

## **Chapter 6**

# **Developing a Food Security Approach to measure Livelihood Sustainability at the Household-Level**

### **6.1 Introduction**

One aspect of a household's livelihood system is food security. Considered an indicator of poverty, the concept of food security has evolved over the last thirty years. It is clear now that availability of food at the macro-level does not necessarily mean that food security is guaranteed at the micro-level. One method of studying food security at the micro-level is to investigate people's behavioural responses to food insecurity at the household-level. For example, when a household is facing a crisis or an external shock, in order to remain food secure and to maintain a sustainable livelihood system, it will use a combination and sequence of coping strategies. In this chapter I develop food security indicators that concentrate on the manner in which households cope with crisis and non-crisis situations. Here I evaluate the usefulness of these different indices in measuring certain elements of food security variations and vulnerability at the household level.

### **6.2 Background**

Several methods have been developed to measure food security at the household-level. Often these methods focus on measuring food consumption, such as the household budget and 24 hour recall methods frequently cited in empirical data (Bouis, 1994; deMerode *et al.*, 2004). These methods however can be fairly costly, time consuming and do not always give an accurate picture of household food security (Maxwell and Frankenberger, 1992). Maxwell (1996) developed a food security index based on the frequency of use and the perceived severity of short term food coping strategies in a household. A discrete score for each strategy was obtained, which was added up together, to give a cumulative score or index of food security. The index was further refined in 1999. This measure highlighted what people actually do when faced with food insufficiency and therefore was a direct measure of intentional responses based on decisions about the sufficiency of food. It captured the issue of vulnerability and the trade-offs made with other basic needs to acquire sufficient food (Maxwell, 1996; Maxwell *et al.*, 1999). However, since this index only measured short-term coping strategies it captured only one aspect of vulnerability of

a household. To overcome this limitation, Maxwell (1996) suggested that parallel indicators are developed taking into consideration non-food related practices and longer-term adaptive strategies, in order to obtain more information on the vulnerability and potential resilience of the household. Malleret-King (2000), built upon this idea and developed four indices: a short term coping strategies index similar to Maxwell's (1996) index, an indicator based on the responses to longer term crisis and to increase the sensitivity of the analysis to non-crisis situations, two accumulation indices (for short term and long term strategies). A detailed literature review on food security concepts and methods of measurement is given in Chapter 2 (Section 2.3.1).

## **6.3 Methodology**

### **6.3.1 Overview of methodology**

In my study I develop indices adapted from the work of Maxwell (1999) and Malleret-King (2000) to measure aspects of food security and vulnerability at the household level in crisis and non-crisis situations, both in the short and long term. The identification of short term and long term actions at the household level during a crisis is in order to distinguish coping strategies from adaptive strategies. In this study I am not attempting to identify how individuals respond to crises that are happening now versus in the more distant past, but how they respond to different types of crisis (short crisis versus persistent crisis) although the two are inevitably confounded and inter-linked. Responses to longer-term crisis can indicate the level of vulnerability and potential resilience of a household. Based on Malleret-King's research, I also test whether in my study site, accumulation strategies help to increase the sensitivity of the analysis to non-crisis situations (in the short term and long term).

### **6.3.2 Data collection**

I divided the data collection into two phases. Phase 1 included preliminary interviews, focus group discussions and developing and piloting a questionnaire. Phase 1 took place over a four-month period, from January to April 2002. Phase 2 included finalizing the food security questionnaire by undertaking further focus group discussions, and carrying out 3 rounds of household surveys that took place between July 2002 and July 2003.

## *Phase 1*

### **Semi-structured interviews**

Under Phase 1, to design short-term and long-term coping strategies for the particular study site, I adopted the methodology used by Malleret-King (2000). First preliminary semi-structured interviews were held with a purposive sample of six households that were from different wealth categories and involved in different livelihood activities, to obtain background information on general consumption patterns at the site. The interviews were conducted with the women in the household since they were considered the best informants in respect to consumption patterns of the household (Malleret-King, 2000). During the interviews, we also discussed food coping and accumulation strategies (see Table 1).

#### **Box 6.1 Preliminary semi-structured interviews with women**

- How many meals do you generally prepare each day?
- What do you generally prepare for breakfast? For lunch? And for dinner?
- In an average day, how many people do you cook for in the house?
- Do you grow any of your own food? (rice, pulses, vegetables, fruits, etc.).
- How do you generally obtain your protein content? (fish, poultry, etc).
- What food items do you generally buy? (rice, pulses, vegetables, fruits, fish, poultry, etc.)
- If you purchase food from the local store/market, how often do you buy your food? (e.g., for 2-3 days at a time? For a week at a time? For more?)
- How do you obtain your drinking water supply?
- Cost of each item purchased? (Can calculate average monthly expenses for food items and basics (e.g., soap, oil)
- General discussion about food coping strategies adopted by household and also accumulation strategies.
  - During these days, when you suffer from food shortages, what do you do to cope in the short term (within a time period of a couple of days to a few weeks)?
  - When you have suffered food shortages over a longer period of time (within the last 10 years), what strategies have you used to address the problem?
  - During these days, when you do not suffer from food shortages, what strategies do you adopt in the short-term (within a time period of a couple of days to a few weeks)?
  - When you do not suffer from food shortages and have surplus money over a longer period of time (within the last 10 years, what strategies have you adopted?)

### **Focus group discussions**

Following the interviews, five focus group discussions were held with women to determine coping and accumulation strategies used by the community (both short-term and long-term) and to identify the sequence in which these sets of strategies were adopted based on the perceived severity of each strategy. The focus group discussions were held in Gurupokuna, Wewegoda, Thuduwa, Boraluwa and Rekawa villages. There were between five and eight participants for each discussion.

The strategies discussed during the preliminary interviews were written on two sets of cards – all coping strategies on yellow card and all accumulation strategies on blue card. First the coping strategies were discussed with the women – all the yellow cards were laid out and the women were asked whether they agreed with these strategies or not. They were also requested to include any other strategies that were not represented on the cards. The women were very enthusiastic about discussing this topic and a lively discussion generally took place. The women were then requested to divide the yellow cards into two groups – short term coping strategies (strategies used over the last few weeks to address crises that last over a short time period) and long term coping strategies (strategies used over the last 10 years to address more persistent crises). They were then asked to rank the cards in each of the two groups in a sequential order from least severe coping strategies to most severe according to their perception. Once the cards were ranked, the order was read out and consensus was reached as to whether all the women agreed on this order or not.

Following this, the accumulation strategies were discussed. The blue cards were laid out and once more the women discussed each of the strategies mentioned on the card and also included any other strategies that had not been brought up at the preliminary interviews. Once again the cards were divided into two groups – short term accumulation strategies and long term accumulation strategies. Thereafter the strategies were ranked by the women in order of how they would perceive the least positive strategy (reflecting a small surplus of food/money) to the most positive strategy (reflecting a large surplus). By the third focus group that was conducted, the already established division into short-term and long-term strategies were adopted and the women were requested to rank the strategies in each category. The frequencies of use of the strategies were also briefly discussed. The focus groups were generally kept as informal as possible and held in the participants'

homes. The local field researchers helped organize the meetings. They also played an active role in the ranking exercises and in ensuring the discussion remained focused.

### **Pilot questionnaire survey**

Based on the results of the interviews and focus group discussions, carried out under Phase 1, a preliminary questionnaire was developed on food coping and accumulation strategies. The questionnaire was piloted in the six villages and the results were useful in identifying which coping and accumulation strategies were most commonly adopted in the study site.

### *Phase 2*

#### **Focus group discussions**

During the preliminary analysis of data collected under Phase 1, it was felt that the long-term accumulation strategies needed to be distinguished further, with more detailed focus group discussions held to differentiate between some of the strategies that were adopted. Four further FGDs with women were therefore held for this purpose. Another important point that emerged was that since only females had participated in the initial FGDs, there could be a gender bias involved. In reality in the household, certain coping strategies may be adopted by only one gender while others may be adopted by both genders. Since I was interested in obtaining a gender perspective on both coping and accumulation strategies, and was getting both a male and female respondent to answer the household questionnaire during Phase 2, I conducted four FGDs with male community members, to obtain their perceptions and ensure the questionnaire was unbiased. Two focus group discussions were held per site. In Rekawa the FGDs were held in Kapuhenwela and Boroluwagoda villages, while in Kalametiya the discussions were held in Gurupokuna and Wewegoda villages. A similar method undertaken in the previous FGDs was adopted.

The discussions with the men revealed similar issues. The perceived severity of strategies was however somewhat different (thereby the ranking order was different in some cases). Some strategies were adopted simultaneously and the range of the rankings between the four FGDs was large (indicating that even amongst the men, individuals had a different perception of the severity of strategies adopted). This indicates that there is a difference in the perception of the severity of the strategies between the men and women in the community.

### **Questionnaire surveys**

Under Phase 2, a revised questionnaire was developed taking into consideration the results obtained from both the male and female FGDs. Because of the lack of consensus within and between FGDs, it was decided to request individual respondents to rank their strategies both in terms of perceived severity and frequency of use. The revised questionnaire incorporated these changes and was administered to both male and female respondents at different times of the year (to capture any seasonal variations). Each round of surveying took about two months. Surveys were undertaken in September – October 2002, January – February 2003 and in June – July 2003 in relation to the short term strategies adopted. In the case of the long term strategies the questionnaire was administered once, during the first round of surveying. The sample covered by the survey was 210 households.

### **6.3.3 Comments on methodology**

Several empirical studies have identified sequencing patterns of response to crisis (Watts, 1983; Corbett, 1988; Davies, 1993; Devereux, 1993; Malleret-King 2000). My initial plan was also therefore to try to determine a ranking sequence of strategies based on perceived severity. Following the methodology adopted by Malleret-King (2000), the final sequence of the strategies was determined by taking the median ranking for each strategy. A number of strategies were identified in the case of both short-term and long-term crisis and non-crisis situations. However unlike other empirical studies such as the Kenyan case study (Malleret-King 2000), results from the focus group discussions in my study site indicated that strategies do not fall into a distinct ranking sequence and some strategies are perceived to be of equal severity and therefore of equal weight and adopted together, not in a sequential manner. See Annex 6.1 for results from the 13 focus group discussions held to try to determine a ranking sequence of strategies.

Four ranking sequences were attempted. The first ranking sequence was obtained from data collection Phase 1 (five FGDs). The second was obtained during data collection Phase 2 by carrying out four more group discussions with females and amalgamating the results obtained from Phase 1 and 2 (i.e., nine FGDs). The third ranking sequence was calculated by deleting the strategies that were not used in the final sequence (i.e., strategies that were later dropped by the participants because of their unsuitability for

various reasons). The remaining strategies were re-ranked and the median values calculated for the 9 FGDs. The fourth ranking sequence was obtained from the four FGDs with males undertaken in Phase 2. Annex 6.1 also indicates the range of ranking given for each strategy during each of the four exercises. Variability between the ranking sequences was high between the different focus group discussions, although the third ranking exercise reduced the range of ranking sequence in some instances. From these different sets of results, although a certain pattern in the ranking does emerge (at least among the female FGDs), some of the intermediate strategies do not appear to be ranked in the same order. It was also noted that some of the overall medians obtained for certain strategies were similar. In other words, it meant that these strategies were not adopted in a clear sequential manner. This was true in the case of both long-term and short-term coping and accumulation strategies and for both males and females.

Since a clear ranking order was not emerging from the FGDs, instead of forcing a sequence on the strategies adopted, I assessed whether it were possible to categorise strategies into perhaps 3 groups as indicated in the literature (e.g. least severe, severe, most severe, representing a scenario of increasing food insecurity in a household). During the FGDs undertaken in Phase 2 therefore, the opinion of the community on categorizing strategies into three groups versus ranking strategies was discussed. In all 8 FGDs however participants unanimously agreed that they found it easier to rank strategies than to group the strategies (both methods were attempted but the grouping failed as participants could not reach a consensus). It was decided therefore that with respect to data collection, to request individual respondents (both male and female) to rank their strategies both in terms of perceived severity and then frequency. The revised questionnaire used in data collection Phase 2 incorporated these changes. This had the disadvantage however of lengthening the questionnaire.

With respect to the analysis, the perceived severity ranking (PSR) score for each strategy was calculated by taking the median rank for the whole sample from the first round of surveying (not from the FGDs). As the median PSR score differed by gender for some strategies (see Annex 6.1), a separate median PSR score was obtained for males and females. Data for males and females were therefore always analysed separately. The median score of the total sample was used to ensure that respondents were placed on a common PRS scale that could be compared and to make the indices more consistent. The

median ranking showed a mixture of clear and unclear sequencing of strategies. There were therefore differences in variability in the perceived severity of these strategies within the sample population.

### **Gender differences**

Male respondents appeared to find it harder to place strategies in rank order of perceived severity. The ranking ability differed significantly by gender for all but the LTCS. For the other three indices results obtained were STCS ( $X^2=41.5$ , 1 df, \*\*\*), STAS ( $X^2=7.1$ , 1 df, \*\*) and LTAS ( $X^2=24.9$ , 1 df, \*\*\*). This may be because females, rather than males, adopt these strategies. With the LTCS however there was no significant difference ( $P=0.09$ ), which may be a result of males being more familiar with this particular set of strategies and therefore having a better understanding of how they perceived their severity.

## **6.3.4 Development of Strategies**

### **6.3.4.1 General household consumption patterns**

Three meals are prepared each day, generally by the women in the household, but some households only eat two meals. If only two meals are prepared a day, these are usually breakfast and lunch. Dinner appeared to be the meal most often gone without. Usually even if the extended family lived in the same house (for example, married son with parents), the two families cooked their meals separately. However food is often shared between the families.

As in most parts of Sri Lanka, rice and curry was the staple diet in the study site, with rice being prepared for most meals each day. For example, breakfast comprised rice and fish curry. Lunch usually included rice, fish curry and about two vegetable curries. Vegetables are those generally grown in the dry zone of the country such as pumpkin, aubergines, okra, snake gourd, varieties of pulses and beans and well as greens. Freshly scraped coconut was also eaten with meals, but not always as coconuts are fairly expensive. For dinner, once again, rice was eaten in most households although some ate roti (flat bread made of rice flour) or bread a couple of times a week. Fish curry with a coconut or onion

sambol was the usual accompaniment. Vegetable curries were also eaten (often left over from lunch).

Those engaged in farming (paddy cultivation) obtain rice from their fields. Others, if possible, grow some vegetables or fruits at home for their consumption. However as a result of the general lack of water in the area, home gardening was often difficult. Some households had planted a few coconut trees and fruit bearing trees, while certain types of cultivation that requires less water (such as chena cultivation) have shown some success. Otherwise, vegetables, rice, greens, condiments, coconuts, coconut oil, fruits (rarely) were all bought at the village market once a week. Spices, soap and sugar were bought at the local store or the government cooperative (samupakara) shop. Food from the local market was usually bought once a week. The nearest markets were in Ranna (held on Tuesdays and Fridays) and in Hungama (held on Saturdays).

Protein requirements were usually obtained through fish, as is the case in most parts of Sri Lanka (Department of Census and Statistics 2000<sup>26</sup>). Fish is not purchased usually, but a small part of the catch is kept for household consumption. Even those families that are not engaged in fishing as their livelihood usually obtained fish free of charge in their own village (usually by going to the fish landing site and helping with bringing in the nets and so on).

#### **6.3.4.2 Short term and long term strategies identified**

During the focus group discussions, a number of strategies were identified in the case of both short-term and long-term crisis and non-crisis situations (see Annex 6.1). In the context of this study, 'short-term' was defined to be a time period not exceeding two – three weeks and 'long-term' to cover a period of approximately the past ten years. The strategies identified were similar to those identified in other empirical studies (such as Corbett, 1988; Maxwell, 1996; Maxwell, 1999; Malleret-King, 2000; Silva *et al.*, 2002).

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<sup>26</sup> According to the food balance sheet for major animal protein sources in 1999 (Source: Depart. of Census & Stats, 2000) fish provided 8.75 g of protein on average per day for an individual. Protein from the total meat products (beef, pork, mutton, poultry) was 2.94 g per day for an individual in 1999.

### **Strategies adopted in the case of shortage of food (crisis situation) in the short term (STCS)**

In the households, when there is a shortage of food, one of the first strategies used was to gather edible wild plants and other food products from the surrounding area. This would be used to substitute for purchasing certain food items. Thereafter the household food consumption was reduced using several strategies similar to those reported by Malleret-King (2000). Females agreed that they would eat less food and ensure that their children had an adequate meal, if they had a smaller quantity of food prepared than usual. Other strategies discussed were cooking fewer times and thereby skipping meals. Also by having kola kenda (thick broth made of edible wild medicinal plants and herbs, water and a small quantity of rice) for a meal the family would skip/replace a 'full meal'. Both males and females stated that it was rare in these villages that households went without meals the entire day, as usually relatives or close friends would help out. It must be noted that while similar strategies in relation to changing consumption patterns were mentioned by males during the group discussions, it was interesting to note that the ranking of the strategies were somewhat different to the females, possibly because they did not adopt some of the strategies themselves (for example eating less to feed their children and gathering wild plants).

Other strategies used in the case of food shortages were to borrow food from relatives or neighbours. If the shortage of food was more extreme, households would buy less food and borrow food on credit from the local shop, or resort to borrowing money from relatives and family. Borrowing money from local credit societies was considered the most severe strategy by both males and females, as the household then also had to pay back the interest accrued.

The ranking order of the strategies indicated that the households first tried to cope independently with the food crisis, before getting help from outside sources. It was clear however that the extended family and close friends played an important supporting role.

### **Strategies adopted in the case of shortages of food in the longer-term (divestment strategies) (LTCS)**

In circumstances where the food shortage lasted for a longer time period, the main divestment strategies used in the households are borrowing of money and pawning/mortgaging of assets. Selling of assets was considered the most severe strategy. The substitution of income by taking up an additional job was considered by both males and females to be one of the first strategies adopted by the households. The next strategies adopted were to borrow money from local credit agencies or moneylenders and also to register for government subsidy schemes. If the crisis continued, then liquid assets such as gold jewellery, motor bicycles, bicycles, and household items such as radios and TVs (if the households possessed such items) and productive assets such as fishing gear would be first mortgaged. If the crisis were to continue, the households would consider selling assets. As expected, liquid assets would be sold prior to selling productive assets (which would be done only in extreme cases). The most severe strategy was considered the mortgaging or selling of their plot of land or house.

In the case of the severity ranking of the longer-term strategies, it appears that the households try to maintain their assets as long as possible before they mortgage or sell them. The households initially try to create additional income, and thereafter try to obtain assistance from outside sources. Households in the study site appear to try to lower their vulnerability by adopting divestment strategies in this sequence. Overall, both male and females ranked strategies in a similar manner.

### **Accumulation strategies adopted in the case of a surplus of food in the short term (STAS)**

When there is a surplus, some of the initial accumulation strategies used by households in the short-term were to change consumption patterns by buying larger quantities of food, stocking up on food and cooking more vegetables dishes than average. In regard to investments, according to both men and women, one of the earliest strategies they adopted was investing the money in their children's educational activities. In the short-term this involved buying children schoolbooks and pencils or paying of tuition fees. A great emphasis is placed on education in Sri Lanka and therefore it is not unexpected that this was considered one of the main strategies to adopt in the case of surplus, even in the short-term. According to the World Bank country fact sheets (2002), in Sri Lanka the

illiteracy rate of the population aged 15+ is only 8 % compared to the South Asia illiteracy rate of 45%. Another strategy adopted during times of surplus was putting aside small amounts of money as savings.

**Strategies adopted in the case of surplus of food and money in the longer-term (investment strategies) (LTAS)**

In the case of investment strategies, to keep their debt to a minimum, households tried and pay back loans and moneys borrowed as soon as possible and therefore this strategy was ranked early in the sequence by both males and females.

Increasing assets was another set of strategies commonly adopted during a period of long term surplus. A number of liquid assets such as gold jewellery, motor bicycles, bicycles, and other household items such as furniture or cooking utensils would be purchased. In addition, surplus money would be invested in productive assets (e.g., in fishing households investing in fishing gear or a new boat), or in the house (refurbishing the house).

In addition, savings would be made during periods of surplus. This included saving money in the bank and also on a smaller scale, saving money at home in a ketaya or piggy bank. It was noted that the latter strategy was adopted in both the long and short-term surplus situations. The reason for this could be due to saving a small amount of money at home on a regular basis being a fairly common practice in a majority of rural households in Sri Lanka.

As in the short-term strategies, investing in children's education was of high priority and was ranked high overall. If the surplus was very high, households would even invest in land and a new house. The household may also play the role of a moneylender to the village, in circumstances of surplus.

### 6.3 5 Development of Indices to measure coping and accumulation strategies

Building upon research previously undertaken (Maxwell, 1996; Maxwell *et. al.*, 1999; Malleret-King, 2000), a simple index that measured certain elements of food security and vulnerability at the household-level, based on short term and long term crisis and non-crisis situations was developed.

As mentioned previously, the food security questionnaire requested respondents to indicate the frequency of use of a strategy in that particular time period and also rank the strategies they had adopted on the basis of their own perceived severity of each strategy. Based on the results of the household surveys, a simple index for each of the four scenarios was calculated as follows:

$$I = \sum_i F_i \text{PSR}_i$$

I = Household's Index (Short-term Food Coping Strategy Index; Long-term Adaptive Strategy Index; Short-term Accumulation Strategy Index; Long-term Accumulation Strategy Index)

F= Household's frequency of use of the strategy i

PSR = Median perceived severity ranking of strategy i

In the case of each index, a score for each strategy adopted was obtained by multiplying F by PSR. By adding all the scores of each of the strategies adopted, a **cumulative security score** was obtained for each household.

The higher the indices, the more food insecure the household with respect to the STCS and more vulnerable in terms of LTCS, while the higher the indices, the more food secure the household with respect to the STAS and less vulnerable in terms of LTAS.

Although similar indices have been developed in previous work giving an equal weighting to frequency of use and perceived severity ranking (Malleret-King 2000), this study developed an index that gives a more realistic representation of F. The indices used individual frequency and the median severity (calculated from the total sample) in order to place a household into the community context. The median PSR for males and females from the first round of surveying was used in the calculations. With respect to the F

variable, frequencies obtained on an individual basis in the questionnaire (based on individual variation rather than a mean frequency) were used. A weighted scale was used to score frequency of use of strategies in the case of the four indices (see Table 6.1 and 6.2) as was done by Maxwell *et. al.*, (1999). It must be noted that the weighting was somewhat different to that used by Malleret-King (2000). (See Chapter 2, Section 2.3.1.3 for a more detailed discussion). To overcome the lack of comparability between the indices due to the different number of strategies used in each case, they were all normalized to make 1 the most severe strategy.

**Table 6.1 Weighted frequency of use for short term strategies (STCS and STAS)**

Frequency of Use	Daily weight	Frequency
Every day	1	1
2 – 3 times per week	2.5/7	0.36
Once per week	1/7	0.14
1-3 times per month	2/30	0.07
Never	0	0

**Table 6.2 Weighted frequency of use for long term strategies (LTCS and LTAS)**

Frequency of Use	Yearly weight	Frequency (normalized to 1)
More than once a year (in one or more seasons)	2/365	1
Once a year	1/365	0.6
2 – 4 times in the last 10 years	3/3650	0.16
Once in the last 10 years	1/3650	0.04
Never	0	0

The number of strategies identified for each index differed (Table 6.3). A separate median PSR score was obtained for males and females as there appeared to be gender differences in the perceived severity of some of the strategies adopted (see Annex 6.1). The range of PRS scores for males and females are given in Table 6.3.

**Table 6.3 The number of strategies identified and the median PSR range for the four indices (STCS, LTCS, STAS, LTAS)**

<b>Indices</b>	<b>Number of strategies identified</b>	<b>PSR range Female</b>	<b>PSR range Male</b>
STCS	11	1-7	1-6
LTCS	9	1-5	1-4
STAS	5	1-4	1-4
LTAS	14	1-9	1-8

### **6.3.6 Investigating factors affecting food security indices**

In the previous chapter, wealth rank was shown to be an explanatory variable in its own right that could act as a proxy to several poverty-related variables such as type of housing, ownership of certain productive and non-productive assets and the total income of a household (see Chapter 5, Section 5.4.4). The relationship between the four food security indices and wealth rank was investigated using a general linear model (GLM). To ensure that circularity in the analysis was avoided, individual variables that were represented by wealth rank were not therefore entered into the model.

Other variables seen to have a positive univariate relationship with four food security indices were included in the GLM. These were geographic variables such as site and village, livelihood activity related variables (fishing, other natural resource uses and all other livelihood activities), demographic variables such as age, household size, dependency ratio, caste and being a female headed household) and CZM policy related variables such as involvement and benefiting from the SAM process (see Annex 6.2 for the Spearman's correlation tests showing univariate relationships). The food security indices were considered to be the dependent variable in each case and the GLMs were undertaken in the following sequence.

- STCS VS WR + SITE
- STCS VS WR + SITE + VILLAGE\*SITE
- STCS VS WR + SITE + VILLAGE\*SITE + X
- STCS VS WR + SITE + VILLAGE\*SITE + X + SITE\*X

Variables or interactions that showed non-significant results were removed from the model. In the case of the short term crisis and non-crisis situations the general linear model was run for all three sample seasons, while in the case of the long term crisis and non-crisis scenarios the model was run once. In addition as the median PSR score differed by gender (based on males and females ranking some of the strategies differently), the data for males and females was always run separately. The summary results of the models are discussed in Section 6.4.6. Since the magnitude of the scores would depend on the number of strategies adopted, values were comparable within but not between indices.

Although the indices were not normally distributed (Annex 6.3) they were near normal. GLMs in general are relatively robust to non-normality, and therefore using GLMs was not considered a major problem. The indices were also based on ranked (ordinal) data. The fact that the scores were however near-continuously distributed suggested that treating them as continuous variables was a defensible assumption in this exploratory study. Further investigations are required in order to determine whether the indices are truly cardinal in nature, i.e., that a change in STCS scores from 2 to 3 is equivalent to a change in scores from 8 to 9.

## **6.4 Results**

### **6.4.1 Comparison of short-term and long-term indices at the household level**

Although there was a significant difference in the ability to rank perceived severity of strategies adopted between the genders (Section 6.3.3), as expected correlation tests showed that there were fairly strong positive associations between male and female STCS and STAS scores at the household level in all three seasons as well as between the male and female LTCS and LTAS scores (see Table 6.4). This strong co-linearity implied that while certain strategies may be adopted by only one gender, and therefore the perceived severity ranking of those particular strategies may differ between males and females, both genders were aware of what strategies were adopted overall in the household during short periods of surplus or shortage.

**Table 6.4 Association between Female and Male (F/M) short-term and long-term indices at the household level**

	F/M STCS Scores			F/M STAS Scores			F/M LTCS Scores	F/M LTAS Scores
	S1	S2	S3	S1	S2	S3		
Spearman's rank correlation coefficient	+0.571	+0.454	+0.620	+0.566	+0.612	+0.613	+0.624	+0.726
Significance (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
N	179	189	196	200	202	208	192	187

(where S1=Season 1; S2=Season 2; S3=Season 3)

#### 6.4.2 Comparison of short-term indices at the community level

With the Short Term Coping Strategy (STCS) cumulative index, the higher the index score, the more food insecure the household is. The mean STCS scores at the site level indicated that overall for females Kalametiya was more food insecure than Rekawa, while for males, Rekawa was more food insecure than Kalametiya (see Table 6.5). Kalametiya was generally more variable than Rekawa having a higher co-efficient of variation, particularly for men.

**Table 6.5 STCS cumulative scores for females and males averaged at the site level**

STCS scores	Females		Males	
	Rekawa	Kalametiya	Rekawa	Kalametiya
<i>Season 1</i>				
Mean	3.42	4.51	3.25	2.29
Co-efficient of Variation	0.59	0.64	0.64	1.04
Count	98	93	93	95
<i>Season 2</i>				
Mean	2.63	2.63	2.32	1.98
Co-efficient of Variation	0.74	0.81	0.61	1.07
Count	100	101	93	99
<i>Season 3</i>				
Mean	2.45	3.06	2.62	2.76
Co-efficient of Variation	0.64	0.66	0.63	0.85
Count	102	106	94	103

To compare the food security situation at the village-level, the villages were ranked separately for males and females according to their mean STCS cumulative score. Table 6.6 shows that for females, Oruwella was better off overall in all three seasons and was the least food insecure. For males, Boraluwagoda was the most food insecure for all three seasons.

**Table 6.6 Communities ranked according to their mean STCS cumulative scores for the three seasons.**

	STCS S1F	STCS S2F	STCS S3F	STCS S1M	STCS S2M	STCS S3M
<i>Site 1 - Rekawa</i>						
Oruwella	6	6	6	2	5	6
Boraluwagoda	4	1	2	1	1	1
Kapuhenwela	5	4	5	3	2	2
<i>Site 2 - Kalametiya</i>						
Gurupokuna	3	3	3	5	3	5
Wewegoda	2	2	1	6	6	3
Thuduwa	1	5	4	4	4	4

*S1F= Season 1 for females, S2F= Season 2 for females, S3F = Season 3 for females; S1M = Season 1 for Males, S2M= Season 2 for males, S3M= Season 3 for males*

*1= most food insecure (worst off), 6 = least food insecure (best off)*

With the STAS cumulative index, the higher the index score, the more food secure the household is. For both females and males, Kalametiya had a higher mean STAS score for all three seasons (Table 6.7). This indicated that overall Kalametiya appeared to be more food secure than Rekawa. Overall Season 3 had a higher co-efficient of variation and therefore a more variable sample than the other two seasons.

**Table 6.7 STAS cumulative scores for females averaged at the community level**

STAS scores	Females		Males	
	Rekawa	Kalametiya	Rekawa	Kalametiya
<i>Season 1</i>				
Mean	0.90	1.71	0.94	1.35
Co-efficient of variation	0.88	0.71	0.82	0.91
Count	101	99	95	102
<i>Season 2</i>				
Mean	0.89	1.39	0.99	1.38
Co-efficient of variation	0.79	0.91	0.71	0.99
Count	100	102	94	101
<i>Season 3</i>				
Mean	1.04	1.06	0.89	0.94
co-efficient of variation	1.21	1.03	1.23	1.29
Count	102	106	95	103

The villages were ranked separately for males and females according to their mean STAS cumulative score, to compare food security at the village level (see Table 6.8). No clear patterns emerged, but overall it appeared that Boraluwagoda and Kapuhenwela in the Rekawa site were the least food secure over the three seasons for both genders. In Kalametiya, Wewegoda and Gurupokuna villages appeared to be the most food secure for both males and females over the three seasons.

**Table 6.8 Communities ranked according to their mean STAS cumulative scores for the three seasons**

	STAS S1F	STAS S2F	STAS S3F	STAS S1M	STAS S2M	STAS S3M
<i>Site 1 - Rekawa</i>						
Oruwella	4	3	6	5	4	5
Boraluwagoda	1	2	1	1	2	1
Kapuhenwela	2	1	2	2	1	4
<i>Site 2 - Kalametiya</i>						
Gurupokuna	5	5	4	4	5	6
Wewegoda	6	6	5	6	6	3
Thuduwa	3	4	3	3	3	2

*1 = most food insecure (worst off), 6 = least food insecure (best off)*

Overall when the median ranks for STCS and STAS for the three seasons were compared, it showed that for STCS, Oruwella was the best off and Boraluwagoda the worst off for both genders in terms of food security (see Table 6.9). The STAS results also showed that Boraluwagoda was the worst off but that Wewegoda and Gurupokuna in Kalametiya site were the best off. The results were therefore in general similar to those obtained above when the individual seasonal mean food security scores were compared.

**Table 6.9 Comparison of median ranks for STCS and STAS for the three surveys**

	Rank Median STCS		Rank Median STAS	
	Female	Male	Female	Male
<i>Rekawa</i>				
Oruwella	6	5	4	5
Boraluwagoda	2	1	1	1
Kapuhenwela	5	2	2	2
<i>Kalametiya</i>				
Gurupokuna	3	5	5	5
Wewegoda	2	6	6	6
Thuduwa	4	4	3	3

*1=most food insecure (worst off), 6=least food insecure (best off)*

#### **6.4.3 Seasonal Variations of short term indices**

As mentioned in Section 6.3.2, three surveys were undertaken to collect data on short-term indices, to ensure that differences in use of strategies linked to any seasonal variations would be captured. There were significant correlations between the STCS and STAS cumulative scores obtained over the three seasons for both genders (Table 6.10). This meant that there was consistency in the STCS and STAS cumulative scores obtained at the household level over the three seasons. The correlations were however fairly weak for both males and females.

**Table 6.10 Correlations of the STCS and STAS cumulative scores for the same household over the three seasons**

	STCS			STAS		
	Season 1 & 2	Season 1 & 3	Season 2 & 3	Season 1 & 2	Season 1 & 3	Season 2 & 3
<i>Females</i>						
Spearman's rank correlation coefficient	+0.266	+0.207	+0.328	+0.292	+0.325	+0.350
Significance (2-tailed)	0.000	0.004	0.000	0.000	0.000	0.000
N	191	191	201	199	199	202
<i>Males</i>						
Spearman's rank correlation coefficient	+0.274	+0.233	+0.288	+0.350	+0.348	+0.314
Significance (2-tailed)	0.000	0.001	0.000	0.000	0.000	0.000
N	183	183	192	204	204	205

#### 6.4.4 A comparison of long-term indices at the community level

With respect to the LTCS scores, it appeared that the Rekawa site was more food insecure than Kalametiya overall, for both males and females (Table 6.11). The co-efficient of variation was higher for Kalametiya for both genders. In terms of LTAS scores, Rekawa was more food secure overall than Kalametiya for both males and females. The coefficients of variation show no clear trend.

**Table 6.11 LTCS and LTAS scores averaged at the community level for males and females**

	LTCS		LTAS	
	Rekawa	Kalametiya	Rekawa	Kalametiya
<i>Males</i>				
Mean	2.84	1.68	9.18	5.80
Coefficient of variation	0.58	0.94	0.57	0.81
Count	99	100	95	98
<i>Females</i>				
Mean	2.72	1.86	8.39	6.76
Coefficient of variation	0.58	0.78	0.62	0.57
Count	100	99	101	100

Where a high LTCS score = more vulnerability and less food secure; a high LTAS score = less vulnerability and more food secure

#### 6.4.5 A comparison of the mean scores for short-term and long-term indices

The mean scores (for the two sites and both genders) for all four indices are given in Table 6.12. For STCS and STAS the mean for all three seasons was used. The mean scores for each index showed differences between males and females and between sites. In general, the between-site results were inconsistent. For example, the STAS index shows that Kalametiya is more food secure in the short-term in the case of both males and females, while the STCS indicates that Kalametiya is also the most food insecure for females. For the LTCS index Rekawa appeared to be more vulnerable overall for both genders while according to the LTAS index Rekawa was less vulnerable for both genders.

**Table 6.12 Mean scores and Coefficient of Variation for the four indices based on gender and site**

Indices	Females		Males	
	Rekawa	Kalametiya	Rekawa	Kalametiya
STCS	2.83 (0.67)	3.36 (0.74)	2.73 (0.65)	2.35 (0.98)
STAS	0.95 (1.0)	1.38 (0.88)	0.88 (0.99)	1.18 (1.07)
LTCS	2.72 (0.58)	1.86 (0.78)	2.84 (0.58)	1.68 (0.94)
LTAS	8.39 (0.62)	6.76 (0.57)	9.18 (0.57)	5.80 (0.81)

*NB: The coefficient of variation is given in brackets*

#### 6.4.6 Factors affecting food security indices

As correlation tests showed that wealth rank was a key variable and gave consistent results with both short-term indices (in the three seasons) and long-term indices (Annex 6.2), to investigate this relationship further GLMs were undertaken with wealth rank as an explanatory variable. In addition, other variables seen to have a positive univariate relationship with four food security indices (Annex 6.2) were included in the GLM.

##### 6.4.6.1 Short Term Coping Strategy (STCS) scores

With respect to the STCS index (see Table 6.13), wealth rank is consistently significant and always in the expected direction (i.e., better-off households are more food secure than poorer households). With regard to the site variable, females show a more consistent significance than males and in the case of males, the site effect is in the opposite direction. Involvement in the SAM process was not significant in general, but where it

was (for females in season 1) there was also a SAM\*Site interaction. Season 2 showed fewer factors significant for both males and females. This may be due to season 2 having a more variable sample in general.

Overall the female STCS index appeared to fit better to the model than the male STCS index in all three seasons and showed higher significance overall and a higher degree of explanatory power. This may be as a result of certain strategies being adopted mainly by females (for example mother eating less, harvesting edible plants or skipping a meal).

**Table 6.13 Summary of GLM results for STCS showing the significance of explanatory variables and overall direction of the effect**

Indices	Wealth rank	Site	Site*Village	SAM involvement	Site*SAM involvement	Sig. of overall model	R <sup>2</sup>
Season 1 Females	0.001	0.002	NS	0.013	0.050	0.000	19%
Direction of coefficients	1<4	R<K		NI<I			
Season 2 Females	0.003	NS	0.021	NS	0.044	0.001	14.9%
Direction of coefficients	1<4						
Season 3 Females	0.000	0.009	0.000	NS	NS	0.000	24.1%
Directions of coefficients	1<4	R<K					
Season 1 Males	0.012	0.033	NS	NS	NS	0.003	11.3%
Directions of coefficients	1<4	R>K					
Season 2 Males	0.004	NS	NS	NS	NS	0.015	9%
Directions of coefficients	1<4						
Season 3 Males	0.016	NS	0.020	NS	NS	0.003	11.6%
Directions of coefficients	1<4						

*In each case the dependent variable is the STCS for a given gender and season; For WR, 1=most wealthy, 4 = least wealthy. 1<4 implies that WR 1 has a lower STCS (more food secure) than WR 4; R=Rekawa, K=Kalametiya. Hence R<K implies Rekawa is more food secure (lower STCS) than Kalametiya; For SAM, I=Involved, NI=Not involved. Hence NI<I implies that those not involved in SAM is more food secure (lower STCS) than those involved in SAM.*

#### 6.4.6.2 Long Term Coping Strategy (LTCS) scores

In respect to the LTCS index, similar results were obtained for both males and females (Table 6.14). Wealth rank was significant in both cases and in the expected direction (i.e., better-off households are more food secure than poorer households). Likewise the age variable also gave significant results for both genders, where younger respondents were more food insecure and more vulnerable than older respondents. In relation to site, Rekawa appeared to be more food insecure for both males and females. These results indicated that there were significant differences in the LTCS scores in the two sites (when wealth rank was taken into account), but no systematic difference between the LTCS scores between villages in a particular site. The results also showed that a site may be food insecure on a short term basis but still be relatively more food secure overall in the longer term. The short and long term indices clearly helped distinguish between these differences in food insecurity over different time periods. Overall the male LTCS index seemed to fit the model better (although both had high  $R^2$  values indicating a good fit to the model). This suggests that males were more involved in adopting these strategies. For example mortgaging or selling of productive assets such as fishing gear.

**Table 6.14 Summary of GLM results for LTCS showing the significance of explanatory variables and overall direction of the effect**

Indices	Wealth rank	Site	Site*Village	Age	Sig. of overall model	R <sup>2</sup>
LTCS for Females	0.001	0.000	NS	0.001	0.000	21.4%
Direction of coefficients	1<4	R>K		Y>O		
LTCS for Males	0.039	0.000	NS	0.000	0.000	24.5%
Direction of coefficients	1<4	R>K		Y>O		

*In each case the dependent variable is the LTCS for a given gender; For WR, 1=most wealthy, 4 = least wealthy. 1<4 implies that WR 1 has a lower LTCS (more food secure) than WR 4; R=Rekawa, K=Kalametiya. Hence R>K implies Rekawa is less food secure (higher LTCS) than Kalametiya. Y=younger, O=Older. Y>O implies that younger respondents more food insecure (higher LTCS than older respondents).*

### 6.4.6.3 Short Term Accumulation Strategy (STAS) scores

For the STAS index, similar results were obtained for both genders in the different seasons (see Table 6.15). Wealth rank is significant and in the expected direction for seasons 2 and 3 but non-significant for season 1. In relation to site, both males and females have non-significant results in season 3, while results are significant for the other two seasons. Moreover, in season 1 there was an interaction between site and village, showing that villages differed consistently in their STAS scores. The site effect is in different directions for females but shows consistency in the case of males.

Overall in all three seasons, the female STAS index appeared to fit better to the model than the male STAS index (with a higher significance and a higher degree of explanatory power). This may be as a result of certain strategies being adopted mainly by females (for example strategies linked to food consumption patterns – cooking more vegetable dishes, stocking up on food).

**Table 6.15 Summary of GLM results for STAS showing the significance of explanatory variables and overall direction of the effect**

Indices	Wealth rank	Site	Site*Village	Sig. of overall model	R <sup>2</sup>
Season 1 Females	NS	0.000	0.000	0.000	26%
Direction of coefficients		R<K			
Season 2 Females	0.014	0.012	NS	0.000	12.6%
Direction of coefficients	1>4	R>K			
Season 3 Females	0.000	NS	NS	0.000	11.2%
Direction of coefficients	1>4				
Season 1 Males	NS	0.002	0.000	0.000	14%
Direction of coefficients		R<K			
Season 2 Males	0.025	0.008	NS	0.019	8.1%
Direction of coefficients	1>4	R<K			
Season 3 Males	0.028	NS	NS	0.028	4.4%

Indices	Wealth rank	Site	Site*Village	Sig. of overall model	R <sup>2</sup>
Direction of coefficients	1>4				

In each case the dependent variable is the STAS for a given gender and season; For WR, 1=most wealthy, 4 = least wealthy. 1>4 implies that WR 1 has a higher STAS (more food secure) than WR 4; R=Rekawa, K=Kalametiya. Hence R>K implies Rekawa is more food secure (higher STAS) than Kalametiya.

#### 6.4.6.4 Long Term Accumulation Strategies (LTAS) scores

In respect to the LTAS index, different results were obtained for males and females (see Table 6.16). For example, wealth rank was significant only for males (the effect was in the correct direction with better-off households being more food secure and less vulnerable). While site showed significant results for both genders and the site effect was in the same direction for males and females (i.e., Rekawa more food secure than Kalametiya), in the case of males, there was also a significant interaction between site and village. This reflects consistent differences between villages once site has been taken into account. The age variable also gave significant results for both genders, where younger respondents were more food secure and less vulnerable than older respondents. Overall the LTAS index for males appeared to fit the model better than that for females with a higher significance overall and a higher degree of explanatory power. A possible explanation could be that generally males adopted these strategies as opposed to females.

**Table 6.16 Summary of GLM results for LTAS showing the significance of explanatory variables and overall direction of the effect**

Indices	Wealth rank	Site	Site*Village	Age	Sig. of overall model	R <sup>2</sup>
LTAS for Females	NS	0.029	NS	0.000	0.000	16.3%
Direction of coefficients		R>K		Y>O		
LTAS for Males	0.010	0.000	0.010	0.000	0.000	29.1%
Direction of coefficients	1>4	R>K		Y>O		

In each case the dependent variable is the LTAS for a given gender and season; For WR, 1=most wealthy, 4 = least wealthy. 1>4 implies that WR 1 has a higher LTAS (more food secure & less vulnerable) than WR 4; R=Rekawa, K=Kalametiya. Hence R>K implies Rekawa is more food secure & less vulnerable (higher LTAS) than Kalametiya. Y=younger, O=Older. Y>O implies that younger respondents more food secure (higher LTAS) than older respondents).

#### 6.4.6.5 The consistency of significant variables for the short-term and long-term indices

Overall wealth rank appeared to have a strong relationship with the different food security indices and was consistent. Site was more variable and the results of the GLM models showed that the between-site differences were inconsistent in terms of both the short and long term crisis and non-crisis indices. While LTCS and LTAS appeared to give contradictory results with respect to which site was more food insecure, the STCS and STAS results were somewhat mixed (see Table 6.17). Participation in the SAM process appeared to be important only in the case of crisis situations (for females). Age showed a strong relationship with both LTCS and LTAS, but was inconsistent in terms in direction of effect. This may be due to age-related perceptions of how respondents act in the long term being different – perhaps as a result of people’s different life experiences it is difficult to compare older and younger individuals in terms of long term indices.

**Table 6.17 Food insecurity and vulnerability at the site level**

<b>Which site is more food insecure after wealth rank has been taken into account?</b>		
<b>Index</b>	<b>Males</b>	<b>Females</b>
STCS Season 1	Rekawa	Kalametiya
STCS Season 2	-	-
STCS Season 3	-	Kalametiya
STAS Season 1	Rekawa	Rekawa
STAS Season 2	Rekawa	Kalametiya
STAS Season 3	-	-
LTCS	Rekawa	Rekawa
LTAS	Kalametiya	Kalametiya

#### 6.4.6.6 The relationship between wealth rank and welfare

In the previous chapter it was shown that wealth rank was correlated with being a recipient of ‘Samurdhi’, the government welfare programme. This is one of the key indicators of poverty in Sri Lanka (all households below the poverty line are eligible to be recipients of Samurdhi) and therefore an important variable in its own right. In this Chapter, both wealth rank and welfare were shown to have strong associations with the four food security indices (see Annex 6.2). To determine which of the two well-being

variables gave a better fit to the food security models with a higher explanatory power the GLMs were re-run with the welfare variable replacing wealth rank.

In the case of STCS scores, similar results were obtained consistently for all seasons (with the exception of season 2 for males), with welfare giving the same overall results but less significance and lower degree of explanatory power (see Table 6.18). Similar findings were observed in the case of all the other indices as well for both genders and the different seasons. Hence wealth rank was used instead of welfare as it is a better explanatory variable. This once again validates the fact that wealth rank can act as a proxy to several poverty-related variables (including being a welfare recipient). It also illustrates that wealth rank encompasses a broader definition of poverty and can explain in general a larger degree of variation in poverty related indices.

**Table 6.18 Summary of GLM results showing the significance of explanatory variables and overall direction of the effect when welfare replaces wealth rank**

*In each case the dependent variable is the STCS for a given gender and season; For Welfare more positive than a non-recipient  $W > NW$  = higher STCS scores which means that those on welfare likely to be more food insecure;  $R < K$  implies Rekawa is more food secure (lower STCS) than Kalametiya; For SAM,  $I =$ Involved,  $NI =$ Not involved. Hence  $NI < I$  implies that those not involved in SAM is more food secure (lower STCS) than those not involved in SAM.*

Indices	Welfare	Site	Site*Village	SAM involvement	Site*SAM involvement	Sig. of overall model	R <sup>2</sup>
Season 1 Females	0.046	0.001	NS	0.023	0.033	0.001	14.5%
Direction of coefficients	$W > NW$	$R < K$		$NI < I$			
Season 2 Females	0.002	NS	0.012	NS	0.005	0.000	14.9%
Direction of coefficients	$W > NW$						
Season 3 Females	0.000	0.003	0.000	NS	NS	0.000	23.3%
Direction of coefficients	$W > NW$	$R < K$					
Season 1 Males	0.006	0.002	NS	NS	NS	0.001	9.6%
Direction of coefficients	$W > NW$	$R > K$					

Indices	Welfare	Site	Site*Village	SAM involvement	Site*SAM involvement	Sig. of overall model	R <sup>2</sup>
Season 2 Males	NS	NS	NS	NS	NS	NS	
Direction of coefficients							
Season 3 Males	0.000	NS	NS	NS	NS	0.002	6.9%
Direction of coefficients	W>NW						

## 6.5 Discussion

The food security indices that combine frequency of use and perceived severity of adopted strategies present a simple quantitative score for each household. These indices that were based on the behavioural responses of individuals in both crisis and non-crisis situations, over different time periods, provided information relating to the poverty situation at the household level. The short-term indices showed aspects linked to the dynamic nature of poverty, but on a short time scale by illustrating changes in mainly household consumption patterns over a few weeks. The long-term indices also demonstrated the dynamic nature of poverty, over a longer-time scale (a ten year period) and showed changes mainly concerned with household asset ownership. When the scores of the four indices were averaged at the village level, they proved useful to illustrate differences under these four scenarios in these communities - across and within villages and sites.

This empirical case study showed that there were distinct gender differences associated with the indices as indicated by the general linear models. Overall for the short term indices, the models fitted better for females, while for the two long term indices the models fitted better for males. These results clearly illustrated that for short term indices which were more related to changes in consumption patterns in the household, the overall responsibility was borne by the females, while in the case of the long term strategies there was more emphasis on the male in the household to undertake these strategies. This meant that it was better to use data collected from females for the short-term indices and males for the long-term indices.

Overall wealth rank was consistent and had a strong relationship with the different food security indices in both crisis and non-crisis situations as demonstrated by the GLMs. Poorer households were consistently shown to be more likely to be food insecure in the case of all four indices. The participation in CZM policy processes such as SAM appeared to be important determinant of food security only in the case of crisis situations (for females). The age variable also appeared to be important in the case of the long-term strategies but gave inconsistent results between the divestment and investment strategies. One possible explanation is that age-related perceptions of how respondents act in the long term may be different.

Although one would argue that the four indices should show a significant relationship with the primary livelihood of the household, this was not the case. This however can be explained fairly easily as the categorization of livelihoods used in this study includes both better-off and poorer households falling into one broad livelihood category. Thus these categories do not reflect one particular socio-economic status (for example under the 'fishing' livelihoods category both multiday-boat operators as well as those using small traditional canoes are included), thereby resulting in both food secure and insecure households falling into one livelihood category. Further disaggregation of livelihood categories may reveal different results.

Seasonal variations were captured by the short term indices. While the scores obtained over the three seasons showed a positive correlation and were therefore consistent, the general linear models gave different results in terms of significance and degree of explanatory power. This highlighted the difficulty in drawing inferences about the status of the household with respect to short term coping and accumulation scores from a snapshot of one season. The situation is clearly dynamic and changes are occurring all the time.

When averaged at the village and site level, the crisis and non-crisis indices appeared to give contradictory results. For instance, the same site showed both high coping and accumulation strategy scores. Overall for site, only the results for the males showed consistency for the short term indices (where Rekawa was shown to be more food insecure) and in the long term both genders showed inconsistent results (where Rekawa was more food insecure according to the LTCS and Kalametiya more food insecure

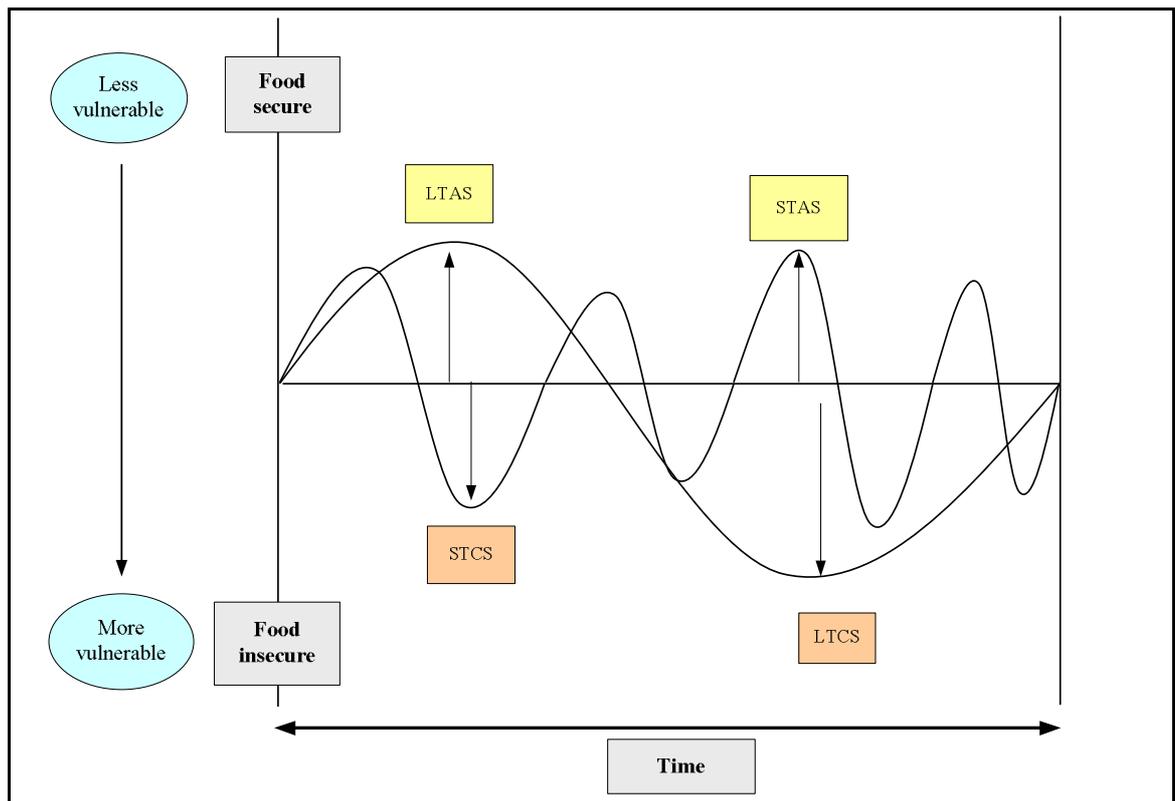
according to the LTAS). There may be several explanations for this. One possibility is the variability in the sample. Overall Kalametiya had a more variable sample than Rekawa for STCS and LTCS and for males in the case of STAS. But it is more likely these results are caused by a genuine response to variation in circumstances and not a sampling error. For example it could be the differences in the PSR values or using certain strategies more frequently - both would influence the cumulative index scores. In the case of each of the indices, when a qualitative check of data was undertaken it was also apparent that there were certain strategies that had high PSR values and were also adopted frequently by a large percentage of the sample. For example, in respect to the STCS, buying less food and taking food on credit; for STAS – cooking more dishes; for LTCS – borrowing money and pawning gold jewellery and for LTAS – depositing money in the bank. The discrete scores obtained from adopting these strategies frequently would result in inflating the overall cumulative score obtained for the index.

Another logical interpretation of the results may be that it is indicative of a more hand-to-mouth lifestyle adopted by these households – so those using more “severe” coping strategies were also using more “severe” accumulation strategies. The indices are perhaps therefore highlighting more subtle differences in the household situation. Discussions with the community revealed that often only small quantities of goods were purchased at any given time in terms of short term accumulation strategies. But as the amounts of consumption goods bought or cooked were not measured under this study, it was difficult to gauge the exact quantities the respondents were referring to in the questionnaire. This highlighted one of the weaknesses in the methodology. It was not possible to distinguish between two individuals who stated that they had bought more goods in the short term, but one a substantially lesser amount than the other. Both would get an equal score according to the manner in which the index is formulated at the moment (see Table 6.19 for a summary of major strengths and limitations of the methodology).

In the longer term, contradictory results at the site level can be explained by the fact that households whether considered relatively poorer or better-off would undergo variations where they adopt a combination of both LTCS and LTAS strategies over a 10 year period. Their situation is unlikely to remain static in this time frame and therefore there would be times of both shortages and surplus. Moreover as many households in the sample are engaged in livelihoods dependent on natural resources there are seasonal fluctuations and

thereby a cyclic nature of the income obtained. In addition to highlighting this dynamic situation, once again the indices may be illustrating a more subtle state in the households where both high coping and accumulation scores were obtained in the long-term. The diagram below attempts to explain these different concepts (see Figure 6.1).

**Figure 6.1 The adoption of short and long term strategies at the household level**



Overall the indices proved useful tools to understand how people responded to food insufficiency and lack of money at the household level in both the short and long term and how they make decisions based on certain trade-offs with other basic needs to achieve a certain level of security in terms of food and asset ownership. Certain elements of vulnerability were also therefore portrayed by the indices. In addition they were useful in highlighting differences in behavioural responses between males and females when faced with food shortages. All four indices show a correlation with wealth rank indicating that they are capturing information on poverty; especially in respect to its dynamic nature in relation to time. When scores were averaged at a village and site level they provided a means of comparing the food security situation between sites and within villages in one site.

**Table 6.19 A Summary of the main strengths and limitations of the methodology adopted to assess food security and vulnerability at the at the household-level**

Strengths	Limitations
<ul style="list-style-type: none"> <li>• Identifying strategies adopted in the household during short and long periods of scarcity and surplus was a concept that people found easy to understand,</li> <li>• A useful method of capturing information on the behavioural responses of individuals when faced with situations of scarcity or surplus.</li> <li>• The indices that combine frequency of use and perceived severity of adopted strategies resulted in a simple quantitative score that provided useful poverty related information at a household level</li> <li>• A useful approach to use to get a better understanding of the dynamic nature of poverty at the household-level in both the short and long term.</li> <li>• The indices lend themselves to comparative assessments between genders, seasons, sites and livelihood groups.</li> </ul>	<ul style="list-style-type: none"> <li>• Ranking strategies adopted according to their perceived severity proved to be difficult, especially for male respondents.</li> <li>• The strategies adopted did not refer to any quantities, just the behavioural response itself. It was therefore difficult to distinguish between individuals who had purchased different amounts of goods at the same frequency. According to the way the index is formulated they would receive an equal score.</li> <li>• In terms of the long term indices, it was sometimes difficult for respondents to recall accurately how many times they adopted certain strategies in a 10 year period.</li> <li>• If respondents did not indicate the frequency for strategies adopted, they were given a score of zero and this led to difficulty in distinguishing between those who had not adopted any strategies with those who had adopted some strategies but were unable to recall accurately how many times the strategy was adopted in a particular time period (this may be one explanation for the zero inflation of some distributions of scores – See Annex 6.3)</li> <li>• Results may be difficult to interpret when scores averaged at the village or site level give contradictory results for the crisis versus non-crisis indices.</li> </ul>

## 6.6 Conclusions

This chapter evaluates the empirical experience of using novel methods to measure certain elements of food security and vulnerability at the household level. Four indices are developed based on the behavioural responses of individuals, and strategies adopted in a household during crisis and non-crisis situations in the short and long term. The four indices were tested and their merits and limitations assessed. The results illustrated that the indices developed are good socio-economic tools to compare households' situation over different time periods and to investigate causes for differences. It is likely that the indices are measuring *different* elements of food security and vulnerability (not necessarily *opposite* elements). For example in the short term, it is likely that the

accumulation strategies are measuring something different to the coping strategies (but that there is some possible link).

As the wealth rank variable shows a strong relationship with the food security indices, it is important to determine whether the indices are measuring anything different to what the wealth ranking is doing. But as wealth rank only accounts for a certain degree of the explanatory power of the indices (when general linear models were run), it can be assumed that the food security indices are covering other dimensions of vulnerability not covered by wealth rank, such as the behavioural responses of individuals to certain circumstances they face. Wealth rank appears to be a relatively more 'stable' phenomenon experienced by the household than short-term indices, while the long-term indices are useful in showing the means by which a household may move to a different wealth rank or remain static. Therefore both tools would provide valuable complementary information of food insecurity, vulnerability and poverty at the household level.

Using both the coping and accumulation indices together may lead to some confusion in determining the food insecurity status of a household. Undertaking surveys using perhaps only the coping indices (since overall they have a higher explanatory power than the accumulation indices) may be therefore the best way forward. In addition, data could be collected from female respondents for the short term index and males for the long-term index as this gave the better fit and higher explanatory power when the GLMs were undertaken. A useful and practical application of this methodology would be in food insecurity and vulnerability mapping exercises. This could make a valuable contribution towards the policy and decision-making process by identifying poorer areas that are more vulnerable to food insecurity. The indices can act as a monitoring tool if the same PSR values are used throughout to record changes in an area over time. There are however several limitations that have been uncovered by the empirical testing of these indices which suggests that further work is needed to refine the method in future work.

The next chapter focuses on another aspect of livelihood sustainability – personal well-being. The simple index that I developed in this respect is also tested against the same variables that the food security indices were evaluated against in this chapter.