Bush stock (Perennial plants)
Bush weight was derived as a product bush standing stock and average percent cover of bush in the baseline plots. Bush sanding stock are based on NBS 2003 report (reference is made to highlighted text on pages 8 and 19 of the attachment).

Fresh standing stock of bush (25 tons) were converted into dry matter by a factor 0.6 (very conservative approach). The average percent cover of bush (based on plot data in Carbon block 3) is 1.49% (very low bush cover percent). Thus average per ha dry matter of bush [1]is about 0.22 tons.

Fresh Tons	Conversion factor	Dry matter	Avg Bush Cover	Avg Dry matter
25	0.6	15	1.49%	0.22

Grass stock
Grass weight was derived as a product grass standing stock and average percent cover of grass in the baseline plots. Grass sanding stocks are based on rangeland data in Mbarara area 2005 - 2006 (Technical Services Division of NFA was hired by Ministry of Agriculture Animal Industry and Fisheries, MAAIF to carry out the study, the Report is still under review and not yet published).

Air dry grass stock (i.e., 0.236 kg per $1m^2$ or 2.36 tons per ha) were converted into dry matter by a factor 0.43 (David Nkuntu personal communication. Mr. David Nkutu is a well experienced botanist at Makerere University, Kampala and was heading the rangeland field inventory. The average percent cover of grass (based on plot data in Carbon block 3) is 57.9% (indicating high grass cover). Thus average per ha dry matter of grass is about 0.58 tons.

Fresh Tons	Conversion factor	Dry matter	Avg Grass Cover	Avg Dry matter
2.36	0.43	1.01	57.9%	0.58

2. Background to the National Biomass Study

The National Biomass Study, (reference number: NR 12 (A) / UGA 003), was originally part of the Second Power Project within the then Ministry of Energy, which included a number of woodfuel-related studies. In 1987, it was decided that the Forestry Department, FD, and the Norwegian Forestry Society, NFS, implement this project with close links to the Forestry Inventory Project of the Forestry Rehabilitation Programme, FRP. The Norwegian Agency for Development Co-operation, NORAD, provided the funds through 100% grant, which was channelled through the Norwegian Forestry Society. The project has had several Phases i.e. Phase I (1989-1992), Phase II 1992-1996 and Phase III 1986-2000.

Phases I and II, were initially planned to take four years, but it soon became evident that this was over-optimistic. A considerable expansion of the scope of the project in Phase II made it necessary to extend it, up to a total of 6.5 years that is until June 1996 which was followed by Phase III.

2.1 Phase I: Overview of objectives and achievements

Phase I (1989-92) was a detailed study of the woody and non-woody biomass (trees, bush, crop residues), which are potential woodfuel in nine peri-urban areas. Phase II (1992-1996) though slightly less detailed was broadened to cover the whole country. It had several additional and/or enhanced components related to natural resource mapping and analysis in general.

As already mentioned, Phase I aimed at providing a more detailed overview of the woody biomass situation in nine peri-urban areas of Kampala, Jinja, Kamuli, Mbale, Kumi, Moroto, Arua, Mbarara, and Kabale. The area coverage in each varied from 920 km^2 in Mbarara to about 3,000 km^2 in Kampala. The total area was about 14,000 km^2. The basis for their selection was regional representation and perceived woodfuel deficits.

The land cover/land use stratification for the nine areas was carried out in collaboration with the Department of Surveys and Mapping using 1:25,000 scale aerial photographs with minimum field surveys (*ground-truthing*). This required about two person-years, with another person-year for manual digitizing and interpretation. These maps served the purpose in Phase I, but were clearly sub-standard for Phase II and therefore not used further.

Activities in Phase I were related to collecting and processing vast amounts of empirical data such as:

(a) *Sample Plots:* A total number of 19,866 plots each measuring 50 m by 50 m were classified using aerial photos. A sub-sample of 3,417 plots were physically measured or assessed on the ground.
(b) *Trees:* A total of 2,721 single trees, (123 different species), were measured for volume or weight. This is termed destructive sampling.
(c) *Tree Species Specimens:* A total of 4,556 specimens, representing 112 different tree species were weighed under green and air dry conditions.
(d) *Bush Plots:* A total of 38 plots classified as bush each measuring 10 m by 10 m were weighed to establish their woody biomass weights.
(e) *Sample Plots for agricultural residues:* A total of 64 plots each measuring 10 m by 10 m were assessed for specific crop residues.

Sub-stratification of bushlands - The data analysis of the previous bush measurements in Phase I revealed that bushlands as stratified earlier on the basis of 40% minimum canopy closure and a maximum height of 5m was insufficient to estimate the standing biomass stock. This was due to the existence of various species and varying ecological conditions that make bushlands vary in both species composition and biomass density. Accordingly, two bushland groups were identified as Bush 1 (B1) and Bush 2 (B2). The biomass density in B1 is on average, half that of B2.

B1 consisted mostly of species which whenever conditions allow, saplings grow from shrubs to trees i.e. *Acacia spp, Combretum and Solanum spp*. The average fresh weight of this bush type is about 25 tons per ha.

B2 was composed of climbers, lianas, and species with non-defined numerous stems that form a dense network of mostly undergrowth vegetation cover. Examples include *Lantana camara,* and *Harisonia spp*. The average fresh weight of this bush type is about 45 tons per ha.

Note that the above sub-stratification and its range were preliminarily used on a work basis only. This was because, at that time, it was not known whether this sub-stratification would turn out to be significant by reducing the variance for better accuracy especially before enough additional plots were measured and all data analysed.

Satellite image interpretation

SPOT XS satellite imageries were used for preliminary interpretation, "ground truthing" and final delineation in preparation for data input or capture in the Geographical Information System.

Preliminary interpretation - The theory behind satellite image interpretation is that different land cover types reflect different quantities of the sun's incidence rays into space. The reflected incidence rays are captured by sensors aboard a satellite vessel plying at over 800 km in space and