UNITED REPUBLIC OF TANZANIA
MINISTRY OF NATURAL RESOURCES AND TOURISM
TANZANIA WILDLIFE MANAGEMENT AUTHORITY – TAWA

NATIONAL WILDLIFE UTILISATION QUOTA SETTING GUIDELINES

Made under Section 121 (a, f) of the Wildlife Conservation Act Cap. 283

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Contents

Acronyms

CBD - Convention on Biological Diversity
CITES - The Convention on International Trade in Endangered Species of Wild Fauna and Flora
DGO- District Game Officers
FAO- Food and Agriculture Organization of the United Nations
GCAs - Game Controlled Areas
GPS- Global Positioning System
GRs - Game Reserves
HOs- Hunting Operators
IUCN -International Union for Conservation of Nature
MNRT- Ministry of Natural Resources and Tourism
NCA - Ngorongoro Conservation Area
NPs- National Parks
OAs - Open areas
PH- Professional Hunter
SADC - Southern African Development Cooperation
TANAPA- Tanzania National Parks
TAWA- Tanzania Wildlife Management Authority
TAWIRI- Tanzania Wildlife Research Institute
TFS- Tanzania Forest Services Agency
WMAs - Wildlife Management Areas

1.0 Introduction

The Tanzanian Government through Tanzania Wildlife Management Authority (TAWA) in the Ministry of Natural Resource and Tourism (MNRT) has the mandate to oversee and coordinate sustainable consumptive utilisation of wildlife resources in the country. TAWA was established under Section 8 of the Wildlife Conservation Act No. 5 of 2009 and is tasked with the functions of addressing protection, management, and administration of wildlife resources outside National Parks (NPs) and the Ngorongoro Conservation Area (NCA). Consumptive utilisation of wildlife resources controlled by TAWA includes trophy hunting, resident hunting and live animal trade. All consumptive uses of wildlife generate revenue that supports development in Tanzania at different levels. Proportionally, however, more than 75% of TAWA revenue comes from trophy hunting. Local communities surrounding hunting areas, receive 25% of the revenue accrued from hunting tourism as game fees. The revenue accrued from trophy hunting, apart from supporting rural development, also enables TAWA to manage wildlife resources in Game Reserves (GRs), Game Controlled Areas (GCAs), Open areas (OAs) and Ramsar Sites (International Wetlands of Conservation Importance).

For a long time, quota-setting procedures in Tanzania have been challenged by limited data and a robust scientific system to provide an exact number of animals that can be hunted in a particular hunting area and in a given hunting period. The data used are inadequate to determine the exact quota that can be harvested for each species and in each area. Standard procedures to involve stakeholders in data collection and quota setting processes were also limited. Other challenges included insufficient capacity among District Wildlife Officers and villagers in Wildlife Management Areas (WMAs) to conduct realistic animal censuses and propose realistic harvesting quotas as well as inefficient mechanisms and tools to consolidate information on trophy quality of hunted animals. Additionally, the Tanzania Wildlife Research Institute (TAWIRI) has been receiving inadequate funds to conduct wildlife censuses and generate data that can be used to guide relatively accurate quota setting process in Tanzania, but also inadequate monitoring of quota utilisation and hunting practices.

The TAWA's Medium-Term Strategic Plan 2018/19–2022/23 emphasises the sustainable management and utilisation of wildlife resources. It is from this understanding; TAWA sought to develop quota setting guidelines that will guide off-take with minimal effect on the wildlife resource base, but maximizes earnings from different types of consumptive uses; i.e. trophy hunting, resident hunting and live animal trade. The guidelines will, *inter alia*, direct how to engage various stakeholders to collect, store and analyse wildlife data that will be used to guide quota setting procedures while complying with national laws

and international agreements (e.g., The Convention on International Trade in Endangered Species of Wild Fauna and Flora – CITES; The Convention on Biodiversity Conservation – CBD; The International Conservation Union - IUCN, etc.).

Globally, principles of quota setting emphasize on the need to ensure resources are utilised sustainably by setting harvesting levels that do not negatively affect the population numbers, population structure or lead to extinction of the species. The IUCN provides biological principles for sustainable wildlife utilisation, which also involves effective quota setting in order to ensure that utilisation does not:

a) Contribute to long-term population declines of the hunted species or of other species sharing its habitat;
b) Alter processes of natural selection and ecosystem function;
c) Facilitate poaching or illegal trade of wildlife; and
d) Manipulate ecosystems or their component elements in ways that are incompatible with the objective of supporting the full range of native biodiversity.

These principles ensure biological sustainability, net conservation benefits and socioeconomic and cultural benefits to the local communities. Furthermore, the IUCN principles form a strong base to guide quota setting, community involvement in planning wildlife utilisation and monitoring the utilisation of wildlife resources.

The national wildlife utilisation quota setting guidelines are developed based on:
Section 121 (a, f) of the Wildlife Conservation Act Cap 283 that states "The Minister may make regulations prescribing or stipulating any matter relating to:
(a) conservation, management and utilisation of wildlife; and
(f) better carrying out the provisions of this Act".

The development of the guidelines also takes into consideration the other enabling policies and legal frameworks, including the IUCN principles on wildlife utilisation, FAO guidelines on wildlife hunting, best practices from SADC Region as well as ecological, population principles on wildlife utilisation and participatory quota setting processes. Prior to the development of these guidelines, a "*Manual for Establishing Hunting Quota Setting Guidelines (2020)*" was prepared. The guidelines are intended to address the previous shortcomings and improve the process of hunting quota setting, utilisation and monitoring in Tanzania.

1.1 What are quotas and why do we need to set them?

In wildlife management, the hunting quota is the number of game animals that is allowed by the wildlife authority to be hunted by the hunting operator in a Hunting Area during a hunting season. In other words, a quota represents the number of animals that can be sustainably removed/harvested from a population each year without biologically damaging that population. Setting quotas ensures that wildlife populations maintain themselves and continue to survive into the future. Only through continued survival of wildlife populations can financial and economic benefits be ensured. A combination of local knowledge and scientific methods is required to help the process of estimating animal numbers and setting quota.

2.0 Types of data to guide quota setting in Tanzania

Different types of data shall be collected and used to estimate quota to be harvested in each ecosystem. Some of the data will include:

2.1 Name of the ecosystem and hunting Block

Name of the ecosystem including hunting block (and its GPS coordinates).

2.2 Estimated average population size of trophy species

The estimated total population of each trophy species recorded in the ecosystem and hunting blocks. Wherever possible, data on population structure will be collected as well.

2.3 Average trophy quality records

At least one key parameter will be used to indicate trophy quality, in each trophy species (e.g., average horn size, etc.)

2.4 Average encounter rate

On average, the number of animals for each trophy species, which were encountered in the ecosystem (including hunting blocks) by HOs and PHs in respective hunting blocks. The number of times recorders get in contact with different species (or with a trophy class animal) to be harvested - 'encounter rate'.

2.5 Average search efforts (days/hours)

The overall amount of time (hours/days) used to search and harvest an animal - 'effort/harvest' ratio. An increase in effort to harvest a particular species of the same quality may indicate that the population is declining (assuming other factors remain constant).

2.6 Harvesting success rate (hunting season results)

Quota approved in past years *vs*. quota harvested (offtake *vs*. approved quota).

2.7 Population rate of increase for different trophy species

The population growth rate of different trophy species will be required to determine a proportion to be harvested after determining the average population (Table 1). In the meantime, estimated population rate of increase from long-term studies in some countries from in Sub-Saharan Africa can be adopted and used by TAWA (Table 1).

Table 1: The population growth rate values (r_{max}) for some large mammal species involved in hunting (W= are average weight values for adult females as adopted from Kingdon, 1997).

Species	**W (kgs)**	$r_{max} = 1.375W^{-0.375}$
African bush elephant (*Loxodonta africana*)	1,950	0.0518
Cape buffalo (*Syncerus caffer caffer*)	550	0.0833
Waterbuck (*Kobus ellipsiprymnus*)	180	0.1266
Impala (*Aepyceros melampus*)	50	0.2047
Grants gazelle (*Nanger granti*)	53	0.2002
Thomson's gazelle (*Eudorcas thomsonii*)	20	0.2886
Plains zebra (*Equus quagga*)	213	0.1188
Blue wildebeest (*Connochaetes taurinus*)	200	0.1217
Common eland (*Taurotragus oryx*)	450	0.0898
Hartebeest (*Alcelaphus buselaphus*)	151	0.1352
Topi (*Damaliscus lunatus*)	109	0.1528
Sable antelope (*Hippotragus niger*)	210	0.1195
Bohor reedbuck (*Redunca redunca*)	40	0.2225
Southern reedbuck (*Redunca arundinum*)	48	0.2078
Mountain reedbuck (*Redunca fulvorufula*)	48	0.2078

Species	**W (kgs)**	$r_{max} = 1.375W^{-0.375}$
Steinbuck (*Raphicerus campestris*)	12	0.3495
Bushpig (*Potamochoerus larvatus*)	57	0.1948
Common warthog (*Phacochoerus africanus*)	60	0.1911
Greater kudu (*Tragelaphus strepsiceros*)	168	0.1299
Lesser kudu (*Tragelaphus imberbis*)	63	0.1877
Roan antelope (*Hippotragus equinus*)	252	0.1116
East African oryx (*Oryx beisa*)	152	0.1349
Oribi (*Ourebia ourebi*)	14	0.3299
Bushbuck (*Tragelaphus sylvaticus*)	42	0.2185
Hippopotamus (*Hippopotamus amphibius*)	1,505	0.0571
African lion (*Panthera leo*)	152	0.1348
Leopard (*Panthera pardus*)	38	0.2268
Caracal (*Caracal caracal*)	11	0.3611
Gerenuk (*Litocranius walleri*)	37	0.2291
Sitatunga (*Tragelaphus spekii*)	63	0.1877
Klipspringer (*Oreotragus oreotragus*)	14	0.3299
Puku (*Kobus vardonii*)	66	0.1844
African civet (*Civettictis civetta*)	13	0.3392
Common duiker (*Sylvicapra grimmia*)	18	0.3002
Suni (*Neotragus moschatus*)	8	0.4069
Kirk's dik-dik (*Madoqua kirkii*)	6	0.4532

2.8 Carrying capacity

Carrying capacity is one of the key parameters that are used in determining harvesting rate (Table 2). The term is closely related to stocking rate and grazing capacity and all are briefly explained below.

Carrying capacity is defined as the maximum stocking rate possible, which is consistent with maintaining or improving vegetation or related resources. It may vary from year to year on the same area due to fluctuating forage production.

Stocking rate is defined as the number of specific kinds and classes of animals grazing or utilizing a unit of land for a specified period. It may be expressed as animal unit months or animal unit days per acre, hectare, or section, or the reciprocal (area of land/animal unit month or day).

Grazing capacity is sometimes used synonymously with carrying capacity, and is defined as the total number of animals, which may be sustained on a given area based on total forage resources available. It is the relationship between number of animals and area of land at any instant of time, expressed as animal-units per acre, animal-units per section or AU/ha.

In collaboration with various wildlife ecologists, TAWA will determine *K* values or stocking rates for ecosystems where hunting is practised. The estimated *K* value will be used in a formula to estimate wildlife harvesting rates in different ecosystems. Based on livestock stocking, however, there are range of capabilities for Tanzania, which may be used in the absence of real *K* values from the wildlife species. The tropical livestock unit (TLU) of 250 kg developed by FAO (1999) can be used as well (Table 2).

Table 2: Stocking potential by rainfall zones for Tanzania rangelands (Source: FAO, 1999).

Zone	Rainfall (mm)	Length of growing period (days)	Ha/TLU/yr
Arid	0 – 500	<90	>4
Semi-arid	500 - 1,000	90 – 180	2 - 4
Dry sub-humid	1,000 – 1,500	180 – 270	1 - 3
Humid	1,500+	>270	0.5 - 2

2.9 Minimum Viable Population (MVP)

The minimum viable population (MVP) is defined as the smallest isolated population (of a given species in a given habitat) having a 99% chance of remaining in existence for 1,000 years, despite the foreseeable effects of demographic stochasticity, genetic drift, environmental stochasticity (random changes in the environment), and natural catastrophes. For sustainable harvesting, MVP has to be taken into consideration to prevent overhunting of species to numbers below the MVP.

Standardised MVP values for vertebrates based on taxa or body mass are provided below for guidance (Table 3). TAWA will need to ensure there is sufficient data to know the population size of the utilised species in all ecosystems where hunting is practised. MVP has not been included in the logistic equation but the experts estimating quota from available data may be required to take the MVP into consideration.

Table 3: Standardised MVP values for different taxa at 95% CL (After Traill *et al.*, 2007)

Taxa/Body mass	MVP
Vertebrates	
Birds	3,742
Mammals	3,876
Reptiles	5,409
Body mass	
<1 kg	5,137
≥1 kg	3,956

3.0 A participatory framework for data collection and quota setting in Tanzania (Triangulation framework)

A participatory triangulation framework for data collection will involve collecting, storing and analysing wildlife data collected from various sources as reflected in Table 4. Some of the sources will include:

- TAWIRI where they conduct animal counts and other research activities;
- TAWA to provide data from protected and open areas outside the TANAPA, NCA, and FRs;
- TANAPA to provide data from areas adjacent to the park and where wildlife utilisation is practised;
- NCA to provide data, if there is an area around NCA where wildlife utilisation is practised;
- TFS to provide data from forest protected areas managed by TFS
- WMAs to provide data from communal protected areas managed by communities;
- Higher Learning and Research Institutions, which conduct research that generate population numbers and distribution of hunting species to provide data;
- Species specialist groups researching and monitoring species of interest (e.g., lion, leopard, elephant);
- Individual researchers that conduct research, which generates wildlife data showing population size and distribution; and
- Professional hunters operating in their hunting blocks.

Table 4: Some data to be collected by different stakeholders to guide quota setting in Tanzania

Ecosystem: _____ Hunting block_____ Year: _____

Species	1.Average population estimate (consider male ratio/% of males)							2.Comments/ remarks	3.Average trophy quality	4.Average encounter rate	5.Average search efforts/days	6.Current quota	7.Harvesting success rate	8.Quota requested	9.Quota approved
	TAWIRI	TAWA	WMA	TANAPA	NCA	HO/PHs	Av. pop								
Buffalo															
Crocodile															
Impala															
Hyena															
Lion															
etc.															

KEY:

1: **Av pop:** average estimated population of trophy species calculated from different data sources?
2: Comments/Remarks: population is stable -S, increasing-I and/or decreasing-D, how many animals were reported killed due to poaching or natural death, how many problem animals were reported in the ecosystem (for species classified in the problem animal group)
3: Average trophy quality: at least one key parameter should be used to indicate trophy quality, in each trophy species (e.g. average horn size, average ivory weight, average body length for carnivores, etc.)

4: **Average encounter rate**: on average how many animals, in each trophy species, were encountered in the ecosystem, including hunting block by HOs and PHs in respective hunting blocks?
5: **Average search efforts**: on average, how many days are spent to encounter and harvest a trophy species?
6: Current quota: how many animals are allocated in the current quota/ecosystem/hunting block?
7: Harvesting success rate: how many individuals were harvested in the current quota? (% of individual trophy species harvested in the allocated quota)
8: Quota requested: how many animals are requested to be harvested in each species, ecosystem and/or hunting block?
9: Quota approved: how many animals should be approved, given the comments/remarks, a formula, among other paramete

4.0 Geographical areas where wildlife data for hunting will be collected

Main areas where wildlife data will be collected shall include:

- Game Reserves
- Wildlife Management Areas
- Game Controlled Areas
- Open Areas
- Forest Reserves

5.0 Personnel to be involved in data collection

- On the ground, wildlife data will be collected by different individuals and organisations (Fig. 1). Some data will be collected by rangers, village game scouts, forest guards, professional hunters and individual people who will be designated by TAWA will collect some data at specified locations.
- To have a reliable dataset, personnel who will be involved to collect data will need to undergo training on data collection protocols, recording and storage.

6.0 Tools for data collection

- There will be standard forms that will be used to collect all the required data.
- The forms will prescribe all the necessary entries needed to estimate population size of counted/observed animals.
- Data collection and filling of forms will be done electronically or in hard copy but later transferred into electronic form. This will entail the use of GPS, digital cameras or any other relevant equipment with the right software.
- The data collection tools shall be in conformity with that of the database at the local centre and head office.

7.0 Data processing

- Raw data collected by personnel on the ground will be submitted to the focal person at a designated centre determined by TAWA for that purpose.
- The focal person will be responsible for filtering and authentication of data before submitting it to the central database at TAWA head office.
- Depending on the type of data received and the available software, the focal person at the centre may determine hunting quota for species with sufficient data/information for that purpose.
- The focal person with the responsibility of handling, storing and processing data should be a qualified ecologist.

- Data from game scouts, park rangers, village game scouts (WMAs), individuals will be submitted to the local focal person.
- Data from higher learning institutions, researchers and TAWIRI will be submitted directly to the central database.
- It will be mandatory for game scouts, village game scouts, and professional hunters, to collect and submit wildlife data required for hunting quota setting.

8.0 Data collation, filtration and authentication

- All data to be used to estimate population size of hunted species must undergo a thorough expert process of collation, filtration and authentication.
- Data will be filtered and authenticated at the focal centre and at TAWA head office database.
- Any data submitted for this purpose, which is doubtful or does not meet the standard requirements shall be discarded.
- Only authenticated data will be used to set hunting quota for a specified species, area, ecosystem, or hunting block.

9.0 Centres of data storage

- There will be two centres of data storage: the focal centre at a localised area which will receive data from personnel on the ground and the TAWA head office centre, which will store data from all over the country and all sources.

10.0 Transfer of data to the head office

- Wildlife population data from focal points will be transferred to the head office by the ecologist in charge of the centre after been satisfied that all summarized data are correct.
- Under special circumstances, data may be transferred directly to the head office for processing.

11.0 Central database

- There will be a central database to store and process data for all species that are involved in hunting.
- The database will be used for storage of data and calculate the hunting quota of hunted species in accordance with the prescribed formulas for each species or taxa.
- The database will be located at TAWA head office and managed by competent personnel.

- Access to the database shall be restricted only to the authorised TAWA staff.
- A back up storage facility will be placed at TAWIRI head office for record purposes.
- The database at TAWA head office may be linked to the Ministerial database.

12.0 Management of central database

- The central database shall be established and managed by TAWA.
- Database staff shall have the responsibility of ensuring that the database is up todate (software and animal data) and contains only the authenticated and approved data
- The database staff shall have the responsibility of ensuring that the facility is always operational and in good condition
- The database staff will only share data upon the approval of the CC or his authorised delegate
- Only authorised staff will be able to access the database.

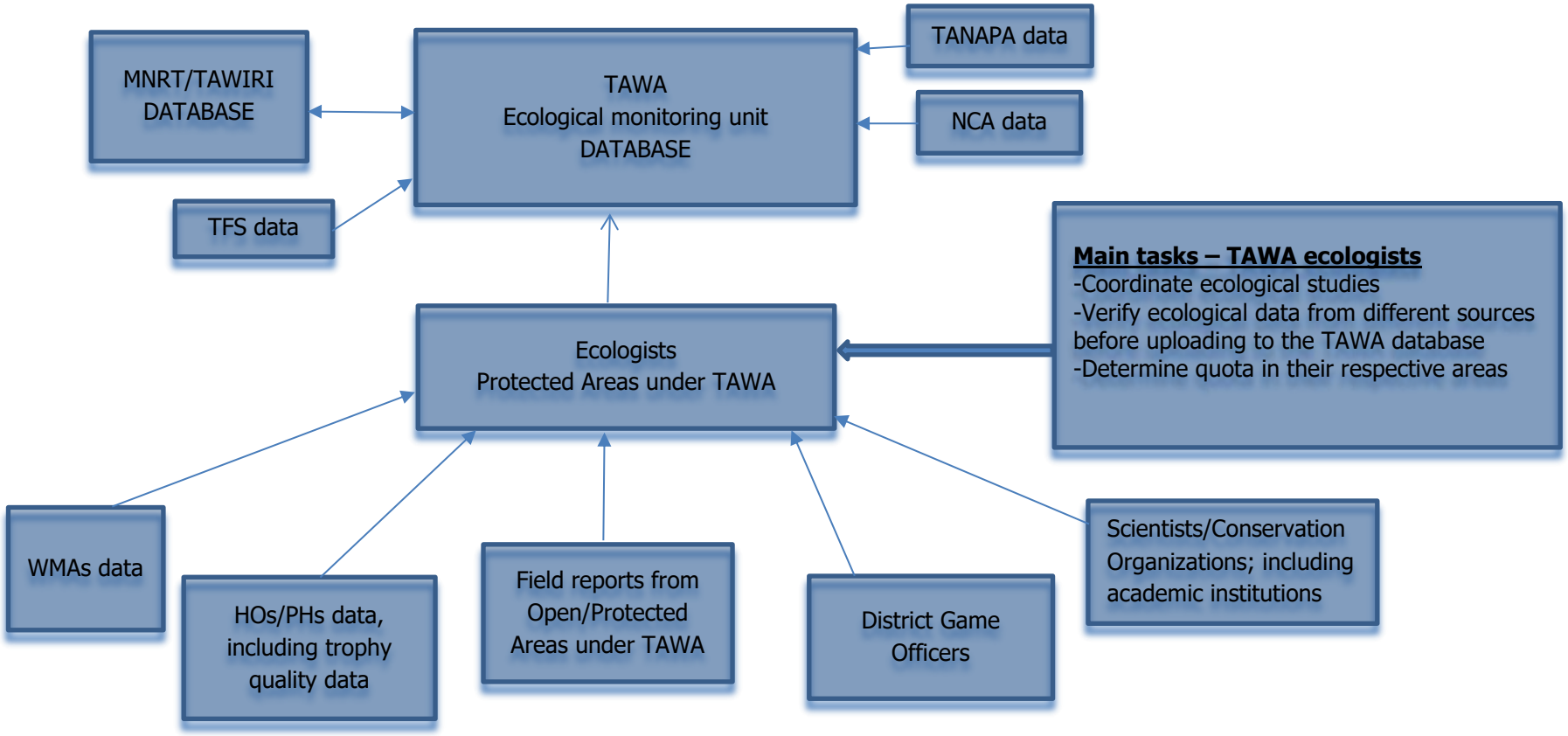

Fig. 1: Structure on how to collect data from different sources before are verified and uploaded in the MNRT/TAWA database.

13.0 Quota determination protocols

- The database shall have the software to assist the staff to determine hunting quota based on the available data and the formula shown below.
- Database staff shall be responsible for determining the hunting quota for all species whose data is available at the database
- Quota determination shall be based on specific species or taxa
- Quota setting will be guided by the logistic equation with density-dependent wildlife harvesting rate (*h*). The quota will be determined by calculating the rate of offtake (h) given as:

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - hN$$

$$N(t_0) = N_0$$

Where

r -intrinsic population growth rate and is constant

N -population size at time t

h - the rate of offtake (harvesting rate)

K - carrying capacity of the environment without harvesting

Let $H = hN$ be the number of animals harvested each time period (annual harvest), $N(t) > 0$ and

Harvesting rate, $0 \le h < 1$.

Sustainable yield is attained when the population is at equilibrium (occurs when $\frac{dN}{dt} = 0$).

$$\frac{dN}{dt} = rN\left(1 - \frac{N}{K}\right) - hN = 0 \Rightarrow rN\left(1 - \frac{N}{K}\right) = hN$$

i.e., the maximum sustainable yield (MSY) is given by:

$$MSY = \frac{1}{4}rK$$

In practice, MSY is used to set an upper limit that can be sustainably harvested from a population each year without biologically damaging the targeted population.

Moreover, the proposed logistic equation works better for most herbivores. Quota setting for the cat family might require additional information from the species specialists working in different ecosystems in Tanzania.

r: will be determined from long term species population studies

N: will be determined from the census/research conducted in hunting areas as explained in Section 3

h: will be determined from the logistic model in terms of r, N and K

K: carrying capacity will be estimated from long term habitat studies

14.0 The Ministerial Hunting Quota Setting Advisory Committee

Section 44 (2) of the Wildlife Conservation Act Cap 283 states "*The Minister shall, for purposes of advising the Director on setting of quota and review of such quotas, establish a committee consisting of persons who possess knowledge and necessary expertise in matters relating to wildlife management*".

- The hunting quota determined by the central database shall be submitted to the Advisory Board for deliberations and approval.
- The Advisory Board shall have the liberty to discuss the proposed quota and advise TAWA management accordingly as per its establishment Order.

15.0 Verification and issuance/allocation of quota

- The approved quota shall be issued to the respective companies at the appropriate time to allow smooth hunting preparations to take place.

16.0 Training of staff to manage quota utilisation/hunting

- All personnel who will be involved in supervising quota utilisation shall get special training for that purpose.
- No quota-utilisation activity shall take place in the absence of a supervisor from TAWA.
- The TAWA staff supervising hunting shall record all the necessary information for hunting activity assessment and evaluation by filling the appropriate forms and submit to authorities.

17.0 Quota utilisation (responsibilities of companies, PHs, TAWA)

- Hunting companies shall be responsible for the hunting quota issued to their companies.
- Hunting companies shall make sure that quota utilisation is in accordance with the hunting permits issued by TAWA.
- Hunting companies shall submit to TAWA the hunting return reports with all the necessary documentation for evaluation.
- PH in the field shall take the lead in ensuring proper reporting of the hunting activities in his hunting block.
- TAWA shall be responsible for monitoring hunting exercises in all hunting blocks during the hunting season.
- TAWA shall ensure compliance by the hunting companies in quota utilisation and proper recording and reporting of hunting activities.

18.0 Noncompliance to the guidelines

- Any person who violates these guidelines shall be liable for punishment/penalty **to be further discussed with different stakeholders.**

19.0 Monitoring and evaluation of quota utilisation

- There shall be the monitoring of the hunting quota for each hunting area or block.
- Companies and their professional hunters shall be responsible for ensuring that hunting is conducted in accordance with the issued permit.
- Companies and their professional hunters shall make sure that all records required for monitoring are recorded and submitted to TAWA as required. These include but not limited to name of the area, animal(s) hunted, habitat, date, time, GPS, type of weapon, species, sex, trophy size.
- TAWA shall ensure that all returns from hunting activities are submitted to the central database for analysis and storage.