

PET-Livestock, Karamoja

A Pictorial Evaluation Tool for Body Condition Scoring Livestock
and Forage Assessment in Karamoja, Uganda



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A Pictorial Evaluation Tool (PET) for Body Condition Scoring
Livestock and Forage Assessment in Karamoja, Uganda

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UKaid from the British people

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INSTRUCTIONS FOR USE OF THIS MANUAL

This manual is printed on polypropylene. If you use this PET manual in the rain, DRY THE WET PAGES with a soft dry cloth before closing.

Contents:

What is PET-Livestock, Karamoja?

PET-Livestock, Karamoja **is a Pictorial Evaluation Tool that has been prepared:-**

- **to help assessors[1] to estimate, rapidly and *without touching* their bodies, the most common body condition of groups of domestic animals seen on the ranges, in fields, backyards, markets and by the side of the road;**

- **to standardise evaluations of livestock body condition and monitor a) changes over time in the same herds and flocks; and b) changes between similar herds and flocks in different locations at the same time.**

PET-Livestock, Karamoja presents photo-indicators of cattle, goats, fat-tailed sheep and camels in a progressive series of body condition, ranging from very thin to very fat for each species. The conditions are scored from '1' to '5' following a grading system developed in Australia for domestic livestock over 40 years ago. Whereas the Australian practice involves both observation and palpation of flesh in key areas of the body for all stock, the PET approach offers a simplified and modified version suitable for use in ranges, based on the critical observation of *one* highly visible *target area* or *feature* of the body that can be accomplished by a quick look at the animal from the correct angle or approach.

PET is divided into three parts:

- An explanatory section that tells you how to use the tool.
- A gallery of photo-indicators providing examples of body condition scores CS 1 to CS 5 of livestock by which to judge and categorise the animals under observation.
- Three annexes providing back-up information for livestock production assessors, including examples of record sheets; assessment methods for typical forage sources including grazing pastures, crop by-products and browse found in the rangelands of Karamoja.

[1] Livestock production planners and evaluators, food security assessors, field workers in agencies and NGOs; all persons conducting general rapid rural appraisals.

In the **PET**, each condition score for each species is portrayed by two photo-indicators of three carefully selected animals exhibiting the characteristics that define the given condition score. The two photo-indicators are linked:

- One photograph is taken approaching the chosen animal while it is either standing alone or within a small group, from a direction that presents the *target area* or *feature* upon which the condition score is based to best advantage.
- The second photograph is a close-up of the detail of the same *target area* or *feature* to help decision making.

By comparing the *target area* or *feature* of each of the animals under observation with the photo-indicators of condition-scored animals, assessors will be **able to select the photograph and record the corresponding condition score that most closely matches the mode condition of the animals in the group.**

Before you start

It is important that you spend time reading this introduction. It explains how to use PET-Livestock, Karamoja to get the best return from the time you invest.

In PET-Livestock, Karamoja, you will find sets of photographs of each familiar domestic species reared in Uganda. The sets are divided into grades or *condition scores* (CS) based on deposits of flesh. In the higher scores the outer layers are mostly fat, laid down in strategic locations or in obvious features of the body that a) can be seen clearly from a short distance away; and b) change significantly enough because of nutritional and physiological demands, for such changes to be noticed over time by a trained and conscientious observer.

The set of two photographs for the three animals in each score, each one slightly different from the other yet within the same score, provides the assessor with an indication of the variation that exists within the scores. Nature rarely moves in precise steps, so as with all animal characteristics except for births and deaths, scores merge into one another and become blurred around the edges. Therefore, the more animals scored the more reliable the result.

The **PET** methodology observes and scores individual animals, but it is the *most common* or ***mode*** condition score of the herd/flock that is the indicator of importance under current levels of management and programme interventions.

After using **PET** for a short time, most assessors with livestock production experience will automatically recognise the most frequently occurring or mode CS of a group of livestock. It takes little time to record the score that immediately springs to mind in a suitable note-book, in an efficient, formalised way, ready for analysis later. Given the level of access to range livestock and the time available for assessments, the *one-site, non-touch* condition scoring system presented in PET is the most appropriate rapid method of assessing the mode CS of herds and flocks in present systems of intervention/management. In such a way, small teams working independently may compare the body condition of different animals in different places at the same time; and the same animals (in different or the same locations) at different times.

The body condition of an animal depends on its immediate past and current level of nutrition and the simultaneous physiological demands placed on that animal, conditioned by its genetic make-up. Consequently, mature animals are the best indicators as their growing spurts are over[2], but they will still lose and put on flesh as nutrition levels change. Therefore, to obtain general overall impressions of flock or herd condition, it is better to disregard young stock *when scoring* [3] and concentrate your observations on the mature animals.

Within the mature sector, animals in early to middle lactation are under the heaviest demand so, given the same access to nutrition as non-lactating stock, milking females are most likely to be exhibiting lower condition scores as they 'milk off their backs'. Therefore, when evaluating change in CS for management purposes:

- It is important to compare *like with like,* so an overall identification of the physiological state (milking or non-milking; fattening or store) of the mature livestock being assessed is necessarily part of the procedure. If the group is mixed, a note of the proportions of each class in the herd/flock under observation is an important prerequisite for useful and enduring assessment[4].

A further point to consider is the overall health of the group. Whereas injury will usually only seriously affect the condition of a single animal, metabolic disorders and infectious diseases are likely to affect the condition of several head at the same time. Disorders and diseases will be invariably accompanied by other specific signs that are beyond the scope of **PET** to record. The *absence* of common non-specific signs of good health in several animals should always be noted on the record sheet. These include:

- Prominent, clear and placid eyes; moist nostrils; a straight back and; a stable confident posture.

Similarly, also note the presence of non-specific signs of ill-health in several animals such as:

- Mucus coming from nose/eyes[5]; a *staring* or patchy coat; faecal stains from long-term scours; exaggerated up-and-down rocking of several heads when a group is walking past[6]; and an unthrifty appearance.

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[2] Except for compensatory growth of store stock.
[3] Not when looking at general health.
[4]Experienced livestock enumerators/assessors count in clusters of heads – do the same thing and note the proportion of milkers.
[5] Maybe caked in dust.
[6] Rapid indicator of lameness.

Step 1

Which animals do I condition score?

To begin the assessment you must first identify the *target area* or *feature* of the animals to be assessed. If the herd or flock is mixed, each species may have a different *target area* or *feature* to be scored.

Livestock are sometimes herded together in mixed groups. You must decide which animals you need or are able to score. This is most usually determined by:

- Whether or not an 'indicator' species has been selected.
- The amount of time you can spend with the herd/flock according to the schedule of the assessment.
- The level of access granted by the livestock keeper.

As a rule of thumb, the large domestic animals in this series (camels and cattle) are easier to score than the small ruminants (sheep and goats) because their *target areas and features* are bigger and so, broadly speaking, are easier to detect. Therefore:

- If the assessment is being done mostly from a vehicle, **use camels and cattle as your main indicators.** Their scores connect also to the prevailing situation of both browse (camels) and grazing (cattle).
- If you are scoring mostly on foot, you may also **use sheep and goats as indicators**. The two species probably offer a much larger sample than camels and cattle as they graze (sheep)/browse (goats) in greater concentrations, so more stock can be viewed with less effort and less risk.
- In locations where the animals are held under control in confined spaces, with the permission of the livestock keepers, **all livestock** may be easily scored but be careful not to impede the operations that confine the livestock in the first place (vaccinating, kraaling, releasing from kraal, watering or selling).

Step 2

What are the target areas and features?

PET photo-indicators show estimated condition scores according to the amount of flesh (fat and muscle) deposited at chosen PET *target areas and features,* where rapid changes in flesh cover reflect general changes in body condition. Such changes can be easily seen from a short distance away from the animal and are not masked by other physical changes to the animal's condition brought about by other factors (*e.g.* daily inflation of rumen or breed).

Remember, *target areas and features* selected for PET-Livestock, Karamoja differ between domestic species:

- The chosen *target feature* for **camels** is the *hump*, which has been used for condition scoring before by Australian assessors[7].
- The chosen *target area* for **cattle** is the *loin*, more specifically the flesh cover over the *transverse and vertical processes of the lumbar vertebrae on the* ***right side*** [8] of the animal.
- The chosen *target feature* for **fat-tailed sheep** is the *fat-tail* and, in the highest scores, the contiguous nature of the fat cover of the tail with the fat cover of loin *on the* ***right side*** *of the body.*
- The chosen *target area* for all **goat** breeds is the *loin*, more specifically the flesh cover over the *transverse and vertical processes of the lumbar vertebrae on the* ***right side*** of the animal and, in highest scores, how the flesh sculpts a rounded rump.

The following three charts provide line-drawings showing the features and the external changes to look for in camels (Chart 1), fat-tailed sheep (Chart 2) the changes of flesh deposition around the lumbar (loin) vertebrae in cattle and goats (Chart 3).

[7] Crabb D., Manwaring J. and Connor T. (1990) Feeding Standards for Australian Livestock. Ruminants CSIRO, Australia; contains some of the history of condition scoring since Jefferies (1961) began the process with sheep.
[8] NOT influenced by daily pressure changes in the rumen.

Chart 1: Camels - Line drawings showing CS 1-5 based on the amount of fat in the hump

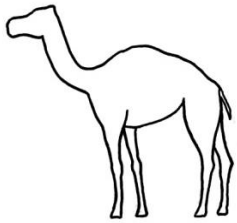
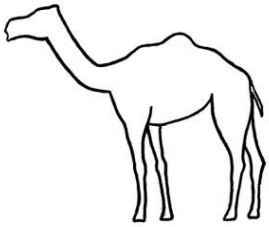
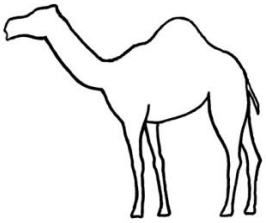
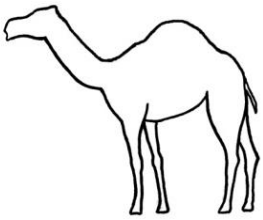
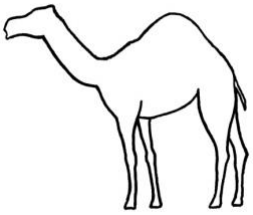
CS	Description	Illustration
1	The hump, though present, is indistinct; the hump sac contains little or no fat and often, in the case of older stock, falls to one side as a 'deflated' hump.	
2	The hump is present and the hump sac contains enough fat to create a distinct shape that is 'hump like' and sits on a base 25-35% of the dorsal length. The height of the hump is 10-20% of the base.	
3	The hump sac contains enough fat to create a hump, characteristic of dromedaries that is swollen beyond the width of the transverse processes, and sits on a base 35-50% of the dorsal length. The height of the hump is 10-20% of the base.	
4	The hump is the dominant feature, extending beyond the width of the flanks and occupying 50-70% of the dorsal length of the body. The height of the hump is 10-30% of the base.	
5	The hump is extremely dominant, extending beyond the width of the flanks and occupying 70%+ of the dorsal length of the body without a 'step' to the tail-head. The height of the hump is 15-30% of the base.	

Chart 2: Fat-tailed sheep - Line drawings showing CS 1-5 based on the amount of fat in the tail

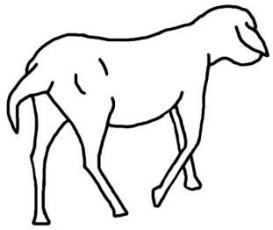
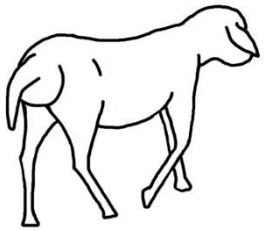
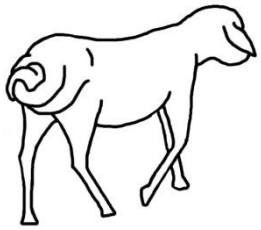
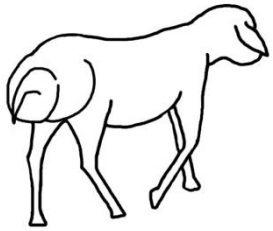
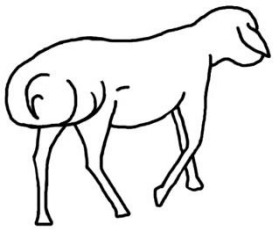
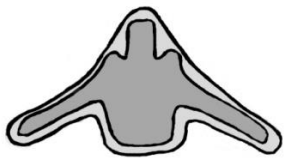
CS	Description	Illustration
1	No fat-tail is present. The shortened tail end is thin and extends from a biconcave-to-flat or 'deflated' tail-head.	
2	A fat-tail is present. The immediate tail-head is full and biconvex showing as a sphere; a second layer of fat is being or has been laid down around the base of the tail-head, offering a clear crease and a second roundel no more than twice the diameter of the first layer at the tail-head.	
3	The fat-tail is a well-formed organ at the base of the spine, comprising at least two (and sometimes three) discernible spherical layers of fat that are, in total, three times the diameter of the first fat roundel at the tail-head.	
4	The fat-tail is a heavy, elongated spheroid of fat, formed of several layers which may have merged into one mass with no creases - others retain clearer creases. The widest part of the tail is in line with well-covered lateral processes of the lumbar vertebrae.	
5	The fat-tail is a heavy, elongated spheroid of fat as in CS 4. However, the main layers are four or more times the width of the tail-head deposits and sculpted significantly beyond the width of well-covered lateral processes of the lumbar (loin) vertebrae, and extend more than half-way down the rump.	

Chart 3: Line drawings showing internal deposition of flesh in loin area for CS 1-5 for cattle and goats.

CS	**Description -** **Viewed from right side only**	**Illustration of cross-section of backbone in loin area**
1	Severely concave between spine and ribs. The backbone is very noticeable, lateral processes of the lumbar vertebrae may be seen as individual bones like *piano-keys*.	
2	Slightly concave between vertical and lateral processes. Ends of the lateral processes of the lumbar vertebrae are seen as a sharpened edge - not individual bones forming a *knife-edge*.	
3	The flesh deposits have sculpted a smooth slope (c.45°) between the tips of vertical processes (spine) to the rounded end of the lateral processes forming a *slope.*	
4	Fat and muscle deposits between the spine and the end of the lateral processes have flattened the back in the lumbar (loin) area like a *table-top.*	
5	Further fat and muscle deposits have swollen the flat back area to the extent, in **cattle** only, that a **groove** is visible between the deposits on either side of the spine. Fat is deposited over the tail-head and wobbles. **Goats** do **NOT show the groove** and the flesh cover is sculpted from the loin backwards to create a rounded rump incorporating the tail-head.	

Step 3

What is the condition score of my animal?

In PET-Livestock, Karamoja**, the photographs of livestock in what is termed 'good' condition have *red* backgrounds. The photographs of animals in 'medium' condition have *yellow* backgrounds. The photographs of animals in 'poor' condition have *blue* backgrounds.**

Remember, 'poor', 'medium' and 'good' are terms that are subjective and connect to purpose[9]. **PET** condition scores from **CS 1** to **CS 5** provide you with a simple measure, like a ruler, that can be used for any animal at any time.

Turn to the section in PET-Livestock, Karamoja that contains the photographs. For each domestic species you will find five pages of photo-indicators, one page for each condition score. Each page presents three pairs of photo-indicators, each comprising an **approach** and a **close-up** of the *target area or feature* that determines the score.

The **'Approach':** The photograph is taken from a distance of 3-5 metres from the animal. It presents the whole body from the angle that shows the *target area* or *feature* in context and to the best effect. In this regard each species has its own recommended **approach** angle which should be strictly adhered to:

- Camels - viewed from the side, either LEFT or RIGHT side may be used.
- Cattle - viewed from their RIGHT SIDE[10] only.
- Goats - viewed from their RIGHT SIDE[10] only.
- Fat-tailed sheep - viewed from their RUMP and RIGHT SIDE[10] only.

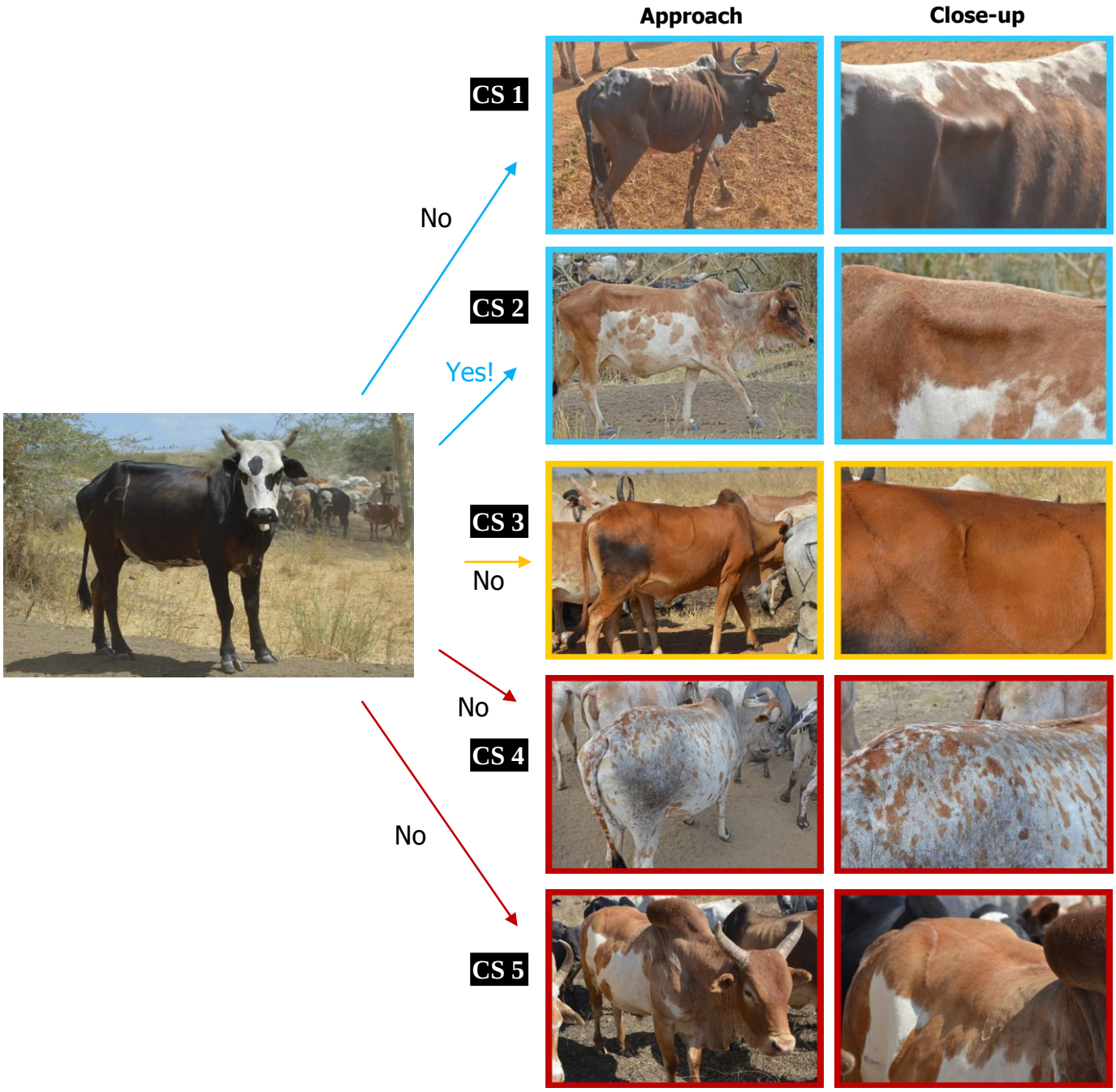
The **'Close-up'**: These photographs show a closer view of the *target area* or *feature,* providing the detail missing in the **approach** shot.

[9] Breeding stock may not be required to go above CS 3; store stock for fattening may be preferred in CS 2.
[10] Inflated rumen after a few hours grazing masks the bones and stretches the flesh cover on the left side of a ruminant causing animals to be falsely scored in higher grades.

In the field, look at the animals from a distance of 3-5 metres and compare the animals you are looking at with the photographs in **PET**:

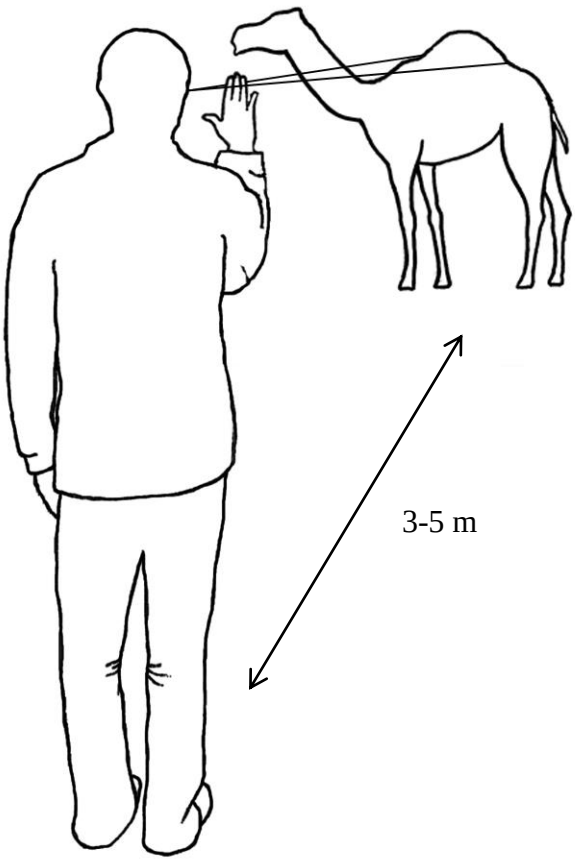
- Select the photograph that most closely matches the animals you are studying.
- Study the *target area* or *feature* in **close-up** to confirm your choice.
- Where appropriate, information written on the photograph may help you to decide if you feel that the animal falls between two scores.

An example of how to use the **'Approach'** photographs in PET-Livestock, Karamoja is given below. The **'Close-up'** photographs should be used for confirmation.



In the example, the cow is best described as a CS 2 – the second set of photographs with a blue background. Do not be afraid to change your mind when you take a closer look at the **Close-up.** The cattle condition score range is determined by the thickness of flesh cover on the loins of the animals. The true score is obtained when the animal is standing still with its head up without straining its muscles.

The camel condition score depends on changes in the comparative size of the hump. To help you judge the proportions of the back occupied by the hump base try using the simple technique described below:



1. Stand 3-5 m from the camel.

2. Place your open hand, at arms length, palm forward in line between your eyes and the camel.

3. Close one eye and see how many fingers cover:-
a) the hump-base (Fingers H)
b) the back, from tail-head to beginning of the neck (Fingers B)

4. Calculate percentage of Fingers H/Fingers B
eg. 3/4 = 75% : 2/4 = 50% : 1/4 = 25%

This may help you confirm the score you have in mind.

Step 4

Condition scoring a herd/flock

Condition scoring a herd or flock means repeating the exercise described in Step 3, with each accessible, healthy, adult member of the group. Here are some suggestions how to approach the herd/flock to be scored.

1. Considering animals grazing at pasture, in the herder's presence and with the herder's permission:

   - Try to approach the grazing/browsing cluster from the animals' right side; *i.e.* in clock face or in military terms, looking at the animals head-on, the observers should approach from nine-o-clock.
   - Walk towards the animal/s with your PET manual open at the correct section in a confident manner - as if you are very familiar with this group of stock.
   - Walk at a steady, even pace; don't run and do not approach jerkily or waving your arms about - unless you are trying to drive the animal/s away or to prevent them from moving towards/around you.
   - When you are about 3-5 metres from the animal/s, slow down and wait for the animal/s to lift their heads. As a *standard operating procedure* try to score the animal/s when they are standing with their heads in the *at rest/walking slowly* position, with their heads up.
   - If the animals move away from you, don't chase after them. Outflank them by walking quickly away from them to the right, at an angle that enables you to continue in an arc that will bring you back on the right side of them as they settle down in their new position.

2. Considering animals moving slowly at pasture, in ranks or in single file, along a track or out of/into a collecting pen, in the herder's presence and with the herder's permission:

   - Position yourself ahead of the lead animal some 5 metres to the right of the intended path; approach the position, with your PET manual already open at the correct section, at a decreasing speed gradually coming to a stop *i.e.* do not move quickly when approaching the moving group and do not stop abruptly.
   - Making no sudden movements or noises, allow the animals to file past *at their own speed*, while you record the scores on the record sheet - this may be easily achieved by putting ticks in a series of columns as noted in Annex 1.

- With a large group in movement, for most general assessing purposes, don't worry about missing the odd adult that may sneak past or that is hidden by another. Trying to chase down an escapee in an open area is likely to disturb the whole group, so is not effective. Remember it is the mode score of the herd/flock that you are trying to record[11].

3. Considering animals that you pass when you are in a vehicle during a driven transect:

- Explain your task carefully to the driver.
- If it is safe to do so, ask the driver to pass the animals:
  - On the right side if they walking in the same direction as you are travelling.
  - On the left if they are walking towards you.
- If time allows, stop the vehicle and allow the animals to file past the vehicle at their own speed.
- Record the scores on the record sheet as you pass them or *vice versa.*

4. Considering animals at a watering point:

- Watering points are *often* a place of tension for herders and animals.
- Obtain permission to remain at the site from the senior herder and/or water point organiser, but negotiate access politely with each livestock keeper.
- Stay out of the path of animals arriving or departing.
- Rather than scoring the animal at the source of water and in the action of drinking, position yourself near the route in/out, close to the source and behave as in paragraph 2 above.

5. Considering animals in a kraal/homestead:

- Any visit to a kraal or homestead should be conducted tactfully and with respect, such areas are private and are often jealously guarded.
- An initial approach should be made by a local-language speaking team member, preferably a member of the same clan.
- If possible, permission should be sought to observe the animals when they are leaving the kraal in a slow and orderly fashion.
- Position yourself looking at the kraal:
  - Stand 5m or so away from the kraal on the left side of the exit, facing the track leading out of the kraal, so you can see the **right** flanks and rears of the animals as they leave the kraal.

[11] When scoring for managerial purposes (such as adjusting the feeding regime; splitting the herd/flock for mating; selecting for sale; or culling), each animal must be scored - so the group should be channelled through a temporary race that will allow you to see each adult animal for long enough to be assessed.

- Don't block the exit, or stand so close you cause the animals to scamper past you when leaving; stand still, keep quiet and go about the business of looking at your PET manual and recording scores smoothly *i.e.* with no jerky movements.

The five situations described above cover most circumstances. Recording scores should not be seen as a contentious activity. However, when doing a general assessment, if note taking is likely to be too intrusive for the circumstances prevailing, trust your own capacity to recognise - in a very short time - the ***mode*** (most common) condition score of the group of livestock under observation and record it later in the summary sheet (Annex 1).

After using PET a few times you should find that scoring becomes *intuitive:*

- You will automatically look at the *target areas and features.*
- Automatically assign a score; and
- With only a little thought, easily be aware of the most common score in the group.
- A little more organised thinking will also give you the range of scores available and the class of animals under scrutiny (*e.g.* milkers, followers, culls, store stock, fat stock, and draught animals).

These points can be stored mentally and a) noted later if walking; b) noted immediately if passing a small group of livestock in a vehicle.

Remember, although a single set of condition scores provides a useful insight into prevailing conditions at the time of collection, the lasting value of condition scoring lies in the comparison of scores of the same livestock over time, allowing:

- The comparison of contemporary scores of similar livestock between locations.
- The regular adjusting and re-planning of management decisions using these improved levels of knowledge.

Step 5
Accounting for herd/flock variability

When you have become confident in using PET-Livestock, Karamoja **to condition-score livestock under any circumstances, you can supplement your records by including more details regarding the animals scored and the factors determining the score.**

A single species, owner-managed, breeding herd or flock is likely to contain animals in different physiological states. The condition score mode of sub-groups may differ from one another, according to the demands placed on the members of that group; therefore, as noted earlier during detailed herd/flock assessments, the mode score of each group should be noted separately.

Given herding practices common in Karamoja, sub-groups of herds and flocks are regularly grazed separately. Consequently, more often than not, a cluster of animals seen together will belong to such a sub-group, which makes scoring of the animals in view at any one time easier than when all the animals of the herd or flock are grazed together. The most likely times to see diverse groups of livestock are a) during seasonal migrations; b) when village herders collect the animals from all households and take them to pasture; or c) in a lairage awaiting slaughter.

Also, livestock traders tend to buy similar animals which they move together; each trader specialising in a particular class, such as fat cattle for sale to butchers in a larger town, store cattle for fattening elsewhere, or cull cows for sale in a market place; plus a similar range of options for goats and sheep. Again this sub-grouping of animals on the move simplifies condition scoring for general assessors.

Animals with condition scores that differ widely from the norm or mode value in such sub-groups are most likely to be *enigmas e.g.* one or two barren cows in a group of milkers that missed a pregnancy; aging animals in a breeding herd/flock that have lost their teeth and are no longer able to graze marginal pastures; animals suffering from a temporary disability (injury) or a disease (footrot). If there are several such animals standing out from what should be the norm, try to find out the cause. Perhaps they are new arrivals, purchased from other more marginal locations; perhaps their signs are indications of a metabolic disorder in the area (*e.g.* a mineral deficiency); or perhaps they are showing early signs of an infectious

disease or a widespread parasitic infection. In any event, it is worth questioning the herder to find out why such variability exists; and noting the response.

Photographs 1 and 2 shown below show two clusters of animals in similar condition, typical of groups met *in transit* at pasture. For comparison purposes, Photographs 3 and 4 show mixed groups of camels and cattle.

Photograph 1: CS 2 sheep

Photograph 2: CS 3 goats

Photograph 3: A mixed CS group of camels

Photograph 4: A mixed CS group of cattle

PET-Livestock, Karamoja

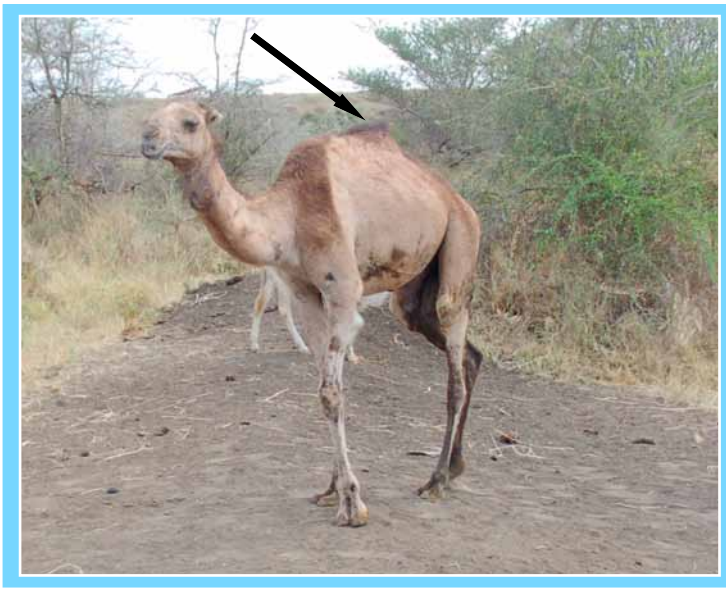
Photo-Indicator pages

Camels

CS 1 – CS 5

Camels - CS 1

Approach **Close-up**

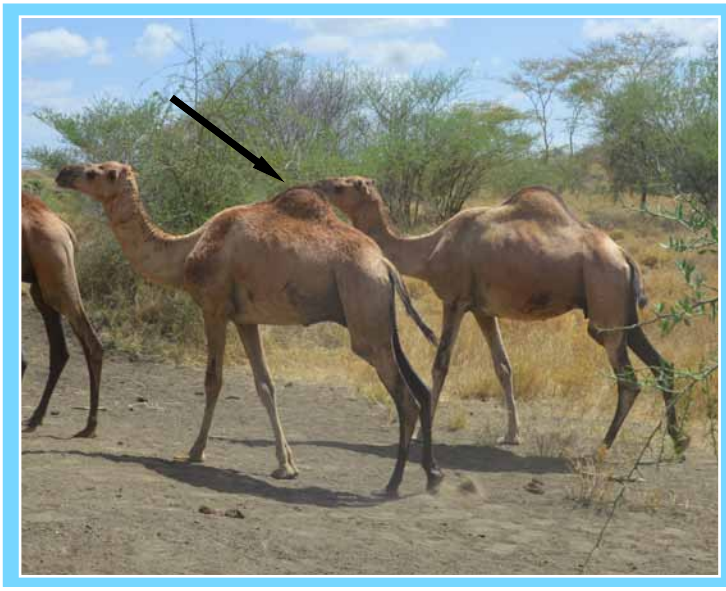


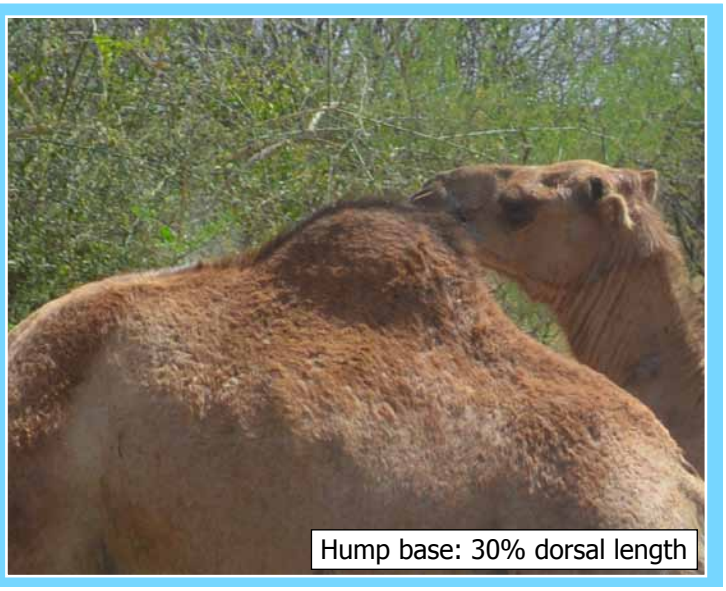



Note: CS 1. The hump, though present, is indistinct. The hump sac contains little or no fat and, in the case of older stock falls to one side.

Camels - CS 2

Approach | **Close-up**

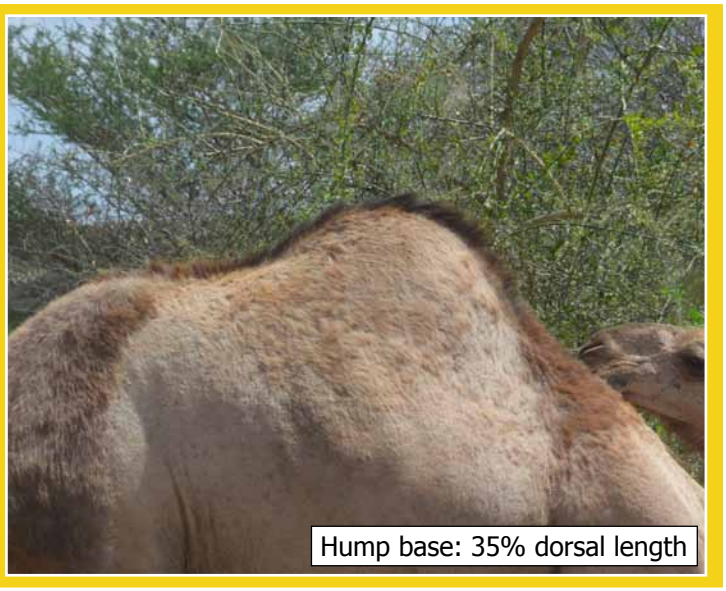


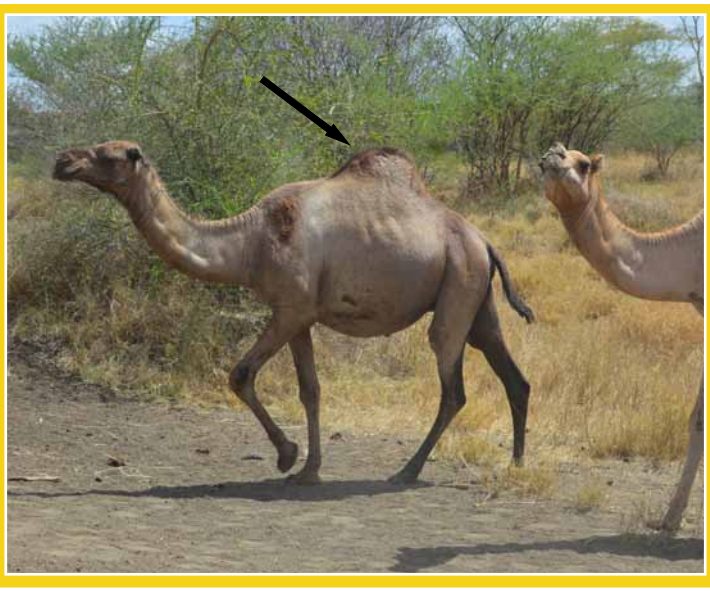


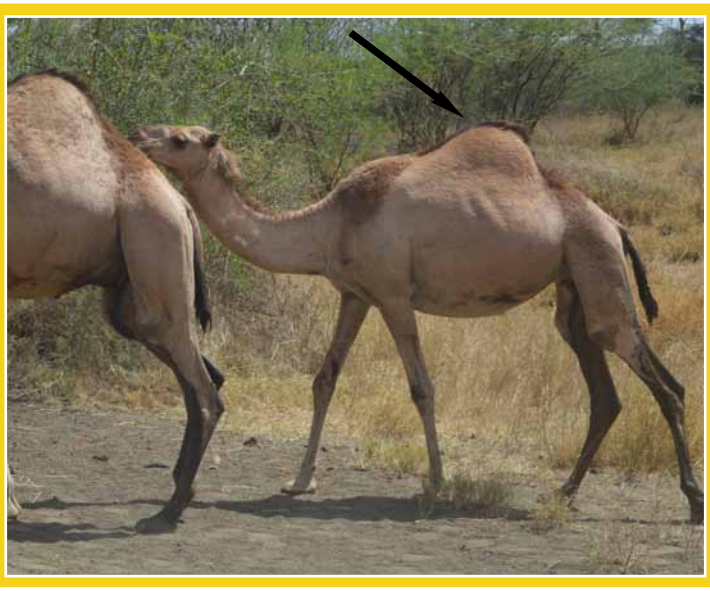
Note: CS 2. The hump is present and the hump sac contains enough fat to create a distinct shape that is 'hump like' with vertical growth and sitting on a base 25-30% of the thoracic and abdominal vertebrae.

Camels - CS 3

Approach | **Close-up**



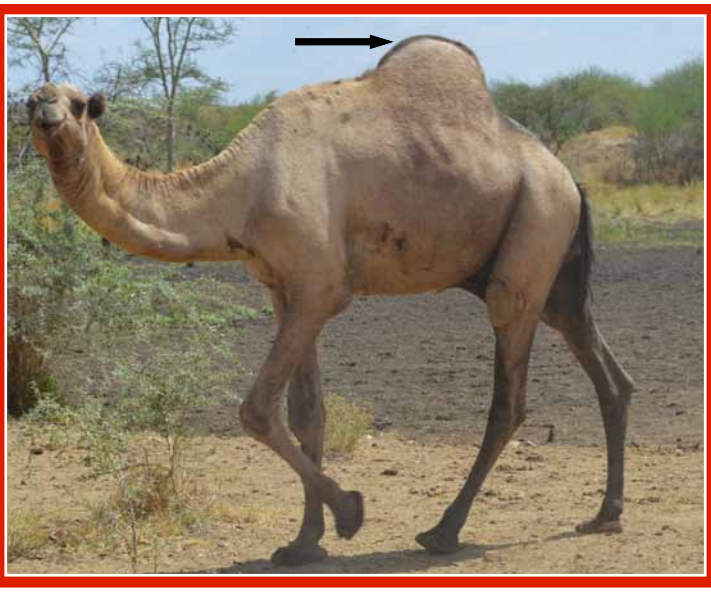




Note: CS 3. The hump sac contains enough fat to create a hump, characteristic of dromedaries that is swollen beyond the width of the transverse processes of the backbone and fits on a base of 35-50% of the dorsal length comprising the thoracic and lumbar vertebrae.

Camels - CS 4

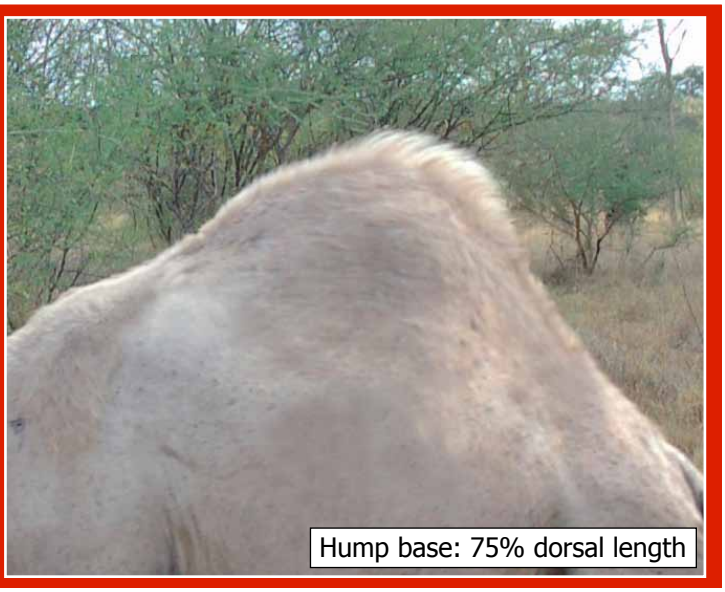
Approach | **Close-up**



Note: CS 4. The hump is a dominant feature extending beyond the width of the flanks and occupying 50-70% of the dorsal length of the body.

Camels - CS 5

Approach | **Close-up**



Note: CS 5. The hump dominates the body; the hump sac rises over the tail-head and progresses further than the middle of the chest (thoracic) vertebrae towards the neck (cervical) vertebrae; extending as it does so, beyond the flanks. The hump base occupies more than 70% of the dorsal length, comprising the thoracic and abdominal vertebrae.

Cattle

CS 1 – CS 5

Cattle - CS 1

Approach **Close-up**






Note: CS 1. Viewed from the right hand side of the body of the mature animal, standing at rest or in slow movement with the head held in a horizontal position; the ends of the lateral processes of the lumbar vertebrae are easily observed as seperate protusions, reminiscent of piano-keys.

Cattle - CS 2

Approach | **Close-up**

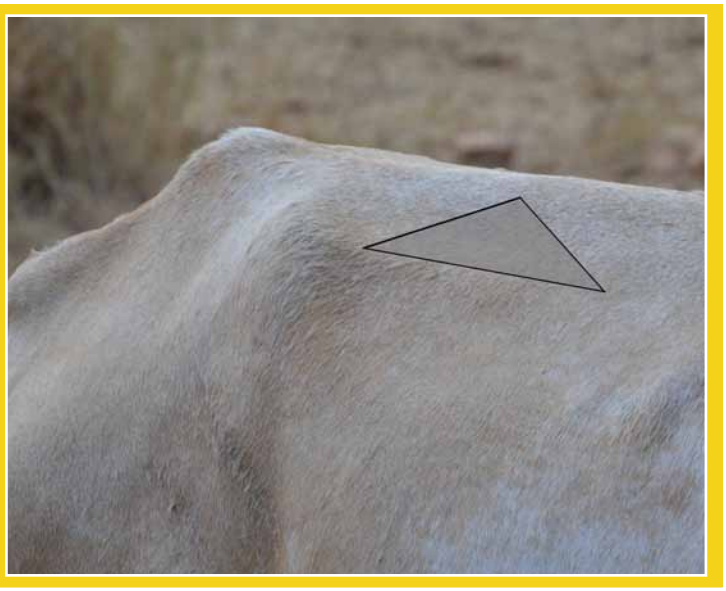





Note: CS 2. Viewed from the right hand side of the body the ends of the lateral processes of the lumbar vertebrae are seen as a straight line.

Cattle - CS 3

Approach **Close-up**



Note: CS 3. Viewed from the right hand side of the body, the straight line noted in CS 2 has disappeared under the fuller cover of flesh between the vertical processes and the ends of the lateral processes of the lumbar vertebrae, forming a filled triangle or wedge of muscle.

Cattle - CS 4

Approach **Close-up**






Note: CS 4. Viewed from the right hand side of the body, the filling triangle of muscle and fat noted in CS 3 has developed to form a flat surface between the top of the vertical processes and the ends of the lateral processes of the lumbar vertebrae like a table-top.

Cattle - CS 5

Approach **Close-up**





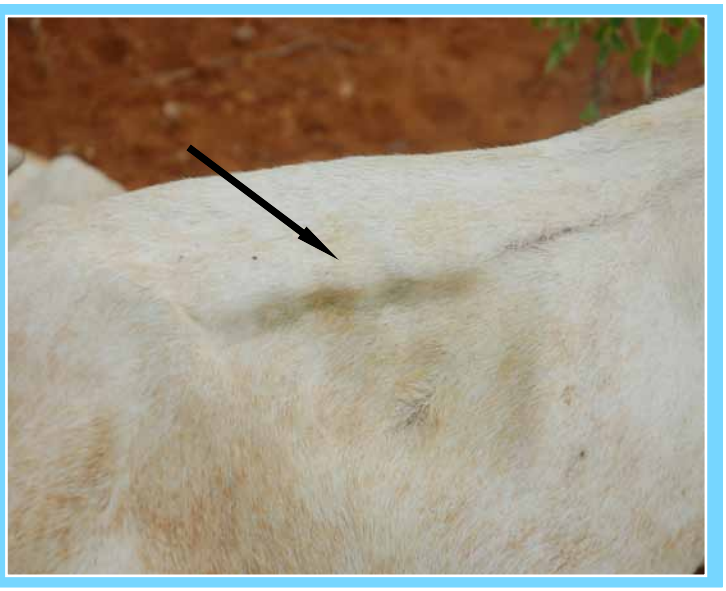

Note: CS 5. Viewed from the right hand side of the body, the CS 4 table-top has developed a groove in the centre as fat and muscle tissues are deposited either side of the back bone. Fat is also noticed in deposits over the tail-head and extending into the rump in a distal distortion.

Goats

CS 1 – CS 5

Goats - CS 1

Approach **Close-up**



Note: CS 1. Viewed from the right hand side when at rest or moving slowly with head in a horizontal position; the ends of the lateral processes of the lumbar vertebrae are visible. These appear as a series of bumps rather like piano-keys. Pin bone is sharply prominent.

Goats - CS 2

Approach **Close-up**






Note: CS 2. Viewed from the right hand side; the ends of the lateral processes of the lumber vertebrae are seen as a straight line - the bumps are no longer visible.

Goats - CS 3

Approach **Close-up**






Note: CS 3. Viewed from the right hand side of the body; the straight line noted in CS 2 is no longer visible. It has disappeared under a wedge of flesh in a filled triangle between the vertical processes and ends of the lateral processes of the lumbar vertebrae.

Goats - CS 4

Approach **Close-up**






Note: CS 4. Viewed from the right hand side; the filled triangle noted in CS 3 has developed into a flat surface between the top of the vertical processes and the ends of the lateral processes of the lumbar vertebrae, rather like a table-top.

Goats - CS 5

Approach **Close-up**

Note: CS 5. Viewed from the right hand side; the flat back of CS 4 is reinforced and sculpted by muscle deposits into a convex shape extending from the lumbar processes, incorporating the tail-head and covering over a rounded rump.

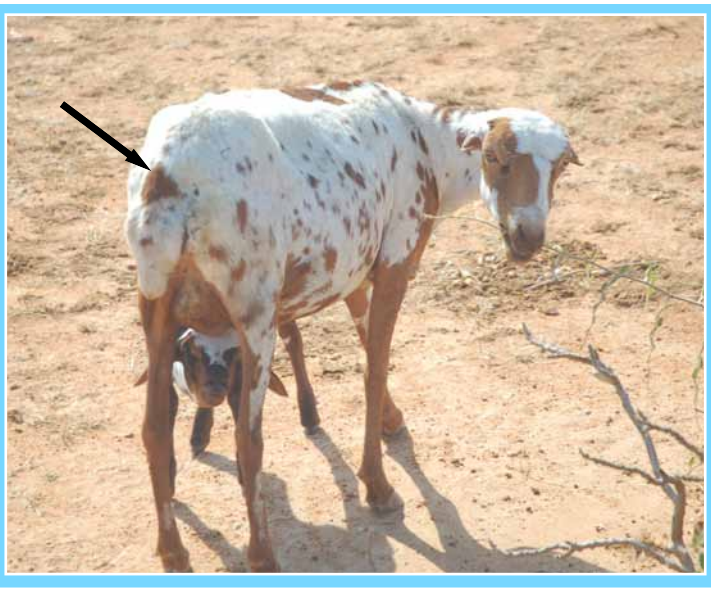
Fat-tailed Sheep

CS 1-CS 5

Fat-tailed Sheep - CS 1

Approach **Close-up**






Note: CS 1. No fat-tail is present. The shortened tail end is thin and extends from a biconcave to flat or 'deflated' tail-head.

Fat-tailed Sheep - CS 2

Approach **Close-up**






Note: CS 2. A fat-tail is present. The immediate tail-head is full and biconvex showing as a spheroid; a second layer of fat is being or has been laid down around the base of the tail-head, offering a clear crease and a second roundel no more than twice the diameter of the first layer at the tail-head.

Fat-tailed Sheep - CS 3

Approach **Close-up**






Note: CS 3. The fat-tail is a well formed organ at the base of the spine, comprising at least two (and sometimes three) discernable spherical layers of fat that are, in total, three times the diameter of the first fat roundel at the tail-head.

Fat-tailed Sheep - CS 4

Approach **Close-up**






Note: CS 4. The fat-tail is a heavy, elongated spheroid of fat, formed of several layers which may have merged into one mass with no creases - others retain clearer creases. The widest part of the tail is in line with well-covered lateral processes of the lumbar vertebrae.

Fat-tailed Sheep - CS 5

Approach **Close-up**






Note: CS 5. The fat-tail is heavy, possibly elongated spheroid of fat as in CS 4, however, the main layers are four or more times the width of the tail-head deposits and sculpted significantly beyond the width of well-covered lateral processes of the lumbar (loin) vertebrae and extend at least half-way down the rump.

Annex 1

Recording sheets

A recording sheet is simply a form prepared to enable data collectors to standardise operations in such a way that everyone assessing collects similar data in the same way.

Rapid appraisals, by definition, are time-bound; therefore, any methods that help speed up operations without risking data loss, misreading and misinterpretation have to be appreciated when the teams are:

- Collecting data.
- Transcribing from local languages and units to international languages and international units.
- Collating data from various sources.
- Storing data prior to analysis.
- Analysing data.

Recording sheets for use in the field should ensure that:

- The correct data are collected[12].
- Data are quick and easy to enter into the tables.
- Records are easy to understand by persons other than the assessor[13].

In the case of recording sheets for PET condition scoring, the example given in Recording Sheet 1 may be used for any livestock species being scored for managerial purposes.

Under the recommended PET *standing operating procedures*, the hard copy recording sheets used in the field should be entered into the computer spreadsheets at the **end of each working day**; and filed for safe keeping in case they are needed later:

- Style:- daily, portrait-orientated, A4 sized sheets that may be used with an A4 clipboard that can also accommodate PET when walking, are recommended.
- Format:- assessor's name, day, sheet number and location should be recorded in the banner of every sheet; these facts may be entered before the day's scoring starts.

[12] In this sense they jog the memory of the assessor.
[13] In the event of a separation of recorder and sheet, other people may read and interpret data collected accurately.

Thereafter:

- Input columns:- should be filled with a series of common marks (ticks, crosses or dashes) or standard letter codes designed for speed of entry.
- The condition score:- CS 1 to CS 5 input cells should be filled-up with 5 marks in each cell, for easy addition later.

The Grand Totals in the field sheet may be used for a general statement of condition in any one location. However, for more meaningful analyses, Recording Sheet 2 has to be completed at the end of each day's field work; this sheet provides a format for a summary of *mode* (most common) condition scores by species and by class.

PET Livestock Condition Scoring Field Recording Sheet 1
Region:

Assessor:	**Date:**	**District:**	**Sheet N°:**

Location	Time	Species	Class	CS 1	CS 2	CS 3	CS 4	CS 5	Comment (health+)
Grand Total		**All**							
Sub-total		Camels							
Sub-total		Cattle							
Sub-total		Goats							
Sub-total		Fat-tailed Sheep							

Record sheet 2: Breakdown of Mode Condition Scores by Location, Species and Class of Livestock

Date	Region, District	Comments	Camels milking mode CS	Camels followers mode CS	Camels male mode CS	Cattle milking mode CS	Cattle followers mode CS	Cattle male mode CS	Goats milking mode CS	Goats followers mode CS	Goats male mode CS	Fat-tailed Sheep milking mode CS	Fat-tailed Sheep followers mode CS	Fat-tailed Sheep male mode CS
Totals														

Annex 2

Forage assessments – residual pasture and stover

Under prevailing systems of management, forage supplies for Karamoja livestock featured in PET come from grazing pasture - grasses and forbs; browsing bushes and trees - predominantly acacia species; grazing straws and stovers from cereals and pulses and from eating *cut and carried* forage from all sources.

Estimating forage availability may be seen both:

- As an *art* insomuch as pastoralists and settled livestock herders use traditional methods of estimation, often based on memory, the interpretation of behavioural tendencies of key animals in the flock/herd and the use of indicator plants *e.g.* the browsing of plants of last resort such as *Calatropis procera.*
- As a *science,* connecting to visual and physical examination of forage availability and its value.

Considering the latter and regarding grazing available on a range:

- Spot checks[14] from stratified samples taken during walking or vehicle-driven transects, will provide an estimate of grazing available on that range, at the time of the transect.
- Spot checks involve cutting a known area of grass, drying and *weighing* to *constant weight.*
    - The size of the sampled plot and frequency of sampling depend on the variability of the pasture, the density of the grasses or forbs; and the time/resources available.
    - Usually, from 1 to 10 square metres of pasture are sampled at random within the range area of interest.

A more rapid method than described above is to compare areas of the pasture under observation with **photo-indicators** of known levels of production[15].

[14] In the absence of long term (seasonal) investigations using *exclusion cages*, *i.e*. small controlled areas where grass growth may be measured accurately over a known period of time - spot checks on **conserved areas,** that is areas set aside as standing hay, are a valuable indication of forage availability during the dry season.
[15] After the manner of PET-Crops, Karamoja.

Consequently **photo-indicators** have been prepared for four types of pasture, comprising Star grass (*Cynodon nlemfuensis*) - 3 levels, Thatching grass (*Hyparrhenia rufa*) - 3 levels, Community mixed grassland - 3 levels and Alet grass (*Sporobolus africans*) - 3 levels.

A similar exercise has been conducted for 3 levels of standing stover from rainfed sorghum and for 3 levels of maize stover. In all cases, samples of 1 square metre were identified as being representative of the sites. These were then photographed, harvested by cutting, the fresh product weighed and the sample then dried to *constant weight*.

The **photo-indicators**, arranged in colour-coded rows of red, yellow and blue, signifying high, medium and low performance, are included alongside their actual levels of production which is recorded in grams per square metre (g/sq m) for harvested weight and final weight after drying. Percentage dry matter (DM) of the sample at cutting is noted plus total weight of DM in tonnes per ha and tonnes per acre (1 ha = 2.47 acres).

The photographs offer a very rapid way of estimating DM by comparing the photographs with the range in view on all sides of the assessor.

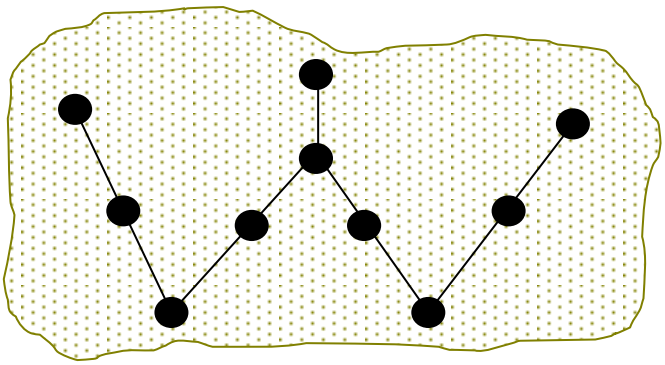
The assessor should **look at the range - look at the photos**:

- From a distance.
- From a close-up of 1 square metre.
- Select the photographs that most closely resemble the quantity of grass available.
- Read-off the estimated DM production in t/ha or t/acre.
- Make a note of the estimates in each direction (N.S.E.W) from the point where they are standing.

Transect walking across the field will allow the level of variability to be accounted for by stopping and noting the production at a series of points. Moving in a **W** shape across the field (Figure 1) and estimating production at 10 points **spaced at regular intervals**[16], is a standard way in which the yield of the whole field/range may be calculated by adding the estimates together and dividing by ten.

[16] The distance between sampling points or stations will vary according to the size of the field. If 4 readings are taken at every station (north, south east and west) the estimate will have been derived from 40 readings.

Figure 1: Transect to determine estimate for a field or range.



It is preferable to check your interpretation of the photo-indicators regularly. Box 1 contains an outline of how to do this.

Box 1: Cross-checking PET Forage, Karamoja estimates.

1. Select an area of range that is uniform.
2. Use PET photographs to estimate the production of DM per ha.
3. Select 1 square metre of pasture you consider to represent that location using a PET quadrat.
4. Harvest the 1 square metre using a sickle.
5. Weigh the grass immediately after cutting.

This gives an immediate indication of grass available but as water content of cut grass varies with age and the time of day of the cut, the dry matter content (DM) of the grass available is a far better indicator of value and should be estimated by weighing the cut sample over and over again until constant (air-dried) weight is reached. This may be done by:

a. After the first weighing, place a sub-sample in a tray, in a sunny, protected area for 5 or 6 hours.

b. Turn the drying grass every hour or so.

c. Weigh again and again, repeating the process until the same weight is recorded at two consecutive weighings.

d. A micro-wave may be used to speed process - with care, dry sub-sample for 2 minute sessions at medium strength, weighing after each session; until constant weight is reached.

DM % = sub-sample (constant weight)/ sub-sample fresh weight x 100%

Fresh weight t/ha = weight (g) from 1 sq m x 10,000/ 1,000,000 = weight (g)/ 100

DM t/ha = weight (t/ha) x DM%

DM t/acre = DM t/ha ÷ 2.47

PET-Forages, Karamoja

A Pictorial Evaluation Tool (PET) for Forage Assessment
in Karamoja, Uganda

Star Grass - *Cynodon nlemfuensis*

From-a-distance **Close-up**






Star Grass - *Cynodon nlemfuensis*

Harvest from 1m^2 | **Yield**

Harvested weight
880 g/m^2

Dry matter
65%

Dry matter

5.73 t/ha

2.32 t/acre

Notes:

- Dense cover
- Tall stems - knee height
- High leaf area index
- Pre-harvest dry

Harvested weight
515 g/m^2

Dry matter
65%

Dry matter

3.35 t/ha

1.36 t/acre

Notes:

- Patchy cover
- Stems shin height
- Tussocks
- Medium leaf area index
- Pre-harvest dry

Harvested weight
200 g/m^2

Dry matter
90%

Dry matter

1.80 t/ha

0.73 t/acre

Notes:

- Patchy cover
- Stems ankle height
- Few tillers
- Stemmy
- Harvest dry

Thatching Grass - *Hyparrhenia rufa*

From-a-distance | **Close-up**

Thatching Grass - *Hyparrhenia rufa*

Harvest from 1m^2 | **Yield**

Harvested weight
580 g/m^2

Dry matter
78%

Dry matter

4.52 t/ha

1.83 t/acre

Notes:

- Dense cover
- Many tillers
- Stems thigh height
- Significant leaf and heads
- Harvest dry

Harvested weight
450 g/m^2

Dry matter
61%

Dry matter

2.75 t/ha

1.11 t/acre

Notes:

- Patchy cover - tussocky
- Stemmy
- Stems waist height
- Green shoots
- Leaf and seed drop
- Pre-harvest dry

Harvested weight
200 g/m^2

Dry matter
90%

Dry matter

1.80 t/ha

0.73 t/acre

Notes:

- Patchy cover
- Few tillers
- Leaf and seed drop
- Stemmy
- Stems shin height
- Very dry

Community Grassland - Mixed

From-a-distance **Close-up**






Community Grassland - Mixed

Harvest from 1m^2 | **Yield**

Harvested weight
250 g/m^2

Dry matter
83%

Dry matter

2.08 t/ha

0.84 t/acre

Notes:

- Mixed perennials and other meadow grasses
- Star grasses > others
- Least accessible area
- 100% cover
- Leaf area high

Harvested weight
190 g/m^2

Dry matter
75%

Dry matter

1.43 t/ha

0.58 t/acre

Notes:

- Mixed perennials
- *Hyparrhenia rufa* and others
- Stemmy

Harvested weight
55 g/m^2

Dry matter
87%

Dry matter

0.48 t/ha

0.19 t/acre

Notes:

- Mixed perennials
- Weed content high
- Lower cover

Alet Grass - *Sporobolus africans*

From-a-distance **Close-up**

Alet Grass - *Sporobolus africans*

Harvest from 1m^2 **Yield**

Harvested weight
255 g/m^2

Dry matter
83%

Dry matter

2.11 t/ha

0.85 t/acre

Notes:

- Big tussocks
- Ungrazed
- High leaf area index
- Harvest dry

Harvested weight
110 g/m^2

Dry matter
83%

Dry matter

0.91 t/ha

0.37 t/acre

Notes:

- Part-grazed tussocks
- Medium leaf area index
- Pre-harvest dry

Harvested weight
55 g/m^2

Dry matter
85%

Dry matter

0.47 t/ha

0.19 t/acre

Notes:

- Grazed-down tussocks
- Stemmy
- Harvest dry

Sorghum Stover

From-a-distance **Close-up**

Sorghum Stover

Harvest from 1m^2 | **Yield**

Harvested weight
2585 g/m^2

Dry matter
32%

Dry matter

8.27 t/ha

3.35 t/acre

Notes:

- 13 cut stems (fresh)/sq metre

Harvested weight
300 g/m^2

Dry matter
100%

Dry matter

3.00 t/ha

1.21 t/acre

Notes:

- 9 cut stems (fresh)/sq metre

Harvested weight
125 g/m^2

Dry matter
100%

Dry matter

1.25 t/ha

0.50 t/acre

Notes:

- 7 cut stems (fresh)/sq metre

Maize Stover

From-a-distance **Close-up**

Maize Stover

Harvest from 1m^2 | **Yield**

Harvested weight 730 g/m^2

Dry matter 100%

Dry matter

7.30 t/ha

2.96 t/acre

Notes: Maize stover only (weeds not included)

- First season maize
- Very dry
- Hand planted in holes
- 5 plants per hole (well grown)
- 1 hole/sq metre

Harvested weight 305 g/m^2

Dry matter 100%

Dry matter

3.05 t/ha

1.23 t/acre

Notes: Maize stover only (weeds not included)

- First season maize
- Very dry
- Hand planted in holes
- 2 plants per hole (well grown)
- 1 hole/sq metre

Harvested weight 150 g/m^2

Dry matter 90%

Dry matter

1.35 t/ha

0.55 t/acre

Notes: Maize stover only (weeds not included)

- First season maize
- Very dry
- Hand planted in holes
- 1-2 plants per hole (poor growth)
- 1 hole/sq metre

Annex 3

Forage assessments – browse

The high level of the contribution to diet of browse as the main forage of *browsers*, and, a significant supplementary/occasional feed of grazers, makes the lack of information on the production of browsing species both surprising and unhelpful when assessing ranges.

Trees, especially thorny acacias, do not lend themselves to rapid assessment[17]. Although the local names of the trees and bushes may change from place-to-place, the same important set of trees and bushes are found throughout Karamoja varying in degree of importance according to altitude, rainfall and soil type.

For animal production purposes, levels of biomass per hectare from browse depend on the type of tree, density of plants, age of tree, the way in which the trees have been formed (crown size/shape), palatability of parts and access of stock to edible parts, and actions of the herders (lopping, pollarding, shaking branches to harvest dry leaves and fruits).

The most important browse trees noted in transects comprise the acacias because they provide edible leaves and pods such as *A. camplacantha and A. nilotica.* Others include *A. senegal, A. seyal, A. drepanolobium, A. tortilis,* and *Indigofera erecta* (Egeru, 2014). In the absence of any production estimates from Karamoja, information from a variety of sources[18], suggest that forage production per annum may vary from 100 g to 20 kg per tree depending on tree species, tree density, size of the crown, and conditions (soil type and depth, rainfall).

Regarding density, a simple technique to estimate tree density per hectare called *Point-to-Plant* is described below and shown in Figure 2. As with most rapid assessment exercises, frequency of sampling will determine level of accuracy; therefore, using the technique on a regular basis and in different places in the same ranges, will lead to a build-up of basic information regarding potential range availability in every location.

[17] Or even long term assessment judging by the research in this domain. Too much compositional analysis of leaves in the laboratory – and not enough time spent in the field to provide a useful guide to all browse trees in any semi-arid area regarding production norms/factors affecting production.
[18] Mali, South Africa, Sudan, Kenya.

Point-to-Plant

The assessors walk through the range at the site of interest and at regular intervals *e.g.* every 1000 ha or 10 sq km, observe the types of trees and their dominance. List the trees in order of dominance/importance as a forage source at that time of the year and determine a) their density and b) crown size mode by judging the length of the radius of the crown.

Choose the dominant tree species, then:

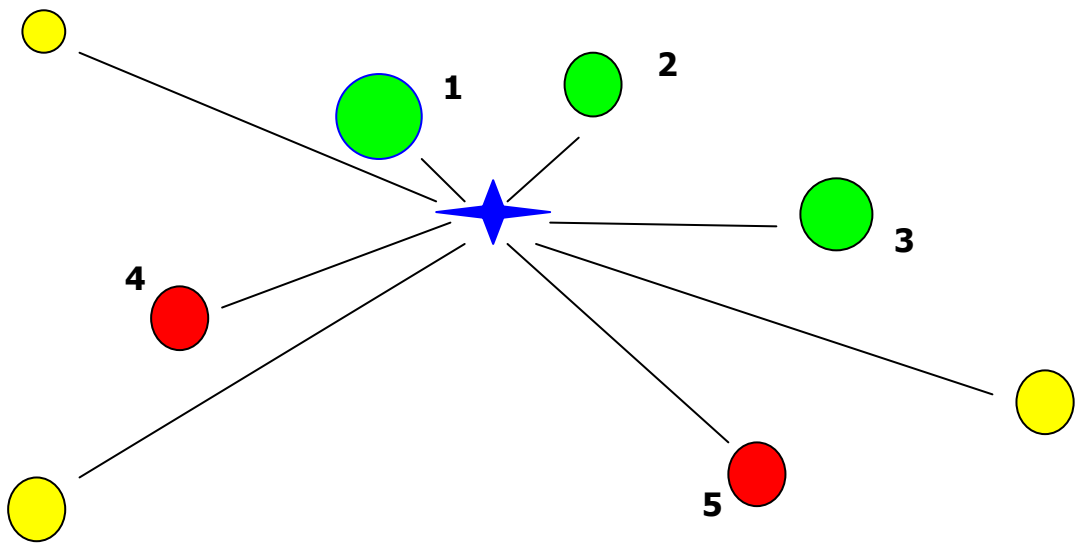
- Select a *point* in the range that seems to represent the prevailing density of the tree species chosen in that area.
- Mark the *point* (blue star in Figure 2).
- Measure the distance, by pacing in metres, from the *point* to the fourth and fifth nearest trees of interest to that *point*[19].
- Add the two distances together, then divide by two.
- The sum of the two distances divided by two gives a radius (r) of a circle within which you have identified 4 trees.
- The area taken up by 4 trees is pi r^2 square metres.
- The area taken up by one tree is pi $r^2/4$ sq m= A.
- The number of trees per ha is 10,000/A.

In Figure 2, the chosen species are marked green and red; the radius within which to find 4 trees is 20 m; area for one tree is 1257/4 sq m or 314 sq m. Therefore, the number of trees in one ha is 32 (10,000/314).

If each tree has a full crown producing 4 kg of leaves over a season, the browse/ha will be in the order of 4 x 32 = 128 kg. More dense savannahs and semi-arid forests may be producing 2 t/ha of high quality browse depending on the size of the crown and the accessibility of the browse as indicated in the ready-reckoner provided in Table 1.

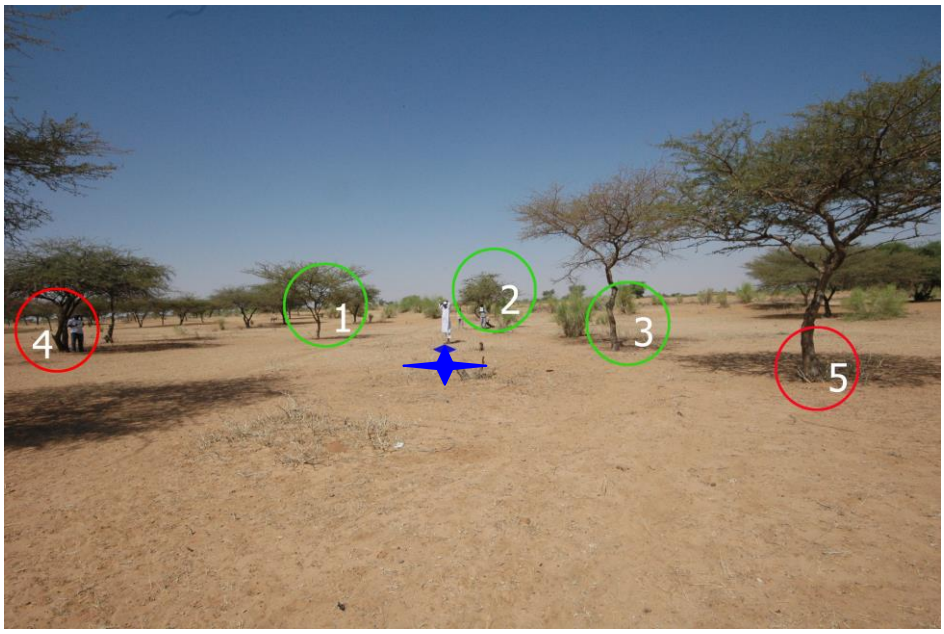
[19] If in doubt, measure all 5 nearest trees.

Figure 2: "Point-to-Plant" Plant Density Estimate.



'Point-to-Plant' Process:

- Identify nearest plants (green and red circles) to point (blue star).
- Distances from point to 4th and 5th plants (red circles) are 18 and 22 metres.
- Add distances together and divide by 2 = 20 metres



Trees are often pollarded by herders (growing points cut) - offering a lower, thicker crown for access. Browsing animals also shape the bushes and trees by returning to the same access points and keeping them trimmed of leaves and twigs.

Notwithstanding the very real differences within and between species regarding *crown* shape and availability, the crown of most acacias of forage interest would be best described as *hemi-spherical* ; consequently, the size of the accessible location of the tree containing the edible parts may be estimated using the formulae for a Curved Surface Area (CSA)[20] of a *hemisphere* = 2 pi r^2.

By combining density of trees per ha (determined using *Point-to-Plant*) with potential CSA for browsing per tree for a series of common crown radius values (0.5 metres to 2.5 metres), it is possible to create a *ready reckoner* that will provide assessors with a table to estimate browse given a known production of browse per square metre of *crown surface area* for such trees.

The table on the following page provides such a *ready reckoner* that may be used for browse trees with *theoretical values* of 50g, 100g and 200g of leaf and pod dry matter (DM) per square metre of *crown surface area*[21].

[20] For animals that reach well into the bushes this will be an underestimate as V*olume of Hemisphere* = (2/3) πr^3 would be more appropriate in their case.

[21] In the fullness of time, assessors should replace the theoretical values with empirical values collected in Karamoja ranges from the different tree species.

Table 1: Simple Ready Reckoner for calculating Browse in Karamoja, Uganda

PET- Livestock, Karamoja																				
Browse- Simple Ready Reckoner in Dry matter per hectare.																				
Tree	Crown area ($2\pi r^2$) in square metres.																			
Crown Radius (m)	0.50	1.00	1.50	2.00	2.50	Production DM kg/ leaves & pods					Production DM kg/ leaves & pods					Production DM kg/ leaves & pods				
Square metres	1.57	6.28	14.14	25.14	39.28	At 50g/ sq metre					At 100g/ sq metre					At 200g/ sq metre				
Trees/ ha	Crown surface area in square metres/ ha					r=0.5	r=1	r=1.5	r=2	r=2.5	r=0.5	r=1	r=1.5	r=2	r=2.5	r=0.5	r=1	r=1.5	r=2	r=2.5
10	16	63	141	251	393	1	3	7	13	20	2	6	14	25	39	3	13	28	50	79
25	39	157	353	628	982	2	8	18	31	49	4	16	35	63	98	8	31	71	126	196
50	79	314	707	1257	1964	4	16	35	63	98	8	31	71	126	196	16	63	141	251	393
75	118	471	1060	1885	2946	6	24	53	94	147	12	47	106	189	295	24	94	212	377	589
100	157	628	1414	2514	3928	8	31	71	126	196	16	63	141	251	393	31	126	283	503	786
150	236	943	2121	3770	5891	12	47	106	189	295	24	94	212	377	589	47	189	424	754	1178
200	314	1257	2828	5027	7855	16	63	141	251	393	31	126	283	503	786	63	251	566	1005	1571
250	393	1571	3535	6284	9819	20	79	177	314	491	39	157	353	628	982	79	314	707	1257	1964
300	471	1885	4242	7541	n/a	24	94	212	377	n/a	47	189	424	754	n/a	94	377	848	1508	n/a
350	550	2199	4949	8798	n/a	27	110	247	440	n/a	55	220	495	880	n/a	110	440	990	1760	n/a
400	628	2514	5656	n/a	n/a	31	126	283	n/a	n/a	63	251	566	n/a	n/a	126	503	1131	n/a	n/a
450	707	2828	6363	n/a	n/a	35	141	318	n/a	n/a	71	283	636	n/a	n/a	141	566	1273	n/a	n/a
500	786	3142	7070	n/a	n/a	39	157	353	n/a	n/a	79	314	707	n/a	n/a	157	628	1414	n/a	n/a
550	864	3456	7776	n/a	n/a	43	173	389	n/a	n/a	86	346	778	n/a	n/a	173	691	1555	n/a	n/a
600	943	3770	8483	n/a	n/a	47	189	424	n/a	n/a	94	377	848	n/a	n/a	189	754	1697	n/a	n/a

NB:

r = radius of a hemi-spherical crown;

DM production of leaves and pods at the highest level is 8 kg per tree per annum;

n/a = passed maximum density/ha for radius of tree.

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