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# An analytical study of food security indicators for farm households in the coastal area of Syria

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## ABSTRACT

As Syria enters its tenth year of crisis, the problem of food insecurity has increased and has become a critical issue at the local and global levels. The aim of this research is to measure the farm households' food security status in the coastal area, using a set of internationally approved measures, which are the Food Consumption Score (FCS), the Reduced Coping Strategies Index (rCSI), and the Consolidated Approach to Reporting Indicators of Food Security (CARI). The research relied on collected preliminary field data using a questionnaire form during the months of October and November of 2019, the study was conducted on a random sample of 382 farm households distributed between Lattakia and Tartous governorates based on their percentage of the total number of households. The results showed that the food consumption score gave the lowest level of food insecurity among households, followed by the Food Security Index of the Consolidated Approach to Reporting Indicators of Food Security. While the reduced coping Strategies Index gave the highest level of household food insecurity, where the value of these three indicators was 20.6, 21.6, 47.2% respectively. The study recommended the necessity of using multiple indicators to measure the different dimensions of food security, and that the combination of indicators can improve the measurement of food insecurity, as this reduces the false possibilities, whether positive or negative, and the misclassification of households' food security status.

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## INTRODUCTION

Before the crisis, Syria used to have high levels of food security. The strengths were in the dimensions of availability and access, while utilization and sustainability performance were of less quality due to poor income sources and unsustainable use of natural resources (NAPC, 2013). During the crisis period between 2010 and 2014, there was a sharp decline in food security level by about 34%, which reflects the negative effects of conflict in depriving the population of food security. The households access to food decreased by about 48%, it has been affected by siege, restrictions on movements and low purchasing power, followed by a decline in the dimensions of utilization, sustainability and availability by about 37%, 25% and 23% respectively. Despite the reduction in sieges cases and the severity of military operations in the period of 2014-2018, availability, sustainability and utilization decreased at rates of 20%, 14%, 1% respectively, while access improved by 3% (SCPR, 2019).

Over the past years, (FAO, 2019) reported that food security had improved in many parts of Syria, due to the improvements in the overall security situation., The rain season in 2018/2019

contributed to enhancing the situation in the governorates which mainly depend on agriculture compared to previous years, in addition to the return of many displaced people, as it was estimated that 800 thousand households, most of them were farmers, had returned to their origin land and resumed their agricultural activities.

However, farmers in rural areas still face many challenges, including access to water and inputs, limited marketing opportunities, high transport costs, fires that have destroyed their crops, inflation and rising food prices (Bayram & Gök, 2020), which have had a negative impact on household purchasing power and its food security status. Recent economic sanctions against Syria have intensified and have led to an increase in the costs of fuel, inputs and other imported goods, which have had a significant impact on agriculture, resulting in a marked reduction in agricultural inputs such as the availability of fertilizers, pesticides, quality seeds and livestock vaccines. Many farmers have been forced to reduce their use of imported inputs and returned to a traditional form of agriculture using their own inputs, which led to a reduction in the quantity and quality of production (FAO, 2017).

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The World Food Summit of 1996 defines food security as “when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life” (World Food Summit, 1996), food security is a complex concept whose achievement requires detailed measures, so there is a need to use appropriate and reliable indicators to determine the state of food security of the population (Cafiero *et al.*, 2014), especially for farm households that tend to be more vulnerable to food insecurity, due to their reliance on agriculture as a source of food and income. Accurate information on the extent of food insecurity is essential to anchoring sound policy and decision-making to eradicate hunger and malnutrition. Critical steps towards assessing relative trends in food security are critical in order to understand the magnitude of food deficiencies and to identify sectors and locations of food-insecure populations to promote appropriate interventions.

## MATERIALS AND METHODS

The research was conducted in the rural coastal region of Syria, that is, in the rural areas of the governorates of Tartous and Lattakia. The sampling unit is the farm household which is a group of people who share the place of residence and income allocated for consumption, and depends totally or partially on agriculture as a source of livelihood. The research sample was determined and distributed by the stratified random sampling method, whereby each governorate was divided based on the extension units in it, and then a random selection of farmers was chosen from each extension unit based on the relative weight of this extension in terms of the number of farmers. As for the size of the sample, it was determined based on the law (Krejcie & Morgan, 1970) at a significant level of 5%, as the total sample size was 382 farm households distributed over the two governorates based on the percentage of each of them from the total number of households, which amounted to 44.6% in Lattakia Governorate and 55.4% in Tartous Governorate, thus the sample size reached 170 and 212 households, respectively.

The research relied on preliminary field data that was collected using a questionnaire form to access a set of main indicators to measure the household food security status. Data were collected during the months of October and November 2019. Correlations of calculated food security indicators have been analyzed, with the approach of (Maxwell *et al.*, 2013) to convert family food security measures into bi-category measures of “food secure” and “food insecure”. The following indicators have been used to measure the food security status of households.

## FOOD CONSUMPTION SCORE (FCS)

The FCS was measured based on WFP guidance (WFP, 2008). It's a composite score based on the dietary frequency and the relative nutrition importance of different food groups. Data were collected on the household level using a 7-day recall. The food frequency was measured as the number of days a particular food group consumed in the previous seven days. And then multiplying the value obtained for each food group by its weight. The FCS was computed by summing up the items of the consumption frequency of each food group and its corresponding

weight. Table 1 shows the food groups and weighting applied to each based on their respective nutritional values.

**Table 1: FCS food items, food groups and nutrition weights**

No	Food groups	Weight
1	Cereals ( <i>bread, rice, maize, barley</i> ) and tubers ( <i>potatoes, sweet potatoes</i> )	2
2	Pulses and nuts ( <i>beans, lentils, peas, peanuts, etc.</i> )	3
3	Vegetables	1
4	Fruits	1
5	Meat and fish ( <i>all types</i> )	4
6	Dairy products ( <i>milk, yoghurt, cheese, other milk's products</i> )	4
7	Sugar, honey	0.5
8	Oil, fat, butter	0.5

Source: WFP, 2008

Households were classified based on their FCS score into three categories: poor consumption (FCS=1.0 to 28); borderline (FCS= 28.1 to 42); and acceptable consumption (FCS ≥ 42.0). (WFP, 2008)

## REDUCED COPING STRATEGIES INDEX (RCSI)

When livelihoods are affected by a particular crisis, households may resort to adopting certain mechanisms and strategies that they do not practice in normal day-to-day life, to cope with reduced or declining access to food. The rCSI was used to compare the hardship faced by the household by measuring the frequency and severity of behaviours practiced by the household reporting food consumption problems. rCSI is based on a short list of 5 food-related coping strategies applied during the past 7 days prior to the survey, each strategy has a universal severity weight. The index is calculated by summing up the frequency of each strategy applied over the 7 days, after multiplying it by its severity weight. Table 2 shows the coping strategies and their severity weight. There are no universal thresholds for rCSI. But the higher the rCSI, the more severe the coping is applied by a household. Based on the context of the study, households were classified according to the indicator value into 4 categories: no coping strategies (0-3), low coping strategies (4-8), moderate coping strategies (9-18) and high coping strategies (≥18).

**Table 2: Reduced Coping Strategies and its universal severity weight**

Coping Strategies	Universal Severity weight
1. Rely on less preferred and less expensive foods	1
2. Borrow food and rely on help from friends and relatives	2
3. Limit portion size at mealtime	1
4. Restrict consumption by adults in order for small children to eat	3
5. Reduce number of meals eaten a day	1

Source: Maxwell & Caldwell, 2008

## CONSOLIDATED APPROACH TO REPORTING INDICATORS OF FOOD SECURITY (CARI)

In view of the great diversity in methods of measuring food security, an approach has been developed by the World Food Program (WFP, 2015) that supports the study of food

security indicators and combining them in a systematic and transparent manner into a summary indicator called the Food Security Index (FSI), which represents the overall food security status of the population. The FSI index measures two main dimensions of food security, the first dimension measures the adequacy of the current food consumption of households using the food consumption score FCS and the second dimension is the ability to adapt using indicators that measure the economic vulnerability and asset depletion of households, this dimension is based on a combination of the Livelihood Coping Strategies and Food Expenditure Share FES.

The Livelihood Coping Strategies Index consists of a set of questions related to the household’s experience with living pressures and asset depletion during the 30-day recall period preceding the survey. Strategies are classified into 3 groups according to their severity (stress, crises, and emergencies) strategies. The Food Expenditure Share (FES) is based on an estimate of the proportion of spending on food out of total household spending. It considers the tendency of people to be closer to the brink of poverty, with a greater proportion of their income being spent on food.

Indicators’ values are converted into a 4-point scale, and Table 3 shows how to collect data for the used indicators and how to convert them into the FSI standardized indicator. The focus of this approach is to classify households into four descriptive groups: food secure, and marginally food secure, moderately food insecure, and severely food insecure.

## RESULTS AND DISCUSSION

### Household Food Security Indicators

#### Food Consumption Score FCS

The FCS for the Lattakia governorate averaged 58.3 while for the Tartous governorate was 57.2.

Assuming there are statistically significant differences between the FCS values between the two governorates, the Independent group’s t-test for FCSs for the two governorates result came ( $t = 0.471$ ) with a probability value  $p > 0.05$ , and accordingly, we determined that there were no statistically significant differences between the average FCS values in the two governorates. Table 4 shows that the prevalence of food insecurity (Poor, Borderline) was greater in Lattakia Governorate, reaching 23.1%, compared to Tartous Governorate, which reached 19.8%.

**Table 4: Households Food security status according to Food Consumption Score**

Governorate	Proportion of households in Food Consumption Score Categories		
	Poor	Borderline	Acceptable
Latakia	3.1%	20%	76.9%
Tartous	7.5%	12.3%	80.2%
Overall	6.3%	14.3%	79.4%

Source: Calculated by the author

### Reduced Coping Strategies Index (rCSI)

Table 5 shows that the most common coping strategies adopted by households to cope with food shortages was relying on less preference or less expensive food 94.8%, followed by limiting portion size at mealtime by 50.4%, then reducing the number of meals eaten a day by 37.3%, then borrow food and rely on help from friends and relatives by 30.2%, and the lowest percentage was restricting consumption by adults in order for small children to eat by 29.2%. By calculating the rCSI index of households in the governorates of Tartous and Latakia, it was found that the percentages of households that follow severe strategies (medium and high) were 41.5% in Lattakia Governorate and 49.2% in Tartous Governorate, as shown in Table 6. Assuming there are statistically significant differences between the rCSI values between the two governorates, the Independent Sample t-test for rCSI for the two governorates result came ( $t = 1.838$ ) with a probability value  $p > 0.05$ , and accordingly we determined that there were no statistically significant differences between the average rCSI values in the two governorates.

### Consolidated Approach to Reporting Indicators of Food Security (CARI)

The approach is based on studying and combining 3 indicators, which are the Food Consumption Score FCS that was studied previously, the Food Expenditure Share FES, and the Living Livelihood Coping Strategies Index. The Food Expenditure Share FES was calculated by dividing total spending on food/total spending X 100 during the 30-day period preceding the survey. Results showed that the average FES in Lattakia and Tartous governorates reached 67.8% and 65.6% respectively. The t-test shows that there are no statistically significant differences between the average FES values in the two governorates ( $p > 0.05$ ), as shown in Table 7. The livelihood coping strategies index is used to form a clearer picture of the household’s ability to adapt in the long term. A unit for measuring the index has been designed consisting of 10 strategies of varying severity. 4 stress strategies, 3

**Table 3: CARI Console: Dimensions and indicators**

Domain	Indicator	Food Secure (1)	Marginally Food Secure (2)	Moderate food Insecurity (3)	Severely Food Insecure (4)
Current Status	Food Consumption	Accepted		Borderline	Poor
Coping Capacity	Economic Vulnerability	<50%	50%-60%	65%-75%	>75%
	Assets Deletion	Livelihood Coping indicator	None	Employed Stress strategies	Employed crisis strategies

Source: WFP, 2015

**Table 5: Proportion of adopting coping strategies by farm households in the Coastal Area**

Coping Strategies	Never	Once	Sometimes (2-3 times)	Often (4-5 times)	All The time (6-7 times)
Rely on less preferred and less expensive foods	5.2%	5.2%	35.3%	30.9%	23.4%
Borrow food and rely on help from friends and relatives	69.8%	11.5%	14.3%	3.6%	0.8%
Limit portion size at mealtime	49.6%	9.1%	28.6%	7.6%	5.2%
Restrict consumption by adults in order for small children to eat	71.8%	6%	11.9%	4.3%	6%
Reduce number of meals eaten a day	62.7%	12.3%	19%	3.2%	2.8%

Source: Calculated by the author

**Table 6: Reduced Coping Strategies Index in the Coastal Area**

Governorate	None	Low	Medium	High
Latakia	23.1%	35.4%	12.3%	29.2%
Tartous	13.4%	37.4%	34.2%	15%
Overall	15.9%	39.9%	28.6%	18.7%

Source: Calculated by the author

**Table 7: Food Expenditure Share for farm households in the Coastal area**

Governorate	Low <50%	Medium 50-60%	High 65-75%	Very High >75%
Latakia	4.6%	33.8%	36.9%	24.6%
Tartous	10.7%	38.5%	27.3%	23.5%
Overall	9.1%	37.3%	29.8%	23.8%

Source: Calculated by the author

**Table 8: Percentages of adoption Livelihood Coping strategies by farm households in the coastal area**

Livelihood Coping Strategies		Latakia	Tartous	Overall
Stress Strategies	Spent savings	43.1%	47.1%	46%
	Sold more animals (non-productive) than usual	9.2%	4.3%	5.6%
	Borrowed money	26.2%	38.5%	35.3%
Crisis Strategies	Sold household assets/goods (radio, furniture, television, jewelry etc.)	12.3%	10.2%	10.7%
	Sold productive assets or means of transport (sewing machine, wheelbarrow, bicycle, car, etc.)	10.8%	3.7%	5.6%
	Reduced expenses on health (including drugs) and education	0	0	0
Emergency Strategies	Decreased expenditures on fertilizer, pesticide, fodder, animal feed, veterinary care, etc.	83.1%	81.3%	81.7%
	Sold house or land	18.5%	4.3%	7.9%
	Sold last female animals	3.1%	2.1%	2.4%
	Entire household migrated	6.2%	1.6%	2.8%

Source: Calculated by the author

**Table 9: Food Security Index for farm households according to CARI method**

Domain	Indicator	Food Secure (1)	Marginally Food Secure (2)	Moderate food Insecurity (3)	Severely Food Insecure (4)	
Current Status	Food Consumption	FCS	79.4%	-	14.3%	6.3%
Coping Capacity	Economic Vulnerability	FES	9.1%	37.3%	29.8%	23.8%
	Assets Deletion	Livelihood Coping indicator	6%	10.3%	71%	12.7%
Food Security Index FSI			2%	75.4%	19.4%	3.2%

Source: Calculated by the author

crisis strategies and 3 emergency strategies were selected, and the household's adoption of these strategies was monitored during the 30-day period preceding the survey. Households were divided according to their most difficult strategy adopted, so stress, crisis and emergency strategies took the classification 2, 3, 4 respectively, and families that do not use any of these strategies. It is classified within Group 1 or Food Secure (WFP, 2015).

Table 8 shows the strategies used to measure the Livelihood Coping Strategies Index, and it is clear that the largest percentages of households depended on decreasing Expenditure on agricultural inputs and animal care, followed by spending

savings and borrowing money at rates amounting to 81.7%, 46% and 35.3% respectively. Results showed that the t-test of adopting strategies in the two governorates was  $p > 0.05$  for all strategies, which indicates that there are no significant differences between the percentages of following the strategies between the two governorates, except for (selling a house or land), where it was found that The percentages of households that sold properties in Latakia Governorate (18.5%) were significantly higher compared to that of Tartous Governorate (4.3%) ( $p < 0.05$ ). By using the Consolidated Approach to Reporting Indicators of Food Security, Food Security Index FSI was found. The results of the Food Security Index FSI showed that about 22.6% of households suffer

from food insecurity (moderate and severe) as shown in Table 9, while the largest percentage of households were marginally food secure (75.4%), meaning that these households have minimally adequate food consumption without engaging in irreversible coping strategies, and unable to afford some essential non-food expenditures (WFP, 2015). It also showed that there were no statistically significant differences between the values of the food security index in the Latakia and Tartous governorates, as Table 10 shows the presence of convergence in the food security status of farm families between the two governorates.

**Table 10: Food Security Index for farm household in Latakia and Tartous governorates**

Governorate	Food Secure (1)	Marginally Food Secure (2)	Moderate food Insecurity (3)	Severely Food Insecure (4)
Latakia	1.5%	72.3%	23.1%	3.1%
Tartous	2.1%	76.5%	18.2%	3.2%
Overall	2%	75.4%	19.4%	3.2%

Source: Calculated by the author

### Comparative Analysis Of The Three Indicators

To analyze the correlation between the studied food security indicators, (Maxwell *et al.*, 2013) methodology was used. Household food security measures were transformed into two-category measures of “food secure” and “food insecure”. As shown in Table 11, the results show that the rCSI gave the highest level of food insecurity among households, followed by the FSI and then the FCS index. This is due to the fact that the rCSI index tends to measure low-intensity adaptive behaviours. By conducting a comparison between the food security status of households for the FSI and FCS indicators as shown in Table 12, it was found that 10.5% of the households were classified as food insecure by FSI and food secure by FCS. On the contrary, only 0.5% households were classified food insecure by FCS. It was classified as food secure by FSI, meaning that approximately 11% of households will be misclassified using only one indicator instead of combining the two indicators. The cross-classification of rCSI and FSI produced the highest level of misclassification. As the rCSI considered that 36.4% of households were food insecure but were classified as food secure by the FSI, as shown in Table 13.

**Table 11: Food Security Status for farm House using binary classification method**

Indicators	Original Categories	Converted binary classification <sup>(1)</sup>	Proportion of farm households <sup>(2)</sup>
FCS	Poor	Food insecure	20.6
	Borderline	Food secure	79.4%
rCSI	None	Food secure	52.8%
	Low	Food insecure	47.2%
	Medium	Food insecure	47.2%
FSI	High	Food insecure	47.2%
	Food Secure	Food secure	77.4%
	Marginally food secure	Food secure	77.4%
	Moderately food insecure	Food insecure	21.6%
	Severely food insecure	Food insecure	21.6%

Source: 1) Maxwell *et al.*, 2013, 2) Calculated by the author

**Table 12: Cross-classification of FCS and FSI in the Coastal area:**

Food Security Status	FSI	
	Food Secure	Food Insecure
rCSI		
Food Secure	99.5%	10.5%
Food Insecure	0.5%	89.5%
Total	100%	100%

Source: Calculated by the author

**Table 13: Cross-classification of rCSI and FSI in the Coastal area:**

Food Security Status	FSI	
	Food Secure	Food Insecure
rCSI		
Food Secure	63.6%	15.8%
Food Insecure	36.4%	84.2%
Total	100%	100%

Source: Calculated by the author

To determine if there was an agreement amongst the food security indicators, a Cohen’s  $\kappa$  was used, and the results showed that there was a fair agreement between FCS and rCSI, and FSI and rCSI ( $\kappa= 0.368$  and  $0.345$ ,  $p<0.0005$ ), as shown in Table 14. The agreement was almost perfect between FCS and FSI ( $\kappa=0.918$ ,  $p<0.0005$ ) (Landis & Koch, 1977). The correlation among the food security indicators was examined using Spearman’s rho. Results showed that all three indicators were significantly correlated at the  $p=0.01$  level (Table 15). The correlation between rCSI and the other two indicators was relatively weak, while FCS and FSI were relatively strongly co-related as expected, considering FCS is a component of FSI.

**Table 14: Cohen Kappa Coefficient for FCS, rCSI and FSI**

Food Security Indicators Pairs	Kappa Coefficient	Significance Level
FCS vs FSI	0.918	0.000
FCS vs rCSI	0.368	0.000
rCSI vs FSI	0.345	0.000

Source: Calculated by the author

**Table 15: Spearman’s rho Correlation between Food Security Indicators**

Indicator	FCS	rCSI	FSI
FCS	1	-0.441**	-0.920**
rCSI	-0.441**	1	0.401**
FSI	-0.920**	0.401**	1

Source: Calculated by the author

### CONCLUSION

The food security indicators studied in this research are unique, although similar, through various estimates of the prevalence of food insecurity among the population. The FCS is used to study the households’ diversity and nutritional quantity, the rCSI is used to study quantity and sufficiency, and the FSI resulting from the CARI approach is used to reflect the economic vulnerability and coping capacity. When conducting a comparative analysis of the three indicators for

farm households in the coastal area, it was found that there is coherence between them. The rCSI gave the highest level of household food insecurity, followed by the FSI index and then the FCS in close proportions, due to the fact that the rCSI index tends to measure low-intensity adaptive behaviors. The use of the CARI approach is good in many ways, as the composite index includes multiple dimensions of food security, yet it maintains the simplicity, and what encourages its use is that it integrates several concepts such as poverty, adaptive capacity, food consumption patterns, energy consumption and dietary diversity into one indicator (WFP, 2015). Based on the results, the study recommends the necessity of using multiple indicators to measure the different dimensions of food security, and that the combination of indicators can improve the measurement of food insecurity, as this reduces the wrong possibilities, whether positive or negative, and the wrong classification of households' food security status.

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