Seasonality Revisited

Perspectives on Seasonal Poverty

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International Conference
Institute of Development Studies, UK
8-10 July, 2009

Modelling Seasonality in the Household Economy Approach and for Individual Households

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This paper illustrates the use of models to analyse income seasonality. Section 1, by Charles Rethman is based on grouped data obtained using the household economy approach. Section 2, by John Seaman provides a more detailed analysis based on income data obtained from individual households.

SECTION 1: SEASONALITY MODELLING IN THE HOUSEHOLD ECONOMY APPROACH

The HEA model for vulnerability over a whole Year

The HEA model is usually begins with the definition of a 'livelihood zone', a geographic area defined as being of similar pattern of livelihood. Within each zone, households are clustered by 'wealth groups', which are differentiated primarily on assets. Examples of assets rural households list in their breakdowns are: land, livestock, labour, household goods and tools (this includes items such as carts, bicycles and farming equipment). Household assets determine productive options; for example, land provides for crop growing and pasture, livestock can be sold, they can produce dairy and they can be slaughtered for meat, while labour can be exploited for gain directly through piece-work, petty trading or some form of self-employment (such as gathering firewood or charcoal-making). Of course, there are inter-linkages between assets and production: livestock proceeds may be used to fund cropping inputs and labour is an essential input for both farming and animal husbandry.

Household production is converted into consumption either directly or through economic exchange. Direct production to consumption is when the household consumes the food it produces. Exchanges for food and other essentials sometimes takes place as direct barter but more usually it is done by selling production and purchasing the desired requirement.

The key to making the model work is to explore the relationships between assets, production, trade and consumption and the *strategies* households employ to get the most out of these relationships, given the constraints of their capabilities and the environment. For example, certain environmental conditions of soil types, climate, etc. and local farming methods are only likely to yield a certain amount of production from for a given a size of land and input of labour, while trading conditions are likely to dictate prices for both sales of crops and for purchases of needs. The investigation is usually done for an annual household spending cycle, the most practical being a ***consumption year***, usually the period running from one harvest to the next. The detailed study that results in a description of these livelihood strategies and the relationships between them is called the ***baseline***.

Human food needs are complex. While great strides have been made in understanding human nutrition, there remains much debate on the importance of different foods and micro-nutrients. However, in trying to construct an economic model to examine the *possibilities* households have in getting the most basic commodities to sustain their lives, the model targets consumption in terms of **energy levels** but makes allowances for other target nutrients or food groups by including them in the *minimum non-staple expenditure*[1]. Each source of food consumed by a household during the consumption year can then be expressed as:

The percentage of the minimum energy required by an average household for a whole year

For example, since an average person's minimum energy requirement is 2100 kcal per day, the minimum energy requirement for the year for average household of five people will be:

$$Food\ energy\ requirement = 2100\ \times 5\ people\ \times 365\ days = 3832500\ kcal$$

Taking the example further, a standard 50 kilogramme sack of maize contains 181500 kcal of food energy, which is therefore 4.7 percent of the households' annual requirement.

All food sources are expressed this way in order to bring them into a "common currency" and allow for them to be added together.

In times of stress, households have to find ways of expanding their sources of food and this is the first course of action a household may take when they experience production or exchange losses. Thus, if casual labour is paid for directly with food, households may seek out additional employment or travel further from home in order to get this employment, so that they *expand* the 'casual employment' source of food. This *expandability* can be thought of as additional *potential* access that can be obtained through adaption or response by the household.

The sum of the baseline access and the expandability are referred to in this paper as 'entitlements'— the sum of the existing and potential income that can be used to meet all basic needs. The degree of vulnerability is then the difference between the entitlements and needs. Put algebraically:

$$V = E - N$$

Where V is the vulnerability of the households being analysed, E is their entitlements and N is their needs. If V is negative, then households have ***missing entitlements***, a potential shortfall in their ability to make the most basic living. If V is positive, households have additional consumption or discretionary expenditure, which they may choose to invest or consume.

However, hazards affect both the 'normal' access to food as well as the expandability, so if hazard is expressed as a *change*, then it is multiplied by both baseline access and expandability. Putting this in an algebraic format gives the following formula:

[1] The minimum non-staple also includes other essential non-food expenditure in addition to non-staple foods, such as health, education and some household items such as soap, fuel, etc.

$$E = (B + X) \times H$$

Or

$$E = B \times H + X \times H$$

Where E is the projected entitlement of the household, B is the baseline access, X is the expandability and H is the hazard or change.

These formulae describe vulnerability in very simple terms; in reality the equation is much more complex, since there are different sources of food and income, which are all interrelated. In addition to providing the sum of ‘normal’ access, the baseline also describes these interrelationships and the linkages between different sources; it therefore is the basis of the ***livelihood model***.

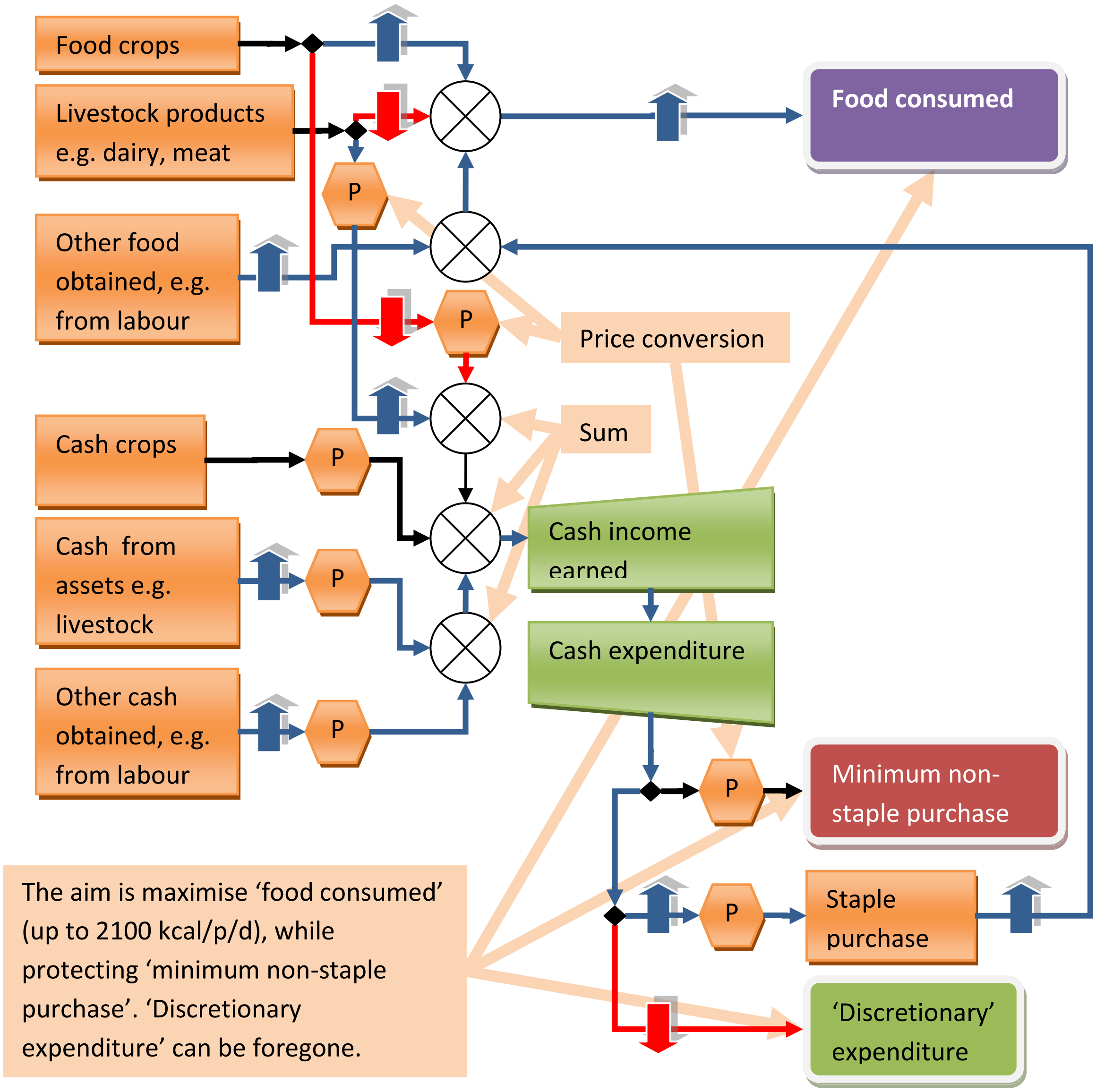
Figure 1 is a simplified representation of the model. The orange boxes show the baseline access of a type of food source such as food crops, livestock products, staple purchase or other source of food.

Starting with food crops, production is either consumed directly or converted into cash and summed into the cash income. The consumed food crops are summed with food obtained from livestock products or obtained some other way. As explained above, food consumption is expressed in terms of the percentage of minimum energy requirements; this way, different foodstuffs are easily summed together.

All of these sources of food may be affected by a hazard event—each one to their own particular degree. If they are affected, households will respond by trying to maximise the food obtained from other sources and by switching food crop sales to consumption. This process of maximising and switching is illustrated in **Figure 1** by the blue up-arrows on food crop consumption and on food from other sources, as well as the red down-arrow on food crop sales. Food obtained from livestock products is normally *reduced*—this is because livestock product food calories are worth three to five times as much as cereal calories, so it is better to switch consumption to sales and purchase cheaper cereal calories to meet food energy (though not necessarily nutrition) needs.

Income from food crop sales and livestock product sales are summed with income from cash crops, assets sales and other sources. The amounts of cash obtained from each source are also each independently affected by the hazard event. With income, households respond by increasing production from cash-earning sources, for example: by selling more assets, seeking extra casual labour, collecting more firewood or making more charcoal. If the households sell livestock products, they will increase this, although they will lose income from reduced food crop sales (food crops are consumed more under duress). This extra selling by many households can flood the local market, and the resultant lower prices may actually cause an income reduction, despite increased sales. Hence, the prices of the commodities sold (including labour, in terms of wage rates) are independently affected by the hazard event as well.

Figure 1 - The HEA Model for a Consumption Year



Cash income is then converted into expenditure, which can be divided into three sorts: *minimum non-staple* purchases, *staple* purchases and *discretionary* purchases[2]. First of all, the minimum non-staple is to be protected, even though it will most likely be subject to a price change—a worsening situation or hazard for households would be a rise in prices, meaning that more income is needed to cover this basket. Discretionary expenditure, however, can be reduced to zero, if need be. All remaining expenditure is then channelled into staple purchase, until minimum food energy needs are met. If the staple purchase, when added with other food sources, is unable to supply household energy needs, practitioners are able to pronounce the difference as a ***missing entitlement***. As explained in the formulae above, 'entitlements' (the sum of items available for direct consumption plus income and potential income from assets and activities) are thus less than households' basic requirements.

[2] Other categories, such as *desirable purchases* (investments or savings) are normally included in this list. These are left out of this description of the model for simplicity.

This livelihood model has been conveniently condensed into an algorithm, which can be coded into a user-friendly format to allow practitioners to make the calculations quickly. Examples of this algorithm in practical use are the analytical spreadsheets developed by Mark Lawrence of the Food Economy Group and the RiskMap software, initially constructed by John Seaman under Save the Children and further developed by Charles Rethman and Zangaphee Chimombo under Save the Children and the Malawi Vulnerability Assessment Committee.

The analytical spreadsheets are in widespread use and have been used to great effect in forecasting hunger in a number of countries; these countries now include but are not limited to: Malawi, Swaziland, Lesotho, Namibia, Tanzania, Somalia and Ethiopia. They come as Microsoft Excel workbooks that are readily copied and managed as files and present the analysis in a transparent and standardised format to trained practitioners. As spreadsheets, they can be readily expanded and additional analysis can be added on to them without the need for specialised programming skills.

Household Economy Approach practitioners already collect information on seasonality

The model for the whole year that has been described above shows that vulnerability to hunger and food security is complex and that capturing information on it requires much more than tracking variables. The Household Economy Approach recognises this and as a framework, it helps practitioners identify the minimum dataset necessary for a useful food security and vulnerability prediction and monitoring systems to be set up. Central to this is the construction of the baselines—the robustness of which influences many years of repeated modelling and analysis.

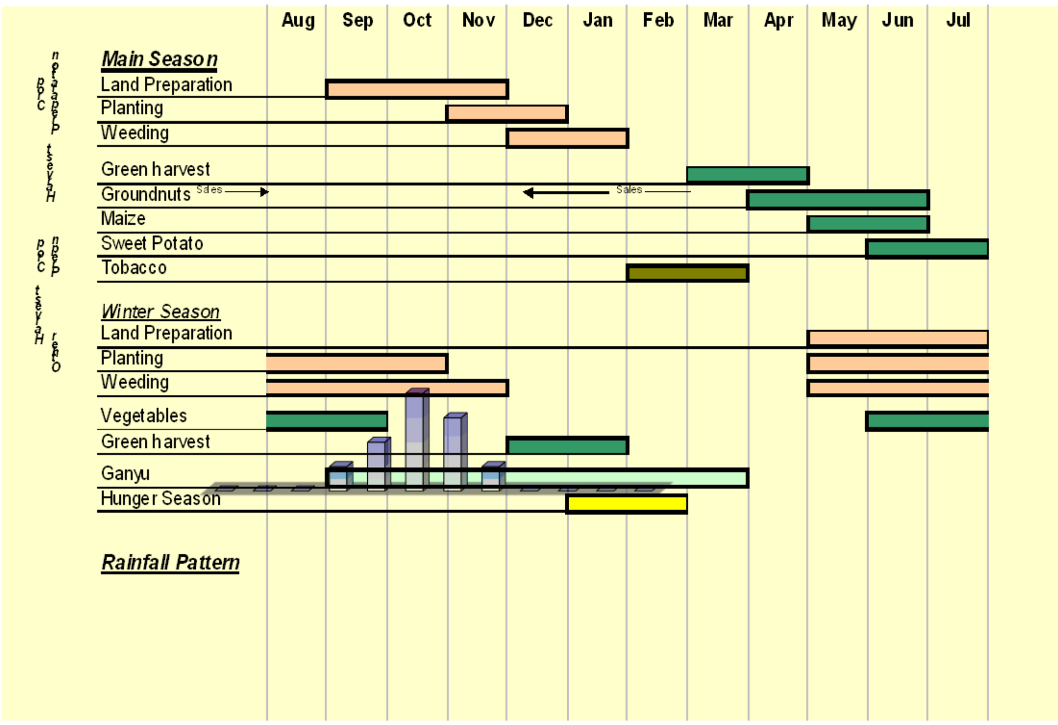
Practitioners in the field have found that for purposes of obtaining large-scale analyses of broad hazards and shocks, this complex information is more easily collected through purposively sampled semi-structured interviews with focus groups, rather than through random probability sampled individual respondents[3]. Granted, respondents in a purposively sample semi-structured interview do not have an equal chance of being picked for presenting their livelihoods, but this is compensated by them quickly providing the enquiry with much detail and analysis up front, which is difficult to obtain from a simple questionnaire-type survey.

To get the required quality of detail and analysis in semi-structured interviews for a good baseline requires skill; in particular the interviewer needs to in triangulate the information collected by making things add up in different ways. Food must add up to something near or more than 2100 kcal per person per day—otherwise the respondents would not be talking to the inquirer. Income must balance with expenditure and crop production figures must tie in with known yields for that area and farming methods. Significantly, household members' time and labour output must balance with production. Labour output is assigned to different activities and these activities all take place at different times of the year.

[3] Of course, the information can be collected through random samples of individuals as well and the Approach does not specify which method should be used. The question of which method to use is best answered by looking at the *purpose* of the enquiry and practical considerations such as cost, speed of data collection and analysis and coverage. If precise figures in a histogram format is required and coverages are smaller, then a random sample-type survey will be preferred; this method is what is presented in the next section of this paper.

Practitioners collect this information on activities by drafting a ***seasonal calendar***, an example of which is produced in **Figure 2**. Without the seasonal calendar, the rigour of the baseline study would be in question, so further analysis would be compromised. This paper shows that the seasonal calendar can be made to do more: it can allow skilled analysts to include a seasonality component to their forecasts of food insecurity.

Figure 2 - Example of a Seasonal Calendar from Malawi



Why Include Seasonality?

Seasonality can thus be incorporated into the analysis model using existing information. Presently, existing baselines are made for the entire consumption year, so the model comprises a breakdown of the whole year's analysis into its constituent seasons.

This useful enough for the following reasons:

- If there are missing entitlements, implementing agencies need to know when to act, sometimes the gaps may only appear after some months or sometimes they may be immediate. If the missing entitlements are early, this information will encourage faster action.
- Monitoring data that are collected continuously is rarely presented aggregated for a whole year because they are not held in much value[4]; rather, data that become available at a particular time are compared with a forecast. More realistic comparisons will thus be made if the forecast is broken into a set of discrete, shorter intervals. Seasons are a much closer representation than an average for a whole year.
- Food Aid responses are usually one-dimensional and are managed badly. Rations are fixed (at about 75% of a beneficiaries' needs) and often do not even vary with household size. As

[4] Users are much more interested in 'peaks' and 'troughs', rather than single average values. This is because the peaks and troughs are much more likely to result in action.

the year progresses and the tonnage delivered increases, more beneficiaries are added to the list, creating an impression of 'scaling-up'. Seasonality information shows that at a particular time, more beneficiaries may need less food or vice versa, and whether the 'scaling up' should be in terms of ration sizes or beneficiary numbers; or a mixture of the two.

Extending the HEA Model

To keep the analysis simple and manageable the model has been made for four equal seasons. It is questionable as to whether there would any value in breaking the year into a greater number of shorter intervals, given the additional burden of analysis and the variation in accuracy of the outcome.

The first part of extending the model is to split the staple purchase price into its seasonal variation. This is then used to calculate the *average annual staple purchase price*, which goes into the annual analysis. This is shown in the following equation:

$$P_y = (P_{s1}, P_{s2}, P_{s3}, P_{s4})$$

Where P_y is the average staple purchase price for the whole year and $P_{s1...s4}$ are the average staple purchase prices for each of the four seasons.

Next, the average contribution of each source of food to the whole year is multiplied by four, since there are four seasons.

The sources of food are then placed into two categories: *lump-sum* sources and *stipend* sources. *Lump-sum* sources are those sources that the household obtains as a single lump-sum once or twice a year. They may then draw down on the source at their discretion, carrying over the uncompleted balance to the next season, until the 'lump' is all finished. Examples of lump-sum sources are grains obtained from harvests; characteristically, lump-sum sources are relatively easily stored. *Stipend* sources are those sources that are available in smaller quantities for a limited time, and must be consumed or sold or else they will be lost. Dairy, non-grain vegetables and harvested tubers are typical of this category (they go bad if not consumed fairly quickly). Food obtained as payment for labour, although usually a grain, is treated in this analysis as *stipend*. This is because it is paid out in relatively small amounts at regular intervals; it is effectively rationed.

The practitioner breaks the stipend sources of food for the first three seasons according to the pattern of availability given in the seasonal calendar. The fourth season is calculated automatically. For example, milk production may be double during the wet season than it is during the dry. So, for example, if milk contributes 12 percent of average annual food needs and the consumption year begins in the first dry quarter the breakdown will be as follows:

$$Milk_1 = \frac{12 \times 4}{6} = 8\% \; (dry\ season)$$

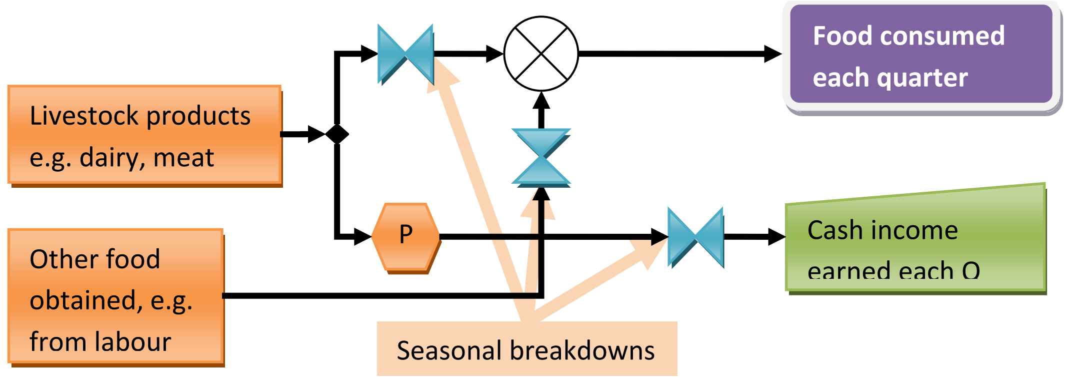
$$Milk_2 = \frac{12 \times 4}{6} = 8\% \; (dry\ season)$$

$$Milk_3 = \frac{2 \times 12 \times 4}{6} = 16\% \ (wet\ season)$$

The fourth quarter is calculated automatically from the average and the other three quarters; in this example it is also 16 percent (it is also a wet season quarter).

Figure 3 illustrates how each source is broken down.

Figure 3 - Seasonality of Budgeted Food Sources



If the sum of the all the stipend food sources is 100 percent of food needs in any quarter, then the lump-sum food sources need not be used during that quarter. They are thus carried forward to the next quarter. This, however, is rarely the case in real life.

To break down the lump-sum food sources, first check on the seasonal calendar when the harvest for each of the lump-sum sources actually begins. The main staple grain's harvest usually determines the start of the consumption year, so this is taken as being available from the beginning of quarter one. Multiply the yearly average of each of the lump-sum foods that are available from the first quarter and sum that product together with the first quarter's allocation of the stipend food sources. If this sum exceeds 100 percent, then a proportion of each lump-sum food source must be removed to the next quarter until the total for all food sources in the first quarter is 100 percent.

If the sum is less than 100 percent, the household will need to purchase food in the first quarter.

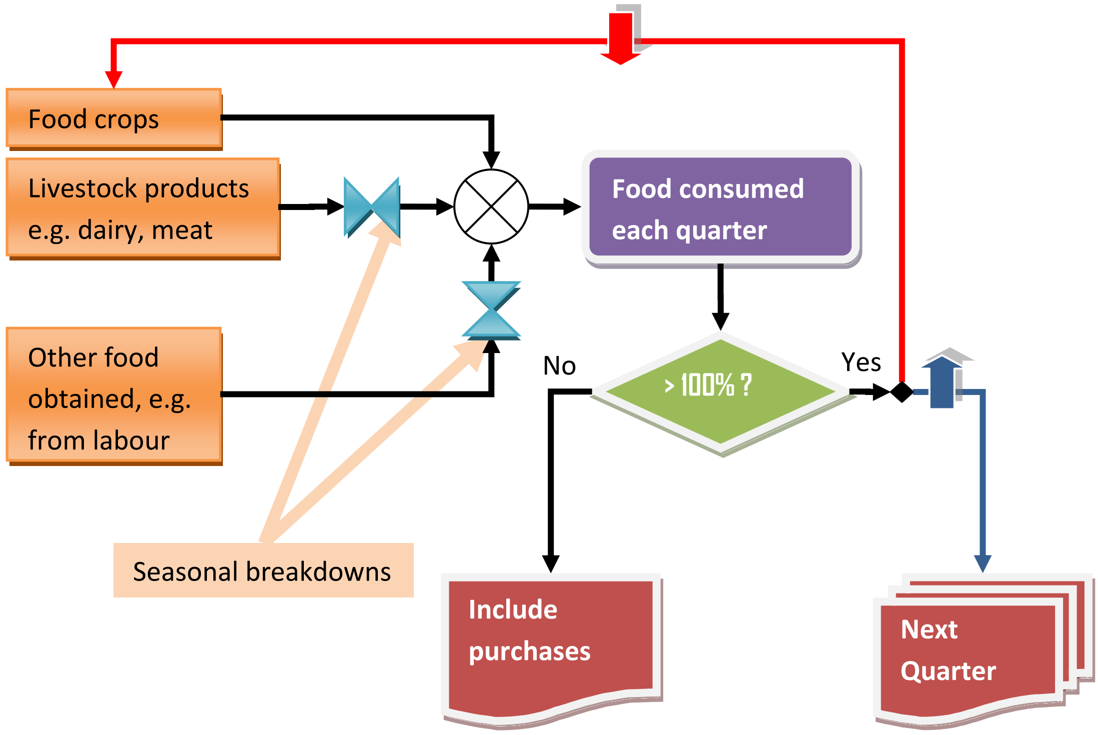
Repeat this process for the second and third quarter. Whatever food remains in the last quarter, if any does, will be consumed.

Figure 4 shows this process graphically.

To obtain the amount of staple purchased, which is a lump-sum source, sum all the income sources for the season. The assumption here is that households will usually cash in any sales as soon as they can[5]. The total income for the season, as with the analysis for the whole year, is equal to the total expenditure.

[5] In fact households may or may not choose *not* to sell some commodities and wait until prices rise, if they believe they may do so. This is a **behavioural pattern** and is beyond this analysis, which does not attempt to model human behaviour, but rather to seek out the limits of possibility.

Figure 4 - Breakdown of food sources: excess lump-sum food is carried to the next quarter



First, disaggregate the minimum non-staple. This is very often the same for each season, although certain purchased items may be available in one season or other costs, like school, may only occur once a year at a certain time.

After subtracting the minimum non-staple from the total income, the remaining funds can be converted into staple purchase at the season's price. This gets added to the total food consumed.

If the food consumed exceeds 100%, then the additional food purchased is becomes additional discretionary expenditure, getting carried over the next quarter's total cash income or expenditure.

If the food consumed is less than 100%, then there is a missing entitlement for that quarter. Expenditure in any forthcoming quarters will have to come entirely from earnings made in those quarters as nothing will have been carried forward.

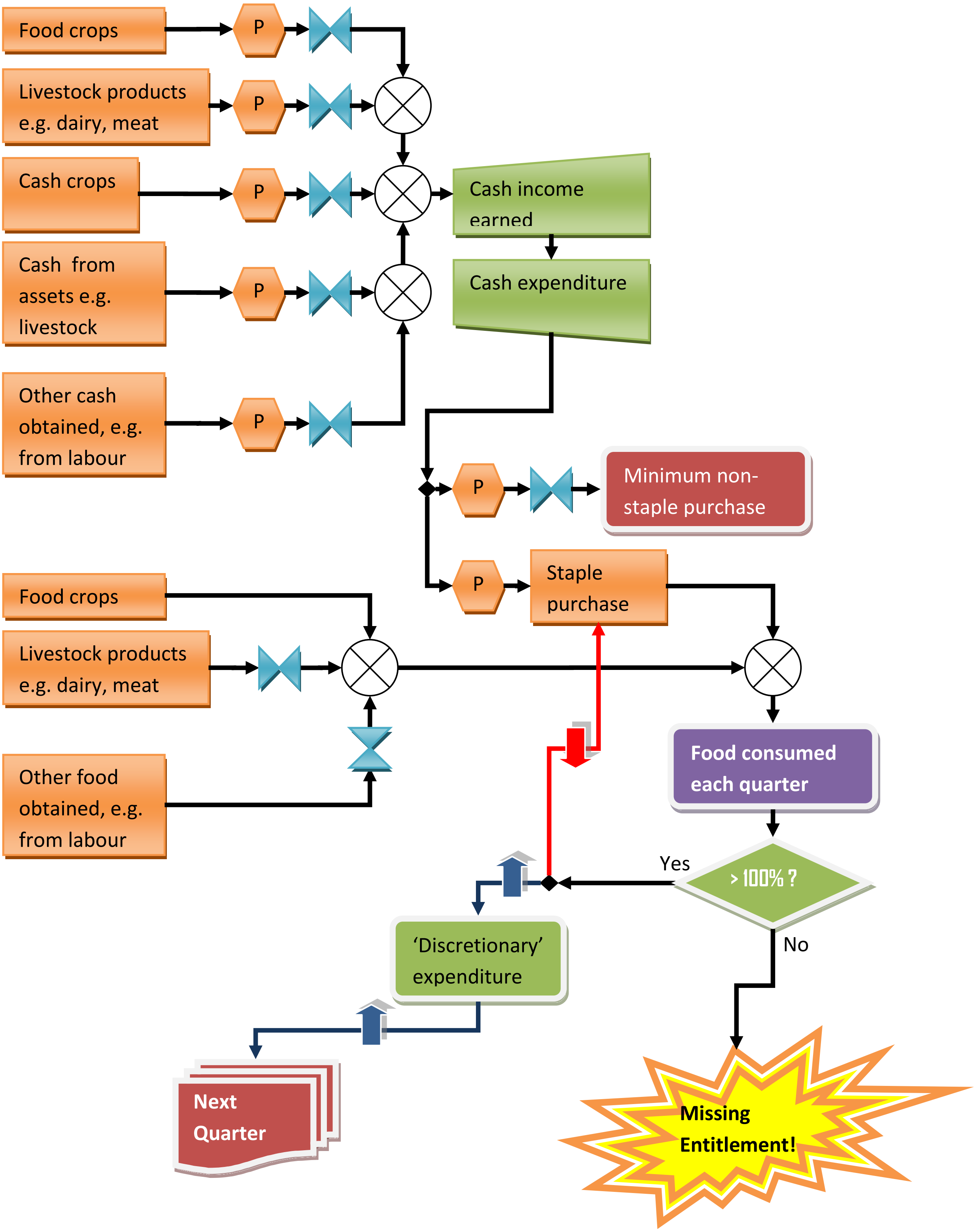
The algorithm is transferred onto the analysis spreadsheet[6] as an additional component. By doing so, the existing yearly analysis is broken down into four equal seasons. Some features of this extended spreadsheet are:

1. The spreadsheet seasonal component is self-zeroing. It automatically adjusts the staple purchase source of food to ensure households reach their needs, given that they have the cash available to do so. If they are able to exceed their needs from all the sources excluding staple purchases, then the staple purchase food source becomes negative (effectively, it becomes staple sales), giving households more income to carry over to the next quarter.

[6] The HEA analysis spreadsheet developed by Mark Lawrence of the Food Economy Group.

2. As with the analysis spreadsheet for the whole year, the seasonality component models options and possibilities, it *does not model behaviour*. As such, it looks at what 'ideal' households would do to make ends meet and whether they are able to do so; it does not take into account the fact that households may over-consume one season (for example, after the harvest) and then be forced to under-consume later (due to behaviour or preferences).

Figure 5 - The whole system with seasonality included



4. If there are no missing entitlements (called a *deficit* on the analysis spreadsheet) in the analysis for the whole year, then the seasonality extension makes sure that there are no missing entitlements during each season. The staple purchase source of food will adjust itself to make sure this is so. Again the assumption is that households spread their consumption to meet their needs; this may not actually be the case in reality but the analysis is seeking to inform us on households' *options and possibilities, not behaviour*.

Some Interesting Outcomes

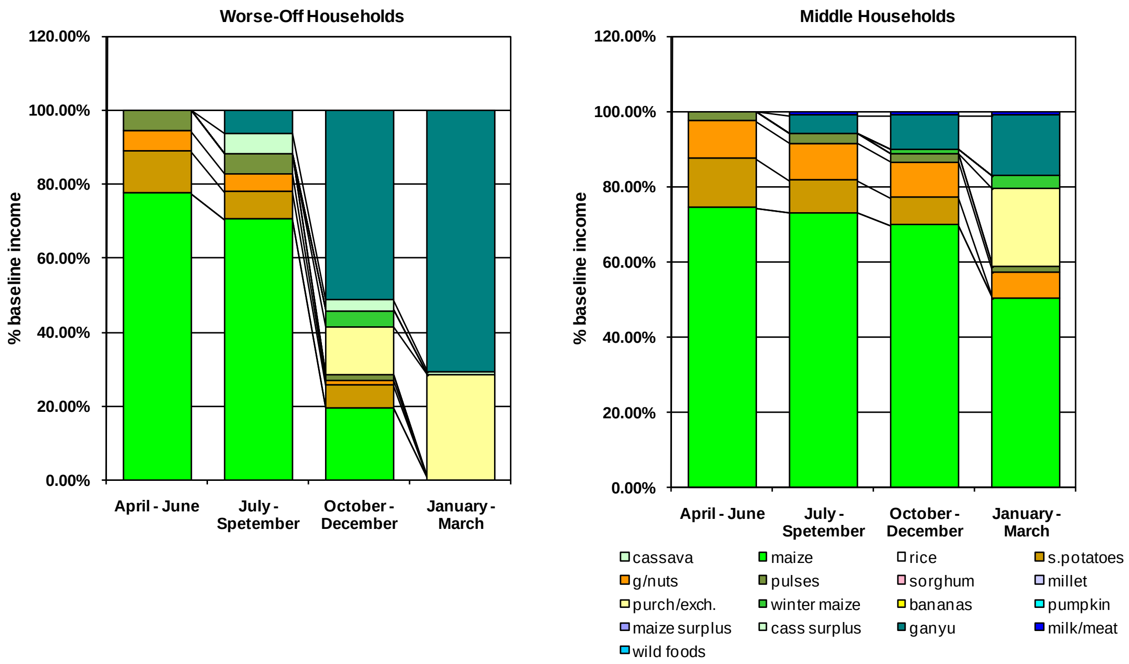
The most interesting result to come out of using this model to do seasonality breakdowns of an HEA situation analysis and forecast is that the timing of the periods of greatest vulnerability varies according to severity of the hazard. In a 'normal' year, households struggle the most or go hungry in the months just before the harvest. This is the usual hunger season and it is a period where the poorest households depend almost entirely on casual labour.

However, in hazard situations (and depending on the nature of the hazard), this hunger period may shift. If crop production takes a particularly severe knock, both food and income at the start of the consumption year are heavily reduced. The consequence is that when food crops run out there is very little money for purchase, either. The ensuing dry season offers little in the way of prospects, as any potential employers and purchasers are protecting their expenditure and are less inclined to spend on home crafts, extracted or collected items like charcoal and firewood, casual labour or small livestock. These are the only things that will boost incomes for the poor. Prices for all these commodities may tumble, tightening the pinch. After this difficult dry season, the start of the rains and the ensuing farming season with its attendant labour opportunities actually offers relief—even if wages may be depressed when compared with staple prices—at least there is something to be done.

The chart sequence below illustrates what happens to sources of food when a crop production hazard affects two different wealth groups, the 'worse-off' and the 'middle', in the Central Region of Malawi. This is a region where cereal and tobacco farming are both very prominent. Adjustments have also been made in this analysis to income prices and purchase prices as well.

The sequence begins with no crop losses. The chart in **Figure 6** for the 'worse-off' households shows that they run out of their own-produced food in the third quarter, replacing it with purchases and food from casual labour (called *ganyu* in Malawi). The 'middle' households still consume their own-produced food in the fourth quarter, supplementing it with purchases and some casual labour.

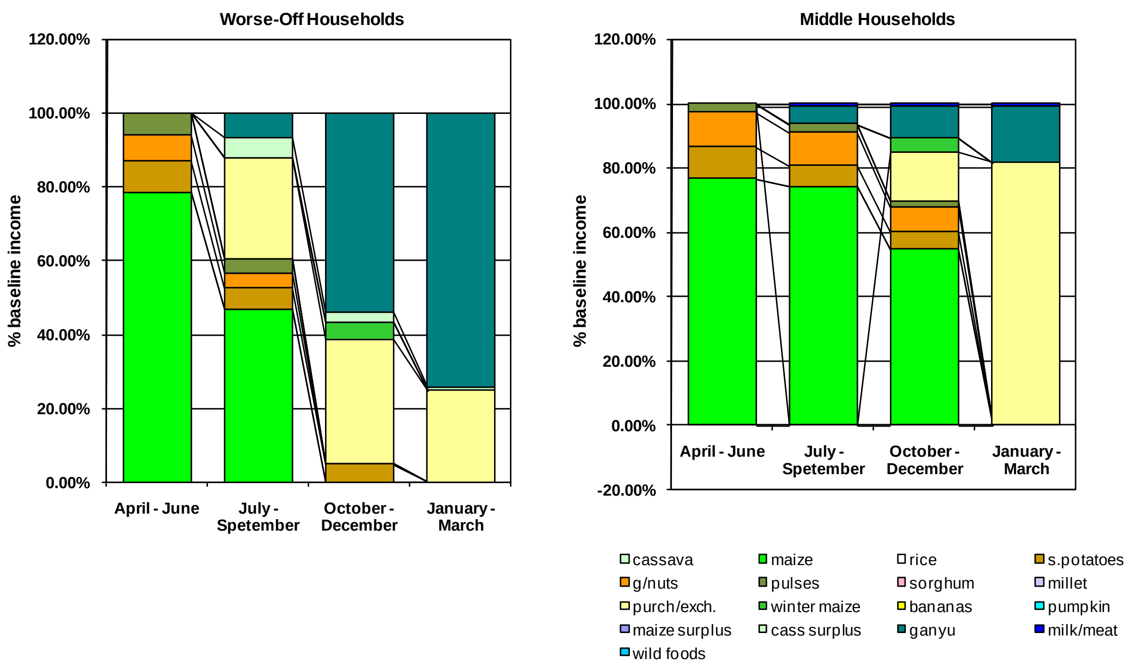
Figure 6 - No crop losses, just price changes (source of data for model: Malawi Vulnerability Assessment Committee, 2003)



In a drought situation, cash crop performance may not be as bad as food crops; hence, in the following series of graphs cash crop losses are roughly half of food crop losses.

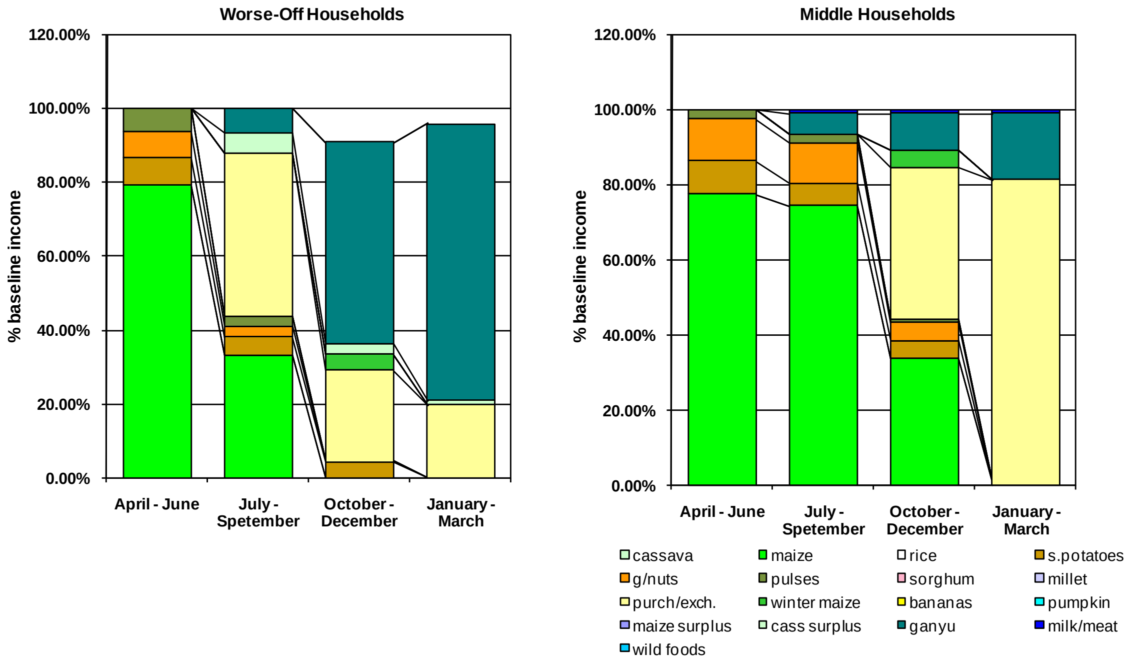
In **Figure 7**, the ‘worse-off’ households run out of own-produced food in the second quarter, while ‘middle’ households do so in the third quarter. Notice that up to this point, all households can, by maximising their food and income sources (there is some ‘coping’ involved in this model), still reach their basic needs.

Figure 7 – Mild failure: lose 13% tobacco and 25% main food crops (source of data for model: Malawi Vulnerability Assessment Committee, 2003)



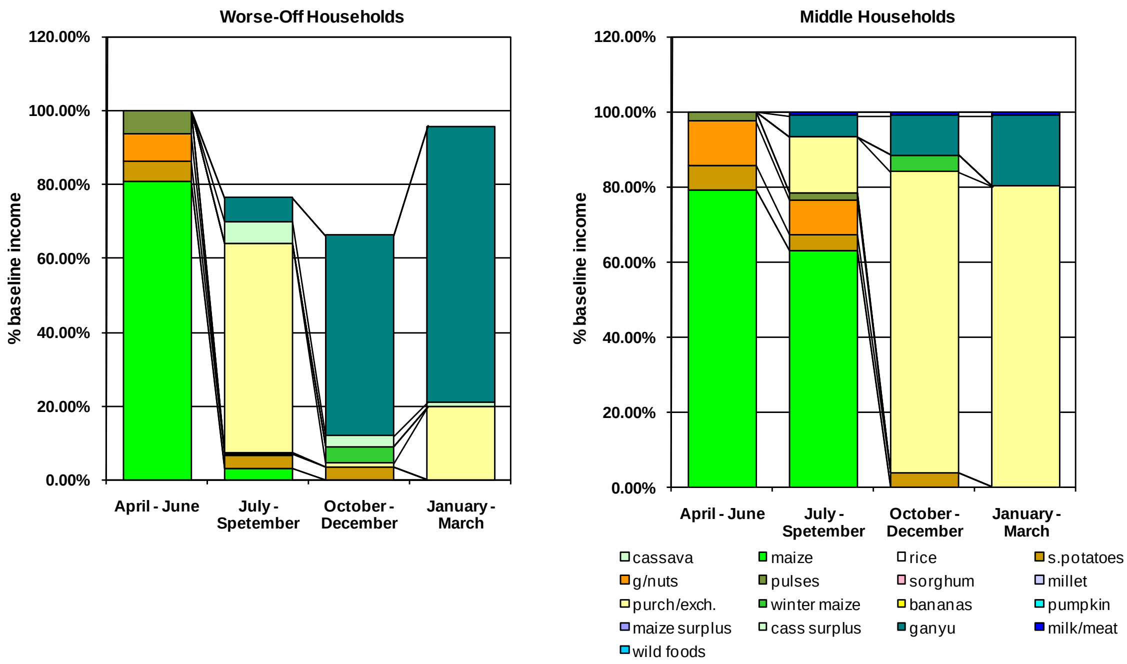
Things go below the minimum threshold for the 'worse-off' households when they lose one-third of their food crops and a sixth of their tobacco; casual labour and purchases dominate the last two quarters but they are not enough for them to make ends meet. Their own-produced food runs out in the second quarter. The 'middle' households now rely entirely on casual labour and purchases (mostly purchases) in the last quarter, their own-produced food running out during the third quarter.

Figure 8 – Significant failure: lose 17% tobacco and 33% main food crops (source of data for model: Malawi Vulnerability Assessment Committee, 2003)



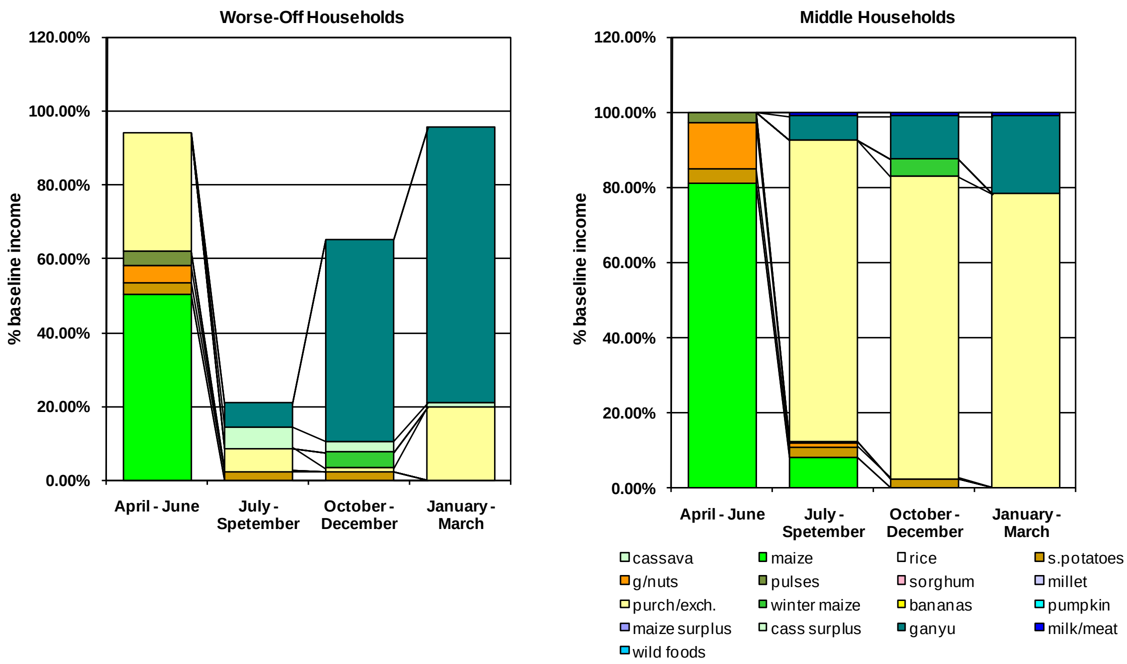
What is noticeable in the model is that when crop losses are really heavy then the worst quarter is not the last; at least there is casual labour during that season. The second and third quarters—winter months—are when 'worse-off' households have the biggest entitlement shortfalls. The 'middle' households are still able to make ends meet, largely through purchases from their better income base.

Figure 9 – Heavy failure: lose 20% tobacco and 40% main food crops



In an extreme crop failure 'worse-off' households are in serious trouble because their own-produced crops do not even last them through the first quarter—they are forced to purchase at that time. This drains what little money they have and they are left with nothing during the cold, dry months from July to September. This is a time of the year of low economic activity and scarce employment opportunities. Weak demand for crafts or extracted products from self-employment activities will only heighten the entitlement shortfall.

Figure 10 - Extreme failure: lose 40% tobacco and 70% of main food crops



Unsurprisingly then, if food distributions have started but food aid is still limited and targeted very narrowly, there will be large numbers of hungry onlookers at the distribution sites. This is exactly what was reported in September 2005 in Malawi during the second, winter season of a year of extreme crop failure.

The analysis therefore shows that in exceptionally bad years for certain types of livelihood the season of want is not what may typically be imagined. In the case of this livelihood system it is imperative to begin humanitarian assistance *early* and the current practice of 'scaling up over the year' is at best inadequate. The analysis also places an additional burden on information providers and analysts; in bad years, the situation forecast needs to take place *earlier*—well before the harvest—so that implementing agencies have time to react. Typically, forecasts in southern Africa are made around May-June (during the first quarter) but in an extremely bad year, such the 2005-06 consumption year in southern Africa, this will need to be moved forward to February –March. Fortunately, the evidence of a pending large-scale disaster is normally strong early on as well.

SECTION 2: MODELLING SEASONAL POVERTY IN INDIVIDUAL HOUSEHOLDS

Introduction

The 'individual household model' ('IHM') was developed as an operational method of economic assessment. The two main features of the method, which is otherwise conventional, are the use of data collection techniques which yield plausible estimates of household income and the use of specialised software which allows data checking and rapid data analysis. The basic IHM data set includes household membership, household assets and household income by source for a defined reference period, usually an agricultural year, to which may be added other information of interest. IHM is used to model the relationship between household income and other household characteristics e.g. orphan residence, and to estimate the impact of changes, for example potential development interventions, on household income. [7]

The addition of information on the time during the reference year at which household income was obtained allows the model to be extended to estimate seasonal household access to food and non-food goods e.g. clothing, soap, fuel etc.

A priori a seasonal household consumption deficit would be expected to be a function of 3 main variables: (i) the household's income relative to its requirement. (ii) the way in which consumption is managed by the household. (iii) to the extent that the household depends on the market for its consumption needs, the price of food and non-food goods. The period in which a seasonal deficit occurred would be determined by the pattern of household's income during the year. For example a very poor household with a regular salaried income might suffer no seasonal deficit; a better off one with irregular income might suffer a deficit if the income was not rationed over the whole year. The use of a model allows the relative importance of these variables and potential interventions to be assessed.

[7] The data collection techniques aim to minimise potential errors: (i) interviewers have a detailed understanding of the economy surveyed i.e. are current with crop returns, rates of pay etc. (ii) interviews are short i.e. typically 40 minutes. If additional information is required a second interview is arranged. (iii) the software is used to check data for internal consistency and consistency with biological need, and the observed standard of living. Households are revisited if necessary.

This note presents an analysis of seasonality using data from a village survey conducted in Salima District Malawi in 2004. This study was not conducted with a view to seasonal analysis and for this purpose the data has some limitations.[8] This analysis is presented primarily to show the potential of the technique.

The survey data

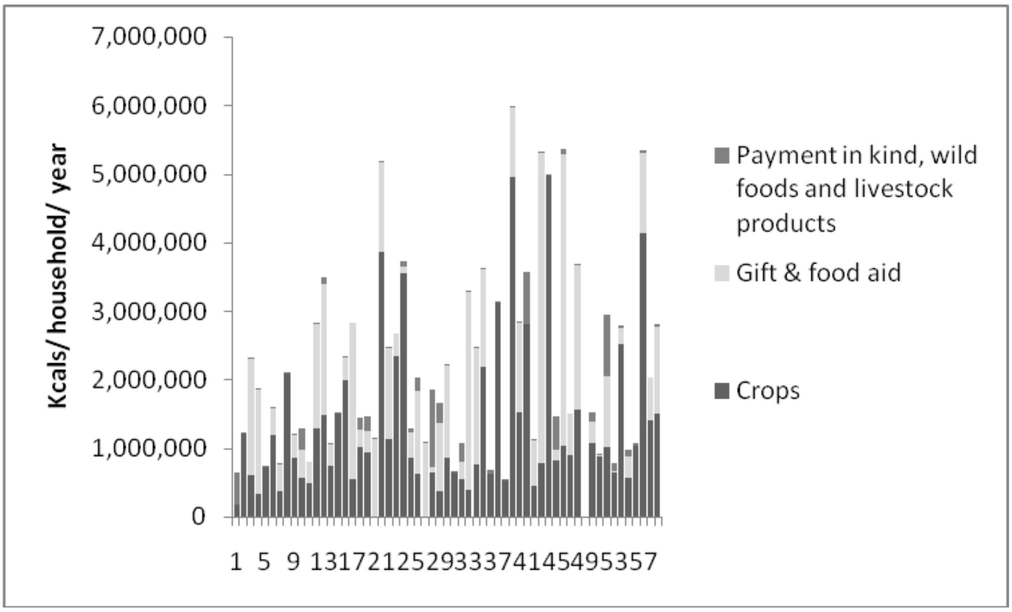
The data used in this note was gathered from a systematic sample of 50% of households (N=59, 309 people) in an upland village in Salima District Malawi in 2004. The data refer to the year from 1st November 2003 to 31st October 2004.

Household income data was gathered in terms of income: (i) as food consumed from crops, livestock, employment paid in food, food gifts (including food aid) and wild foods. (ii) as cash, from crop sales, the sale of livestock and livestock products and wild foods, employment and cash gifts.

Figures 11 and **12** show household income as food and cash where households are shown in ascending order of household income, where income is defined in terms of the amount of cash remaining to the household after the household has met its food energy requirement to a standardised level from its own production and / or food purchase.[9]

Most food income was from crops (58.5% of all food produced and consumed), mainly maize, groundnuts and beans. Food gifts from kin (10.9%) and food aid including meals provided to preschool children (25.7%) made up most of the remainder (36.6%) and the balance by wild foods, chiefly green leaves, fish, birds and mice, livestock products and payment in kind for work.

Figure 11: Household income as food consumed, Kilocalories ('Kcals')/household/year.



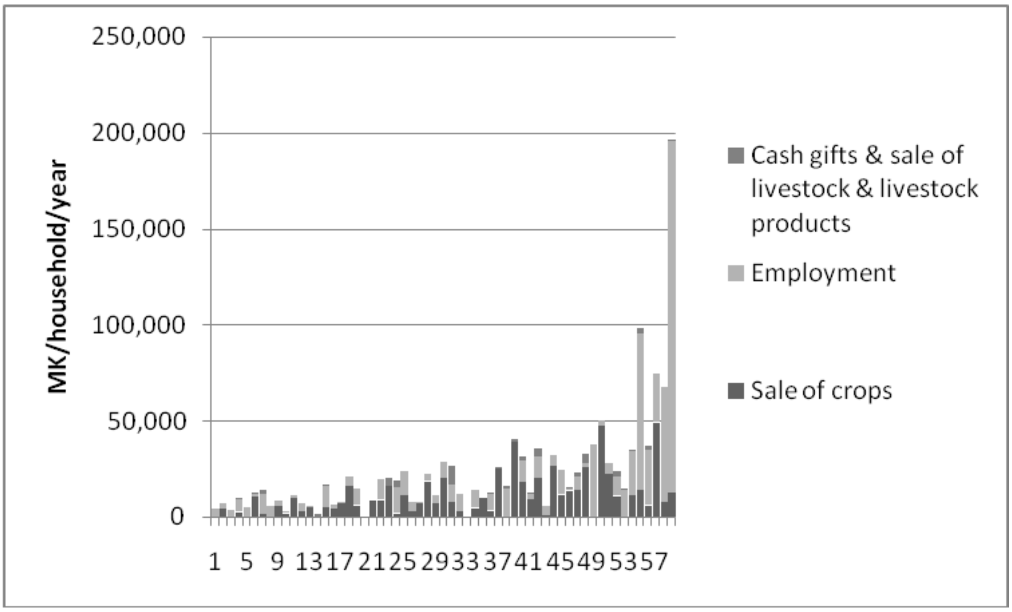
[8] The impact of HIV/AIDS on household economy in two villages in Salima district, Malawi. John Seaman, Celia Petty and James Acidri. Save the Children UK. 2005

[9] Household food energy requirement is estimated for each household individually by its age and sex membership using values for a population typical of a developing country (WHO technical report series 724, Geneva 1985). Averaged over the population this is 2,100Kcals/person/day. The food purchased is that usual for a poor household in the survey location (in this case maize) at the mid-year price food price. Income is standardised by the number of adult equivalents in the household i.e. a standardised measure of household purchasing power after food needs have been met.

Cash income was from crop sales, mainly of groundnuts and cotton (43.9%), paid employment (52.6%), chiefly from low skilled agricultural work and other day-paid labouring tasks. The remaining 3.5 % of cash income was made up of occasional cash gifts from kin and the sale of livestock and livestock products. Only one person had salaried income and there were no remittances.

It is evident from **Figures 11** and **12** that in the survey village household wealth was determined primarily by a household's cash income.

Figure 12: Household cash income, Malawi Kwacha (MK) / household/ year



The standard of living

The cost of a basket of non-food goods was established which represented a standard of living sufficient for 'social inclusion'.[10]

Seasonal data

Data was also gathered on the month in which crops and wild foods were harvested, the time at which employment was available and the time of food aid distributions. Maize, the main food crop, is harvested from February (eaten green) – June. Cash income from unskilled day labour which follows the agricultural cycle is more available in the periods January – March and October – December with little work being available in the middle of the year.

Omissions in the data

For the purpose of a seasonal analysis the seasonal data is incomplete. Specifically: (i) the time at which income was obtained from sources unique to a household was not recorded i.e. livestock and food crop sales and the receipt of gifts other than food aid. (ii) data was not collected on actual

[10] Household costs (matches, salt, utensils, paraffin, an annual levy for borehole maintenance, health costs) and personal costs (laundry soap, salt, clothes, and school costs) are allocated to each household by household membership by age and sex e.g. school costs are charged only for children aged 6-16 years. In this case the standard of living was set at a very basic level.

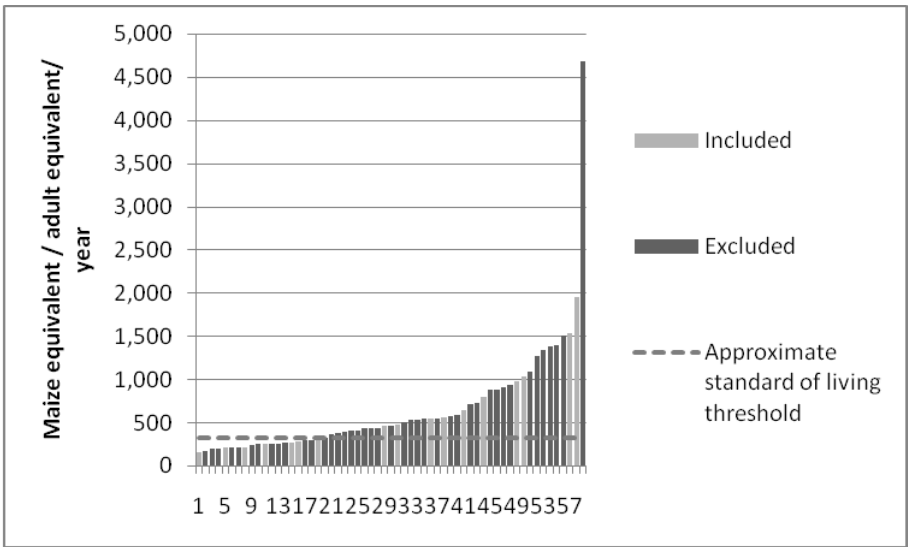
household expenditure on food and non-food goods in the reference year. (iii) the sale price of maize increased from MK11/kg after the 2004 harvest to MK16/kg before the 2005 harvest although the price actually paid by individual households is not known. It is known that some maize was available at a lower rate e.g. food aid was sold at MK7/kg and that some poorer households purchased cheaper foods e.g. maize bran.

The poorest households may have had very small additional income from: (i) small gifts e.g. of cooked food. (ii) 'self – provisioning' by older children e.g. hunting for small birds, which were not recorded. Neither is likely to be large.

The pattern of income in the reference year was also distorted by the distribution of food aid.[11]

Therefore only households which did not have income from the omitted sources (N= 18) have been included in the analysis (**Figure 13**).

Figure 13: Households included in the analysis and the approximate standard of living threshold.



Method of estimating household seasonal food access

For each household:

1. Annual household income as food and cash from each income source is divided by month according to the time at which this was received (**Table 1**). These are summed, to obtain the income flow by month as food energy and cash.

Figure 14 shows the estimated monthly income from all sources as food consumed and cash of a better-off household.

2. Household food and non-food access is then estimated in the following way.

(i) As household income is uneven e.g. at an extreme all household income might be obtained in the last month of the reference year, any carry over from a notional preceding year is calculated.

[11] Food aid was targeted at orphans and vulnerable households.

Starting with month 1 (in this case November, the start of the reference year).

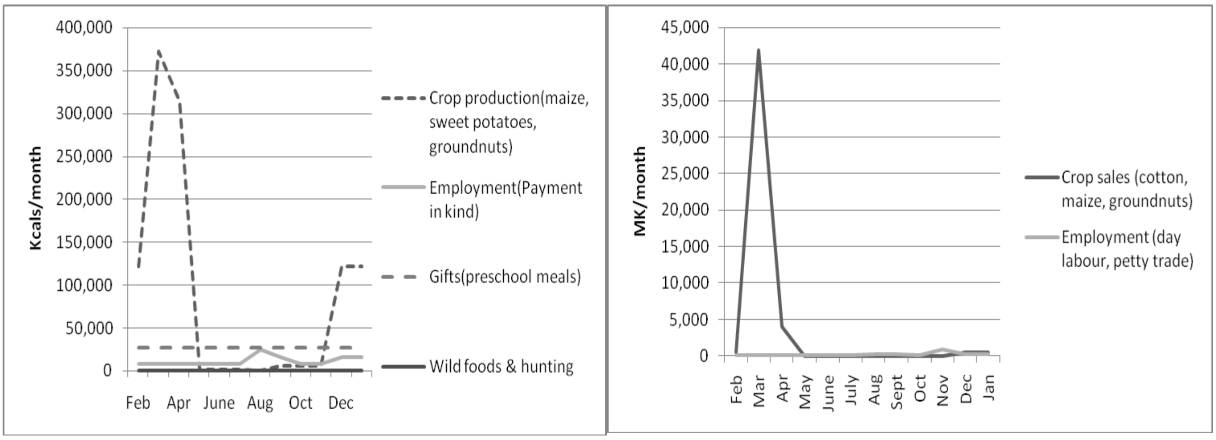
(ii) The proportion of household food needs met from household production in that month is calculated. Food needs are calculated according to household membership (Footnote 3)

(iii) If in that month household food needs cannot be met from household production, and if the household has money, food is purchased to make up the balance of household food requirement or to the limit of the cash available.

Table 1

		J	F	M	A	M	J	J	A	S	O	N	D
% maize harvested					20	40	40						
% of day labour available		5.9	11.8	11.8	5.9	5.9	5.9	5.9	5.9	5.9	17.6	11.8	5.9
Household income/year		**Household income in month**											
Maize consumed (Kcals,000s)	544.5				108.9	217.8	217.8						
Maize sold(MK)	200				40	80	80						
Day labour(MK)	3,600	212	424	424	212	212	212	212	212	212	635	424	212
Food income/ month(Kcals,000s)					108.9	217.8	217.8						
Cash income/month(MK)		212	424	424	252	292	292	212	212	212	635	424	212

Figure 14



(iv) Any money remaining after food requirement is met is used to purchase non-food goods i.e. households will purchase non – food goods on a month to month basis as and if they have money in hand. The cost of non-food goods is calculated for each household according to its membership (Footnote 10)

(v) Money remaining after food and non-food purchase is carried over to month 2, and steps (ii) – (iv) are repeated until the end of the year.

By changing the values used for food energy requirement, non-food needs and the purchase price of food the model simulates:

1. The month to month management of food and non-food consumption i.e. a lower value for food requirement or non-food costs will potentially make food and cash available in a later month. It does not simulate other potential household management objectives e.g. reserving food to meet anticipated periods of higher food energy expenditure, or changes in consumption which may result from events such as illness.

2. Changing the price of food purchased simulates a change in the quantity and quality and of food purchased, although not changes in these during the year e.g. a household which consumed maize for part of the year and maize bran or cassava for the remainder.

In the following example the year has been shown as running from 1 February - 31 January, the agricultural year i.e. from the first green maize crop.

Example

Household food and non-food consumption is unique to each household. The lack of survey data on household expenditure requires that assumptions are made about each household's food, non-food consumption and the food price. This presents some difficulties.

The very poorest households live in a state of near destitution. Households are encountered which might reasonably be described as starving even outside the 'hungry season' – in this survey the poorest household was described by the interviewer as 'truly desperate' - and which have the most limited level of non-food consumption.[12] Realistic assumptions for these households would be very low indeed. Less poor households will consume at a higher rate but may still experience seasonal deficits.

For example **Figure 15** shows four estimates of seasonal food access for a poor household (the 5th poorest household in the whole data set) at different assumed levels of food energy intake and price, assuming 20% non-food expenditure (relative to the cost of meeting the standard of living). Prices follow the series in **Figure 16**.

Figure 15 – Simulated seasonal food access under different assumptions

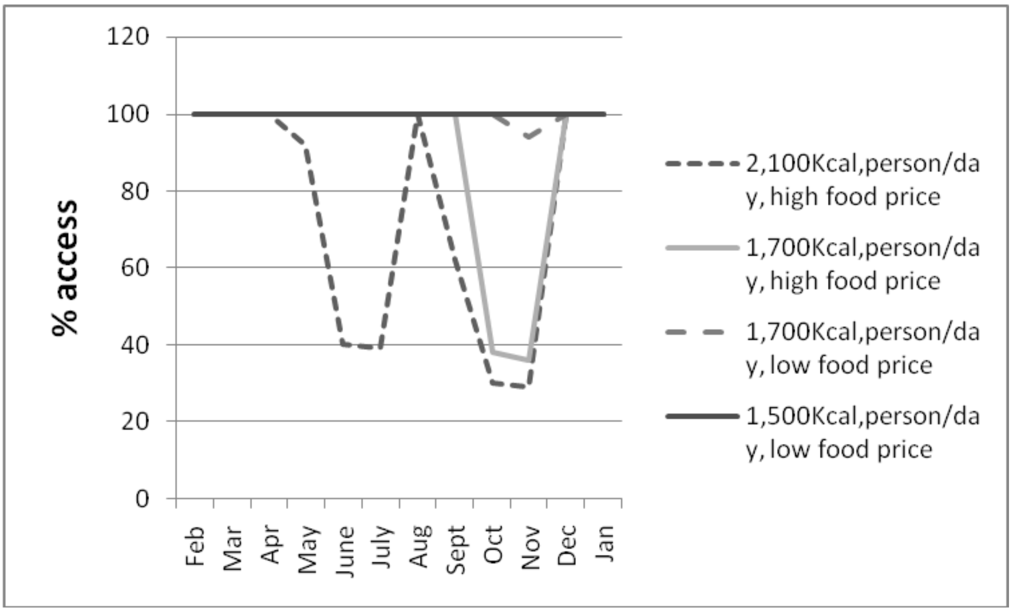
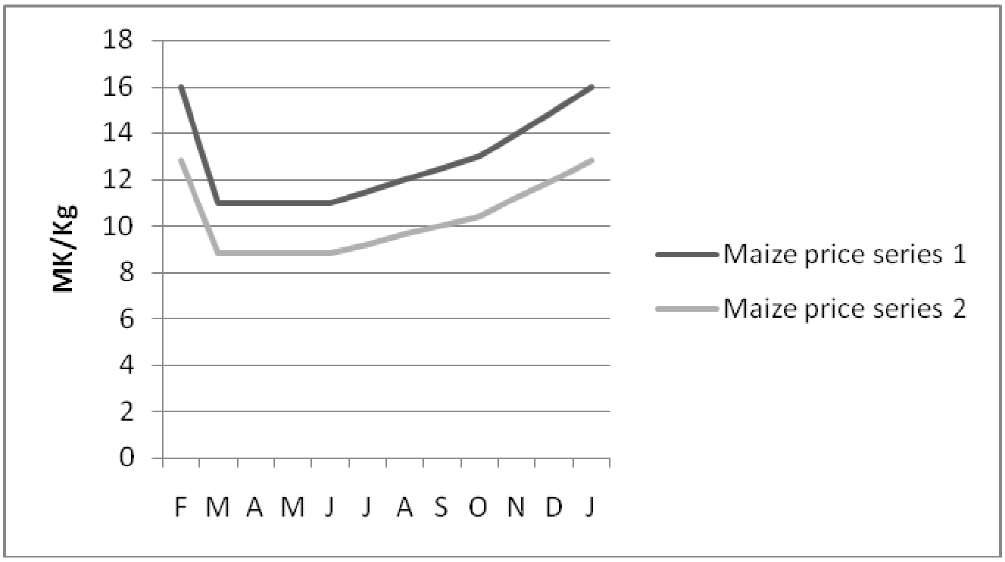


Figure 16 – Series 1 is interpolated from the 2004 – 2005 sale price of maize. Series 2 is 80% of series 1.



[12] Ragged clothing is replaced piecemeal with less ragged clothing, a small piece of soap is occasionally purchased, diesel rather than paraffin is used for lighting and seasonally not at all, borehole and other fees go unpaid.

From **Figure 15** it is evident that the estimates which yields the greatest seasonal deficit (2,100Kcal at the higher maize price) is impossible as by any estimate of food energy requirement the household would starve.

Therefore in the example a higher and a lower set of values have been used (Table 2):

Table 2	**Higher**	**Lower**
Food energy (Footnote 3).	80% of the reference food energy requirement i.e. 1,700kcals/day averaged over a population typical of a developing country	70% of the reference food energy requirement i.e. 1,500kcals/day averaged over a population typical of a developing country
Non-food consumption (Footnote 4).	50% of the cost of the standard of living for each household	10% of the cost of the standard of living for each household
Price	Series 1(**Figure 16**). The sale price of maize.	Series 2(**Figure 16**). 80% of the maize sale price.

Figure 17 shows the results for each household estimated to have a seasonal deficit. On the higher assumptions 4 of the 18 households included showed some degree of seasonality, on the lower assumptions 1. The results for poorest household suggest a seasonal deficit too severe to be plausible, even on the lower assumptions. This household was female headed with 4 dependent children with income from a small amount of maize and daily labour. The results for this household can be brought into a seasonal consumption pattern approximating the reported living conditions by assuming a food intake equivalent to 1,400Kcals averaged over the population, a non-food consumption of 10% of the amount needed to meet the standard of living threshold and the lower food price (**Figure 18**).

Conclusion

This limited analysis does not allow firm conclusions to be drawn. However, the analysis does suggest that in the survey village seasonal consumption deficits result from the difficulties facing households with irregular income in smoothing consumption over the year. In general, this is likely to occur due to the problems of rationing consumption under conditions of extreme poverty, although in particular households a deficit might arise for the many reasons households are unable to manage their resources. The results for the very poorest households, which appear to be able to limit the duration and depth of seasonal consumption deficits to – at least in the short run - potentially survivable levels, suggest that this can happen to extraordinary degree, but this remains to be investigated.

Figure 17 – For clarity food access is shown as a percentage of the food requirement given in Table 2. Non-food access as the percentage of the actual cost for the household e.g. 50% would be the highest level for non-food expenditure under the high assumptions.

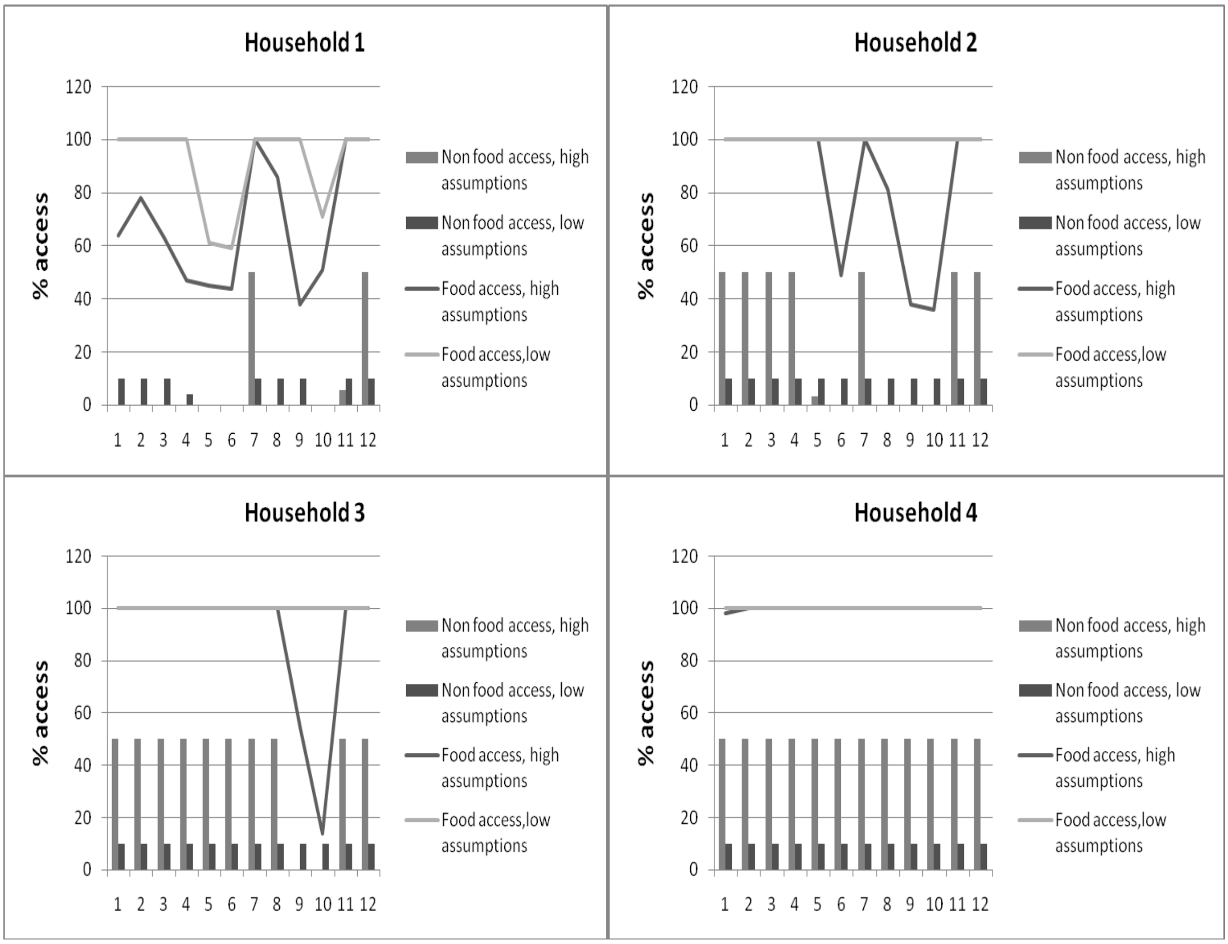


Figure 18 – Estimated seasonal consumption of the poorest household assuming a food intake equivalent to 1,400Kcals averaged over the whole population; 10% of the non-food expenditure required to meet the standard of living threshold and the lower food price in Figure 16.