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# INFORMATION NOTES

# INFORMATION NOTE ON THE DEVELOPMENT AND QUALIFICATION OF SAMPLING METHODOLOGY AND STATISTICAL ANALYSIS FOR MEASURING POST-DELIVERY LOSSES

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# NOTE TO THE EXECUTIVE BOARD

**This document is submitted to the Executive Board for information.**

The Secretariat invites members of the Board who may have questions of a technical nature with regard to this document to contact the WFP staff focal points indicated below, preferably well in advance of the Board's meeting.


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| Director, OML*: | Mr A. Daoudi | tel.: 066513-3289 |
| Chief, OMLL**: | Mr M. Ohlsen | tel.: 066513-2547 |


Should you have any questions regarding matters of dispatch of documentation for the Executive Board, please contact Ms C. Panlilio, Administrative Assistant, Conference Servicing Unit (tel.: 066513-2645).

*Logistics Division
**Logistics Branch

## INTRODUCTION

1. In 2005, at the request of WFP's Executive Board, the National Audit Office of the United Kingdom conducted an audit of the arrangements for reporting post-delivery food losses to the Board. Several Board members noted a possible contradiction between the relatively low level of losses reported and the realities inherent in any food management system; even for the most organized and efficient of commercial operations in developed countries, food losses exceed the level reported by WFP.

2. WFP's technical manuals and agreements with governments and cooperating partners (CPs) contain very detailed descriptions of which elements have to be reported as technical losses; these are losses due to transport, storage and handling, infestation and the reconditioning of bags. Distribution losses and losses attributed to incorrect targeting – which are those resulting from distribution to unauthorized beneficiaries or unauthorized sales – require further elaboration, because for now WFP relies on post-distribution monitoring to identify food losses attributable to CPs.

3. The External Audit recommendations of 2004–2005 proposed the following:

   - Risk profiling should be the basis for monitoring, to obtain more sensitive and reliable statistical assessments of total food losses.
   - Field monitors should report all food losses, irrespective of size, to obtain more accurate estimates of post-delivery losses.
   - The Commodity Movement Processing and Analysis System (COMPAS) should be developed further, together with data validation and monitoring arrangements, to improve accuracy and reliability and enable reporting of the entire food supply chain.
   - WFP should maintain its efforts to record all post-delivery food losses arising from the transportation company, to enable full reporting of commodity transportation losses to the Executive Board.

4. Coverage of distribution losses requires the detection of all food losses occurring between release from final storage points and hand-over of food entitlements to beneficiaries. WFP considers a statistical sampling approach as the most cost-effective and feasible way of achieving this. Since April 2007, WFP has undertaken the following actions to evaluate the merits of universally introducing statistical sampling methods for distribution losses and to identify implementation strategies for doing so:

   i) fact finding missions to Bangladesh, Kenya and Malawi to study the nature of distribution losses and the present reporting structures for covering them;

   ii) elaboration of a concept paper defining the kinds of losses to be captured, possible methods for capturing them, and related operational aspects;

   iii) approval of the methodology propose by a WFP internal working group, made up of relevant WFP units and chaired by the Logistics Division; and

   iv) pilot field testing of statistical sampling in Malawi and Zambia.

## DEFINITION OF DISTRIBUTION LOSSES FOR STATISTICAL SAMPLING

5. Documents dealing with food aid issues interpret food aid losses in a wide variety of ways. Such losses are not necessarily the result of physical deficits or unauthorized off-takes: for instance, exaggerated beneficiary numbers in refugee and internally displaced person (IDP) operations can lead to "hidden" food aid losses, which are rarely documented and very difficult to quantify without a thorough review of the entire programme.

6. Because of this wide range of interpretations, this paper seeks to answer two questions:

- What do WFP documentation and other studies and articles dealing with food aid mention as food losses?
- Based on field studies and the experience of WFP staff, what types of losses should be included to improve WFP's reporting on losses?

7. Studies mention many potential causes of food aid losses during the final distribution phase, including:

- inclusion error: distribution to needy beneficiaries who are not on the list *or* to beneficiaries who are not in need and do not hold ration cards;
- multiple registration of the same beneficiaries;
- use of food by project staff, such as teachers, workers and hospital staff;
- sales to cover expenses not provided by the project/programme, such as for transport/handling;
- inclusion of the packaging weight in received/distributed commodity weights;
- discrepancies between volume measures and assumed weights, such as faulty application of weights of vegetable oil, or use of the same scoops for different grains;
- application of the "a bag is a bag" approach, which ignores the possibility that a bag may contain less than its correct/declared weight;
- discrepancies caused by food cleaning, repacking, etc.; and
- distribution of poor-quality food, which contains impurities or is damaged/infested.

8. Technical losses in the logistics chain up to final distribution points (FDPs) can be clearly defined and well quantified, but verifying distribution losses on the basis of actual food receipts at the beneficiary level is more complicated: at best, the total extent of these losses is only estimated qualitatively. The main justification for using statistical sampling for loss analysis is therefore because existing WFP loss monitoring systems are insufficient to capture losses during the final distribution phase to beneficiaries.

9. Distribution losses can be defined as the difference between the *declared* beneficiary number multiplied by *the declared* individual ration and the *actual* beneficiary number multiplied by the *actual* individual ration.

10. Loss categories that should be included in the project performance reports, but not in the loss analysis, are:

- targeting imperfections;
- unfavourable exchange or milling rates;
- differences in loan repayments;
- discrepancies in project outputs, such as in food for work;
- acceptance of project staff's use of food to cover food distribution expenses;
- excess distributions to avoid commodity losses; and
- reduced rations due to pipeline breaks.

11. Only two elements are important for distribution losses, and should be covered by statistical sampling of losses:

- difference between reported and actual numbers of beneficiaries; and
- difference between reported size of food rations and actual rations distributed.

12. In most WFP food aid operations, deficiencies during food distribution are the main cause of deviations from the approved food allocation plan. The now more rigorous capture of distribution losses can therefore considerably increase the food losses reported by WFP. Food aid reaching non-registered beneficiaries will now be manifested as losses; these may be regarded as more acceptable than physical losses caused by deterioration and theft, because these beneficiaries are usually also in need of food.

## DEVELOPMENT OF THE RANDOM SAMPLING METHODOLOGY

13. As a first step in developing the loss sampling methodology, fact-finding missions were undertaken in Bangladesh, Kenya and Malawi to evaluate existing loss reporting procedures and identify problem areas. The country office in Bangladesh had already applied statistically based loss sampling for some years, albeit in a specific project context.

14. The fact-finding missions confirmed that the WFP COMPAS system can detect all losses up to the FDPs, provided a universal waybill system has been introduced. As a matter of principle, waybills and store records should be considered legal documents, so any falsification of them should be dealt with by management.

15. As a next step, field testing took place in Zambia and Malawi.

16. The following method was applied for the random sampling of distribution losses:

- Sample sites were selected according to a statistical model that applied the proportionate-to-size principle in which larger distribution points had a greater chance of being selected.
- The individual rations distributed were weighed or counted. The number of ration samples depended on the type of project activity.
- Beneficiaries were checked against a list and when possible, identified by their individual ration cards. In schools, actual attendance rates in several classrooms were calculated.
- The contents of FDPs was checked against recorded off-takes and stock returns after distribution.

17. These activities identified:

- the difference between declared rations and actual rations received by the beneficiary;
- the difference between declared number of beneficiaries and actual number of beneficiaries receiving food; and
- discrepancies between recorded and actual stock off-takes and return loads after distribution.

## VALIDITY OF THE LOSS SAMPLING METHODOLOGY AND PRECONDITIONS

18. If statistical sampling of losses is to remain manageable and not interfere excessively with the distribution process, it must involve a limited number of parameters. As the purpose of improved loss detection is to enable WFP staff and CPs to report better on the final distribution of WFP food, a clear distinction must be made between losses in legal terms and targeting imperfections that lead to reduced rations.

19. To avoid influencing the distribution process, the sampling exercise must maintain absolute confidentiality regarding the selection of distribution sites and the schedule of visits, and take ration samples after beneficiaries have collected the rations. CPs must provide WFP with monthly lists of their planned food distributions and any alterations to these plans.

20. Beneficiaries must be identified at the distribution site according to a list and, to the extent possible, through individual ration cards. There must be adequate records at the final distribution storage points to verify actual food distributions and eventual returns of non-distributed rations. Stores must be stacked in a way that allows easy counting of their contents.

21. The loss sampling should be planned and executed by trained staff at the country office or regional bureau level; it cannot be entrusted to food monitors or CPs.

22. To produce statistically relevant results, loss sampling can be carried out only in steady project environments with stable food supplies to all project sites. The exercise should be repeated at intervals of six months to one year, depending on the timing for corrective actions. The trial run demonstrated that sampling requires little time – less than an hour per project site, excluding travel time – provided that adequate store records are available; sampling will not create excessive extra work.

## RESULTS OF PILOT TESTING

23. Field testing of the loss sampling methodology was successful. Whereas previous loss monitoring could detect only individual food losses, and could not relate these to the overall losses in an operation, the statistical loss sampling approach indicates the correct magnitude of distribution losses. By pinpointing deficiencies in the final distribution phase, it is also a valid instrument for mitigating losses at that stage.

24. Reasons for losses of distribution of dry rations were inadequate scooping of grains and, for vegetable oil, discrepancies between volumetric measuring and accounting in weight. Variations among individual samples were small. Adjusting ration sizes to packaging unit sizes or allowing rations to be split into equal parts of a packaging unit can reduce

distribution losses considerably. Underdistribution to beneficiaries can only be considered a loss when the remaining quantities are not returned to the store or utilized in some other, documented way.

25. In school feeding projects, food supplies were based on enrolment figures, and school utilization records showed that quantities used corresponded to those figures. It has been observed that teachers and kitchen personnel sometimes take a share of dry rations home, which might contribute to losses.

26. All the projects covered by the loss sampling trial had accurate beneficiary lists and no discrepancies were found. Most schools had accurate records of actual attendance, which, however, were not reflected in determining daily food use. Some food assistance operations, particularly in emergency situations, have far more difficult conditions for registering beneficiaries, and in such conditions further testing would be required.

## CONCLUSIONS AND THE WAY FORWARD

27. Statistical sampling of distribution losses is an appropriate extension of the tracking of post-delivery losses. It provides realistic estimates of food losses during the final distribution phase, enabling WFP to complete its accounting for losses along its entire food supply chain.

28. WFP should follow up on this trial phase and introduce the methodology systematically in country offices where there is a need to reduce distribution losses and where staffing levels are adequate. Sampling of distribution losses could also become part of the project performance review and provide baseline information for project audits.

29. The loss sampling methodology can be a valid tool for:

- improving adherence to standard procedures and best operational practices with CPs;
- correcting observed weaknesses immediately; and
- mitigating future losses through the introduction of standardized measuring devices and adjustments to food rations to facilitate distributions.

30. A precondition for introducing the sampling of distribution losses is good accountability along the logistics chain up to the final delivery warehouses. Stable food supplies to each project site and a steady project environment are also necessary for obtaining statistically relevant data.

## ACRONYMS USED IN THE DOCUMENT

| | |
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| COMPAS | Commodity Movement Processing and Analysis System |
| CP | cooperating partner |
| FDP | final distribution point |
| IDP | internally displaced person |