■Part IV

Analysing the Aggregate Food Supply/Demand Situation

The following chapters provide guidance on preparing estimates for the various components of the *national* staple food balance sheet. In addition, *sub-national* staple food surplus/deficit balances may be prepared in countries where food markets are not well integrated and certain areas are more or less isolated from the rest of the country.

9 Drawing up and interpreting the staple food balance sheet

9.1 The purpose and elements of a staple food balance sheet

The National food balance sheet is a means to summarize the aggregate impact of a shortage in domestic production by comparing total domestic utilization, based on apparent consumption in a reference year, with supplies (assessed domestic production, stocks, anticipated imports) in a year when domestic production has severely fallen short. In this case, the "reference year" level for apparent consumption is expressed as the per capita consumption of basic staples - usually the main cereals - calculated as the average of total utilization over several years. Even though per capita yearly consumption levels vary across countries, it would be arbitrary for the CFSAM team to set the level of how people perceive a loss due to a shortfall in production as something other than the difference between a food diet at a critical time and food consumption in a normal year. Average per capita consumption is, therefore, used as the *status quo ex ante* level of consumption for comparison purposes with a year of lower domestic production.

Caveat - The cereal or cereal-equivalent balance sheet provides a quick overview of the expected aggregate food supply situation in the country during the coming marketing year. However, the final product, as in any synthesis, incorporates many assumptions and simplifications that the user needs to keep in mind, to draw sound conclusions:

- the findings from a short and discrete CFSAM exercise undertaken shortly before the main harvest can only be taken as best estimates at that point in time, and only as a very approximate forecast for the coming year. Ideally, the balance sheet should be updated when additional information becomes available, particularly with respect to domestic production and commercial imports; *and*

- as an aggregate summary for the country (or a region), a food balance sheet does not provide any information on the *inequalities in access to food* among the country's population, nor does it, in itself, show whether food flows from surplus to deficit areas take place and, if so, with what degree of economic efficiency (see examples in 9.3).

The balance sheet is expressed as follows:

Projected utilization = Projected domestic supplies + Total import requirements[11]

Projected utilization (forecast total requirements) includes: domestic requirements - the quantities needed for human consumption, seed, animal feed, industrial use (for products not for human consumption), and closing stocks - plus post-harv/est losses and exports.

Projected domestic supplies include: opening stocks and forecast domestic production.

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[11] Import requirement only when projected utilization exceeds projected domestic supplies. In other cases, rare for most food-deficit countries where CFSAMs are undertaken, the country may be self-sufficient or have projected exportable surplus.

The difference between projected utilization (total requirements) and projected domestic supplies needs to be made up by **imports**, which include government imports, private commercial imports and food aid. Food aid on hand and in the pipeline includes all forms of donor-financed food imports (programme food aid from bilateral donors, food aid for development projects, and emergency food aid, if any). The CFSAM Team must establish the best possible estimates for all the elements listed above in order to arrive at an estimate for the **uncovered import requirement**, if any. Chapters 9, 10, 11 and 12 describe how to establish these estimates.

Panel 9-1 provides some brief notes on the various elements of a balance sheet. Panel 9-2 provides an example of a balance sheet.

Panel 9-1

Notes on the main elements of the Staple Food Balance Sheet

Production estimates for total production of the main staples are a major part of any CFSAM. Production estimates for the main crop are based on area and yield estimates shortly before harvest time. Production forecasts for any second-season crops, however, can only be projections based on historical data and information on how the planted area or the availability of inputs might vary from what was "normal", taking account of any land that has become inaccessible for any reason and any changes in cultivation patterns.

Stocks include public stocks (marketing board, national security stocks) and private stocks (traders, farmers). While public and traders' stocks can be assessed through interviews, on-farm stocks can only be roughly estimated on the basis of rural cereal production compared with needs over the last few marketing years. (N.B. Food aid stocks are not included here; they are counted in imports as food aid on hand).

Food Use (human consumption) is the largest component of projected utilization. For previous marketing years, total *apparent consumption* of staple foods is calculated as difference between (i) the total available supplies (domestic supplies + imports), and (ii) the total utilization for all purposes other than human food consumption use. *Per capita* apparent consumption is then calculated. Projected requirements are then estimated using the estimated national population at mid-marketing year for the coming year.

Seed uses are estimated on the basis of anticipated area to be planted for next season, widely accepted standard seeding rates in the country or historical figures possibly adjusted according to conditions prevailing at the time of the CFSAM including anticipated replantings.

Feed use is estimated from data on intensive and semi-intensive livestock feeding operations, including the back-yard livestock feeding.

Industrial use generally refers to use of grains for production of biofuels. Processed foods are not included in this category, but under food use.

Post-harvest losses generally are based on the regional norms by crop adjusted by examining the storage, transport and handling conditions in the country.

Exports (registered and unregistered) can take place even when the overall supply balance is negative, especially when surplus areas are much closer to deficit zones across the

border than within the country, and when the foreign exchange needs are paramount. Estimates are based on historic trends, adjusted, if necessary, to forecast conditions.

Commercial Imports often consist of a combination of public and private imports. *Public* cereal imports tend to be determined by a mix of policy choices, budgetary resources, and foreign exchange reserves. *Private* commercial imports, on the other hand, tend to be driven by the importers' perception of national effective demand (i.e. the extent to which people have purchasing power to buy imported food), and their perceptions of the intentions of Government and food aid donors in relation to public importation of food. The interaction between public, food aid and private import strategies can be quite complex and yield both unexpected outcomes and substantial economic inefficiencies.

Food aid (as used here) comprises all donor-funded ***imports*** including programme food aid and targeted food aid for development and emergency programmes. It does *not* include commodities purchased locally for food aid programmes. It may include emergency government imports funded by special donor subventions.

Great care is needed when establishing estimates for each item but the most critical and difficult elements are projected domestic production and projected private commercial imports. Data will come from the analyses outlined in chapters 7, 8, 10, 11 and 12. Worksheets are provided in ❂ **Technical Note F1**. Estimating ***domestic production*** is particularly difficult in countries where there is a significant secondary harvest. Estimating ***commercial imports*** is always difficult and sensitive, as such imports depend not only on domestic prices and traders' capacities but also on government policies, the availability of foreign exchange and traders' perceptions of effective demand and the commercial risks involved as described in chapter 12. Those risks are influenced by government policies and any uncertainties concerning what the government and aid organizations may import and when such supplies might arrive.

Panel 9-2							
Staple food balance sheet Malawi, April 2004 - March 2005 ('000 tonnes)							
	Maize	Rice milled 1/	Sorghum /Millet	Wheat	Cassava in cereal equiv. 2/	Sweet potatoes in cereal equiv. 3/	Total in cereal equiv.
Domestic availability [1]	**1 712**	**44**	**63**	**4**	**692**	**440**	**2 955**
Opening stocks	7	1		2			10
Production	1 705	43	63	2	692	440	2 945
Total utilization (required) [2]	**2 062**	**44**	**63**	**62**	**692**	**440**	**3 363**
Food use	1 791	36	62	60	382	287	2 617
Seed use	38	2	19	0			60
Animal feed & industrial uses	20						20

Post-harvest losses	256	1	6	0	207	132	603
Closing stocks	60	1		2			63
Exports							0
Cross commodity substitution	-103	4	-24		102	22	0
Import requirements [2 - 1]	**350**	**0**	**0**	**58**	**0**	**0**	**408**
Estimated commercial imports (Government plus private - registered & unregistered)	294			58			352
Food aid in stock & in pipeline	15						15
Uncovered import requirement	*41*	*0*	*0*	*0*	*0*	*0*	*41*

Notes:

This example includes cassava and sweet potatoes, both converted in cereal equivalent, and also a line for ***cross-commodity substitution*** effects by which surpluses in these two items reduce import requirements for maize and sorghum/millets. In other cases, this line can transfer identified deficits of non-importable commodities, such as millets and/or sorghum, to additional import requirements of importable ones, such as maize.

[1/] Paddy rice converted to milled rice at an extraction rate of 65 percent.

[2/] Cassava cereal equivalent of 32 percent. Production based on the area harvestable within the 12 months of this marketing year.

[3/] Sweet potato cereal equivalent of 28 percent.

A country in a substantial deficit situation has several not mutually exclusive options to avoid a fall in total food consumption: (i) to make an "extraordinary" effort to increase commercial imports; (ii) to apply for financial assistance to do so; or (iii) to request food aid to cover the net deficit. Whether a country in crisis can be expected to increase substantially commercial imports (or might actually fall below trend) depends on several factors, to be carefully weighed by the team: the number of years in consecutive crisis, the size of the food deficit compared to total utilization, the level of economic activity and export earnings, the financial position of the public sector in terms of hard currency.

The challenge is to figure out how the shock/crisis has affected, and will affect, the various elements of national supply/demand balance on the left-hand side of the framework in Figure 3a and the factors influencing them and what the effects of different types of response might be.

9.2 Drawing up the balance sheet(s); estimating uncovered import requirements

What the CFSAM report might include (in chapter 5

Present and explain the national balance sheet. Briefly explain why supply-demand balances have, or have not, been prepared at the sub-national level.

General comments on the balance sheet(s). Explanation of the team's estimate for uncovered food imports. Factors that could positively or negatively affect the estimate.

Where sub-national balances have been prepared: present and explain the balances for the different areas; highlight surplus and deficit areas and changes compared with recent years, and explain the implications.

- Prepare separate balance sheet columns for each of the major crops, if possible, and then convert all to a standard "cereal equivalent" to obtain aggregate estimates. For an example of such an analysis, see Côte d'Ivoire, 2004, for example (http://www.fao.org/giews/english/alert/index.htm). Do not assume that all crops are equally affected.

Reviewing and interpreting the balance sheet

- Compare the balance sheet you have drawn up with those of previous years and examine the changes line by line: What is the significance of the changes? Are they indeed plausible?

- Reflect on the sources of your data and the bases of your estimates: How reliable are they? While retaining a specific figure - the best guess - for each item/line in the FBS, consider the range within which you could confidently say that the real value lies. What are the implications for your estimate of the uncovered food import requirement?

- *If there had been other CFSAMs in recent years*, compare the figures in the *ex-ante* balance sheets drawn up by previous CFSAMs with the figures in the up-dated, *ex-post* balance sheets now available for the same years: What can you learn from the differences between the CFSAM estimates and the subsequently reported figures? What could this mean for your estimates?

Considering the supply/demand balance at sub-national level

In addition to the national balance sheet, sub-national staple food surplus/deficit balances should be prepared in countries where food markets are not well integrated and certain areas are relatively isolated from the rest of the country (e.g. Mozambique, Nepal, Sudan, etc.), particularly when an earlier CFSAM or the preliminary consultations identified the need. In such cases draw up gross, approximate supply/demand balances for each distinct part of the country as follows:

- Review the gross estimates of production/consumption surpluses and deficits by zone from the analysis of agricultural production - see section 7.5;

- Review the team's conclusions concerning effective demand in the deficit areas (see section 8.3) and trade flows in and out of each part of the country especially cross-border trade with neighbouring countries (see section 8.4);

- Draw up a rough supply/demand balance for each distinct part of the country taking account, if possible, of the expected cross-border trade flows and any important differences in the production and consumption patterns.

Estimating the uncovered food import requirement

The estimates for domestic availability and utilization requirements (derived as described in chapters 7, 10, 11 and 12) result in an estimate for the total import requirement for the coming year.

Subtracting the estimates/projections for public- and private-sector imports based on perceived effective demand and administrative measures promoting or hindering trade flows (see chapter 12) results in an estimate for the total imported food aid requirement, including all forms of imported food aid.

Subtracting the quantity of food aid, including both programme and project food aid already pledged but not due to arrive in the country before the beginning of the next marketing year, gives the total ***uncovered food import requirement*** that would need to be made up by additional government, private and/or food aid imports (possibly including government commercial imports funded by special budget subvention from donors) during the coming year.

Section 14.2 provides guidance on comparing the uncovered food import requirement with the aggregate food-security assistance needs and drawing conclusions for action.

9.3 Examples of balance sheets and relationship with household shortfalls

Examples

The following simplified examples show how national Food Balance Sheets (NFBS) relate to each of the three main types FAO/GIEWS classifications of food crises used in the FAO/GIEWS terminology: a) exceptional shortfalls in production, b) generalized lack of access (i.e. in a very poor country, a situation where most households cannot have access to abundant and relatively inexpensive local supplies), and c) severe localized food insecurity. The latter case "c" applies to countries where certain regions are economically "isolated" because of ongoing conflicts, political reasons, or a combination of both.

The examples compare estimated balances for an upcoming marketing year (t) with those for a previous year (t-1). They illustrate how balance sheet estimates of aggregate deficit (uncovered import requirements) may differ from estimated aggregate household food assistance requirements because of the difference in bases used for per capita consumption figures.

They show that the NFBS is necessary and important for understanding the general extent of a food crisis but that it is not sufficient and must be complemented with additional analysis of the various factors that influence the distribution of domestic supplies within the country.

Table 9.1 illustrates a situation where ***production*** **and domestic availability have fallen** substantially from year t-1 to year t, the current marketing year. Projected habitual

food use may have grown with population, but total utilization has fallen because exports and closing stocks have been cut, due to tighter supplies. Even if the country is able to increase commercial imports compared with the previous year's level (from 360 000 tonnes to 500 000 tonnes), an uncovered deficit of 373 000 tonnes will remain to be covered through food assistance to avoid a fall in total food availability for consumption.

In this example, we assume a population of about 8 million people and that the deficit between domestic availability and total utilization (873 000 tonnes) is based on a per capita cereal consumption (SQE) of 135 kg/person/year. This deficit may be expressed in terms of an equivalent number of persons who have lost basic food productions and most means of support: about 2.7 million. The amount of food assistance that would be required to provide them with the cereal component of a 2 100 kcal ration would be about 403 000 tonnes. In this case, the FAO aggregate deficit (373 000 tonnes) and WFP aggregate food assistance estimates (403 000 tonnes) are different, because they are based on different consumption bases.

Table 9.1 **Exceptional shortfall in production**

1 Aggregate balance sheet		
National Food Balance Sheet (1,000 tonnes)		*Drought (40% loss)*
	(t-1)	(t)
Domestic availability (1)	**1.550**	**950**
Opening stocks	50	50
Production	1.500	900
Main season	1.200	600
Secondary season (forecast)	300	300
Total utilization (2)	**1.910**	**1.823**
Food use at 135 kg/cap/year (3% growth p.a.)	1.080	1.115
Feed use	300	300
Seed use	300	300
Losses (12% of production)	180	108
Exports	0	0
Closing stocks	50	0
Total Import requirement (2-1)	**360**	**873**
Commercial imports	360	500
Food aid received and pledged	0	0
Uncovered import requirement	0	373
2 Assistance requirements		
2a Based on balance sheet "deficit"		
Population	8.000.000	8.256.000
Historical "normal" per capita consumption, kg/yr	135	135
Normal' food use (1,000 tonnes)	1.080	1.115
Deficit (1,000 tonnes)		373
Deficit (number of persons at 135 kg/cap/yr)		2.759.704

2b Based on 2100 kcal for the same number		
2100 kcal, 70% from cereals = about 400grams/cap/day = 146 kg/cap/year		
Cereals in 2100 kcal rations for deficit population (1,000 tonnes)		403
(based on 400 grams cereals/cap/day)		

Table 9.2 provides an example of an increase in production ***after a bad year*** in a very poor country[12] characterized by generalized lack of access to food, and where the simple mere numbers in the balance sheet may be misleading. Food use and total utilization have grown, but the respective shares of cereal production being held after harvest by households on the one hand, and by traders on the other, may depend on the extent of indebtedness in the previous year. For a very poor country, ***indebtedness*** during a bad year tends to be high and widespread, so reimbursements in kind at harvest time may represent up to half of households' food production by households. Although estimates for commercial imports and food aid requirements have fallen, the NFBS does not reflect the post-harvest change in ownership of food supplies. In such a case, the balance sheet would imply that little or no (imported) food aid is needed. However, in spite of a seemingly balanced demand/supply situation, most households would need (financial) support to buy back most of the food they used to repay debts. That food is available in the country but now held by private traders. A similar situation may arise in countries affected by sudden economic collapses and mass unemployment, even in the presence of sufficient domestic supplies.

In such a case, the CFSAM team should reach the conclusion that no food aid imports are required, but that the first priority is to develop or support mechanisms through which households can earn the money needed to buy back the food they had produced but no longer own. In this example, the relative price between crisis and harvest times is such that twice the quantity borrowed would have to be bought back by local households - 500 000 tonnes in this example against 250 000 tonnes borrowed (i.e. twice the quantity borrowed). Cash for work (CFW) or a combination of local purchases and food-for-work (FFW) programmes would be ideal if the capacity exists to quickly organize CFW or FFW on a large scale. Since prices tend to rise after harvest, such programmes should also start as soon after harvest as possible.

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[12] This example is based on the case of Niger, where a very bad year (2004) was followed by a good one. However, a major share of 2005 production changed hands right after harvest, to repay 2004 debts.

Table 9.2 Generalized lack of access (after a bad year)

1 Aggregate balance sheet		
National Food Balance Sheet (1,000 tonnes)	*Drought (40% loss)*	Post-crisis year
	(t-1)	(t)
Domestic availability (1)	**950**	**1.550**
Opening stocks	50	50
Production	900	1.500
Main season	600	1.200
Secondary season (forecast)	300	300
Total utilization (2)	**1.668**	**1.945**
Food use (3% growth p.a.)	1.080	1.115
Feed use	300	300
Seed use	180	300
Losses (12% of production)	108	180
Exports	0	0
Closing stocks	0	50
Total Import requirement (2-1)	**718**	**395**
Commercial imports (250,000 tonnes on credit)	510	395
Food aid received and pledged	208	0
Uncovered import requirement	0	0
2 Assistance requirements		
Population	8.000.000	8.256.000
Historical "normal" per capita consumption, kg/yr	135	135
Normal' food use (1,000 tonnes)	1.080	1.115
Deficit at 135 kg/cap/year (1,000 tonnes)		-0
Repayment of 250,000 tonnes borrowed in t-1		500
May need equivalent of 500,000 tonnes of FFW or CFW to buy back the food.		

Table 9.3 The third case also depicts an increase in production in year (t), after a particularly bad year, when both commercial imports and food aid were needed. Total food use and total utilization have grown from (t-1) to (t), and there is even scope for limited exports (13 000 tonnes). However, the overall increase in production "hides" long-term, substantial and severe *local deficits* in parts of the country. To illustrate this, the national balance is broken down into four regional ones; whereby Regions I through III have food surpluses adding to 166 000 tonnes, while Region IV has a severe deficit of 166 000 tonnes, which is why the national deficit is 0. For simplicity's sake, the population is assumed to be distributed evenly across regions and per capita consumption across regions is estimated to be equal, at 135 kg/person/year, in each region. If national markets were integrated and effective demand existed in Region IV, food would flow from the surplus to deficit regions to Region IV. In this case, the

surplus from Regions I, II and III may be stored or exported, leaving Region IV with a deficit of 166 000, equivalent to the annual requirements the full "normal" year supply of 1.228 million persons. To provide food assistance to that number of people at 2 100 kcal/person/ per day would require about 179 000 tonnes. In this case, the report could thus arrive at the apparently paradoxical conclusion that the aggregate balance is slightly positive, but that (the equivalent of) 179 000 tonnes of food assistance are required.

These three simple examples illustrate the complex and broad set of situations under which adjustments to the aggregate balance sheet, either because of the difference in bases used for per capita consumption figures, post-harvest re-allocations of domestic availability, or obstacles to mechanisms evening out the national supply, can result in sharply different outcomes. In conclusion, the aggregate cereal balance sheet is a necessary and important condition for understanding the general extent of a food crisis, but it is not sufficient, and must be complemented with additional analysis on the various economic and non-economic factors which influence the distribution of domestic supplies.

Table 9.3 **Severe localized food insecurity** (good year after a bad one)

1 AGGREGATE BALANCE SHEET

National Food Balance Sheet (1,000 tonnes)	Drought (50% loss) (t-1)	Post-crisis year (t)	Country Regions - Year (t) [3 surplus, 1 deficit]				
			I	II	III	IV	National
Domestic availability (1)	**1.250**	**2.150**	**645**	**645**	**650**	**210**	**2.150**
Opening stocks	50	50	15	15	20	0	50
Production	1.200	2.100	630	630	630	210	2.100
Main season	900	1.800	540	540	540	180	1.800
Secondary season (forecast)	300	300	90	90	90	30	300
Total utilization (2)	**1.764**	**2.150**	**589**	**589**	**595**	**376**	**2.150**
Food use (3% growth p.a.)	1.080	1.115	279	279	279	279	1.115
Feed use	300	300	90	90	90	30	300
Seed use	240	420	126	126	126	42	420
Losses (12% of production)	144	252	76	76	76	25	252
Exports	0	13	4	4	5	0	13
Closing stocks	0	50	15	15	20	0	50
Total Import requirement (2-1)	**514**	**0**	**-56**	**-56**	**-55**	**166**	**0**
Commercial imports (250,000 tonnes on credit)	300	0				0	0
Food aid received and pledged	200	0				0	0
Uncovered import requirement	14	0	-56	-56	-55	166	166

2 ASSISTANCE REQUIREMENTS

	Drought (50% loss) (t-1)	Post-crisis year (t)	I	II	III	IV	National
Population (1,000)	8.000	8.256	2.064	2.064	2.064	2.064	8.256
Historical "normal" per capita consumption, kg/yr	135	135	135	135	135	135	135
Normal' food use (1,000 topnnes)	1.080	1.115	279	279	279	279	1.115
Deficit at 135 kg/cap/year (1,000 tonnes)		-0	-56	-56	-55	166	0
Population equivalent with full deficit (1000s)						1.228	
2100 kcal rations for deficit population (1,000 tonnes) (based on 400 grams cereals/cap/day)						179	

10 Estimating and forecasting stocks

A detailed analysis of the national food stock position, including the potential for stock draw-down or a need for stock build up, is essential for drawing up the balance sheet. The estimation should include all cereals and, in countries where they form an important part of the diet, roots, tubers and pulses.

> *What the CFSAM report might include (in chapter 5)*
>
> Brief description of the various types and locations of food stocks held by government, traders and others, and the policies governing the use of government (reserve) stocks.
>
> Compare the current level of stocks (opening stocks for the FBS) with a normal year. Explain the basis for the estimate. Comment on any uncertainties and give a range of possible figures, where appropriate.
>
> Explain the figure used for the target/planning level of stocks at the end of the coming marketing year (required closing stocks) and any difference from previous years.

10.1 Estimating opening stocks

Opening stocks include all food stocks that will be available for domestic utilization as of the first day of the upcoming marketing year but excluding supplies from crops that will be included in the coming year's production estimates, if some are already in store. Opening stocks may include:

- public sector working stocks, buffer stocks, food security reserves (FSR), relief sector stocks;

- private stocks including on-farm and miller/trader stocks;

- stocks of open pollinated cereal varieties for seed use;

- all commercially-imported foods in store, at port or in domestic transit at the beginning of the new year.

All stocks, including flours and meals, are calculated in **whole grain equivalents** using domestic extraction rates. Tubers, including cassava and sweet potato, should be in dry-weight equivalents.

Try to break stock information down by sector and commodity type, although data constraints often make this difficult. The main sources for opening stock information are, typically, the grain reserve parastatal agency, early warning system or food information service, and interviews with private traders and farmers.

Note that food aid stocks are *not* included in "opening stocks" but appear in the balance sheet, combined with food aid in the pipeline, as a separate "food aid" item that is discounted, together with expected commercial imports, against the total import requirement.

On-farm opening stocks

Good data will rarely be available for on-farm stocks. You may have to arrive at your own estimate as follows:

1. consider the average level of opening stocks recorded for previous years by commodity: this average reflects stock behaviour under "normal" conditions;

2. examine whether "normal" conditions apply, and therefore whether the average should be used or adjusted.

<table>
<tr><td>Panel 10-1</td></tr>
<tr><td>Factors influencing normal on-farm opening stock levels</td></tr>
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The average size of on-farm opening stocks will depend on the beginning of the marketing year and when it falls in relation to the harvesting of the main crops, for example:

- in Kenya, farmers may harvest three months into the marketing year - so subsistence and semi-subsistence households may carry-over in excess of three months' consumption supply.
- in Ethiopia low levels of old crop carry-overs will be expected, as part of the new main crop has already been harvested at the beginning of the new marketing year.

In countries with diversified food production, Burundi, Rwanda, Democratic Republic of Congo, for example, early-maturing pulse and vegetable crops may reduce the need for farm carry-over stocks.

Human consumption of green maize may also obviate the need for high carry-over stocks.

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</table>

A significant increase in on-farm opening stocks could be motivated by expectations or sharp price rises in the coming year (due to poor crop expectations), a bumper crop in the previous year, or marketing problems that restricted sales opportunities. Below-normal farm stocks could be motivated by low price expectations (due to good harvest prospects), a poor crop in the previous year, or factors such as civil strife that can make stock-holding risky.

If any of these factors is suspected, seek corroboration from farm interviews. Ask farmers how much they are holding in relation to previous years and **why**. Beware of drawing conclusions from a small sample but, if there is clear evidence of higher or lower than expected stock holdings, it may be necessary to adjust the average national on-farm stock estimate up or down.

The probability of **zero** on-farm carry-overs at the national level is very low. However, after one or more years of crop failure (due to severe drought or other reasons) in a country where most farmers are subsistence producers, stocks from the last season may have been exhausted, including even seed reserves. Most smallholders would then already be dependent on food aid distributions or on purchasing very small amounts of food on a daily or weekly basis with meagre incomes from casual labour. In such cases, on-farm carry-over stocks at the end of the marketing year may be indeed very low or negligible.

If your opening stock estimate is significantly different from the historical average, explain clearly the reasons behind the deviation in the report.

Private trade stocks

Where some or all marketing activities of a commodity are performed by the private sector (officially or unofficially), estimates are needed for the stocks held by wholesalers, retailers, millers and large commercial farms. Information on such stocks is generally scarce. Your estimates will generally rely on time-series data extrapolation but you should interview a sample of small-, medium- and large-scale traders, and visit some of their warehouses, if possible, to get an idea of whether current stock holdings are significantly different from what would be normal, and adjust trend estimates accordingly.

Where a trend analysis is not possible, calculate the average for the last few years, excluding freak years, and make adjustments if there was an exceptionally good or poor harvest in the previous year, there are exceptionally good or poor prospects for the current crop, or there have been major changes in government marketing and price policies.

N.B. The likelihood of high private-sector carry-overs is small: prices at the beginning of the new marketing year are likely to fall with the arrival of the new crop and incentives to store from one marketing year to another are therefore weak.

Public (government) opening stocks

Public opening stocks may include some or all of the following:

• working stocks for supplying the civil service or military;

• buffer stocks for price/supply stabilization interventions;

• a food security reserve (FSR) or strategic grain reserve (SGR) to address unforeseen supply problems; *and*

• working stocks for ongoing food distribution programmes.

Public stock quantities are generally well documented and food parastatals and the aid agencies concerned - including WFP - should have data on stocks but give attention to the following aspects:

• Be sure to get estimates of opening stocks (not just current stocks): ask the relevant officials about their intentions for the interval between the mission's visit and the beginning of the new year, calculate the likely net drawn down (sales less purchases in the interval), and subtract that quantity from the current stock estimate.

• Exclude any supplies from the current crop that might already be in store, to avoid double counting.

• Exclude any stock that is unfit for human consumption unless it will be used as livestock feed in the coming year.

If you suspect that official stock figures may not be accurate, pose a few discrete questions to store keepers and auditors and, for a sample store, try to make a rapid visual assessment of the quantity in stock to see whether it tallies with the official stock records.

Stocks in port and in transit

Check whether official opening stock figures include stocks in port and in transit or refer only to stocks in government stores. This is particularly important in a country with significant food imports. Commercial sector stocks may also be at port or in transit at the beginning of the marketing year. Include any quantities in port and in transit in your opening stock estimate unless they will be consumed before the beginning of the new marketing year, but be careful to avoid double counting.

To estimate stocks in port and in transit: examine expected time of arrivals (ETAs) and actual delivery data. Consult WFP logistics staff or commercial importers to determine the average lead time between the arrival of shipments in harbour and delivery to their final consumer, including milling time. Include in the opening stock estimate all consignments that are expected to arrive before the start of the new marketing year but not in time to be consumed in the current year.

Cross-checking total opening stock estimates

When you are satisfied that you have a complete set of opening stock data, calculate the total for each commodity, convert to standard cereal equivalents, if necessary, and insert the overall total in the National Food Balance Sheet (NFBS). Compare this with the previous year's projected closing stock estimate. If there is a significant difference, an adjustment may be needed to the previous year's food-use estimate as food-use is the residual item for previous year's balance. If your opening stock estimate implies a major change in per capita consumption during the previous year, and especially if it is based on questionable assumptions, re-examine your estimate. Total food consumption is less likely to be prone to major inter-annual fluctuations than carry-over stock levels.

10.2 Establishing a planning figure for closing stocks

Closing stocks are defined as *all* in-country stocks, except the food aid stocks, on the last day of the marketing year. The methods for forecasting public and private-sector closing stocks for the end of the coming marketing year are very different and you should establish planning figures for them separately.

Estimating on-farm and private traders' closing stocks

Use the long-term average regressed trend, or the latest information obtained from traders/importers. Include domestic production as an explanatory variable in a country that is not a significant importer.

Estimating public closing stocks

Establish planning figures separately for:

- Working stocks for **continuous food interventions**, where relevant (e.g. if the State maintains food supplies for specific groups such as public servants or the military); and

- Reserve stocks for **occasional** interventions to protect buyers or sellers against extreme supply and price fluctuations or for emergency interventions.

Carefully assess the government's stated objectives for stock levels. Are they appropriate, from an efficiency perspective? Are they feasible, in terms of the availability of budgetary and hard currency resources?

- **Working stocks** should be fairly stable and predictable. Base your estimate on the current (opening) stock level, but make adjustments to take account of any planned changes in the scale of the programmes concerned or operational factors that will influence stock rotation time. Improved internal distribution mechanisms, for example, may speed up stock rotation and reduce the desired level of working stocks.

- In a country where donors provide food assistance to support national **reserves**, guidelines on closing stock levels will generally have already been agreed upon bilaterally or multilaterally. If so, use those figures. If, however, the government proposes a significant increase in stock levels to be achieved through food assistance, and donors are not in general agreement with the target closing levels, use a conservative estimate based on current stocks. Donors are rarely willing to provide assistance for large stock build ups.

Where the government intervenes heavily in the domestic food market, its objective is likely to be national food supply/price stabilization. The minimum public closing stock level of a food commodity will then be calculated to cover average monthly government sales or ration distributions from the beginning of the coming marketing year until the next main crop reaches the retail market, allowing food imports during that period:

- If the beginning of the marketing year coincides with the retail availability of the main domestic harvest, closing stocks should be kept to a minimum working level as they incur costs and occupy valuable storage space.

- If there is a lag between the beginning of the marketing year and the domestic harvest, the desirable closing stock level will depend on the reliability of imports during the lean season and the variability of crop production.

If ports and internal transport facilities are good, and crop production reasonably reliable (not subject to delays), closing stock calculations should take into account likely monthly imports in the pre-harvest period at the beginning of the next year, based on historical data on the timing and scale of monthly imports, production, and sales. If both imports and domestic production are unreliable, higher levels of lean-season carry-overs will be required to ensure that average sales volumes are met.

11 Estimating domestic food utilization requirements

Domestic "utilization" includes human consumption, seed, feed and industrial uses of food commodities, plus post-harvest losses and closing stocks. This chapter discusses the estimation of these elements for the coming marketing year with the exception of closing stocks discussed in section 10.2. The total is crucial for the calculation of total import requirements and of the uncovered food import requirement, if any.

What the CFSAM report might include (in chapter 5)

Food consumption requirements

Brief explanation of the team's best estimate of per capita consumption and how it compares with estimates in previous years and with that of similar populations in neighbouring countries. Comment on any uncertainties and give a range of possible figures, where appropriate.

Other uses and post.-harvest losses

Brief explanations of the team's best estimate of requirements for animal feed, seed and industrial uses, and for post-harvest losses, and how they compare with estimates in previous years. Comment on any uncertainties and give a range of possible figures, where appropriate.

Factors that could positively or negatively affect the estimated requirements or losses.

11.1 Estimating food use/consumption requirements

For CFSAM balance sheet purposes, "food use" is the quantity of staple food required for human consumption. The analysis is sometimes limited to cereals but non-cereal staple foods - including roots, tubers and pulses - should be included if they represent important sources of dietary energy in the country.

Estimating effective demand for staple food

As indicated in section 3.4, the level of effective demand influences private commercial imports and therefore the proportion of the total import requirement that can be expected to be covered by commercial imports, and the residual that will remain uncovered.

Where elasticity data are available from detailed household income and expenditure surveys, households' effective demand for staple foods can be estimated by adjusting the normal apparent per capita consumption rate(s) (SQEs - see section 11.1) for the changes in the **price** of food and changes in **incomes**. This can be done for each main staple separately if data are available for individual staples and for cross-price elasticities between different staples or, more simply, for all staples together. See Panel 11-1 and step 1 in Panel 11-2.

Multiplying by the estimated population gives an estimate for the aggregate effective demand which, if traders' perceptions are similar, would be reflected in changes in private commercial imports, as indicated in section 3.4. Applying that change to the "normal" level of imports and taking account of changes in domestic production, an

estimate can be prepared for the residual, uncovered import requirement, as shown in step 2 in Panel 11-2.

The estimated *changes* in effective demand may also serve to provide an indication of aggregate household food access *shortfall(s)* for households that rely substantially on market purchases for their food. Such an analysis takes into consideration the response of traders as well as consumers and local food producers to food price changes due to a shock. It avoids the biases that may affect estimates obtained using the other methods of estimation and can help to design responses to minimize any negative effects of external assistance on the local economy. Note, however, that shortfalls estimated in this manner are implicitly estimated in relation to pre-crisis consumption (as is the food balance sheet) rather than internationally-accepted nutritional norms.

The key steps, therefore, are:

- Obtain appropriate elasticities or make explicit assumptions based on data for other similar areas/population groups.

- Decide whether to estimate demand for the main staples separately or make a single estimate for all staples combined.

- Estimate per capita and absolute changes in effective demand as indicated in Panel 11-2.

- Compare the results obtained to estimates produced by using other methodologies.

Other methodologies include:

- the partial equilibrium (Zambia) model in ❂ **Technical Note F7**; *and*

- ❂ the *Shock-response spreadsheet model* on the WFP Market and Economic Analysis website.

Panel 11-1
Estimating changes in per capita effective demand for staple food (kg/capita)

The percentage change ($\overline{o}$) in per capita effective demand for a given staple food (X) is the sum of the percentage changes in X due to the changes in the factors that determine effective demand for that food.

The principal factors that determine effective demand are: real price at the consumer level for that staple food (P) and the real per capita income level (Y). Other factors are the real price of a substitute commodity (S) and income distribution within the population (D).

However, change in income distribution (D) at the national level is expected to be small and a suitable and accurate measure for this factor is not easily available, so a rough estimation of changes in effective demand at the national level can be made while omitting this factor. However, its effects on specific sections of the population and specific regions should be discussed.

Thus, for estimation of *the percentage change in per capita demand for a particular staple food at national-level*:

$$\bar{\delta}X = (\bar{\delta}P * \eta_P) + (\bar{\delta}Y * \eta_Y) + (\bar{\delta}S * \eta_S) \text{ [equation 1]}$$

where $\bar{\delta}X$, $\bar{\delta}P$, $\bar{\delta}Y$, $\bar{\delta}S$ and $\bar{\delta}D$ are the percentage changes in X, P, Y and S, and η_P, η_Y, and η_S are the demand elasticities of X with respect to P, Y and S, respectively.

For estimation of the *percentage change in per capita demand for staple foods in general* (all staples together), the calculation can be further simplified as follows, omitting S since, in practice, there is no real substitute for aggregate staple foods:

$$\bar{\delta}X = (\bar{\delta}P * \eta_P) + (\bar{\delta}Y * \eta_Y) \text{ [equation 2]}$$

Estimation of demand for specific commodities (major staple foods including cereals and pulses) is important where commodity-specific price changes and the substitution of one for another are significant, especially if the crisis has affected production of various commodities differently due to regional differences in severity of the crisis or different seasonal stages of various crops. If this is not the case, one needs to deal only with the aggregate food demand level.

Panel 11-2

Calculating the change in effective staple food demand (tonnes)

There are two steps: (1) calculating the change in *per capita* effective demand; (2) calculating the *absolute value* of the effective, commercial demand.

Data required:

Data items	Example
1. Normal level of demand for each commodity (SQE)	**150 kg/capita/year**
2. Price elasticity of demand for the major staple food	**-0.2**
3. Income elasticity of demand for the major staple food	**0.5**
4. Expected change in price level of the major staple food for the coming marketing year with the anticipated assistance interventions by the national and international humanitarian community	**10%**
5. Expected change in per capita income for the coming marketing year with the anticipated assistance interventions	**-6%**
6. Expected level of mid-year population for the coming marketing year.	**100 000**

calculating the change in per capita effective demand

Start with the status-quo estimate (SQE) of per capita consumption based on a 5-year or other appropriate period. The trend in these estimates in the recent past may be due to a trend in the per capita income, so if the consumption figure is adjusted for the income change (growth change) it should not be adjusted for the time trend[13] as well. To reduce the degree of inaccuracy, use the time series of consumption figures

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[13] In some cases, when estimating demand for specific commodities, changes in the taste and preferences of the population may be significant and may need to be considered. Time trend may be used as a proxy in such cases.

from the national food balance sheets based on the updated/actual consumption rather than forecasted consumption. This SQE should then be adjusted for the current year that is affected by a specific crisis using formula in equation 2 in Panel 8-7 for each of the major commodities and then sum the result.

Percent change in per capita effective staple food demand

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$$= (-0.2 * 10\%) + (0.5 * -6\%)$$
$$= (- 2\% - 3\%)$$
$$= - 5\%$$

and expected per capita effective food demand

$$= 150 \text{ kg.} * (1 - 0.05)$$
$$= 142.5 \text{ kg.}$$

(2) Calculating the absolute value of the effective, commercial demand

(This analysis is similar to supply/demand concept explained in Panel 3-2)

	Example (tonnes)
A. Total food consumption requirement in a normal year (based on SQE of 150 kg per capita per year)	**15 000**
B. Total effective/commercial food demand (SQE adjusted for price and income effects; 142.5 kg per capita)	**14 250**
C. Domestic production	**13 250**
D. Anticipated commercial imports (demand) = B - C	**1 000**
E. Total import requirement (commercial plus humanitarian) = A - C	**1 750**
F. Uncovered food import gap (to be met by external food aid) = E - D	**750**

The difficult task is determining what to do in a case where there has been significant and persistent food aid consumption. For example, if average consumption through food aid was 5 kg/capita/year and if we assume that, in the absence of food aid, the population would purchase about half of this amount, then we consider this 2.5 kg as a potential commercial demand. The final estimate for the commercial food demand in this example would then be 142.5 + 2.5 = 145 kg/capita/year.

Where elasticity data are NOT available

- Look at **relative changes** in

  - macro-economic indicators, wage rates, the consumer price index and the price of a basic household food basket compared with historical trends;

  - the condition of various livelihood patterns in key deficit areas;

  - the profile of the buyers in retail markets in the affected area(s), see Panel 11-3; and

  - the extent to which some of these could rely on food from surplus areas (e.g. relatively more than in the past if they are doing well in the current year, or relatively less if they are doing less well than in a past similar year); and thus

- Determine how the crisis has impacted on demand for the various crisis-affected population groups and forecast how that is likely to change in the coming months - the direction and general magnitudes of the expected changes.

This can provide a rough ranking of areas where the market *may* help make up for *some* of the food shortages. The market will not, however, resolve the problem of population groups that lack income.

For specific population groups, this involves forecasting the **periods** during which they will purchase staple foods from the market and their **purchasing power** at those times, i.e. their access to cash and the prices of staple foods at those points in the future or the terms-of-trade between cash crops or saleable assets (such as livestock) and staple foods.

Note that **debt repayments** can absorb much of the income of poor farmers (and other households), reducing effective demand. Furthermore, farmers who have to sell a part of their harvest to meet other obligations and then purchase from the market later in the year can be faced with unaffordable high prices at that time (see Panels 3-2 and 3-3 in section 3.3).

Panel 11-3
Establishing consumer profiles

- What proportion of the population could be classified as subsistence farmers? What is the degree of dependence on markets by these groups for food and other requirements?
- What is the proportion of food producers and among these, what is the proportion of net buyers?
- What is the proportion of non-producers with complete dependence on markets for food?
- What proportion of their total income do households spend on food?
- What are the major staples and substitutes for different population groups?
- How have household incomes been affected by the crisis (own production, labour income, transfers)?
- Are there recent estimates of price and income elasticities of demand applicable to the areas and populations under consideration?

Using proxy for staple food consumption during rapid assessment:

In practice, where no reliable effective demand estimates are available a simple proxy for the per capita food consumption requirement can be the apparent per capita consumption or the **status-quo** level of consumption. In this case the (staple food) consumption requirement for the coming year is estimated as follows:

Status-quo estimate (SQE) for staple food consumption per capita	$\times$	the estimated total population

This assumes that people should eat as much in the coming year as they have in the last few years. (The SQE is *not* based on any normative or recommended *nutritional*

requirement: it may or may not meet the average energy intake requirement as established by FAO and WHO.)

- The ***status-quo estimate*** (SQE) is derived from the apparent per capita staple food consumption in recent years, adjusted for special circumstances, if necessary, as described below.

- Prepare status-quo estimates (SQEs) for per capita consumption for each staple food included in the CFSAM analysis and balance sheet, and then an aggregate (or total) SQE for all staple foods expressed in terms of cereal equivalent or total energy content.

- ***Population*** is estimated at the mid-point of the coming marketing year allowing for population changes from previous years - see section 6.2.

The reasoning behind the choice of *status quo* as a benchmark for the preparation of national food balance sheets is as follows: In countries where CFSAMs take place, average incomes are low and food consumption represents an important share of household budgets. The income elasticity of demand is less than one but always substantial and positive; people, therefore, consume as much of basic foods as circumstances allow. This is why total food consumption actually increases in good years and tends to decrease in bad years. Taking an average over a few years, excluding exceptionally good and bad years, is an approximation for a "normal" year.

Deriving "Status Quo Estimates" for food consumption

There are 4 steps:

- Calculate the ***apparent per capita staple food consumption*** for each staple food included in the CFSAM analysis and balance sheet from: (i) total apparent consumption data from each of the last 5 years; and (ii) population data from the same years. Use the *ex-post* national food balance sheet (NFBS) data in FAOSTAT[14] as a starting point but cross-check against other data available in country. Remember that, in *ex-post* NFBS, aggregate food consumption is calculated as the residual of food availability once all non-food uses have been accounted for. Look out for any revisions that may not yet have been incorporated in FAOSTAT, especially in the figures for population, production and post-harvest loss coefficients. Also consider whether the past data for cross-border trade (especially unregistered imports and exports) are reliable. Do *not* use the estimates (forecasts) of food consumption in the balance sheets drawn up by previous CFSAMs.

- Determine whether the last few years have been ***exceptional*** in any way or there has been a distinct ***trend*** in apparent consumption figures that might make it inappropriate to use the average apparent per capita consumption over the last 5 years - see Panel 11-4. If so, look further back in time to identify "normal" levels of food consumption and establish an ***adjusted*** SQE planning figure based on analysis of available data (and provide an explanation in the CFSAM report).

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[14] FAOSTAT provides FBS data for nearly 200 countries since 1990. The data are based on national statistics and cross-checked with other sources (such as trade partners, FAO field experts, and others). FBS from 1961 are also available on-line for many countries.

- Allow for ***cross-substitutions*** between foods if there is evidence that consumers faced with higher prices for preferred staples are shifting to some extent to less preferred, cheaper staples. Use data from household income/expenditure studies, where available. If little information is available for the populations of concern, use data for similar communities in neighbouring countries. In all cases, make estimates using a range of values and a conduct sensitivity analysis. For more guidance, see:

    - the partial equilibrium (Zambia) model in ❂ **Technical Note F7**; *and*

    - ❂ the *Shock-response spreadsheet model* on the WFP Market and Economic Analysis website.

  Note that demand elasticity varies with income and is different for different foods. A single, average figure for the elasticity of demand for staples (as available in the FAO/GIEWS database *…URL…?*) can be used to obtain a rough aggregate estimate of demand. (It will not be sufficient to inform the household-level food security analysis, however.)

- Calculate the ***aggregate (or total) SQE*** of all staple foods (expressed in terms of cereal equivalent or total energy content) and check that it is consistent with historic levels or trends. If it is significantly higher or lower, there may be errors in the estimated SQEs for individual items which need to be re-examined and, if necessary, adjusted. Alternatively, there may be an underlying trend in total staple food consumption that should indeed be reflected in the total current year SQE estimate. If so, this should be clearly explained in the report.

Panel 11-4

Circumstances in which a 5-year average for apparent consumption may not be appropriate

- When the apparent per capita food consumption (i.e. SQE) is found to be higher than the international norm of 2100 kcal multiplied by the normal cereal proportion in the diet (in caloric terms), then the cereal requirements for human consumption are calculated using this norm. This is done to avoid overestimation of the total food requirement and thereby the overestimation of food aid on a per capita basis.

- **When there has been a distinct upward or downward trend**

If the country has been undergoing an upward or downward trend in food consumption during recent years, you must decide whether the projected food use for the coming year should be based on the ***average*** food use of recent years or the ***trend*** of food consumption during recent years.

If a trend value is used, explain the reason in your report. Underlying consumption trends may be driven by: shifts in relative price as a result of underlying changes in production (adoption of new production technologies, for example), shifts in relative prices as a result of domestic policy changes (price de-control, import policy), macroeconomic changes, underlying shifts in demand (tastes, average income, demography) and changes in levels of donor food assistance.

A careful analysis of trends will help to ensure that food assistance in the coming year does not distort the commodity composition of domestic markets or long-term economic adjustment processes.

- **When the last few years have been exceptional in terms of food consumption**

If a country has undergone a ***protracted crisis*** such as a long drought and for most of that period has received insufficient external food assistance, the 5-year average will not be representative of - it will be lower than - the historical, pre-crisis level of consumption.

On the other hand (and less commonly), if a country has been enjoying an ***exceptionally good food situation for a few years***, possibly including extensive public subsidies during an (ultimately non-sustainable) fiscal bonanza, the latest 5-year average may be unsustainably high, well above the historical long-term average. (The same might conceivably be the case if a country accustomed to lower levels of consumption had received substantial food aid inputs in recent years based on recommended energy requirements rather than SQE.)

In case of an ***exceptional decline*** of an important ***non-cereal energy food*** commodity which is not widely traded on the world market or provided as food assistance (e.g. cassava), it may be necessary to convert the net dry-weight shortfall into its cereal equivalent and to add it to the SQE estimate for the main staple cereal as "commodity cross substitution" (CCS). In this case, cereal imports would be expected to cover an exceptional shortfall in non-cereal production. If this procedure would result in a sizable increase in import requirements for a particular cereal commodity in relation to total food consumption, it could distort domestic food markets and (in the long run) dietary preferences. It should therefore be used sparingly and only after consultation with the GIEWS country officer.

See ❂ **Technical Note F8** for details

Once a full set of SQEs are available for individual cereals, cross-checked, and adjusted to reflect CCS, the aggregate SQE is multiplied by the mid-new year population estimate to give the national food-use estimate for the forthcoming year.

11.2 Estimating seed use requirements

For the purposes of a CFSAM, the analysis of seed use should be restricted to ***domestically-produced seeds for food crops*** to be planted during cropping seasons that fall within the current marketing year. Ensure that all imported food-crop seeds are excluded from the food import estimates. If domestic hybrid or composite production for seed is included in the domestic cereals production estimates it should also be included in the seed use estimates. Conversely, if production for seed is *not* included in the total grain production estimates, nor should it be included in the seed use estimates. In many developing countries, open-pollinated seeds are used from on-farm production. Hence, seed and food uses are directly substitutable. All such seed use should be included in the estimate.

To estimate total seed use of a particular commodity, use time series data to make an approximate forecast of planted area for all relevant crops which are likely to be planted from seed stocks or production available in the new year. This will include all plantings which fall within the new year, excluding the current crop. From farm interviews and discussions with the staff of MoA, estimate average per hectare seeding rates by commodity, crop season and sector. Cross-check the figures against the estimated seed use in FAO <u>Food Balance Sheets for previous years. Adjust seed rates for potential replantings.</u> Multiply average seeding rates by area forecasts to give a total seed use estimate for each crop and sector. Subtract commercially produced or imported seeds from the total, if they have already been excluded from the crop production and trade data.

In cases of an ***exceptionally poor current crop***, the supply of seed for the next crop may be threatened, particularly if the country's capacity for seed imports is constrained. This would apply in countries where local varieties are predominant in rain-fed agriculture, where hybrid seed production is rain-fed, or where domestic seed production has been influenced by some non-weather-related factor. If you perceive that such a situation may arise, be sure to mention it either in the report or during the de-briefings.

11.3 Estimating feed use requirements

Feed use comprises all the consumption of domestic and imported grains in the livestock sector. Include all whole-grain uses and milling residues in the estimation but *not* crop residues. If you intend to estimate non-cereals utilization, the analysis of feed use should also include non-cereal staples.

The approach to estimate feed use requirements will largely depend on the availability of data:

- Where data are available on ***in-country production for feed*** - if, for example, certain crop varieties are cultivated only for feed - use it.

- Data on ***imported feedstuffs*** may be more readily accessible, at least for past years, when certain commodities or grain qualities are imported exclusively for the feed sector.

- Where there is a significant commercial livestock sector, collect data on annual throughput from the main ***feed suppliers and mills***.

- The series of *ex-post* **NFBS** (in country or at FAOSTAT) provide information on historic levels of reported feed use at the national level, albeit approximate.

Take account also of the trend in livestock numbers - the most up-to-date estimates and trends for national large and small ruminant herds, swine, poultry, etc..

In countries with a ***commercial farming or livestock sector***, the proportion of a ***food crop*** used as feed may be modelled as a function of the relative prices of the food crop and livestock. If good price series are available, as well as a series conveying the physical proportion of the relevant crop product used as feed, a regression may be specified, for example one of the following form:

$$\pi_F = b_0 + b_1[log(p_L)] + b_1[log(p_C)]$$

where π_F is the proportion of the crop's supply used as animal feed (taken from previous ex post NFBS available in country or from FAOSTAT), p_L is the price of the relevant livestock or livestock product, and p_C the price of the relevant crop. Historical series of crop and livestock prices may be available in the country. The estimated value of π_F along with reasonable estimates of the price of crops and livestock at the time of the mission may be used to predict the proportion of the relevant crop's use for feed purposes in the commercial livestock sector.

Milling residues are often used in the feed sector. It is therefore necessary to make a rough calculation of the annual milling throughput, the extraction rate (available from FBSP) and the proportion of residues that are sold for feed. All milling residues that are *not* sold for feed should be included in the "losses" element of the NFBS.

Remember that a significant change in **pasture, browse** or **fodder availability** (for example, as a result of drought or exceptional rainfall) may lead livestock farmers to increase or decrease feed use. However, unless good quality supporting data are available, you may be forced to depend on average or trend-adjusted estimates.

11.4 Estimating post-harvest losses

For CFSAM purpose, post-harvest losses (PHL) include all losses that occur after harvesting, including threshing and storage losses. Data are usually scarce, however, and estimates of post-harvest losses to the domestic crop are usually based on a **certain percentage** of annual supplies (including those of carry-over stocks).

Nevertheless, try to discuss the subject with national post-harvest/storage specialists, look at the quality of public and private trade storage conditions, where possible, and try to determine whether anything has changed that would necessitate an adjustment to the previously-used PHL rate.

Exceptional **changes to the PHL rate** may result from:

- the introduction or eradication of a virulent storage pest;

- one-off changes in supplies of storage pesticides;

- major changes in storage and marketing policy, opening or closure of government stores; *or*

- heavy post-harvest rainfall in a country where uncovered storage is practised or a substantial proportion of the crop is left in stacks in the field.

Note that:

- In countries with limited storage capacity or highly variable domestic prices (typically land-locked countries with largely tropical rain-fed agriculture) storage losses of domestic produce may not be linearly related to the **size of the harvest**. A poor crop, implying higher prices, will act as an incentive for better storage and handling practices. Conversely, a bumper crop and low price expectations may reduce the returns on good storage management. In some countries, there is a physical capacity limit to covered stores and silos, and crops in excess of this limit may therefore be subject to open storage and higher than usual marginal loss rates. Adjustments may accordingly be made to the PHL rate used.

- Post-harvest losses also vary according to season reflecting the **crops grown**, the amount to be stored, and duration of storage as well as storage conditions. Basically, the smaller the grain the lower the loss, so *teff* (in Ethiopia) or *fonio* (in Mali) is estimated to have a mean loss of <3 percent per year whereas maize is expected to have a mean loss of 20 percent per year in the same countries. Consequently, grain losses in any one year vary according to the proportion of crops grown *viz;* the significant fluctuations in teff/maize planting ratios in Ethiopia depending on early season rainfall.

Note that high loss rates can be expected for emergency food assistance as **emergency programmes** often operate under severe logistic constraints. Losses in food aid quantities should be used to adjust the food aid stocks on hand in the balance sheet. Misappropriated as distinct from damaged stock should *not* be included in the loss estimate because the food remains "available" in the country.

Panel 11-5
Calculating losses to imported foods

To calculate losses to imported foods:

1. Agree on a plausible average annual loss rate (Z) with traders, relief agencies and other importers; divide this by 12 for the monthly loss rate.

2. Calculate the average time that imports are likely to be in-country (T).

3. Calculate Z/12 x T x M as the total annual losses to the expected current year quantity of imported food (M).

11.5 Estimating requirements for industrial use

Industrial use of food crops generally refers to non-food uses, such as biofuels, industrial starch, medicines, etc. Use of grain for brewing purposes (i.e. making beer) involves an industrial process but the end product is used for human consumption and provides calories. Hence it is not considered as "industrial"use.

12 Forecasting external commercial trade

What the CFSAM report might include (in chapter 5)

Brief explanations of: (i) the team's estimate for effective demand (at present and during the coming year); (ii) traders' intentions in relation to imports and exports, and any uncertainties that are influencing their decisions; and (iii) the team's estimates for registered public and private commercial imports and exports, and unregistered cross-border imports and exports in the coming year.

How those figures compare with previous years. Factors that could positively or negatively affect the estimates. Give a range of possible figures, where appropriate.

The focus is on **cereals**, as they are the most commonly traded food commodities. You may also consider trade in non-cereal staple food commodities, where they represent a significant proportion of the national diet, a significant income source for households or an important foreign currency source for the government.

For the purposes of a CFSAM, commercial food imports are imports that are purchased and brought into the country by the State or private traders, and destined to be used within the country. Some, but not necessarily all, will be destined for normal commercial sale. Some may be sold at partially or totally subsidized prices representing a form of assistance to domestic vulnerable groups. The subsidies, which may be funded from domestic or foreign resources, may go directly to consumers or to processing industries, or take other forms. Some food brought into the country as commercial imports may be used as food aid to households. For example, the government may import food commercially and then distribute it to schools or make it available to poor or vulnerable households free or at a subsidized price.

Food aid from international donors is *not* included in commercial imports but counted separately.

12.1 Influences on external trade

Commercial imports, public or private, may be bought with **foreign exchange** available to the government (central bank) or private traders, or accessed through loans from foreign creditors. **Loans** may include commercial loans from foreign banks or exporters, or loans from donors or international financial institutions.

Private-sector imports (and exports) are influenced by trade policies and changes in trade policies, taxes and regulations, and traders' perceptions of effective demand, their commercial interests and the risks involved all influence.

There are important interactions between private-sector commercial imports, government (public-sector) policies and imports, and food aid imports, as outlined in section 3.6. You must understand and describe these inter-relationships in order to be able to make reasonable estimates and appropriate recommendations.

Panel 12-1

Import capacities

Import capacity measures the quantity of basic foodstuffs that the government and the private sector is able to purchase from abroad during the coming year.

Government import capacity depends on the total budgetary resources available and the government's budgetary priorities (hence the resources earmarked for the public procurement of food, notably imported food). These priorities can be a source of controversy, particularly with certain donors, who may feel that the government is not making sufficient efforts to feed its people.

Budgetary priorities also affect the possibilities that the government gives to the private sector to procure foreign exchange to finance private sector imports.

Private sector import capacity depends on government policies, traders' perceptions of effective demand, their financing capacity (access to foreign exchange and financial reserves or credit), the opportunities to barter (e.g. obtain cereals in exchange for livestock), and their perceptions of the risks involved (which includes their confidence in the behaviour of the government and food-importing aid agencies).

Even if foreign exchange is plentiful, it will not be used for private sector imports if traders are unsure of the effective demand, are unable to finance themselves, or consider the risks too important.

12.2 Compiling data on registered external trade

Before estimating imports and exports for the current year, ensure that you have: (i) a full set of past -year import data by commodity type; (ii) existing new-year import forecasts; and (iii) historical series of past imports also disaggregated by commodity, whenever possible.

Data on flour trade should be included as whole-grain equivalent, using domestic extraction rates. Seed imports should *not* be included.

Data on ***historic*** recorded international cereal trade are available from FAO/Rome, and the WFP country office may have data on shipments in the current marketing year. FAO may also provide current monthly data on international cereal flows by country of origin and destination. The FAO/GIEWS country officer includes available data in the briefing pack for the CFSAM team. The Ministry of Commerce or CSO may hold data on previous years' trade.

Data on ***intended government imports and exports*** for the new marketing year may be available from the Ministry of Finance/Treasury (food imports may be specified in the breakdown of the budget). If grain parastatals control external trade, they should provide a useful source, as well as the Early Warning and Food Information System (where appropriate).

There are numerous data sources for ***current-year commercial imports*** but the data may not be complete or reliable:

- If the country has already commenced its new marketing year, you can obtain data on arrivals and expected time of arrival (ETAs) from customs and excise offices, WFP, the grain parastatal and possibly the Ministry of Trade/ Commerce. Data on formal exports may be available from the same with the exception of WFP.

- If the country is heavily dependent on trade, the team would be well advised to visit the main ports or border trading posts to talk with officials and traders there.

- In all cases, check the FAO database of cereal dispatches by country of origin and destination to arrive at reasonable estimates about the most recent flows of commercial trade and a more reliable projection of commercial flows during the coming marketing year. (The FAO database usually includes data with only one or two months delay.)

The food trade has been totally or partially liberalized in many of the countries in which CFSAMs are likely to be conducted. There are only a few where the State still retains a monopoly or near monopoly of cereal trade. However, even in liberalized trade countries **cereal boards** may still regulate trade to some extent and in some cases authorize imports, while also keeping records of the amounts traded.

12.3 Forecasting private-sector trade

The international grain trade is a volatile business and forecasting is difficult, especially in data-scarce countries. Preparing estimates for projected private commercial imports and exports is one of the greatest challenges the CFSAM team will face. There is no ideal method. You will have to make a judgment based on:

- analysis of **trends** and how trade changed during previous crises;

- estimates of **effective demand** for staple foods, when possible - see section 8.3;

- examination of macro-economic and other likely **influences** on traders' decisions (see Panel 12-2); and

- **interviews** with a sample of the main traders to learn about their perspectives and intentions.

See section 8.5.

Panel 12-2

Factors that influence private commercial trade especially imports

Prices and perceptions of effective demand

- the difference between import parity prices and wholesale prices within the country (in areas close to points of entry for imports) - see *Import-parity price tool* on the WFP Market and Economic Analysis website.

- domestic wholesale/retail price expectations - perceptions of domestic supply and demand prospects. Note that high price uncertainty may act as a disincentive to importers; government storage, marketing, pricing or trade policy may increase or decrease this uncertainty.

Macro-economic factors likely to influence private commercial trade are:

- *exchange rates*: note that in countries with fixed exchange rates, it is important to consider both the price and the availability of foreign exchange through formal channels. In those countries foreign currency may often be rationed, especially when official rates differ from parallel (and often illegal) free market rates used for un-recorded transactions;

- *domestic interest rates*: as most grain trade is on credit, high interest rates will act as a disincentive;

- *inflation rates*: high/variable inflation increases the uncertainty over real returns to trade.

Market factors that may influence traders' decisions include:

- border or world market commodity prices, tariff levels, taxation;

- storage costs: high domestic storage costs act as an incentive to export now rather than store for domestic sale at a later date; low costs encourage more storage and may therefore discourage imports later in the marketing year.

Institutional variables which should be considered include:

- physical private sector storage and transport capacity - there are considerable economies of scale in international grain trading hence capacity constraints may make trade unprofitable;

- banking confidence and credit guarantee problems - importers may have difficulties raising letters of credit in the exporting country, because of domestic financial insecurity;

- domestic quality or quantity controls for imported goods, or in countries to which grain is exported;

- uncertainty as to public-sector intentions regarding commercial food imports and appeals for food aid, which would affect the market for private commercial imports.

You may estimate changes in effective demand for staple foods individually or as a whole as described in section 8.3, depending on the availability of data on elasticities.

You may also use a partial-equilibrium demand model to anticipate how prices might move, build scenarios for prices and commercial imports, estimate the likely volume of private commercial imports and make rough estimates for the maximum quantities of food aid that can be imported without unduly disturbing the market. See Panel 12-3. A model developed in Zambia by Michigan State University and the World Bank in collaboration with WFP is available in ❂ **Technical Note F7**.

In addition to the government and WFP country office, the agricultural attaché at the USA embassy and the EC delegation may be useful sources of information on external trade.

Occasionally, traders will have already made initial decisions at the time of the mission and may be able to provide details of planned new-year exports, imports and ETAs. This information will provide you with a minimum bench-mark below which private trade is unlikely to fall. Cross-check such information against what you learn from the trend analysis and other key informants. Interviews with traders will also help to determine which factors will be important in determining final private trade decisions.

Look closely at the time series data to identify **trends**, identify any unusual changes and try to find out what the causes might have been, and look specifically at previous crisis years to see how registered import and export flows reacted. Trend or average values are only likely to be good estimates when inter-annual variability is low, which is unlikely. The results should not be used in isolation, however. Several micro- and macro-variables that can not be modelled explicitly without extensive data and time-consuming analysis should also be considered. You will have to use judgment in assessing the quantitative influence of these variables.

Panel 12-3

Using a partial equilibrium demand model

A spreadsheet can be used to analyse how the volumes of commercial imports may change in response to changes in prices due to a shock provided, the following are available:

- baseline data on production, imports and prices including import-parity prices; *and*

- an estimate of average demand elasticities for the main staple and cross-price substitutions for the main substitute (to get a single, rough estimate of import levels) or, better, estimates of the elasticities for different population groups and the breakdown of population numbers and consumption levels among those groups (to produce a more accurate estimate of the consumption shortfall by household group).

Where figures for demand elasticity are not known:

- use figures for similar populations in a neighbouring country, if available;

- assume figures in the range -0.3 to -0.5 and include a sensitivity analysis.

The projections for private commercial imports must be cross-checked against:

- levels of imports in previous crisis years compared with the trend in imports at the time; *and*

- the factors (other than traders' perceptions of effective demand) that could limit such imports - government trade policies and regulations, and the availability to traders of credit and foreign exchange, or possibilities for barter with overseas suppliers.

The model included in ◉ **Technical Note F7** was developed in Zambia and is designed for situations in which there is one predominant staple (maize in the case of Zambia) and one principal substitute (cassava in Zambia). Its use in countries where there is a greater variety of staples is yet to be demonstrated. It has been used (in Zambia) in the context of production shortfalls (and bumper crops) but can also be used to develop scenarios and estimates in case of sharp reductions in incomes and purchasing power.

12.4 Estimating unregistered cross-border trade

Unregistered cross-border trade (UCBT) includes all staple food cross-border flows that are not officially documented by the government. They may be illegal or simply unregistered. Such trade flows are a common feature of countries with high tariff rates,

price or movement controls, or extensive un-monitored borders. They are notoriously difficult to estimate and volumes are likely to be highly seasonal. Rough orders of magnitude of UCBT can be understood from previous CFSAM reports, key informant opinions and, occasionally, local estimates. In some parts of Africa (e.g. eastern and southern Africa), WFP is now monitoring UCBT on a sample basis in order to produce rough estimates.

- If estimates exist, scrutinize them as all other secondary data and, on that basis, make the best estimate (forecast) you can of the likely level of UCBT for the whole country for the coming year.

- If no estimates are available, you can get a rough idea of the magnitudes by visiting a sample of border crossings, noting the number and tonnage of trucks carrying cereals and, tactfully, interviewing traders in the main receiving markets. If harvesting has already commenced in the supplying country, trade may already be in evidence but no strong conclusions should be drawn from observations during a short sample period.

- In all cases, try to get - and then take account of - information about supply and demand conditions in the neighbouring countries. (The FAO/GIEWS country officer may be able to provide current year forecasts of cereal deficits or surpluses, recent harvests and crop prospects in neighbouring countries which will be useful for verifying UCBT estimates.)

Supply and demand conditions on both sides of the border together with the ***exchange rate*** and government policies, ***controls*** and enforcement are the key determinants of the level of UCBT. See Panel 12-4.

Calculate the difference between the ***prices*** in markets on both sides of the border in a common currency, and the cost of transporting a ton of grain from the surplus market in one country to the deficit market in the other. This, together with exchange rate movements, knowledge of the likely effects of any recent ***policy changes***, and information from key informants, may give a useful indication of likely UCBT in coming months. If the price differential per ton significantly exceeds the transport cost, there may be an incentive for trade. This is particularly likely when urban markets in one country are farther from the main growing areas than urban markets in the other country. If a significant change in transport costs or the cross-border/domestic market price differential is identified, the team should adjust the historic UCBT estimate accordingly when making the forecast for the forthcoming year.

Estimates of UCBT (exports and imports) should be included in the estimates of total commercial exports and imports by commodity. As with all estimates, the reasoning and assumptions behind the UCBT forecasts should be clearly explained in your report.

Panel 12-4
Influences on unregistered cross-border trade (UCBT)

UCBT thrives on border and internal movement controls, and may also be influenced by pricing policies:

- High levels of producer price support, for example, may encourage unscrupulous traders to try to sell illegally imported food on the domestic market.

- Internal movement controls may provide an incentive for UCBT by distorting market prices.
- Sales taxes or stringent quality controls can also boost UCBT.
- Changes in exchange rate policy and in exchange rates on the parallel (illegal) currency market, will have a significant influence on incentives, and hence on cross-border trade.

12.5 Forecasting public-sector trade (exports and imports)

For CFSAM purposes, public sector trade comprises all grain imports and exports for which the government decides on the quantities traded. This includes the operations of government-run import-export enterprises (which still exist in some poor countries) and trade which the government controls either by sub-contracting to the private sector on the basis of tenders or by issuing export/import permits to the private sector for each operation (which is more common).

Public Sector Exports

Where the government is responsible for grain exports (directly, through grain parastatals, or by subcontracts to the private sector). Use the ***government's planned figure*** for total annual exports if this has already been decided. If the planned exports exceed the mission's estimate for the national surplus, seek advice from the GIEWS country officer in Rome. Sometimes, the government will have a specific method for planning exports. If possible, apply the same method to calculate the new-year exports, if sufficient data exist, and discuss findings with relevant officials.

If you are making forecasts of both public and private sector exports, parameters will have to be restricted to ensure that, together, they do not exceed the total exportable volume.

Adjust export forecasts to reflect any non-production factors that may affect inter-annual export levels, for example: border price expectation, domestic demand conditions and exchange rates and, perhaps most importantly, government closing-stock policy.

Public Sector Imports

When estimating public sector food imports (PSFI) for the new year, be careful to distinguish between "planned" and "actual" (average or usual) imports.

- If the government has already ***budgeted*** for a certain quantity of imports, ascertain the total planned quantities by commodity. If this exceeds the estimated total food import requirement net of private sector imports and cross-border trade, inform the FAO/GIEWS country officer. In general, the planned imports should be entered into the NFBS and the closing stock figure be re-calculated as the balancing element.

- If ***no planning figures*** are available, calculate (for a food-assistance-recipient country) public sector imports on the basis of the Usual Marketing Requirement (UMR).

The UMR is the quantity of food that a country can be expected to import without placing excessive burdens on foreign currency reserves and the government budget. The guideline for calculating UMRs is provided in ✇ **Technical Note F5**. You may have to arrive at a *provisional* estimate for the current year UMR. Ultimately, however, UMRs are decided in the context of negotiations (usually held in Washington) on the food assistance plans of the major exporting countries.

Examine carefully whether planned imports are significantly higher or lower than the agreed UMR or, if the donors' negotiations have yet to take place, the team's provisional estimate:

- If the planned PSFI level ***exceeds*** the estimated UMR, this may indicate that food imports will place a strain on domestic foreign exchange reserves or the government budget.

- If planned PSFIs are ***not sufficient*** to cover the total import requirement (net of private sector imports and unregistered cross-border trade) and they are below the UMR, the implication, from the donors' perspective, is that the government should import more commercially. (Donor food assistance allocations are generally based on the principle of *additionality*: if the total import requirement for a commodity exceeds the UMR, the difference may be covered by food assistance. But, as food assistance is a scarce resource, allocations among countries should be according to need - i.e. with priority to those that are least able to pay for commercial imports.)

The starting point for calculating the new year UMR for a food commodity (which we will call UMR1) is the average level of food imports for the previous five years, excluding freak high and low years (UMR5). However, the UMR1 should take fluctuations in national income and foreign exchange earnings as well as government budgetary constraints into account. If food imports represent a significant part of total imports, a sharp drop in GDP, caused, for example, by a major decline in export earnings, may imply that the economy can afford only a smaller quantity of commercial food imports than normal. Should this situation arise, take this into account when establishing the estimate for UMR1".

Ascertain whether the government can afford to finance the UMR:

- If the government budget has already been prepared, find out what allocation (E) has been agreed upon for PSFI expenditures.

- If budgetary allocations have not yet been made, you will have to estimate E taking account of the factors listed in Panel 12-5. Try to arrive at an agreed figure in discussions with relevant officials - typically Ministry of Finance and the Central Bank - and the IMF and World Bank delegations. (There are too many unknowns in the new year to be able to estimate E with any accuracy, especially when an unspecified part of the budget is allocated to subsidization of food imports.)

- Then calculate the total cost of public commercial food imports and assess the adequacy of budget allocations as shown in Panel 12-6.

Panel 12-5

Factors likely to influence government budget allocations for food imports

Budget allocations are likely to be influenced by:

- the size of the food deficit;

- major changes in other types of government spending: a rapid increase in military expenditure, for example, may lead to belt-tightening in other sectors;

- political pressures: the fear of large and politically vocal urban populations may encourage governments to import food;

- changes in government revenues: changes in tax levels, or in revenues from sales, income or trade taxes;

- general budget cuts: if the government is seeking to cut its budget deficit or for any other reason is following a tight fiscal policy (under pressure from the IMF to control spending, for example); *and*

- exchange rate uncertainties: with a floating exchange rate, a large increase in public sector imports could lead to a depreciation of the currency, crowding out private-sector imports.

Panel 12-6

How to calculate the total cost of public commercial food imports and assess the adequacy of budget allocations

Once a figure for E has been arrived at, the total cost of food imports (C) is calculated as follows:

$$C = M^* [(Pw - Pd) + (S + H)]$$

where M* is the maximum quantity of imports which will not overshoot the budget. Pw the border price at which imports are purchased in local currency terms, Pd the average domestic sales price, S the domestic storage costs and H the total domestic handling and marketing costs per ton (if these are not budgeted separately). If the budget is fully utilized, the total import costs C are equal to the total budget (E), therefore:

$$M^* = E / [(Pw-Pd) + (S + H)]$$

If M* < UMR5 it will mean that the budget will have to be increased to finance the imports. If E is already regarded as the maximum that the government can allocate to food imports, there may be an argument for calculating UMR1 = M*. If M* ≥ UMR5 then budgetary constraints should not be regarded as a limiting factor in calculating UMR1. Note that if the domestic price exceeds the marginal cost of importing, storing and marketing the food, the government makes a profit - and food purchase will not be limited by budgetary considerations.

In a country with an over-valued exchange rate or very low export earnings, foreign currency may be rationed and ***foreign exchange*** (FX) availability a major constraint on commercial food import capacity. If there has been a major change in FX availability, as a result of a fall in the world price of a major export commodity, for example, you should confirm that FX allocations for food imports are sufficient to cover the UMR or planned level. The Central Bank or Ministry of Finance/Treasury will usually be able to provide information on FX allocations.