

Somalia flood relief operation 1997-1998

**An appraisal of data collection methodologies
with special reference to using a GIS approach**

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An appraisal of data collection methodologies with special reference to using a GIS approach: Somalia flood relief operation 1997-1998

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Introduction

Sustained rains falling on the Highlands of Ethiopia and in Juba and Shabelle Valleys created unusually large floods in October 1997, which continued for the following three months. A large number of people had to leave their homes and gathered in locations where no facilities were available, trying to survive until water levels dropped. As a first step, UN agencies, donors, ICRC and NGOs established a coordination body to gather information on the number and location of the affected population in order to trigger and appropriate response.

In this paper the potentialities of using an ARCVIEW geographical information system (GIS) together with UNDOS database to monitor the extent of the floods, to predict the locations and the number of villages affected, and to provide estimations of the population at risk will be described and comparison with other methods of data collection will be made.

The situation of about 77 villages of the Lower Juba Valley located between Jilib, Jamaame and Gobweyn will be considered. This was where the consequences of the floods were particularly dramatic, due to the combined effects of the Juba and the Shabelle rivers. These areas were also fairly well known by ICRC, who has carried out programs including seed distribution and rehabilitation of irrigation schemes, where the number of beneficiaries was closely monitored.

In this paper, only the number of families in the villages south of Jilib is reported. For a more global

analysis the original reference may be consulted¹.

The GIS Unit of UNDOS conducted aerial surveys and produced population estimates and flood boundary maps for use at field level for relief operations. In-field assessments were conducted by ICRC as soon as the airstrips were open and the appropriate relief programs set up. Following the first distribution of food and standard non-food items, which continued until the end of 1998, a further effort was made during these specific surveys to address the water and sanitation needs of the population. Figures of the number of affected people were also obtained.

It was then possible to compare the accuracy of the estimations obtained from the GIS database with the numbers collected during the surveys. The advantages and disadvantages of the two approaches – both essential to help relief workers develop a comprehensive plan of action and to request adequate donor support – are then discussed.

Methodologies

GIS

All the maps used in the Flood Relief Operation were prepared by the GIS Unit of the United Nation Development Office for Somalia². The geo-referenced maps were obtained using the 1:100'00 maps scanned and geo-referenced to be readable in Arcview GIS 3.0 (ESRI). Population estimations were obtained from pre-war data corrected for the

¹ Anselmo J., 1997 Somali scene, ICRC's response to the floods. Special Edition. February 1998.

² GIS Section funded by the Royal Dutch Government. Hardware also provided by the Italian Government through WHO Somalia and UNICEF Somalia.

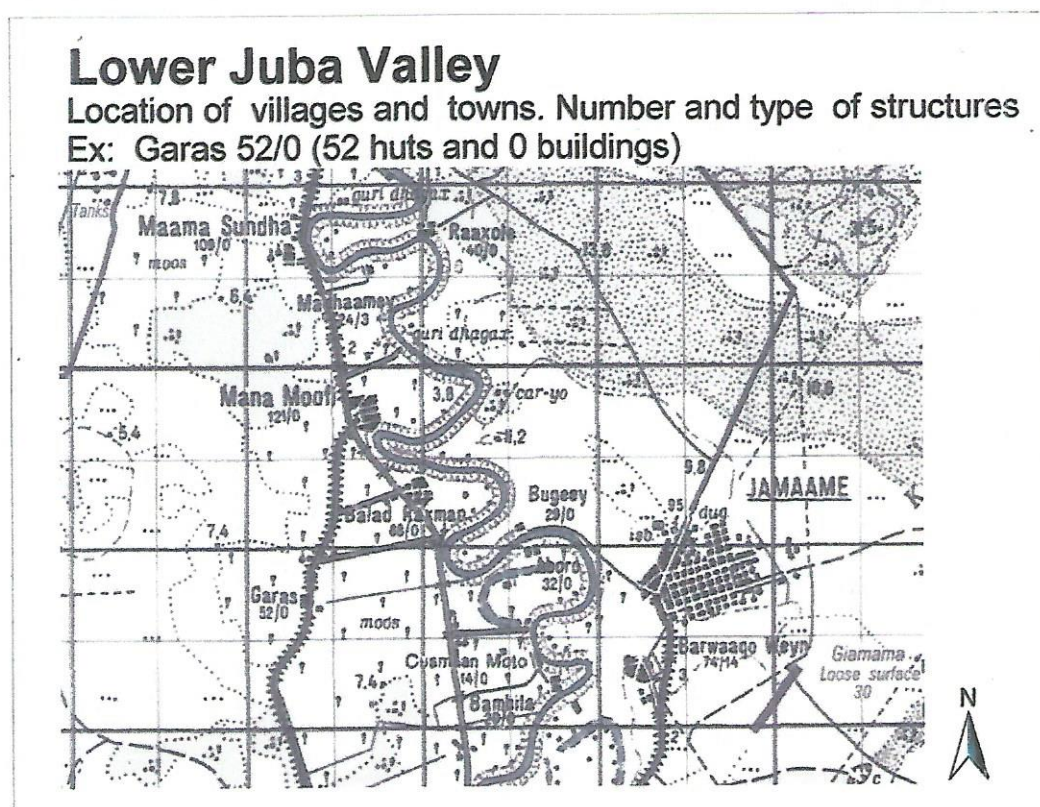


Figure 1 Example of the 1:100'000 topographic maps

increase. Village population were computed using the number of structures indicated below the names of the villages on the 1:100'000 maps prepared by the Government of Somalia between 1980 and 1986 with the assistance of the government of the former USSR. Structures are in fact huts and buildings and one family per structure was assumed. A 25 % increase in the number of families obtained from the database was used, taking into account the estimated population increase during the last seven years³. At the beginning of the floods the location of the villages were recorded on several maps and

added to obtain the total number of people affected in the area covered by the floods.

Flood boundaries were determined by aerial surveys, carried out on 3 and 12 November 1997, and at the end of December during the in situ surveys. The limits reached by the water were recorded using a Magellan GPS 3000 XL Global Positioning System (GPS). These data were then mapped with the database information, thus allowing definition of which villages were affected and computation of the number of people requiring immediate assistance⁴.

³ Vaidyanathan, K.E. Report of the UNPFA consultant on population statistics of Somalia. UNDOS economic Planning Unit, UNDOS 97/32, December 1997.

⁴ UNDOS. Flooded areas in Lower Shabelle and Middle Juba from aerial surveys 3/11/1997 and 22/11/1997, Part 1-6, 1997.

Field surveys

Figures from ICRC seed distribution programs were obtained during assessments carried out by ICRC field officers. Some of the officers have been based in their respective area for many years and know the different villages and their traditional leaders particularly well. In this case the figures can be considered reliable. In areas where local knowledge is not as comprehensive the figures obtained are in general overestimated and correction factors were used to carry out a balanced distribution of seeds, which was mainly concerning farmers of Bantu origin. Large settlements were, and still are, difficult to assess and the figures for town and villages with a number of families greater than 300, obtained from the traditional leaders, were also corrected. For that specific program a factor of 0.6 was used for a settlement greater than 300, while for villages with a number of families between 100 and 300 a 0.75 correction factor was used.

Rapid assessment

During the floods, the figure for the number of families living in town or villages, displaced in makeshift camps or having found shelter on dikes were obtained from local authorities and traditional leaders, and through rapid assessments during field surveys using classical counting methods of representative areas (number of people of huts/hectare)⁵. Figures obtained using this method were biased by personal estimation and were in general, overrated. This is particularly so if relief workers had other priorities such as installing water treatment units or cleaning and disinfecting wells or other time-consuming emergency related activities.

Results

At the end of October, it was clear that the floods would last for months. Rainfall in the Juba Valley was

⁵ Telford J., counting and identification of beneficiary population in emergency operations registration and its alternative. Good Practice Review, No.5, p.61, RRN, September 1997 (See under Gallery).

monitored from 1-20 October at different location along the river and amounts 6 to 10 times higher than normal were recorded⁶. At that time, the floods were moving down river to Lower Juba where the situation was becoming more alarming due to the influence of the river Shabelle which was also overflowing its banks. By mid-November almost the entire population of Belet Weyne was displaced and had gathered on the higher grounds close to the airport, where it could be assisted. Water, sanitation and medical needs were provided for an estimated 25-27'000 people⁷. However, the rivers were not only fed by the higher rainfalls in Ethiopia but also by complete abnormal rainfall levels in Somalia, increased the flooded areas to an extent not observed during the last 50 years. Figure 1 clearly shows the differences between the 1997 rainfall and normal rainfall patterns⁸.

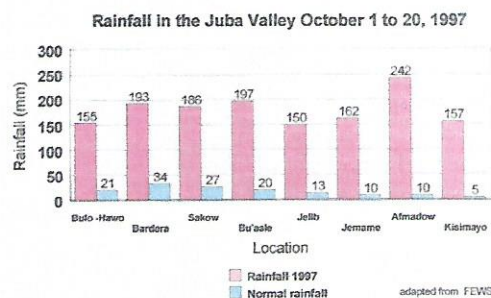


Figure 2 Differences in rainfall between normal and 1997 values.

At the end of November, the Somali Inter-Agency Flood Response Operation – a joint effort by UN agencies, NGOs and ICRC – had brought some relief to the stranded people, but in-depth assessments could only be performed from the beginning of December. The continuous rise and fall in water level had obliged displaced people to move to safer

⁶ FEWS Watch. No. 27, November 1997

⁷ Salone G.L. and Werdmueller M., Report on the water and sanitation program in Belet Weyne during the floods. ICRC. January 1998.

⁸ FSAU/FEWS/Somalia in www.unicef.unon.org/somalia/pics.

ground and most of the locations could still only be accessed by boat after long trips. Figure 3 shows the area south of Jilib affected by the floods. In the next figure an example of the maps produced using the Russian topographic maps at 1:100'000. Affected villages or settlements are shown as well as the number of families concerned.

The boundaries of the flooded areas are indicated on the map were developed from aerial surveys carried out at the beginning of November. On the same map, the prewar populations of the affected villages are indicated using proportional squares. The total number of people (families) considered in the seed distribution program is shown with the use of circles, proportional to the number of families per location. At the end of November, most of the villages located South of Jilib, down the river to Jamaame, were totally flooded, but those South of Jamaame were not yet so adversely affected. They were nevertheless included in the assistance programs due to their isolation, most of the roads having been cut or damaged by the rising waters. At locations beyond the limits of the flooded areas, the number of families far exceeds the prewar figures and the increase is certainly due to people coming from several villages to find refuge.

Due to the combined effects of both rivers, all the villages South of Jamaame were eventually also severely affected by the rising waters and makeshift camps were set up on higher grounds. Their locations can also be spotted in figure two, recorded at different sized circles.

For a total of 77 villages, reported in figure 4, there are large discrepancies between the figures obtained using the two different methods of estimation.

Reported in figure 5 are the values for 22 villages located between Jilib and Kamsuma (not included).

They were chosen because all the villages were similarly affected and comparison are of some validity. This is not the case for the villages South of Jamaame, where only part of the population had to move out of their huts or houses.

Figures of pre-war data are significantly lower than the ICRC agro-corrected ones with the number of families counted using the number of structures

being 1934 compared to 2909 for the ones obtained using ICRC corrected data. The uncorrected value for the considered number of villages is 3909 families and can be compared to the ones obtained during watsan surveys, up to 3760, while almost all the people were affected and stranded in makeshift camps. For the 77 villages considered the discrepancies are consistent with the results for the 22 villages. The number of families from prewar estimates being 11'790, the ICRC agro-survey corrected ones being 17'561 and the uncorrected ones 26'520. The total watsan estimates for 3 settlements was 25'720 families.

Relief response (water and sanitation)

Predictions from a GIS cannot tell where people have found refuge and in-field assessments must be conducted. Information in the limits of the floods are of paramount importance in order to prioritize the areas to survey and to estimate the magnitude of the response once the strategy for an intervention has been prepared. A total of 33 settlements were visited during the assessment trips. The objective of these field trips was to find out where the people were and assess their immediate needs. It was clear that the entire area was in need of assistance but in every areas, different types of activities had to be implemented. Even though several wells were still operational in Jilib town, almost all the population of Jilib was without any possibility of having access to clean water – the only available source being that of the river. Knowing the number of the displaced families in need was crucial when temporary water supply treatment stations had to be set up.

Logistical constraints were enormous and objectives as low as two liters of potable water per person were chosen. Controlled preparation of chlorinated water after alum coagulation has been preferred to mass distribution of disinfected tablets, the impact of the last option being questioned in many occasions, particularly when the turbidity of the raw water is high, which was the case in this situation. Treatment kits for 1000 people have been designed to fulfill the objective, with batch turbidity removal

Lower Juba Valley (Somalia)

Comparison between prewar data (1986 + 25 %)
and ICRC agro survey 1998 for selected villages

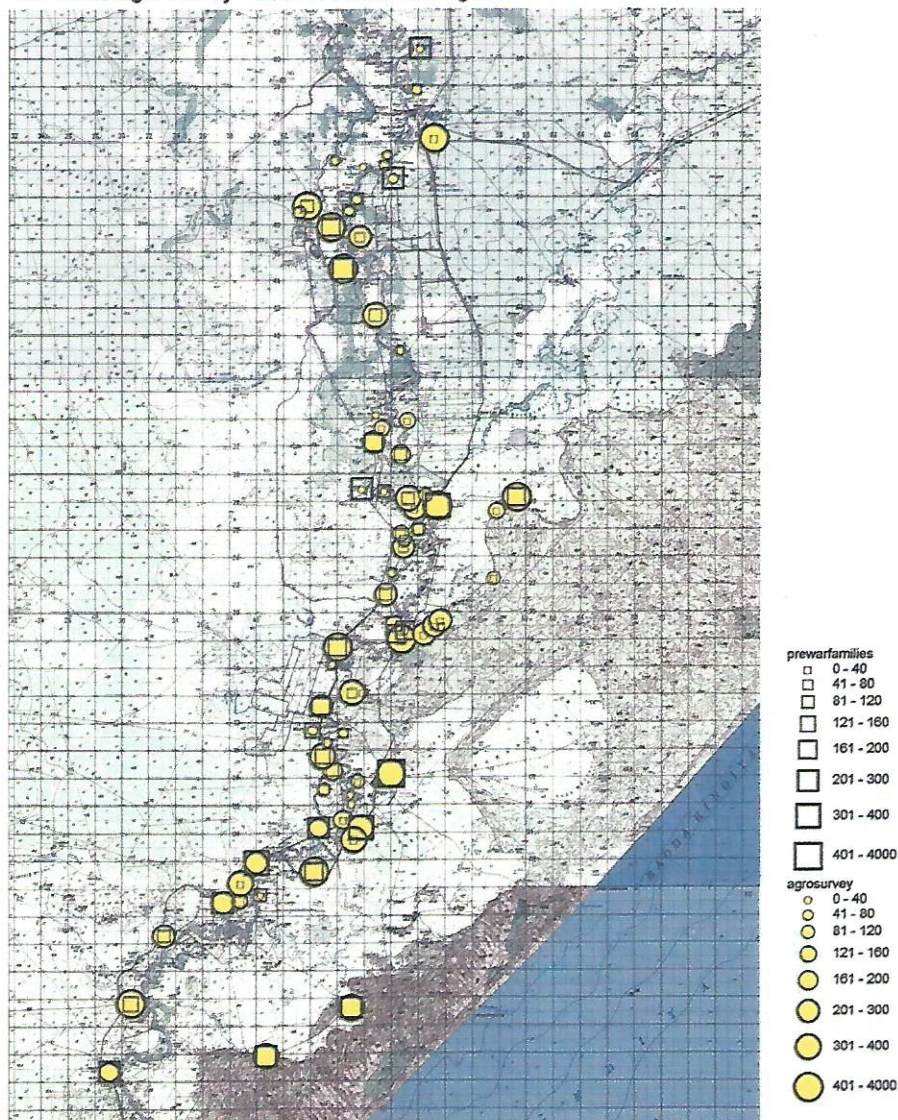


Figure 4 Differences between data collected from an agro survey (corrected) and the prewar data computed from the topographic maps

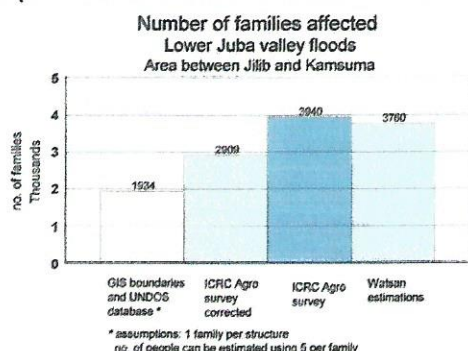


Figure 5 Different estimation methodologies

and residual chlorine levels between 0.3 and 0.5 mg/l and a distribution station for every 250 people, refilled at least five times a day and operated by Somali health workers. In the area of Mareere, 16 hand operated water treatment stations were set up at 9 displaced people sites and 3 other in the Jilib area. They were kept in operation until the displaced people could use again the village wells, which had to be cleaned and disinfected. 17 wells have been rehabilitated and cleaned, with a further added in January. In the area South of Jamaame, 22 stations have been set up in 15 camps, surveyed by the end of the year. At another 9 locations, the second phase of the strategy to provide clean water to the people was implemented and by the end of February more than 50 wells had been made operational.

Latrine digging and surface spraying to decrease the number of vectors transmitting diseases were also conducted.

Mosquito nets were distributed to about 9000 families, in coordination with the efforts of other organizations.

Discussion

During emergencies it is always difficult to gather precise figures for people requiring assistance. Several methods which can be used to collect data are known by the majority of the relief workers. But in emergency situations, the main objective is to

deliver immediate relief and, in general, a rough estimation of the number of affected people is considered sufficient, particularly for water supply assistance projects. Logistical constraints may delay the distribution of the very much needed assistance and when the people are finally reached, immediate action is required. Fine tuning may be postponed. Engineers, health workers and other representatives of the agencies involved in setting up a basic response are very busy, if not overwhelmed, in carrying out their daily tasks. Data collection is generally considered to be a secondary priority, particularly if rough estimates can be obtained. Only later there is time for accurate counting and for the evaluation of the impact of the emergency activities. Numbers (or denominators) are generally over estimated and great variations may be observed in figures given by different actors. Plans of action must be prepared quickly and lack of time for proper assessments is common. Consequently budgets also reflect the lack of precision and donor skepticism is sometimes understandable. The need for better preparedness has been recognized by NGOs and other organizations.

Recently, GIS has become popular among emergency relief agencies and new tools like GPS allow easy interaction with geo-referenced maps. Data can be visualized, sorted by type and analyzed. In the specific case of the Somalia flood emergency, the limits of the flood boundaries could be mapped and the number of affected villages calculated, provided that the appropriate data were available in a database. Databases provide reliable information for relief organizations to develop precise plans only if they are continuously updated to improve accuracy, using frequent cross-checking mechanisms. UNDOCS has been setting up such databases for several years, but they need to be completed and updated. In this particular occasion, the numbers used were obtained from prewar maps and some errors were inevitable. Some villages, like Gududey, close to the Mareere area, were even not reported, and other villages have certainly grown larger than the 25% increase used here for the estimates.

On the other hand, data obtained from the people in need is certainly overestimated, due to the natural tendency to try to obtain more than is really needed. This is common in most the emergency and sometimes there are the very same agencies who are inflating the figures, mainly for funding and to cover non-direct costs, in the increase everywhere. In this specific case comparisons could be made using four sets of data, total numbers obtained using prewar data, ICRC agro-estimations obtained before the floods, corrected and not corrected, and estimates obtained during the watsan field surveys carried out beginning of December 1997 in 33 locations (settlements, makeshift camps and on the dikes). Unfortunately, it was not possible to determine from which village the displaced were coming. It has been assumed that most of the people in the camps located East of Mombasa island (Juba) have probably been set up by people coming from the nearby villages, but elsewhere this assumption is not valid. It is also the case for the area of Mareere, where it is likely that almost all the people of the nearby villages found a safe area on the main dike and the estimated population may be compared with some degree of confidence. But, even here, the discrepancies are high, as it can be seen in the next table.

Table I. Estimated number of families in Mareere area

Prewar data	1087
Non-corrected data	3520
ICRC agro-survey	2349
Watsan-survey data	4160

The difference between prewar data and the ICRC agro-survey data can be attributed to the fact that the village of Gududey, assumed to have about 1000 families (600 after correction) is not recorded on the prewar maps and the figures for this area should therefore be increased accordingly. But ground data may also be inaccurate. Despite the fairly good knowledge of the area by the ICRC field officers, a correction factor had to be introduced to take into account the very likely exaggeration of the number of people concerned by the seed distribution.

Watsan surveys clearly overestimate numbers, but it does not affect too much the intervention, people may have 2 liters of potable water instead of 3/p/day, which, in such situations is sufficient in the short term. The number of affected families in the villages South of Jamaame was quite low. They have been affected, but not to the same proportion than the villages located between Jilib and Kamsuuma, at least initially. The figures did not include the villages of Gob Weyn, Ludlow, Yontoy, bulo Gaduud, etc. and estimated were for dwellings under water. It was only later that the water level in this area rose, triggering the inclusion of the villages South of Jamaame in the relief effort.

Conclusion

In this case figures obtained from GIS data most probably underestimate the number of people affected. Discrepancies between GIS estimations based on prewar data and field surveys are important to note. It has also to be bore in mind how the prewar data have been obtained and corrected. The number of families "counted" during difficult rapid assessments is always much larger than what is obtained using corrected prewar data.

A GIS is able to estimate the order of magnitude of the global number of people concerned and may help to predict where the displaced may find safety. However, it cannot tell where the individual families of a village are heading for shelter, even if topographic information may give some hints.

Nonetheless the GIS approach allowed the different agencies to plan their food relief assistance and helped to prioritize different areas of need. It is well to remember that these priorities could not always be respected due to logistical constraints and the rapid evolution of the situation.

Bearing in mind the difficulties of conducting precise assessment in the field due to lack of time and logistical constraints, it is very likely that a GIS approach may be more useful than the rapid assessment surveys in providing realistic estimation

of the global number of affected people, provided that updated relevant information is stored in an accessible database.

The present work shows without a doubt that field surveys are still of paramount importance in defining where to implement specific activities. This approach is also essential to assist relief workers in appreciating the magnitude of a problem and so planning more specifically prior to requesting donor support.

Acknowledgements

Markus Fasel is thanked for providing the ICRC agro-data.