was possible to demonstrate how consumption behaves concerning communities, using the multivariate technique of Multivariate Analysis of Variance (MANOVA). The results obtained from **MANOVA** show that there are significant differences (p = 0.022) in carbohydrate consumption in rural communities (Table 14), while in proteins **there is no** significant difference (**p = 0.209**) in consumption in communities in study, that is, the families of different communities consume the same proportion of proteins per month (Table 13 and 14).

Table 13. Multivariate tests[a] (Carbohydrate)						
Effect		Value	F	Gl hypothesis	gl error	Sig.
Community	*Wilks Lambda*	.605	1.627[b]	34.000	194.000	.022

Table 14. Multivariate tests[a] (Protein)						
Effect		**Value**	**F**	**Gl hypothesis**	**gl error**	**Sig.**
Community	*Wilks Lambda*	.625	1.292[b]	16.000	78.000	.224

CONCLUSIONS

1. Among the main socio-economic characteristics that families presented in the communities, the following stand out: the male sex prevailed in the heads of households, with men mostly responsible for making decisions at home and mainly responsible for carrying resources to their families. The progress of the rural communities is potentially affected by the *low level of schooling* of the heads of families, of whom 36.90% have a primary education and even more alarming is the level of illiteracy that exists, which reaches 18%. Most of them have active employment, although with low income, with respect to the cost of the basic basket.

2. In general, it was established that with the basic food (rice, beans, oil, sugar, onion, green plantain, eggs), the rural family is supplied. The main associations between the variables of production, income, and consumption, in the communities under study, refer to the consumption of basic grains and the number of people in the household. A significant correlation between the number of people in the household and rice consumption was demonstrated, with r = 0.381 (p < 0.05).

3. In particular, a significant correlation between the production and consumption of red beans was highlighted, with a r = 0.379*. This evidenced that, in the families that are dedicated to the production of basic grains, only those families that produce red beans, use this item for their own consumption, that is to say, that as the main food product, the bean is prioritized in the consumption of the families producers. In relation to income and consumption, the income per month of the head of household is low, being below the cost per consumption of the basic basket of food products.

4. Regarding the cause-effect relationships between the main production and income variables: it was determined through **ANOVA** that the average income of rural families in each community has significant differences from each other, this shows that rural families have different monthly income, depending on the community in question. According to the criteria of the **LSD** test, it was shown

that the communities with the highest income are: *first*, the Carlos Fonseca con and Camilo Ortega communities; *secondly*, the Panama, Rigoberto López Pérez and Roa Padilla communities; and lower-income communities: the Loma Negra community, followed by the Cruz de Mayo communities and the July 19 community. On the other hand, the municipality of La Concepción stands out for its production of citrus fruits (sweet orange, sour orange, lemon and sweet lemon). For the different communities under study, the **ANOVA** carried out on the citrus production variable determined that there are no significant differences between them.

5. Regarding the multivariate type relationships for the main consumption variables, two patterns of food consumption were determined. **First: Carbohydrate. Second: Proteins**. *For the carbohydrate consumption pattern*, the consumption variables were used: rice, beans, tortillas, pinolillo, pasta, bread, potatoes and green plantain, for which the most representative were obtained before the population under study, using the technique **ACP** multivariate, which allowed to define the **CP1**, with the most representative variables, which were *rice, beans, pasta, and green plantain*. The **MANOVA** carried out for the most representative variables of the carbohydrate group, determined the statistical evidence that consumption among rural communities **has significant differences** from each other. *For the Protein consumption pattern*, the consumption variables were used: beef, pork, poultry, fish meat, milk, eggs, and dry cheese, for which the most representative were obtained before the population in study, through the multivariate technique of the **ACP**, which allowed to define the **CP1**, with the variables of greater representation, which were *beef, pork, poultry, and fish meat*. The **MANOVA** performed for the most representative variables of the protein group, determined the statistical evidence that consumption between rural communities **does not have** significant differences between them.

GRATITUDE

for allowing me to have an excellent education in the course of my life. To Deborah Murillo, for being a very important part of my life, for having supported me in good times and bad times.

I appreciate the trust, support, and dedication of time to my teachers: PhD. Manuel Enrique Pedroza, Dr. Sebastián Gutiérrez, MSc. Ricardo Orozco, MSc. David Garcia For having shared with me their knowledge and especially their friendship.

Thanks to the Mayor's Office of La Concepción for believing in me and for providing the opportunity to develop my professional thesis for all the support and facilities that were granted. For allowing growing professionally and learning new things. To my third year colleagues in the major of Statistical Engineer who was very supportive in my thesis and the field.

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