WRITE SHOP REPORT
"DEVELOPMENT OF REVISED AND HARMONIZED CHARACTERIZATION, INVENTORY AND MONITORING ANIMAL GENETIC RESOURCES TOOLS' GUIDELINES"

14th – 17th April 2015

NAIVASHA, KENYA

African Union InterAfrican Bureau for Animal Resources (AU-IBAR)

AFRICAN UNION
INTERAFRICAN BUREAU
FOR ANIMAL RESOURCES
AU-IBAR

EUROPEAN COMMISSION

Development of revised and harmonized characterization, Inventory and monitoring Animal genetic resources tools' guidelines

Write shop report of the Genetics project

African Animal Genetic Resources

Naivasha, Kenya

14th to 17th April 2015

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Acknowledgements

The Project Team would like to thank all the Animal Genetic Resources Taxonomy Advisory Group (AnGR-TAG) members and participants for their invaluable contributions and active participation during the write shop. Your continual support and dedication towards the improved utilization of AnGR tools in Africa, is indeed the fulcrum of this African-led process.

We further extend our gratitude to our implementing partners (ILRI, BeCA and CIRDES) who worked tirelessly to ensure a successful write shop. We are confident that through this collaboration, our unified efforts will enable us to achieve the set-out objectives to the benefit of the African continent.

Acronyms

AnGR	Animal Genetic Resource
AnGR-TAG	Animal Genetic Resources taxonomy Advisory Group
APU	Animal Production Unit
AU	African Union
AU-IBAR	African Union-Interafrican Bureau for Animal Resources
ARC-API	Agriculture Research Council - Animal Production Institute
BeCA	Biosciences eastern & central Africa – ILRI Hub
CIRDES	Centre International de Recherche-Dévelopment sur l'Elevage en zone Subhumide
FAO	Food and Agriculture Organization
GPA	Global Plan of Action
HH	Household Head
ICT	Information and communications technology
ILRI	International Livestock Research Institute
MS	Member States
NAPRI	National Animal Production Research Institute
PEDs	Production Environment Descriptors
RAB	Rwanda Agricultural Board
RECs	Regional Economic Communities

Executive summary

The write shop on "**Development of revised and harmonized characterization, inventory and monitoring animal genetic resources tools' guidelines**" was organized and conducted in Sweet lake Resort Naivasha, Kenya from the 14th- 17th of April 2015. This write shop was organized under **Result 4 Activity 1** "*Develop harmonized tools/protocols for characterization and inventory of AnGR*" under the AU-IBAR genetics project "**Strengthening the Capacity of African Countries to Conservation and Sustainable Utilization of African Animal Genetic Resources**". The project through the above mentioned activity aims at building consensus on methodologies and tools for characterization and inventory of AnGR between AU member states. The project intends to assist countries and Regional Economic Communities (RECs) in the production of inventories and characterization of AnGR, so as to ensure homogeneity of data and easier compilation through the utilization of harmonized tools.

Following an expert's consultation on "**Assessment of Animal Genetic Resources Characterization, Inventory and Monitoring tools to guide revision and harmonization processes**" held in September 2014 in Dar-es-Salaam, Tanzania, key outcomes were documented. The participants established suitable characterization, inventory and monitoring tools for use within the continent as well as deemed it necessary that a specialized group namely the Animal Genetic Resources Taxonomy Advisory Group (AnGR-TAG) should be established and be mandated to drive the process of revision and harmonization of these proposed tools. The write shop provide a platform for the members to undertake in-depth deliberations on the working documents provided with the primary objective of developing the first draft of revised and harmonized characterization, inventory and monitoring AnGR tools' guidelines and work towards the development of a stepwise strategy to guide the harmonization process across member states.

Through intensive deliberations and thought provoking sessions held, major outcomes were realized that included; an in-depth draft tool guidelines for the revised and harmonized characterization, inventory and monitoring tools. The draft tool guidelines captured details of data collection templates, photography protocols and sample collection protocols. The AnGR-TAG members also focused on the establishment of a robust and unbiased selection criterion for member states in the 1st phase of implementation of the revised and harmonized tools. Members also outlined the TORs for the enumerators and established key aspects or modules to be considered during the pre-planned training-of- trainers' sessions. A major emphasis was placed on the need to give back prompt feedback to the farmers so as to win their confidence and make them direct beneficiaries of the process.

The write shop concluded with discussions focused on a proposed content framework presented by the recruited consultant (Prof. Anne Muigai) that was adopted by members. The participants reiterated that this entire process should be an African led process by AU-IBAR and her collaboration with various relevant partners and stakeholders. The pre-training and subsequent piloting activities should be undertaken speedily as time is of essence.

Introduction

Africa is home to a world of diverse Animal Genetic Resources displaying a vast range of Darwinian adaptations that continually evolve due to the ever-changing ecosystems. These Animal Genetic Resources (AnGR) for food and agriculture are essential for Africa's food security, and contribute to the livelihoods of millions of people within and without the continent. It is critical that these resources are effectively managed by ensuring a deeper understanding of their population dynamics, status and trends and spatial distribution. Characterization, surveying and monitoring have remained key elements in the development of effective AnGR management plans and emphasis should be placed on certifying that these critical processes are well executed. Knowledge on population trends and genetic status of livestock populations informs breeding strategies, conservation programs and policy-making processes. This information is vital at local, national, regional and global levels.

The evident gap in relation to the availability of relevant and reliable data on population status and trends of African AnGR has consequently resulted to misinformed decisions and poor management of AnGR within the African continent. The use of molecular tools for characterization is limited in Africa mainly due to lack of technical skills and availability of the biotechnology equipment. Evidently, poor utilization of characterization, inventory and monitoring tools has contributed largely to this present situation. The ever-present challenges faced by users within the African continent need re-address. There is an urgent need to seek sustainable solutions that will ultimately promote the improved utilization of these tools within Africa.

AU-IBAR is currently implementing a project "**Strengthening the Capacity of African Countries to Conservation and Sustainable Utilization of African Animal Genetic Resources**". The project aims at strengthening the capacity of countries and Regional Economic Communities to sustainably use and conserve African AnGR through institutionalizing national and regional policy, legal and technical instruments. The project will strengthen the inherent capacities of Regional Economic Communities (RECs) and the end-users at community level to improve the utilization of AnGR and rural livelihoods through:

- Establishment of the status and trends of animal genetic resources in Africa.
- Development of Policy frameworks for the sustainable use of AnGR.
- Supporting and strengthening national and regional conservation and improvement strategies and initiatives
- Increasing knowledge, attitude and practice of the contribution of livestock and livestock sector to economic growth, food security and poverty reduction.

In relation to AU-IBAR genetics project - **Result 4 Activity 1 "Develop harmonized tools/protocols for characterization and inventory of AnGR"**. The Genetics project intends to assist countries and

RECs in the production of inventories and characterization of AnGR, so as to ensure homogeneity of data and easier compilation through harmonization of standard tools (guidelines, protocols, templates for data collection etc.). These harmonized tools will be produced and validated before dissemination to Member States.

To set this process in motion, an e-discussion "**Improving the utilization of Animal Genetic Resources characterization, inventory and monitoring tools in Africa**" and technical workshop "**Assessment of existing characterization, inventory and monitoring tools to guide revision and/or harmonization processes**" have since been undertaken. The outcomes from these two activities suggested the need for technical guidance and advice towards the necessary processes that will enable successful revision and harmonization as well as sustainable strategies for implementation and adoption of the harmonized AnGR tools guidelines. For that purpose, it was proposed the creation of an animal genetic resources taxonomy advisory group (AnGR-TAG). The AnGR-TAG primary role will be to offer technically sound advice and lend subject matter towards the final delivery of the revised and harmonized characterization, inventory and monitoring tool guidelines. The appointed experts' group contribution will be pivotal in driving this multi-stakeholder process that is geared at revision and harmonization of characterization, inventory and monitoring AnGR tools. This group has since been established and consists of 22 technical experts drawn from the 5 sub-regions of Africa and implementing partners (FAO, ILRI and CIRDES).

The primary objective of the write shop was to offer a platform for the newly appointed AnGR-TAG members to;

1. Undertake in-depth deliberations on the working documents provided primarily to develop the first draft of revised and harmonized characterization, inventory and monitoring AnGR tools' guidelines.
2. Develop a stepwise strategy to guide the harmonization process across member states was to develop revise and harmonize to assess and review the existing animal genetic resources characterization, inventory and monitoring tools/protocols so as to improve their utilization in Africa.

The main outcomes expected from the write shop included a robust 1st draft of AnGR tools' guidelines based on the outlined content framework and a clearly outlined strategy to guide successful implementation and improved utilization within member states.

The write shop was well attended by all newly appointed AnGR-TAG members. A total of 21 participants comprising of 18 participants drawn from 13 African countries: Cameroon (University of Buea, University of Dschang), Egypt (Animal Production Research Institute), Ethiopia (Ethiopian Biodiversity Institute), Ghana (University of Ghana, Legon, University of Education, Winneba), Kenya (Jomo Kenyatta University of Agriculture and Technology), Lesotho (National University of Lesotho), Malawi (Lilongwe University of Agriculture and Natural Resources, Bunda College of

Agriculture), Nigeria (Cornell University, Ahmadu Bello University-Zaria, Federal University of Agriculture – Abeoukota), Rwanda (Rwanda Agricultural board), Sudan (Department of Animal Production Research Center-Ministry of Livestock, Fisheries and Rangeland), Tanzania (Department of Research and Training-Ministry of Livestock and Fisheries Development), Tunisia (School of Higher Education in Agriculture, INRA-Tunisia) and Uganda (Makerere University) and 3 participants representing the project's implementing partners (ILRI, ILRI-BeCA and CIRDES).

This document summarizes the discussions and deliberations that took place during the write shop aimed at revising and harmonizing the characterization, inventory and monitoring tools' guidelines.

Attached in the annexes are each of the working groups' presentations and the list of participants.

Write shop proceedings

The write shop opening ceremony was facilitated by Dr. Simplice Nouala. This was an informal opening given the technical nature of the write-shop. Brief introductions were given by members before two presentations were given by AU-IBAR genetics project staff (Drs. Mary Mbole-Kariuki and Pissang Tchangai).

Workshop Format and Plenary Sessions

The workshop format was a combination of presentations which included giving a general overview of the genetics project, the current activity under deliberations and the activities so far undertaken. A brief overview on the major outcomes based on the previous e-discussion and technical workshop were also shared. Breakout sessions were used to enable detailed and interactive discussions guided by the respective session's queries on the development of tools' guidelines for characterization, inventory and monitoring of Animal Genetic Resources in Africa.
Brief plenary sessions were held to share the complied group discussions with the larger audience.

Presentations

The presentations summarised below were given mainly to bring all the AnGR-TAG members up to speed with the various activities that have since been undertaken towards the realization of the primary result.

Introductory presentation

Dr. Pissang Tchangai gave a brief presentation of the on-going genetics project. He highlighted the projects' background and objectives. He also shed light on the processes that have been undertaken concerning this primary activity commencing from the e-discussion to the technical workshop, two activities that provided fodder for the write shop. The main topics of discussion

were shared and it was agreed the write shop needed to follow a flexible programme to allow the TAG members to deliberate at depth on these key issues.

Outcomes (e-discussion technical Workshop) presentation

Dr. Mary Mbole-Kariuki gave a presentation detailing the main outcomes of the e-discussion *Improving the utilization of Animal Genetic Resources characterization, inventory and monitoring tools in Africa*" and the workshop "*Assessment of Animal Genetic Resources Characterization, Inventory and Monitoring tools to guide revision and harmonization processes*". For the former initiative, various strengths and weakness of the current tools in use within Africa were highlighted. The presentation also shared the various approaches that were shared by the e-members. This included the short term approaches that were considered easily implementable and their impacts would be realized in a short period of time. One of the short term approaches, revision and harmonization of the AnGR tools was considered as the priority action during the e-discussion deliberations.

The key outcomes for the technical workshop included the establishment of suitable characterization, inventory and monitoring tools for use within the continent. The revisions made were based on existing characterization, inventory and monitoring tools mainly being the FAO guidelines on phenotypic characterisation of Animal Genetic Resources[1], molecular genetic characterization of animal genetic resources[2] and surveying and monitoring[3]. For example, for the phenotypic tool, a "composite" tool was proposed that consisted of a mix of aspects drawn from FAO (2012)[1] phenotypic descriptor lists and the production environment descriptors (PEDs). The revision of the phenotypic characterization tool also entailed the incorporation of sketches or photographs that would guide linear body measurement. The phenotypic characterization tool would mainly collate data on the following categories; Morphometrics, Environment, Production and reproduction; Adaptation; Socio-economic and Indigenous knowledge. The consensus was that various biological samples should also be collected during surveys to make provision for molecular characterization as well as additional related AnGR research (i.e. landscape genomics). The deliberations also highlighted the importance of making the guidelines farmer/livestock keeper friendly so as to encourage their participation in the characterization and taking inventory activities of AnGR and that the primary objective of the data collected should be to be a reliable and robust source of information that policy makers could use to inform the policy making processes and resource allocation.

[1] FAO (2012). Phenotypic characterization of animal genetic resources. FAO Animal production and health guidelines. No.11. Rome
[2] FAO (2011a). Molecular genetic characterization of animal genetic resources. FAO Animal production and health guidelines. No.9. Rome
[3] FAO (2011b). Surveying and monitoring of animal genetic resources. FAO Animal production and health guidelines. No.7. Rome

The presenter summarised by calling the attention of the participants to their crucial role in the development of these very important AnGR tools' guidelines that would be used by generations to come. She further emphasized that these guidelines must be considered as living documents that will continually evolve with the needs and specific requirements of MS.

Working group sessions

Session 1: Revised and harmonized characterization tools' guidelines

A brief introductory session given by Dr. Mary Mbole-Kariuki presented some typical data collection templates that have been used in previous phenotypic characterization studies. The sessions TOR'S were also presented which mainly included the development of data collection templates for phenotypic and morphometric traits of AnGR.

The participants were grouped depending on their livestock species specialty and/or preferences. In total six groups were formed as outlined below:

Table 1: Distribution of AnGR-TAG members across various species

Groups	Species	No. Grp members	Members
Grp 1	Cattle and camels	4	Prof. Ikhide G. Imumorin Dr. Ahmed Elbeltagy Dr. Jemmali Borni Dr. Charles Dayo G. Kossigan
Grp 2	Sheep and goats	4	Prof. Sonia Bedhiaf Prof. William Ouko Odenya Dr. Hassan Ally Mruthu Dr. Yassir Ahmed Hassan Dr. Solomon Abrgaz Kebede
Grp 3	Poultry (Chicken and guinea fowl)	5	Dr.Timothy Gondwe Prof. Olufunmilayo A. Adebambo Prof. Isaac Adetunji Adeyinka Dr. Christian Keambou Tiambo Dr. Hirwa Claire D'Andre
Grp 4	Pig	3	Dr. Richard Osei-Amponsah Prof. Anne Muigai Dr. Denis Mujibi
Grp 5	Non-Conventional species (Grass cutter and cavies)	2	Dr. Felix Meutchieye Prof. Serekye Yam Annor
Grp 6	Fish	3	Prof. Morris Agaba Dr. Nelly Isyagi Dr. Donald Kugonza

Grp 7	Equine (Horses and donkeys)	2	Prof. Anne Muigai Dr. Jemmali Borni

Each group selected a facilitator and a Rapporteur. Each group was guided by the pre-set session queries that focused on the development of data collection templates based on the recommendations of the Dar-es-Salaam workshop, validation of the data collector networks and identification of strategies to guide the 1st phase of implementation (including establishment of a selection criteria for member states, ToRs for enumerators and training-of-enumerators workshop outline). Group's discussion sessions were also guided by the AU-IBAR team members supported by the identified co-facilitator. The group members deliberated in-depth upon issues and document the various outcomes to be presented in plenary. A selected Rapporteur presented the group discussions in plenary.

The main deliberations here were for the group members to develop revised and harmonized data collection templates for core categories (as recommended during the technical workshop) for the "composite" phenotypic tool.

Session 2: Revised and harmonized molecular genetic tools' guidelines

The molecular characterization session included a detailed presentation on Genotyping-by-Sequencing on the Next Generation Sequencing Platform for Livestock Genetic Improvement in Developing Countries by Prof. Ikide Immourin of Cornell University (USA). He highlighted the advantages of using genotyping by sequencing (GBS) technique as well as the challenges of this tool of choice.

The session TORs were also to develop sample collection templates and laboratory protocols (where feasible). From the FAO molecular and characterization guidelines[2], in which the next generation genomic technologies are highlighted, the Dar-es-Salaam workshop participants identified the genotyping by sequencing as the most practical tools of choice in Africa. It was thus deemed necessary that the AnGR-TAG members establish;

a) Which biological samples should be collected (considering practicality, storage, sampling ease etc.),
b) What studies will be undertaken with this data
c) Establish sample sizes.
d) How the large-scale genotyping data will be analyzed and by whom

Session 3: Revised and harmonized Inventory and monitoring tools' guidelines

The primary objective of this session was to develop data collection templates for the taking of inventory of AnGR within Africa. The data templates should be based on the recommendation of the technical workshop held in Dar-es-Salaam whereby participants based on the FAO, surveying and monitoring of animal genetic resources guidelines[3] recommended the use of household surveys as the most inventory tool of choice for Africa. The session also provided an opportunity to discuss the issue of including breed specific inventories. Participants also embarked on developing a monitoring tool that will be based on the analysis of already collated data such as genomic data (estimate effective population size), inventory data – census or livestock surveys (calculate population size trends) amongst others.

In this session, simple data management and analysis methods were also identified and proposed for utilization in Africa.

Session 4: Establishment of strategic options to guide implementation & improved utilization of the revised and harmonized AnGR

This session included in-depth discussion between the AnGR-TAG members on three main aspects

I. Establishment of a selection criterion for member states to undertake the 1st implementation/piloting of the revised and harmonized tools' guidelines
II. Establishment of the Enumerators Terms of reference and their training modules
III. Identify practical and sustainable incentives to give to farmers to encourage their participation in characterization, inventory and monitoring of AnGR.

Session 5: Write shop synopsis

In this session, a summary presentation was undertaken by the recruited consultant (Prof. Anne Muigai – JKUAT) whereby a proposed table of content frameworks was shared with the participants for review and enrichment. The consultant also took this opportunity to share with the participants a synopsis of all the deliberations that were undertaken during the write-shop for any additional comments or inputs.

Working group outcomes

In summary, rapporteurs shared their respective group outcomes on the various discussion topics in plenary. The outcomes of the discussions are available in the Annex 2-3.

Revised and harmonized phenotypic tools' guidelines

Based on the recommendations made during the technical workshop held in Dar-es-salaam, it was agreed that Member States should standardize phenotypic characterization and a composite tool was proposed which consisted of aspects drawn from FAO phenotypic descriptor lists and the production environment descriptors (PEDs). The revision of the phenotypic characterization tool also entailed the incorporation of sketches that would guide linear body measurement. The phenotypic characterization tool would mainly collate data on the following categories; Morphometrics, Environment, Production and reproduction; Adaptation; Socio-economic and Indigenous knowledge. The consensus was that various biological samples (blood, tissues, feaces and hair) should also be collected during surveys but for the first phase of implementation members' agreed to take whole blood samples for the molecular characterization aspect amongst other studies. Based on the above mentioned groupings, revised species specific phenotypic data collection templates were developed as presented in Annexes 2a-2g.

From the deliberations between the AnGR-TAG members', it was agreed that for the composite phenotypic tool, clear photographs should be used instead of sketches. Instructions on how to take the linear measurements should be clearly illustrated in the photographs. Actual coat colors and patterns will also be incorporated to avoid ambiguity.

The other issue discussed during the revision of the tools was in relation to adaptive traits, it was proposed due to the nature of the kind of data to be collected that requires repeated measurements, on farm studies may be developed so as to ensure controlled and well-supervised data collection activities are undertaken.

The issue of indigenous knowledge was also tackled with focus on the specific species and aspects that would be tapped into identified, this included indigenous knowledge on breeding practices, feed management, ethno-veterinary practices, value addition (processing of products), animal identification and associated cultural taboos/beliefs.

Revised and harmonized molecular tools' guidelines

Following the presentation given by Prof. Ikhide Imumorin of Cornell University (USA), members were split into two main groups to deliberate on the way forward pertaining molecular genetic tools' guidelines. From the deliberations, the following were the main outcomes;

a) Africa could adopt next generation sequencing through the genotyping by sequencing (GBS) as proposed by group 1. However, group two proposed the adoption of a Hybrid method which will include use of GBS and Target GBS for a small sample to discover SNPs and target a smaller number of markers for genotyping a larger number of samples.
b) To undertake molecular characterization, it was agreed that the blood sample collection should be harmonized across the continent. The members therefore collectively proposed the use of either;

I. FTA cards
II. Whole blood collections – Possibly in high concentration of EDTA (0.5M) using 1ml for every 10ml to avoid degradation for at least 3 weeks at room temperature.
III. Ethanol: although this is not a good medium for tissue preservation as it degrades the DNA; hence the use of DMSO, Trisol, EDTA, RNA later, magic buffer were recommended.

NB: It was agreed that it may also be necessary to hold consultations with laboratory managers of reputable Research Institutions, Universities or any other relevant organizations/departments to share protocols that can be adopted for use in the continent.

Sample size

The members' also recommended various sample sizes for the phenotypic and molecular characterization studies. This was considered very important as the number of samples used would ensure the data generated is robust. There was variability between the two groups with Group 1 proposing for large animals (Minimum 100) and small animals with short generation intervals (e.g. cavies) a minimum of 400 animals. Group 2 proposed for phenotypic characterization 1500 animals/country for all animal species and for molecular characterization, sample at least 300 animals /country of which for each 5th animal sampled is molecularly characterized. In addition, Group 2 proposed for the piloting phase the consideration an average of 11 breeds per country of which would be distributed amongst species found in the respective countries. The working groups also come up with a form of sampling criteria with considerations to be made as listed below;

i. Agro-ecological zones
ii. Geographical location – random sites/farmers
iii. Ecotype/ Breed type/strain – random sample numbers
iv. Known population size
v. Production system
vi. % of population (random allocation of numbers within target locations based on presumed distribution/population)
vii. Farmer density – if farmers are scattered have a central sampling location
viii. Phenotypic diversity – get representative sample of phenotypic diversity e.g. 'coat color'
ix. Predetermined number of farmers and animals based on rough estimate of number of animals/farmer
x. Number – random but based on population number/herd size (25-40 Shoats; chickens 5/farmer; phenotypic diversity; mating system; Sample oldest animal, youngest animal, and any other random animal, irrespective of sex; Sample every bull on farm; snowballing sampling which involves prior identification of the key information sources through established groups or agencies (e.g. use breeder associations to identify farmers who rear certain livestock breeds), Use of related animals – e.g. triads)

Revised and harmonized inventory tools' guidelines

Deliberations held were very informative in the development of the inventory tools' guidelines. Members took time to deliberate on what was the main goal of taking inventory (Annex 3a) and established some fundamental queries to guide the process;

I. What do we have?
II. Where is it at?
III. What kind of production systems do they thrive in?
IV. What are the prevalent threats to AnGR?

From the deliberations, the main issues that needed to be included in the tool were; population sizes, spatial distribution of populations, production systems, AnGR purpose and products amongst others. During the plenary sessions, members felt that the revised phenotypic tool guidelines socio-economic component captured a large aspect of the inventory tool, thus members were in agreement that cross-cutting issues should not be repeated.

The two groups also agreed that the two draft guidelines developed for the inventory tools should be synchronized.

The guidelines proposed by the two groups for the inventory tool are presented in **Annex 3b-c**

Revised and harmonized monitoring tools' guidelines

In general, the write shop participants agreed that the analysis will be based on available;

I. Inventory data
II. Phenotypic characterization data
III. Molecular characterization data

The members agreed that the monitoring should be considered as a very critical component that will provide the much needed evidence to the policy makers. Several key issues of interest should be a priority and sought out during the data analysis.

These core indicators include;

a. Population size numbers – indicators of trends
b. Changes in Phenotypic status of populations (positive and negative)
c. Changes in Genotypic status of animal populations (positive and negative)
d. Threats (Usage changes, inbreeding, droughts, diseases, market forces, practices, crossbreeding)
e. Opportunities (Usage changes, pure breeding, drought resistance, disease resistance, market forces, practices, crossbreeding)

Data Analysis and management

Following the presentation given by Dr. Mary Mbole-Kariuki on the African Animal Genetic Resources Information system (AAGRIS), members were introduced to the proposed structure that will be a one-stop-shop for all issues related to AnGR. Six main categories namely the Species and breeds, Inventory, monitoring and surveillance, Conservation and breed improvement programmes, Capacity development, AnGR Institutions and news trends have been established following the needs assessment and further validated by member states and the process of designing and developing AAGRIS is underway. The data collector networks that were proposed in the technical meeting "**Finalization on operational structure of the African Animal Genetic Resources Information System (AAGRIS)**" was shared and enriched.

The AnGR-TAG members were in agreement that the data collector networks were exhaustive and well represented.

The participants also shared some data analysis software for phenotypic and molecular data (Annex 4).

Establishment of strategic options to guide implementation and improved utilization of the revised and harmonized AnGR

These deliberations through were not held in depth as would have been desired. However, the AnGR-TAG members held deliberations and established an unbiased selection criterion for the Member States that will be included in the first phase of implementation/piloting.

The selection criteria variables were ranked as per the priority issues and this included:

1. Regional approach – West, South, East, North, Central (sub regional AnGR priorities)

2. Agro ecological zones/diversity

3. AnGR- based – consider;

   - Data gaps in AnGR characterization etc.
   - Uncharacterized-unique AnGR
   - Trans-boundary breeds (species –specific)
   - largest target species diversity
   - Risk status
   - Emerging species
   - Fisheries

4. Human Capacity – consideration should be made based on

   - the sub-regions
   - available institutions

- technical expertise
- On-going initiatives.

Members also outlined the TORs for the prospective enumerators and developed an outline for the training of enumerators training sessions. For the selection criteria of the enumerators they should be;

- Technically proficient – ability to bleed an animal, animal handling skills, preferably a veterinarian.
- ICT – telephony literate – necessary for the ODK training*
- Educational qualification – post-secondary/certificate Animal Science
- General aptitude
- Experience in livestock surveys and sampling
- Role of enumerator to lead the team and selects the team
- Physical ability

Nb: Minimum 3 persons to undertake the activity and an additional coordinator or supervisor in the station

The outline for the planned training of enumerators included;

- Training on the use of the ODK data collection kit
- Training on the data collection templates and coat colour guides etc
- Familiarization with the photographs for breeds- uploaded on the ODK system
- Training on the Adapt map protocol-photography
- Familiarization with the toolkit
- Training on the gadgets – android phones or tablets
- Communication skills – Establish rapport, How to pose the questions
- How to identify local help/community
- Training through a preliminary testing of the tools – linear measurements etc
- Training on the logistical arrangement and reporting and data collection

For the piloting phase it was agreed that initial/introductory meetings should be held the farmers well before the activity commences.

It was also agreed amongst the AnGR-TAG members that offering of incentives would be a good option to consider so as to encourage farmer participation. The consensus was that the incentives should be;

- non-monetary
- customized to the region
- bring immediate benefits to the farmer

The primary incentive was feedback on issues related to production, management, and threats on AnGR amongst others. It was agreed that feedback should be promptly passed down to farmers as a form of information and promote a sense of ownership to the AnGR related activities.

General recommendations from the write shop

Some recommendations were formulated to effectively sustain the achievements of the workshop:

1. Adoption of the proposed content framework as shared by the Consultant (Prof. Anne Muigai). This included Executive summary, General Principals, Training for enumerators, Data collection templates, phenotypic characterization tool, Molecular characterization tool, Sample collection guidelines/ protocols and storage, Annex (photography and glossary of descriptors).
2. For the full involvement and participation of livestock keepers in the implementation of the tools, some of the proposed incentives should be adopted
3. The enumerators will be selected based on the agreed-upon TORs and the various areas of training as discussed will be undertaken
4. The Selection of institutes to be involved in the piloting of molecular tools should also include the consideration of their ability to collect and analyze the data
5. The harmonized tools should be adopted for use by the stakeholder institutions involved in their revision
6. An African-lead data consortium should be established to undertake data analysis

List of annexes

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Annex 2b: Group 2 – Phenotypic characterization guidelines – Small Ruminants (sheep and goat)
Annex 2c: Group 3 – Phenotypic characterization guidelines – Poultry (Chicken and guinea fowl)
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Annex 2e: Group 5 – Phenotypic characterization guidelines – Non Conventional species (Grass-cutter and Cavies)
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Annex 3 Revised Inventory guidelines
Annex 3a: Inventory and Monitoring
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Annex 4: Data analyses methods
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Annex 1: The Agenda

Write shop "Development of revised and harmonized characterization, Inventory and monitoring Animal genetic resources tools' guidelines"

Tentative Agenda
(Naivasha, Kenya)

14th – 17th April 2015

	Activity	Responsibility
Day 1: Tuesday		
Item 1	Opening	IBAR
Item 2	Presentation of workshop background, objectives, methodology and expected outcomes	IBAR
	Presentation of Dar-es-Salaam Workshop Outcomes; • Phenotypic tool • Molecular genetic tool • Inventory and monitoring tool	IBAR
Item 3	**Group work**: Development of guidelines for phenotypic characterization of AnGR (*Based on the content framework outlined above*)	All
	Plenary – Summaries of Group work presented	Rapporteurs
Day 2: Wednesday		
Item 4	**Group work**: Development of guidelines for Molecular genetic characterization of AnGR(*Based on the content framework outlined above*)	All
	Plenary – Summaries of Group work presented	Rapporteurs
Day 3: Thursday		
Item 5	**Group Work**: Development of guidelines for Inventory and monitoring tools for AnGR(*Based on the content framework outlined above*)	All
	Plenary – Summaries of Group work presented	Rapporteurs

	Presentation on AAGRIS needs assessment ▪ Validation of the data collector networks	AU-IBAR All
Day 4: Friday		
Item 6	Establishment of strategic options to guide implementation and improved utilization of the revised and harmonized AnGR; ▪ Development of MS selection criteria – Phase 1 ▪ Development of Enumerators TORs ▪ Establishment of training-of-enumerators modules outline	All
Item 7	▪ Compilation and ratification of 1st draft of revised AnGR tools guidelines ▪ Presentation of the proposed Content framework for the revised AnGR tools' guidelines	Consultant
Item 8	Recommendations and way forward	All
Item 9	Closing	All
Day 5: Saturday Departure		

Annex 2a. Group 1 – data collection template - Cattle and camel

Identification

Cattle	Camels
- Country (scroll down list) - District/governorate/province - Village - Farm code - GIS (3 dimensions) - Date of visits (season) - Species - Breed name (synonyms) - Animal Sex - Animal Age (could be calf, growing and adult)	- Country (scroll down list) - District/governorate/province - Village - Farm code - GIS (3 dimensions) - Date of visits (season) - Species - Breed name (synonyms) - Animal Sex - Animal Age (could be calf, growing and adult)

Morphometrics

Cattle	Camels
1. Animal weight/growth indicators: - Height of withers - Chest girth - Body length 2. Coat colour and pattern (multiple choice from photos/catalogue) - Colour - Pattern 3.Horn - Horn presence - Horn orientation 4.Hump - Hump presence - Hump Circumference - Hump position 5. Udder shape - Udder size (circumference) - Udder attachment - Udder evaluation **6. Facial measures** (enumerator training for data homogeneity) - Facial profile (photos should be taken) - Face length (cm) - Face width (cm) - Eat length (cm)	1. Animal weight/growth indicators: - Height of withers - Chest girth - Body length 2. Coat colour and pattern (multiple choice from photos/catalogue) - Colour - Pattern 3.Horn - Horn presence - Horn orientation 4.Hump - Hump presence - Hump Circumference - Hump position 5. Udder shape - Udder size (circumference) - Udder attachment - Udder evaluation **6. Facial measures** (enumerator training for data homogeneity) - Facial profile (photos should be taken) - Face length (cm) - Face width (cm) - Eat length (cm)

- Ear orientation (dropping, pointing backward, erecting up, etc.) **7. Tail** - Tail shape - Tail length **8. Rump size** **9. Legs** - Leg height (height from ground)	- Ear orientation (dropping, pointing backward, erecting up, etc.) **7. Tail** - Tail shape - Tail length **8. Rump size** **9. Legs** - Leg height (height from ground) **10. Bedding** (to tolerate hot soil) - Chest and abdomen bedding (presence/location) - Hoof bedding

Environmental

Cattle	Camels
1. Meteorological and geographical variables **GIS** (3D; Lat, Lon, Alt.) **Met. Stations data** - Ambient temp. (C^0) - Relative humidity (%) - Precipitation (ml/cm^2) - Solar intensity - Wind speed - Season, -Topography. **2. Management systems** - Feeding system (rangeland – supplementation- … etc.) - Water (availability and Accessibility) - Animal Housing - Season	**1. Meteorological and geographical variables** **GIS** (3D; Lat, Lon, Alt.) **Met. Stations data** - Ambient temp. (C^0) - Relative humidity (%) - Precipitation (ml/cm^2) - Solar intensity - Wind speed - Season, -Topography. **2. Management systems** - Feeding system (rangeland – supplementation- … etc.) - Water (availability and Accessibility) - Animal Housing - Season

Production

Cattle	Camels
1. Utility (scroll down choice) - Meat - Milk - Hides - Draught - Mix (choosing more than one) **2.Longevity traits** (How long in the herd- the oldest animal, the	**1. Utility** (scroll down choice) - Meat - Milk - Hides - Draught - Mix (choosing more than one) **2.Longevity traits** (How long in the herd- the oldest animal,

youngest animals and average animals) Survival (herd level then population estimates) Mortality (herd level, then population estimates) **3. Lactation traits** - Lactation yield (may need >= 2 visits) - Lactation length (in months) **4. Bull fertility traits** - Scrotal circumference - Genomic data (later stage) **5. Meat production/Growth Performance** - Weight at calving - - Weight at weaning - Any other weights available **6. Reproductive performance data:** - Calving interval - Number of calves/female - Age of the first calving	the youngest animals and average animals) Survival (herd level then population estimates) Mortality (herd level, then population estimates) **3. Lactation traits** - Lactation yield (may need >= 2 visits) - Lactation length (in months) **4. Bull fertility traits** - Scrotal circumference - Genomic data (later stage) **5. Meat production/Growth Performance** - Weight at calving - - Weight at weaning - Any other weights available **5. Reproductive performance data:** - Calving interval - Number of calves/female - Age of the first calving

Adaptive traits

Cattle	Camels
1. **Heat adaptation** (assessed for population level) - Rectal Temperature - Respiration rate - Ear temperature (using infrared device) (all corrected for THI) 2. **Mobility/trekking ability** (season) 3. **Drought tolerance** - Using historical information on draught cycles - Herd mobility due to draught - Survivability in draught-stress time 4. **Poor forage adaptation** (Y/N, season) 5. **Solar radiation adaptation** (grazing under sun) 6. **Body condition** (training enumerators for body-score approach for different breeds)	1. **Browsing behaviour** 2. **Heat adaptation** (assessed for population level) - Rectal Temperature - Respiration rate - Ear temperature (using infrared device) (all corrected for THI) 3. **Mobility/trekking ability** (season) 4. **Drought tolerance** - Using historical information on draught cycles - Herd mobility due to draught - Survivability in draught-stress time 5. **Poor forage adaptation** (Y/N, season) 6. **Solar radiation adaptation** (grazing under sun) 7. **Body condition** (training enumerators for body-score approach

7. **Disease/Parasite tolerance** (general implication/knowledge for populations level, endemic disease and parasites in the region)	for different breeds) 8. **Disease/Parasite tolerance** (general implication/knowledge for populations level, endemic disease and parasites in the region)

Biological samples (to be collected)

Cattle	Camels
1. Blood (always preferable, large amount of 10 ml+1 ml 0.5 M EDTA, unless animal holder objection). If available, use TFA cards for conservation and transportation. 2. Tissue (second preference, ear punctures)- Conservation of high quality DNA needs lab developing protocols 3. Nasal swaps (DNA yield needs verification) 4. Hair (needs training for collector/enumerator to get enough hair bulbs for genotyping/sequencing)	1. Blood (always preferable, large amount of 10 ml+1 ml 0.5 M EDTA, unless animal holder objection) 2. Tissue (second preference, ear punctures)- Conservation of high quality DNA needs lab developing protocols 3. Nasal swaps (DNA yield needs verification) 4. Hair (needs training for collector/enumerator to get enough hair bulbs for genotyping/sequencing)

Annex 2b: Group 2 – Data collection templates for small ruminants (sheep and goat)

GROUP2 Small Ruminants
SHEEP & GOATS

Morphometrics

Morphometric - to be supported by pictures of animals)

Height at withers

Procedure
stand squarely
Should stand on a level ground
Front hoof to point of withers) top of shoulder blades
Suggested inclusion of
Cannon bone length
Cannon bone circumference
Tools
Use of calibrated moveable T-stick (perpendicular)

Body Length (BL)
Point of top of shoulder to the last sacral vertebrae
The animal should stand straight
Point of lower shoulder to pin bone (bones on either side of anus)

Morphometrics

Procedure

Heart (Chest) girth
Body circumference at the heart just behind the elbows)

Procedure
Use strings and then measure the strings using calibrated sticks
The tape should be kept straight
The tightness should be a slight indentation into the hair
Two measures one with strings under the hair cover and the other with the hair and wool
Width of PIN bones:
Width between rear bones at either side of the anus
Procedure
Use strings and measure using calibrated sticks
Use calipers
Width of points of shoulder bones in front
Width of points on either side of the lower shoulder
Procedure
Use strings and measure using calibrated stocks
Use calipers

Morphometrics

Head size
The width between the poles
Procedure
Use strings
Tail
For sheep
Width
Circumference at the middle
Length
From the first caudal vertebrae to the tip of the tail
For goats
Orientation at tip of the tail

Ear length
From base of ear to the tip
Ear width
Measured at the center of the ear
Procedure
Use strings and change into

Morphometrics

Horn size
From base horn to the tip of horn taken on a straight line (shape to dealt in the description (spiral, curved, straight)

Horn circumference
Horn circumference at the base

Scrotal circumference
Circumference at the center of the pair of testis
Use string with slight indentation into the hair and change it into measurement using calibrated stick

Morphometrics

Qualitative (for both sexes)
Coat colour
Pattern
Uniform (one color)
Pied (two or more colors patched)
Spotted (dotted colors of one or more on the dominant one)
Colour type
Red, black, white. Grey. Brown
The dominant colour of the flock the animal belongs to
Indicate colurs in the case of pied
Indicate the dominat and the spot in the case of spotted
Facial
Concave –curved in ward
Convex –curved outward
Straight- straight from upto lower
Horn orientation
Upright, Lateral, Forward, downward
Horn type
Spiral, Curved, Straight

Morphometrics

Qualitative (female)
Udder attachment
Narrow
wide
Toggle - a pair of extension under the lower side of the neck
Present or absent
Wattles- a wider extension below the neck
Present or absent
Beard
Present or absent
Horn
Present or absent

Photographs for morphometrics

Cannon bone length

Height at withers

Heart girth (short hair)

Heart girth (long hair)

Short hair

long hair

Environmental

Temperature (from secondary sources)
Annual average
Annual maximum
Annual minimum
Spatial information (GPS readings at every household)
Latitude
Longitude
altitude
Water availability and sources
Average annual precipitation (secondary sources)
Availability –Access to drinking water
Frequently restricted
Normally not restricted
Occasionally restricted
Drinking water salinity Yes,no
Water sources
Watershed-water harvesting
Lakes, Water points and ponds,River, Water wells, Tap water, Dams,Spring
Relative Humidity (secondary sources)
Annual average
Annual Minimum
Annual Maximum

Environmental

Production system

Mixed crop livestock
Pastoral
Agro-pastoral
Agro-forestry-livestock
Tree based livestock production
Ranching
Rangeland system

Tending management

Free grazing
Zero grazing
Shepherded

Feeding management

Grazing only throughout the year
Grazing and supplementation during periods of shortage
Grazing and supplementation during critical physiological states

Environmental

Feed type (multiple responses are possible)

Sown pasture, Natural pasture(including browse),Concentrates
Crop residue, Forage crops, Fodder crops, Industrial by-product
Mineral and vitamin supplement

Mating and breeding management

Do you have your own ram? 1. Yes 2.No

How your ram give mating service?

1. For my flock only 2. For my flock and neighbors 3. Rent out 4. Not fixed

Is there any special management for breeding ram? 1. Yes 2. No

How long the same ram give service in your flock? _____ month/year

How mating is practiced in your flock?

1. Mixing of ram with ewes 2. Introduction of ram with fixed time 3. Other (specify) _____

Where do you get replacement ram?

1. From young lambs of my own flock 2. From young lambs of other flock (neighbor) 3. Purchased from market 4. Others (specify) _____

At what age ewes and ram culled?

1. Ewes_____ year 2. Ram _____year

What is the use of culled animals?

1. Sold 2. Slaughtered 3. Exchange 4. Others _____

Environmental

Feed type (multiple responses are possible)

Sown pasture, Natural pasture(including browse),Concentrates
Crop residue, Forage crops, Fodder crops, Industrial by-product
Mineral and vitamin supplement

Mating and breeding management

Do you have your own ram? 1. Yes 2.No

How your ram give mating service?

1. For my flock only 2. For my flock and neighbors 3. Rent out 4. Not fixed

Is there any special management for breeding ram? 1. Yes 2. No

How long the same ram give service in your flock? _____ month/year

How mating is practiced in your flock?

1. Mixing of ram with ewes 2. Introduction of ram with fixed time 3. Other (specify) _____

Where do you get replacement ram?

1. From young lambs of my own flock 2. From young lambs of other flock (neighbor) 3. Purchased from market 4. Others (specify) _____

At what age ewes and ram culled?

1. Ewes_____ year 2. Ram _____year

What is the use of culled animals?

1. Sold 2. Slaughtered 3. Exchange 4. Others _____

Environmental

•Housing type

Do you house your sheep?

•What type of shelter do you have for your sheep?

•1. No shelter 2. Open barn 3. Separate house for sheep 4. Shelter constructed in side main house 5. Shelter constructed expansion of the main houses. 6. Other

Season	Yes	No	Why?
Dry season			
Wet season			

Production

11.1. **Weight**
- Birth weight-monitoring
- Weaning weight-monitoring
- Mature weight (

Procedure
- Using suspended balance to the nearest 100 gm

11.2. **Milk yield**
Repetitive measurements (twice a month beginning three days after birth) -monitoring
Do you milk ? no, yes
- How much milk do you get at the beginning
- At pick
- At the end

Procedure
Measure actual milk produced
Use weight suckle weigh system
Ask keeper to quantify using a known size container

Production

Milk quality (samples collected for laboratory work)
Butterfat
SNF
Protein
lactose

11.4. **Lactation length** (days)
From kidding/lambing to termination of milking excluding suckling period
From milking/lambing to termination of suckling/milking

11.5. **Wool/hair**
Wool Presence no/yes
If yes
- Fine (soft)
- Medium (a little softer)
- Coarse (rough)

Hair size (measure in centimeter at the thirteenth Vertebrae area)

Reproduction

Number of lambs/kids born per lambing/kidding
Longevity: at what age do you cull the ewe/does/rams/bucks?
Female fertility (on flock basis):
- The proportion of females given offspring during the past six months.
- How many times has the animal lambed/kidded in two years?

Age at first lambing/kidding
Mothering ability
- Do you practice suckling? Yes, no
- Proportion number of lambs/kids surviving to weaning (flock bases)

Scrotal size-scrotal circumference
Scrotum type
- Cleft type
- Non-cleft type

Semen characteristics (laboratory)
- Volume
- Colour
- Gross mobility

Adaptive

Mortality/survival rate (flock level)

Heat tolerance

Respondents view on the heat tolerance and flock dynamics

Rectal temperature along with ambient temperature

Mobility

Average distance travelled in different seasons

Trekking ability

Disease and parasite resistance (on flock basis)

The frequency of treatment

The respondents view about the resistance of their animals

Social and economic

Sex of HH head 1. Male 2. Female

Age of HH head _____

Education back ground of HH head

1. Illiterate 2. Read and write 3. Literate

If your answer is literate, what is your grade?

1. Primary school 2. Secondary school 3. University

_____

What is your family livelihood (source of income)?

1. Agriculture 2. Trade 3. Employee 4. Other (specify)_____

What is your major farming activity?

1. Crop 2. Livestock 3. Both

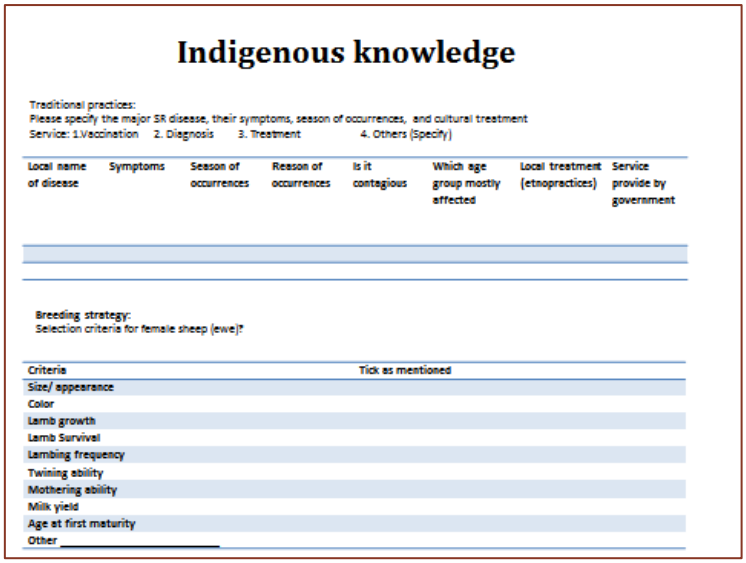
What is your family total area of land? Local measurement_____= _____ha

Crop land_____ Local measurement = _____ha

Fallow land_____ Local measurement= _____ha

Grazing land_____ Local measurement= _____ha

Other specify_____ Local measurement= _____ha



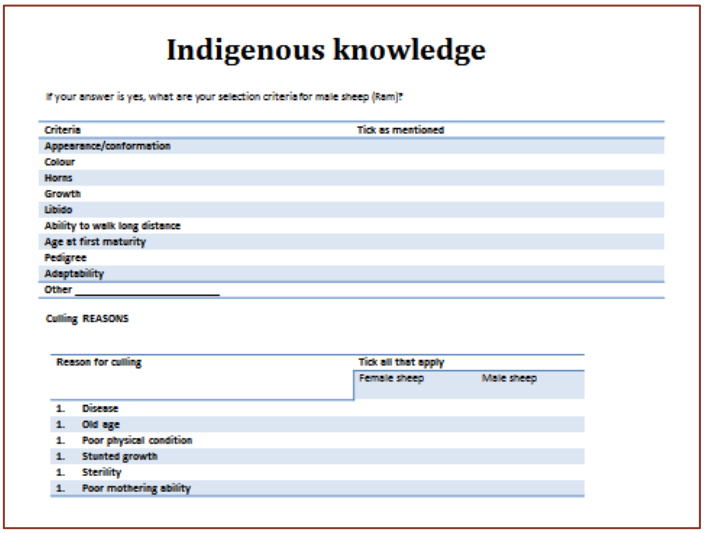
Indigenous knowledge

Traditional practices:
Please specify the major SR disease, their symptoms, season of occurrences, and cultural treatment
Service: 1.Vaccination 2. Diagnosis 3. Treatment 4. Others (Specify)

Local name of disease	Symptoms	Season of occurrences	Reason of occurrences	Is it contagious	Which age group mostly effected	Local treatment (etnopractices)	Service provide by government

Breeding strategy:
Selection criteria for female sheep (ewe)?

Criteria	Tick as mentioned
Size/ appearance	
Color	
Lamb growth	
Lamb Survival	
Lambing frequency	
Twining ability	
Mothering ability	
Milk yield	
Age at first maturity	
Other _____	



Indigenous knowledge

If your answer is yes, what are your selection criteria for male sheep (Ram)?

Criteria	Tick as mentioned
Appearance/conformation	
Colour	
Horns	
Growth	
Libido	
Ability to walk long distance	
Age at first maturity	
Pedigree	
Adaptability	
Other _____	

Culling REASONS

Reason for culling	Tick all that apply	
	Female sheep	Male sheep
1. Disease		
1. Old age		
1. Poor physical condition		
1. Stunted growth		
1. Sterility		
1. Poor mothering ability		

Annex 2c. Group 3 – data collection template – Poultry (Chicken and guinea fowl)

PHANEROPTIC DESCRIPTION

Types of feathering

A 

B 

C 

D 

Feather structure

Smooth

Superficial silky

Frizzle

Silky

Plumage colour

Colour	Image
Barred	
Birchen	
Black	
Black Breasted Red	
Black Laced	
Black-tailed Buff	

Black-tailed White	
Black-tailed red	
Blue	
Blue Brassy Back	
Blue Breasted Red	
Blue Golden Duckwing	
Blue Laced	

	
Blue Laced Red	
Blue Light Brown	
Blue Silver Duckwing	
Blue Mottled	
Blue Wheaten	
Blue-red	
Brassy Back	
Brown	
Brown Red	Sometimes called Gold Birchen

Buff	
Buff Columbian	
Buff Laced	 Alternatively known as Chamois

Citrus Spangled	
Coloured	
Columbian	
Coronation	
Cream Light Brown	
Crele	

Silver Cuckoo	
Golden Cuckoo	
Dark brown	
Exchequer	Found only in Leghorns.
Fawn Silver Duckwing	
Ginger Red	
Golden	
Golden Duckwing	
Golden Laced	 
Golden Neck	
Golden-necked	

mille fleur	
Golden Pencilled	
Golden Spangled	
Gray	
Lavender	
Lemon Blue	
Lemon Mille Fleur	
Light	
Light Brown	
Mille Fleur	 
Mottled	

Partridge	
Porcelain	
Pyle	Alternatively spelt Pile
Quail	 
Red	
Red Pyle	

Salmon	 
Self Blue	
Silver	
Silver Blue	 
Silver Duckwing	
Silver Gray	
Silver Laced	

Silver Pencilled	
Silver Spangled	
Spangled	
Speckled	
Splash	
Tolbunt	Seen only in Polish chickens
Wheaten	

White	
White Laced Red	

Skin Color

White; Yellow; black

Shank Color


Pink


yellow


Green


White


Steel Bleue


Black

- Ear lobe shape

  Round

  Oval

- Ear lobe colour

  Red;

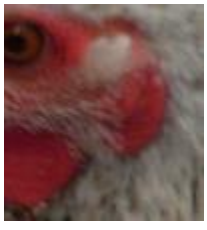
  White;

  Yellow

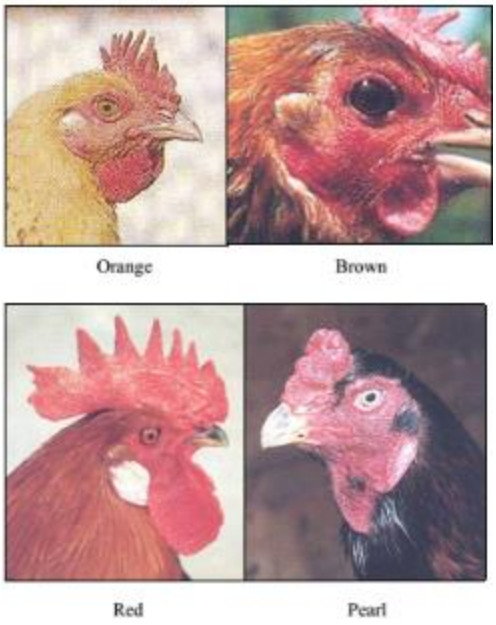

Oval and white


Round and white


Oval and red


Round and red

- Eye colour
  - Pink Yellow Brown Orange Red



- **Comb type**
  - Single;
  - Pea;
  - Rose;
  - Walnut;
  - Strawberry
  - Double

Single comb of chickens

Rose comb of chickens

- **Skeletal variance**
  - Normal;
  - Polydatyl ;

- creepers;
- dwarf;
- rumpless;
- multiple spurs
- body carriage

• structure of the beak
  Straight
  Curve
• colour of the beak

Yellow Black Brown White Green

BODY MEASUREMENTS OF THE CHICKEN

Figure : body measurements in chicken

Legend

a = crest height
b = length of the head
g = diameter of the thorax
h = body length

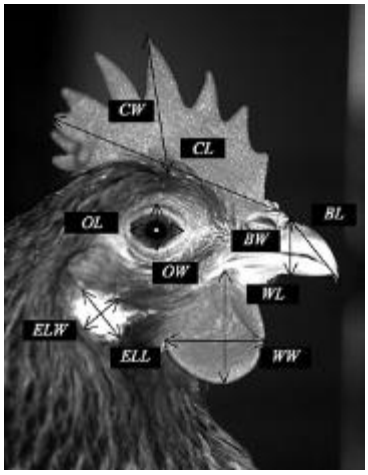
c = length of beak	i = diameter of tarsus
d = length of the wattle	j = tarsus length
e = length of the neck	k = diameter of tarsus
a = crest height	l = length of the crest

General characteristics

1. Weight: The birds were weighed on the same day by the same operator.
2. body length: Measuring from the tip of the beak to the end of the tail when the bird was laid down on its back.
3. Wingspan: Distance between the ends of the longest primaries with wings stretched. On the work table, maintain the joints of the wings as stretched as possible

Head (see Figure)

4. Skull length: Was measured as the distance between the occipital bone to the insertion of the beak into the skull (where the plumage starts).
5. Skull width: Measured at eyes level.
6. Comb length: Distance between the insertion of the comb in the beak and the end of the comb's lobe.
7. Comb width: Distance from the tip of the central spike until insertion of the comb in the skull. If the number of spikes is even, the highest must be chosen.
8. Ocular length: Distance between eyelids corners.
9. Ocular width: Second ocular dimension, perpendicular to the length, including the folds of the eyelid.
10. Beak length: Length from the tip of the beak until insertion of the beak into the skull
11. Beak width: Measured from the insertion of the beak in the skull and perpendicular until the end of the inferior mandible.
12. Ear lobes length: Maximum length, keeping the head of the bird perpendicular to the neck. Person holding the bird should catch the bird's legs with one hand and with the other hand hold the neck on the middle height and with index finger keeping the bird's head perpendicular to the neck's line.
13. Ear lobes width: As in the previous measure, measured the second-largest dimension.
14. Wattles length: Length from insertion of the right wattle into the beak, holding the wattle with one hand and drawing a straight line to the end of the wattle.
15. Wattles width: Measurement of the second maximum dimension of the wattle perpendicular to the length.



source : Francesch et al., 2011.

CL, comb length; CW, comb width; OL, ocular length; OW, ocular width; BL, beak length; BW, beak width; ELL, ear lobe length; ELW, ear lobe width; WL, wattle length; WW, wattle width

Body

16. Back length: Length from insertion of the neck into the body to the saddle.
17. Keel of sternum length: Distance between both vertices of the sternum (*pocessus carinae* and *processus xiphoideus*) leaning the bird on its back.
18. Tail length: Length from the tip of a central rectrix to the point where it emerges from the skin
19. Breast angle: A goniometer was placed at 1 cm from the extreme of the keel (*processus carina*e) of the sternum. The fixed arm of the tool had to be adjusted on the left breast and the mobile arm, on the right breast

Extremities

20. Thigh length: Length from shinbone—femur joint, to shinbone–tarsus joint.
21. Folding wing length: taken along the wing chord. Wing had to be folded and closed to the body, and it corresponds to the length from carpal joint until the end of the longest primary.
22. Tarsus length: Length from the notch of the shinbone– tarsus joint until the other end, taking the toes forward 90° respect tarsus.
23. Tarsus diameter: Diameter from back to the front, on the middle of the metatarsus bone, without pressuring the skin
24. Central toe length: Extending the toes on the table, length from the central toe – metatarsus joint until the insertion of the nail.

Corporal indexes

a) Skull index = skull length/skull width
b) Ocular index = ocular length/ocular width
c) Comb index = comb length/comb width
d) Ear lobes index = ear lobes length/ear lobes width
e) Wattle index = wattle length/wattle width

- **Comb size**
- Small:
- Medium:
- Large:
- Erect or droopy:
- **Breast circumference**
- **Keel development**
    - **Length- angle**
- **Body length**
- **Wing span**
- **Shank length**
- **Beak length**

PLUMAGE PATTERNS IN GUINEA FOWL

Colour	Image	Notes	Genotypes
Grey,			M+ / M+ I+ / I+ D+/D+ w+ / w+ (all wild-type genes)
pearl,			
pearl grey,	 	These are a dark gray with white dots throughout their plumage. They are the old fashion original color of Guineas, a favorite, prized by many for their beautiful dotted feathers. **Keets** are brown with black stripes and markings and a tan underside. The head has a broad black stripe down the center with two narrow black stripes on each side of it, with narrow orange stripes between the black. The beak, legs, and toes are orange.	
speckled,			
wild-type			

Violet,			
royal purple	 	These are a very dark black color with a lovely purplish sheen. They do not have regular dotting, but do have some dotting and barring in the flank area. These are magnificently handsome beauties. Keets: The keets are brown with small irregular black striping on the back and the top of the head. The face, front of the neck, belly, and wings are white. Beak, legs, and toes are orange. These feather brown with black markings. They feather with a dark underside, losing all the white as they feather. At two to three months of age, they molt in with their dark black feathers. Purples are often confused with Pearl Grays before this molt.	m /m I+ / I+ D+/D+ w+ / w+
Lilac,			
lavender,	 	They are light blue with white dots. This is a very popular color. Keets are a light blue with dark blue stripes and markings. The belly is light blue. The head markings are a broad dark blue stripe down the center of the head with two narrow dark blue stripes on each side of it, with narrow tan stripes between the dark blue stripes. The beak, legs, and toes are orange. Like all guinea keets, they are very lively and alert.	M+ / M+ i / i D+/D+ w+ / w+
light grey			

Lite Lavender:	 	These are a light version of the Lavender. The color is right in between the Lavender and the Porcelain. Keets are a solid light blue with a white face and throat. They feather light blue and gradually get white dots throughout.	
Sky blue,	 	These are a beautiful blue color similar to the coral blue, only without any dots or bars as the Coral Blues have. They are a solid blue color with a hint of blue on blue lacing. Keets are a solid light blue color with white belly and wings. They feather a light blue with color similar to the Powder Blues but get a darker blue as they mature.	m / m i/ i D+/D+ w+ / w+
coral blue,		These are a medium blue which tend to a darker beautiful coral blue on the neck, breast, and back. Sometimes referred to as the only poultry with a true sky blue color. These are not dotted, but do have a few dots and bars in the flank area. They are very colorful. Keets are light blue with dark	

	 	blue irregular striping on their backs. The top of the head is dark blue irregularly striped with tan between the stripes. The face, front of the neck, belly, and wings are white. Beak, legs, and toes are orange. These feather a light irregular blue all over (no white) and are often confused with Lavenders until at two to three months, when they molt to their darker coral blue color.	
blue coral			
Chamois,			M+ / M+ I+ / I+ d/d w+ / w+
dundotte,			
buff dundotte	 	These are a soft tan color with white dots throughout. The hens are darker color than the cocks. These can almost be sexed by color. They are very unusual a d beautiful. Keets are a light tan color with dark tan stripes on the back and head. Once again a broad tan stripe with two narrow tan stripes on each side. Light tan underside. Beak, legs, and toes are a light orange. Day old keets are darker on the hens and lighter on the cocks. These feather near white until they molt at two to three months. Then they get the tan color with dots. These are easily mistaken for Whites, Buffs, Porcelains, and Opalines before the molt.	

Buff	 	These are a soft tan color without dots. Once again, the hens are darker than the cocks as adults, and keets. They are rare and in great demand. Keets are near white with light irregular tan stripes on the head and back. They feather near white and are hard to distinguish from the other light colored varieties until the molt at two to three months.	m/m I+ / I+ d/d w+ / w+
Porcelain	 	These are a very pale pastel blue with white dots. Hens are darker here also. This is a dilute of the Lavender, very rare. Keets are off white with very light blue gray stripping on the head and back. Broad and narrow stripes on the head again. They feather near white until they molt at two to three months.	m/m I+ / I+ d/d w+ / w+
Opaline	 	The coloring of these is a pale icy whitish blue, essentially a bleached Coral Blue. Hens are darker than the cocks. Also very rare.Keets are near white with only a tint of bluish on their head and back. Almost the same as the whites, but they do not have any black spots on the head as some of the whites do. These feather near white until they	m/m i/i d/d w+/w+

		molt.	
White	 	These are pure white with a few black hairs on the back of the neck. The whites have lighter colored skin and the meat is lighter color also. The colored guineas have all dark meat. Both are fine textured and with a gamy taste. Both are very good eating and a fine delicacy. Keets are snow white with orange beak, lets, and toes. Many of the keets have a small black spot on the back of their head, although not all of them will have this.	anything with W/W
Splashed,			
white-breasted pearl			M+ / M+ I+ / I+ D+/D+ W/ w+
Laken pur			m/m I+ / I+ D+/D+ W/ w+
white-breasted purple			
Silverwing			M+ / M+ i / i D+/D+ W/ w+
Coral white			m/m i / i D+/D+ W/ w+
Dondotte white			M+ / M+ I+ / I+ d/d W/ w+
Buff white			m/m I+ / I+ d/d W/ w+
Porcelain white			M+ / M+ i / i d/d W/ w+
Opal white			m/m i / i d/d W/w+

Slate	 	These are very rare, being seldom seen in the U.S. They're a steel blue color with a slight cast of cream color over the shoulder and back. They also have a collar of iridescent purplish blue around their neck. This extends from the bare area on the neck down to the shoulder in the back and the crop area in the front. The color is very uniform with no dotting or barring as in the other semi-solid color varieties. This is a very nice color and will be very popular as more of these become available. Keets are a solid rusty cinnamon red color with no stripes. They are a little lighter color on the belly. Very cute little keets. As they feather they gradually change to the steel blue color.	
Brown:	 	These are dark brown with white cots. The males are slightly lighter than the hens. Keets are similar in color to the Pearl Gray keets, only slightly lighter. They feather a light tan color until they molt at two to three months old and come in quite dark with white dots. These are very rare and beautiful.	
Powder Blue:		These are a solid uniform light blue color. They have absolutely no dots or barring. A very pretty new color. Keets are a solid light pewter color. They feather from the start with their light blue color.	

			
Chocolate:	 	These are a dark brown color, very unusual. They have a few dots and bars in the flank area. Keets are near white with tan irregular stripes on their head and back. They feather light tan similar to the Browns, but at two to three months they molt to a dark brown color.	
Violet:	 	These are a dusty black with a purple sheen throughout. They look very purple on a cloudy day or in the shade, unlike the Royal Purple which show their purple best in the sun. However with the sun at your back, the Violets have a very iridescent purple throughout. These are a solid uniform color with no dots or barring. Keets are a rusty red color with a white belly and wings. These are very cute. As they feather they gradually change to the steel blue color and then darken to a dusty black, with the purple sheen.	
Bronze:	 	These are a dark black color with a cast of bronze or brown over the shoulders, back and on the neck and chest. The primary wing feathers have a reddish color. These are very similar to the Royal Purples but have lost most of the purple sheen and taken on the bronze cast. As keets and	

		through the growing period they are very similar to the Purples. In fact, it takes until they are 6 months old to really get the bronze color.	
Pewter:	 	These are a pewter gray color. Sometimes a little streaky in appearance. Keets are a solid rusty red color like the Slates only a little lighter in color. They feather light blue, and later turn to the pewter gray color.	
Pied:	 	These have white in the chest, wing and sometimes the back area. Pied can be of various mixed colors. Some in purple, pearl, chocolate, buff and other colors all with white on them. Keets vary in color with white wings, belly and face.	

Environmental

- Ambient Temperature
- GIS (Latitude and Longitude)
- Water Availability/Watering systems
- Precipitation
- Humidity
- Altitude
- Vegetation cover
- Soil type
- Solar intensity
- Management system(feeds and feeding systems)
- Season
  - Dry
    - Months e.g. May - October
  - Rainy
    - Months e.g. November - April
- Topography
- Housing types

Production and reproduction

Flock size and composition

Egg production

- Age at 1st egg
- Hen Day Production (HDP
- Hen Housed Production (HHP)
- % at Peak Production
- Age (wk) at peak Production
- No of weeks at peak Production
- Persistency at Peak Production
- Age (wk) at 5% lay
- Age (wk) at 10% lay
- Age (wk) at 50% lay
- Wt of 1st egg
- Wt of hen at 1st egg

Egg quality traits

- Egg length (mm)
- Egg width (mm)
- Egg weight (g)
- Yolk height (mm)
- Albumen height (mm)
- Shell thickness,Shell weight
- Egg size,Egg colour

Production and reproduction

Meat Production
Age at slaughter
Weight at slaughter
Meat quality
Carcass yield
Liveweight
Plucked weight
Eviscerated weight
Cut part weights
Thigh (drum stick)
Breast
Gizzards
Wing
Neck
Leg
Lean to Bone ratio
Feed efficiency ratio
Feed conversion Ratio
- Feed per kg body weight
- Feed per dozen eggs

Reproduction

Reproductive Data
Fertility
Hatchability
Embryonic mortality
Dead in shell
Clutch size
Pulse length
Semen characteristics
- Quality
- Volume
- Colour
- Motility
- Deformity

Adaptive

Mortality
- Brooding
- Rearing
- Laying

Heat Tolerance
- Body Temperature
- Pulse rate
- House environmental temperature

Social and economic

- Age of farmer
- Gender of the farmer
- Marital status of farmer Single; married; divorced; widowed
- Education level of farmer
- Gender of family head
- Age of the family head
- Education level of Household Head(HH)
- Labour distribution
  - Who is feeding
  - Who is watering etc.
- Who is selling the products?
- Cultural valuation of livestock
  - No of egg and chickens for gifting rituals etc
- Family income from livestock
  - No of eggs sold
  - No and age of chickens sold
  - Manure sold
- Nutritional Level
  - Egg consumption per week
  - Household Chicken consumption per week

Social and economic

- Other sources of income
- Occupation of HH
- Type of production system
- Decision making
  - House hold head
  - Farmer
  - Children
- Price of Animal
- Age at market
- Production Objective
- Experience of famer
- Any training in poultry production
  - From Government, extension Agent etc

Indigenous Knowledge

- Traditional practices (Treatments to diseases, worms etc.)
- Breeding strategies/ trait preference
- Selection criteria
- Identification criteria
- Indigenous feeds and Feeding practices
- Product management/processing
- Housing
- Cultural beliefs/taboos

Annex 3a. Group 4 – data collection template - Pigs

GROUP4 PIGS

Morphometrics

Animal name/Animal sex/Animal ID: Please enter the animal name
Animal breed: as perceived by farmer
Profile pictures: Side, Front, back
Body length: *Please enter the body length in cm* (body length measured from the small of the shoulders to the root of the tail. Put appropriate images to guide in Appendix
Heart Girth: *Please enter the heart girth in cm* (Heart Girth measured at the point behind the shoulders across the widest region at the chest. Put appropriate images to guide in Appendix
Height at wither: *Please enter the height at withers in cm*
Coat Color: *What is the coat color of the animal* (white, black, red, grey)
Coat Pattern : What is the coat pattern (spotted, pied, patched, plain, others)
Facial length: *Please measure the length of the face in cm_____from the top of the fore head to the tip of the snout*
Ear orientation: *What is the orientation of the ears on the pig* (Erect, droopy, pointing backwards)
Teat number: indicate the number of teat pairs
Hair density: (dense, sparse, other)

Morphometrics

Length of hair: (short, long, other)
Tail shape: curly or straight
Shape of back: straight, or curved
Presence/absence of hair****
Ear length****
Length of fore and hind legs****
Face shape
Tail length***
Tail presence***
Snout Shape****
Snout circumference****
Snout length**** NB: *Appropriate sketches will be put in appendix to illustrate how body lengths are measured*

Environmental

Month and Season of year
Temperature (Ambient) in ^{O}C and time of day (24hrs format – 0000hrs)
GIS: record GIS to the nearest 8m accuracy.
Altitude: from GIS readings
Production environment (intensive, semi, extensive)
Water source: lake, river, well, pond, piped, rain-harvested
Topography: Flat, undulating, hilly
Vegetation cover: Forest, Grassland, Savanna, semi-arid, arid, mangrove,
Solar intensity***- obtained for the area from nearest met station or NASA/Columbia university Earth Institute weather data
Precipitation***
Humidity***
Window speed***
Soil type****

Production

Body weight (girth length)- obtain weight in Kg
Carcass weight – sample animals for determination of carcass characteristics to be taken to a lab for measurements
Litter size at birth- provide the average litter size per animal sampled
Farrowing rate- how often it farrows per year
Number at Weaning- provide average of young at weaning per animal per season
Age at farrowing- provide age at first farrowing in months
Manure quantity per animal- do you collect manure from the animal, what is the quantity in buckets (important we agree on measurements)
Blood (for livestock meal formulation)- do you use blood for anything

Adaptive

Disease resistance-how often does the animal get sick (Never, monthly, yearly)
Do you provide any medical assistance (if yes-do you pay for this service or does government provide the service)
Do you sell slaughter- sick animals
Mortality rate (survival at market point)
-How many animals per litter do you prepare for the market
- On the average how many animals do you lose per litter at weaning ? Was it local/cross/exotic
Distance to foraging ground- how far do your animals walk to the foraging grounds (to measure hardiness)
Distance to watering point- how far do your animals walk to drink water

Social and economic

Age of HH- give exact age in years
Gender of HH- male or female
Species owned by different gender
Herd structure- no of boars, sows, piglets
Herd size
Education level of HH
Assets give assets (production)
Type of housing (e.g. water harvesting for livestock)
Purpose for keeping pigs
Main use of pigs
Other species (and breeds) kept, reason for keeping
Distance to market (where they sale)
Exits and entries – how and why
Source of breeding stock

Social and economic

Type of housing
Housing system: Permanent, shed, none
Do you supplementation
Access and use of veterinary care
Labor input
Source of labor (family/ hired)
Who determines price and when to sell

Extra income
Other job
Training on pig farming
Land size
Who makes final decision on pig matters

Indigenous Knowledge

Trait preferences
Breed selection criteria
Cultural beliefs
Cultural benefits and use
Animal replacement criteria
Indigenous feeds and feeding practices
Ethno-veterinary practices

Biological samples

Tissue (ear notch/biopsy)
Blood
Hair
Fecal (intestinal)

Toolkit

Blood
- Whole Blood: Vacutainer, needles and holder
- Serum: Vacutainer, needles and holder
- Thin nib permanent marker
- Labels (preferably barcoded)
- Ice box and ice packs
- Rope (restraint)
- Ear notcher
- Preservative (RNA later)
- Ethanol
- Paper towels
- Ear tags, Ear tag applicator
- Tablet computer
- Barcode reading software (free)
- Disposable gloves

Hair
- Hair cards/small envelops

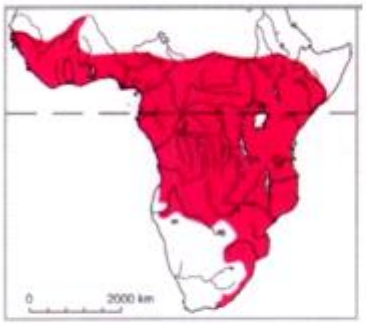
Fecal
- Gloves
- Ziplock bags
- Barcoded labels

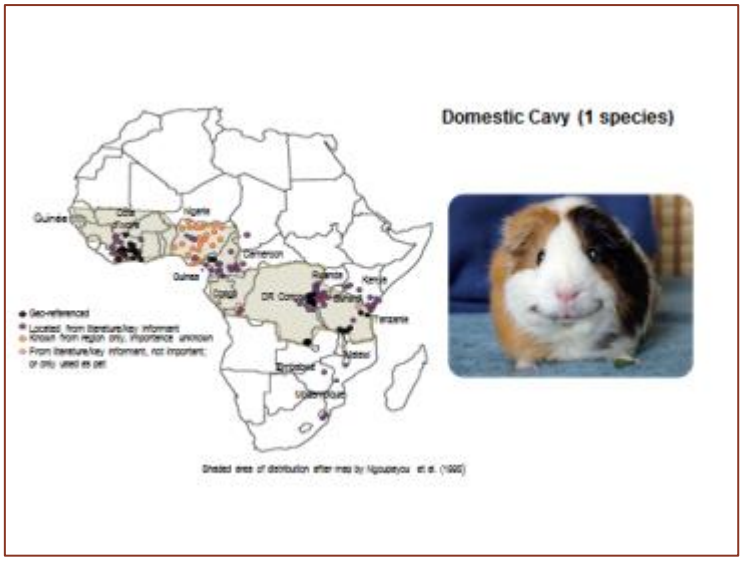
Annex 3b. Group 5 – Non-conventional species (Grass-cutter and cavies)

Grasscutter & Cavy Group

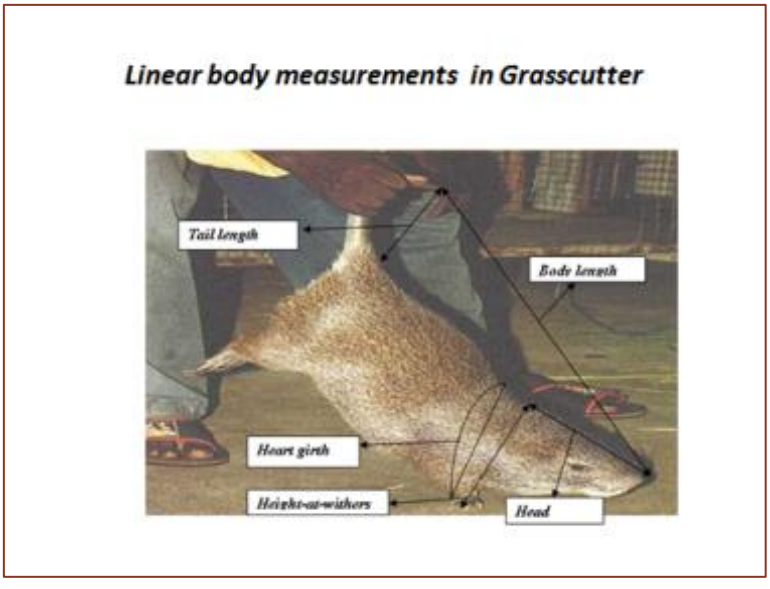
Phenotypic descriptors applicable to Grasscutter and domestic cavy populations

Grasscutter (2 dom. Species)





Morphometrics *(body measurements illustrated by sketches and photos; equipments list provided) => Handling these animals may need some skills...and patience!!!*	
GC - Height at withers - Body lenght - Chest girth - Tail length - Body length - Head length - Leg length (F/R) - Facial profile (Convex, concave and straight) - Individual photos (standards to be developed)	**C** - Height at withers - Body lenght - Chest girth - Body length - Head length - Leg length (F/R) - Facial profile - Individual photos (standards to be developed)



Coat & eyes	
GC	C
- Hair type/distribution (soft, coarse, short...) - Hair color (standardized color chart to be developed) - Coat Color patterns (standardized color chart to be developed) - Eyes color (black, pink, yellow)	- Hair type/distribution (soft, coarse, short...) - Hair color (standardized color chart to be developed) - Coat Color patterns (standardized color chart to be developed) - Eyes color (black, pink, yellow)

Environmental	
GC	C
- Location (urban/peri-urban/rural; GPS coordinates) - Housing types (kitchen free floor, roaming, indoors, outdoors) - Cage type (wooden, metal, concrete, mud) - Feeding system (once, twice, thrice, irregular) - Feeds type (forage, forage and agricultural byproducts, forage and kitchen left overs, forage+concentrates, concentrates) - Season (dry, short dry, wet, short wet) - Meteorological data (mean temperature, relative humidity...) - Watering system (no water, frequent, sporadic) - Availability of grass (throughout the year, seasonal) - Feeding equipments - Watering equipments - Transport cages (Y/N) - Handling cages (Y/N)	- Location (urban/peri-urban/rural; GPS coordinates) - Housing type (kitchen free floor, roaming, indoors, outdoors) - Cage type - Feeding system (once, twice, thrice, irregular) - Feeds type (forage, forage and agricultural byproducts, forage and kitchen left overs, forage+concentrates, concentrates) - Season (dry, short dry, wet, short wet) - Meteorological data (mean temperature, relative humidity...) - Watering system (no water, frequent, sporadic) - Availability of grass (throughout the year, seasonal) - Feeding equipments - Watering equipments - Transport cages (Y/N) - Handling cages (Y/N)

Weighing Grasscutter & Cavies

Production	
GC - Birth weight - Weaning weight - Mature weight - Dressing percentage - Carcass quality (fat, tenderness...)	**C** - Birth weight - Weaning weight - Mature weight - Dressing percentage - Carcass quality (fat, tenderness...)
Reproduction	
GC - Age at sexual maturity - Age at first parturition - Litter size at birth - Litter size at weaning - Parturition interval - Sex ratio - Mating ratio - Reproduction system (days the males spend with female) - Pregnancy diagnosis (visual, vaginal swap, abdominal	**C** - Age at sexual maturity - Age at first parturition - Litter size at birth - Litter size at weaning - Parturition interval - Sex ratio - Mating ratio - Reproduction system (days the males spend with female) - Pregnancy diagnosis (visual, abdominal appraisal)

Adaptive characteristics	
GC - Pre weaning mortalities - Post weaning mortalities - Observed ectoparasites - Observed diseases - Docility (Docile = allows to be touched and played with; Flighty = when touched it will have the tendency to move; Restless = goes away when someone approaches; Aggressive = will jump around, bite sometimes and try to escape...) Cf Annor et al. 2011 - Cannibalism (Y/N) - Hair dropping (Y/N) - Gnawing (Y/N)	**C** - Pre weaning mortalities - Post weaning mortalities - Observed ectoparasites - Observed diseases - Docility (Docile = allows to be touched and played with; Flighty = when touched it will have the tendency to move; Restless = goes away when someone approaches; Aggressive = will jump around, bite sometimes and try to escape...) Cannibalism (Y/N) - Hair dropping - Gnawing (Y/N)

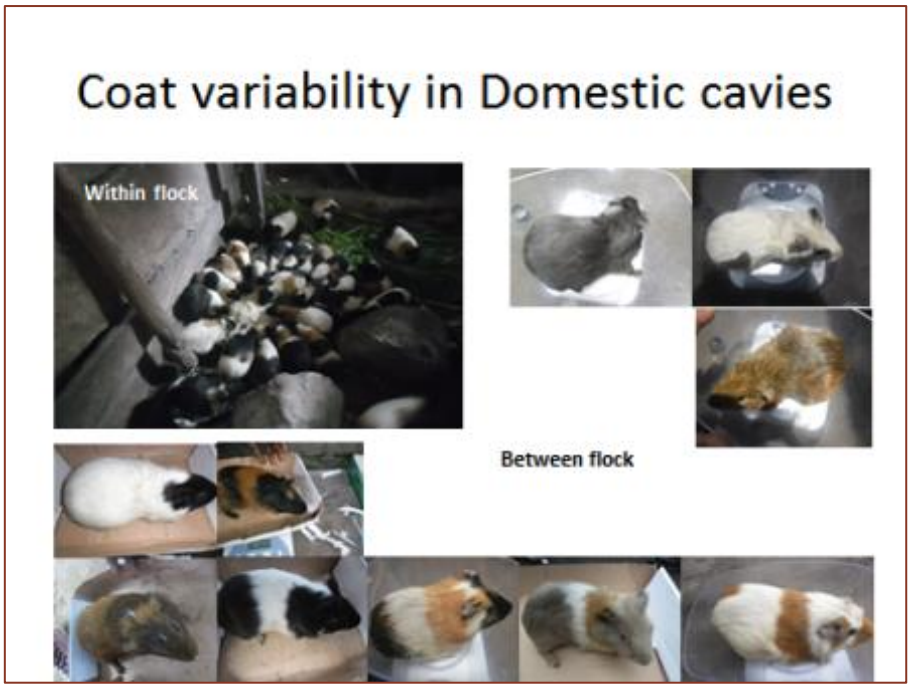
Socio-economic	
GC - Sex of farmer - Age of farmer - Educational level - Labour source (HH, Hired, Contracted) - Number of labourers - Number of year of farming - Purposes of farming (HH food, cash, social networking) - Belonging to a professional network (Y/N) - Herd size - Herd structure (adult males/adult females/young males/young females) - Data recording (Y/N) - Access to veterinary and extension services (Y/N) - Access to credit (Y/N) - Average price of an animal - Pricing determinants (age, LBW, others) - Sales points (farm gate, markets, restaurants)	**C** - Sex of farmer - Age of farmer - Educational level - Labour source (HH, Hired, Contracted) - Number of labourers - Number of year of farming - Purposes of farming (HH food, cash, social networking, manure) - Belonging to a professional network (Y/N) - Flock/Herd size - Data recording (Y/N) - Access to veterinary and extension services (Y/N) - Access to credit (Y/N) - Average price of an animal - Pricing determinants (age, LBW, others) - Sales points (farm gate, markets, restaurants)

Indigenous knowledge	
GC *Ethno veterinary practices (Y/N)* - Type of materials (seeds, fruits, leaves, ash, stems, barks, bones) - Kinds of materials (mixtures, powders) - Source of practices (own experience, inherited) - Frequency (regular/irregular) *Breeding strategies* - Selection objectives (ranked): 1.... 2....3.... 4.... - Selection criteria (ranked): 1.... 2....3....4.... - Identification criteria (Color, Size, others) - Sources of breeding males (Own stock, farmers, on station research stations, from the wild, gift) - Sources of breeding females (Own stock, farmers, on station research stations, from the wild) *Feeding practices* - Existence of specific feed formulation (Y/N) - Functions of specific known formulation (fertility/growth/disease tolerance)	**GC** *Ethno veterinary practices (Y/N)* - Type of materials (seeds, fruits, leaves, ash, stems, barks, bones) - Kinds of materials (mixtures, powders) - Source of practices (own experience, inherited) - Frequency (regular/irregular) *Breeding strategies* - Selection objectives (ranked): 1.... 2....3.... 4.... - Selection criteria (ranked): 1.... 2....3....4.... - Identification criteria (Color, Size, others) - Sources of breeding males (Own stock, farmers, on station research stations, from the wild, gift) - Sources of breeding females (Own stock, farmers, on station research stations, from the wild) *Feeding practices* - Existence of specific feed formulation (Y/N) - Functions of specific known formulation (fertility/growth/disease tolerance)

Products processing/management	
GC - Slaughtering methods (knocking, stunting slaughter, slaughter) - Bleeding (Y/N) - Skinning (Y/N) - Fur removing (burning, hot water) - Meat processing (freezing, drying, smoking, salting) - Cultural taboos (Y/N) - Beliefs attached to consumption (fertility, disease tolerance, health and others)	**C** - Slaughtering methods (knocking, stunting slaughter, slaughter) - Bleeding (Y/N) - Skinning (Y/N) - Fur removing (burning, hot water) - Meat processing (freezing, drying, smoking, salting) - Cultural taboos (Y/N) - Beliefs attached to consumption (fertility, disease tolerance, health and others)
Biological samples	
- Preferred dry blood spots (4/animal) from ear - Ear punches (protocol to come) - Faecal samples (individually in adapted cages) - Hair scratches (for parasitic screening)	- Preferred dry blood spots (4/animal) from ear - Ear punches - Faecal samples (individually in adapted cages) - Hair scratches (for parasitic screening)
Need a pilot	*Need to collaborate and buy from SA colleagues*

Note on ITC/Telephony:

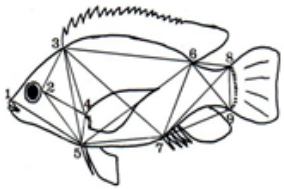
Possible to implement this survey or data collection sheet under ODK tool. We started using this under Goat Project (SIDA-ILRI-BecA Hub), with some issues of data transfer. We re designed the system again (already operational in CMR on bees and to start in TZ for cavies by July)
We are planning to use Telephony based monitoring of pilot/multipliers farms in CMR and DRC for cavies.


Coat variability in Domestic cavies
Within flock
Between flock

Annex 3c. Group 6 – Phenotypic characterization tool guidelines-Fish

GROUP6 FISH

Morphometrics



- Teleosts
- Finfishes:
- Finfish
- Catfishes
- **Cichlides**
- Body length (total and standard)
- Body measurements (between snout, fins, and eye)
- Head profile (shape, length, color)
- Colour (red, blue, white, mixed)
- Colour patterns (banded, spotted, patches)
- Scales (shape, size, rings)
- Fins (shape, number of rays, colour, colour patterns, bones/cartilage)
- Gender differences
- Tail profile (length, shape, colour, colour patterns, bony/cartilagenous)
- *time fish has been out of water should be specified.

Morphometrics

Table 1. Measurements used to examine morphological variations among *O. mossambicus* and *O. niloticus*. Fin numbers are as indicated in Figure 1.

Character No.	Fin No.	Character Description
1		Standard length
2		Total length
3	1-3	Snout to origin of dorsal fin
4	1-5	Snout to origin of pelvic fin
5	2-3	Posterior point of the eye to origin of dorsal fin
6	4-2	Posterior point of the eye to origin of pectoral fin
7	5-2	Posterior point of the eye to origin of pelvic fin
8	5-3	Origin of dorsal fin to origin of pelvic fin
9	4-3	Origin of dorsal fin to origin of pectoral fin
10	5-4	Origin of pectoral fin to origin of pelvic fin
11	6-5	Origin of pelvic fin to posterior end of dorsal fin
12	7-3	Origin of dorsal fin to origin of anal fin
13	6-3	Origin of dorsal fin to posterior end of dorsal fin
14	7-5	Origin of pelvic fin to origin of anal fin
15	6-7	Origin of anal fin to posterior end of dorsal fin
16	9-7	Origin of anal fin to ventral attachment of the caudal fin to tail caudal fin to tail
17	8-6	Posterior end of the dorsal fin to dorsal attachment of the
18	8-7	Origin of anal fin to dorsal attachment of the caudal fin to tail
19	9-6	Posterior end of the dorsal fin to ventral attachment of the caudal fin to tail
20	9-8	Dorsal attachment of the caudal fin to tail to ventral attachment of the caudal fin

Morphometrics

Table 1. Measurements used to examine morphological variations among *O. mossambicus* and *O. niloticus*. Fin numbers are as indicated in Figure 1.

Character No	Fin No	Character Description
1		Standard length
2		Total length
3	1-3	Snout to origin of dorsal fin
4	1-5	Snout to origin of pelvic fin
5	2-3	Posterior point of the eye to origin of dorsal fin
6	2-4	Posterior point of the eye to origin of pectoral fin
7	2-5	Posterior point of the eye to origin of pelvic fin
8	3-5	Origin of dorsal fin to origin of pelvic fin
9	3-4	Origin of dorsal fin to origin of pectoral fin
10	4-5	Origin of pectoral fin to origin of pelvic fin
11	5-6	Origin of pelvic fin to posterior end of dorsal fin
12	3-7	Origin of dorsal fin to origin of anal fin
13	3-6	Origin of dorsal fin to posterior end of dorsal fin
14	5-7	Origin of pelvic fin to origin of anal fin
15	7-6	Origin of anal fin to posterior end of dorsal fin
16	7-9	Origin of anal fin to ventral attachment of the caudal fin to tail
17	6-8	Posterior end of the dorsal fin to dorsal attachment of the caudal fin to tail
18	7-8	Origin of anal fin to dorsal attachment of the caudal fin to tail
19	6-9	Posterior end of the dorsal fin to ventral attachment of the caudal fin to tail
20	8-9	Dorsal attachment of the caudal fin to tail to ventral attachment of the caudal fin

Environmental

- Ambient temperature
- GIS (latitude and longitude)
- Water availability and quality (saline, fresh; water temperature, turbidity, pH, dissolved oxygen)
- Water systems (lakes (deep/shallow), rivers (seasonal/flow rate), swamp, mangrove, production systems)
- Ecosystems (water shed characteristics, soils type, vegetation, land use)
- Managements systems (fisheries/aquaculture, aquaculture production systems (ponds, tanks, cages, static water/flow-through; water reuse, stocking rates, feeding)

Production and reproduction

- Meat (size of fish
- Filleting percentage
- Flesh quality (colour)
- Egg characteristics (sticky/floating, egg size
- Reproductivity (no. eggs/kg female, longevity, egg characteristics
- Broodiness (mothering ability) (no/yes (nest/mouth)
- Growth performance (growth rate,
- Type of nesting behavior
- Nest characteristics (shape, raised/not,
- Skin characteristics
- Age at sexual maturity
- Semen characteristics
-

Adaptive

- Mortality/survival rate (fertilization rate, hatchability rates, survival rates at following stages swim-up, fry, fingerling, market)
- Heat tolerance (water temperature limits)
- Mobility/migration
- Disease/parasite resistance
- Drought tolerance (survival during periods of low water volume/availability)
- Ability to survive poor forage (ability to survive with no feed)
- Morbidity at population/sub-population level
- Body condition scores (season, physiological stage, age and sex)

Social and economic

- Age of farmer/manager/attendant
- Gender of household head
- Education level of household head and manager
- Labour distribution
- Family income from aquaculture *vis a vis* other livestock and other income sources
- Occupation of household head
- Decision making (who makes and how are the following decisions made: breeding, disposal, acquisition, husbandry decisions, sales, proceeds, who uses the proceeds,)
- Price, size and age of animal at market
- Market preferred attributes

Indigenous Knowledge

- Traditional fishery practices /Fishing methods
- spawning seasons and breeding grounds
- Migration
- Maturity of fish (environmental conditions, seasons, size, age, physical characteristics, sex differentiation)
- Taste of fish
- Mortality (Which ones die, when, susceptibility of age or sex, season,)
- Processing and preservations
- Recipes
- Cultural beliefs associated with fish consumption and reasoning behind these (taboos, pharmaceutical, taste, nutritional values, rearing, production requirements, etc)
- Unique attributes of fishes

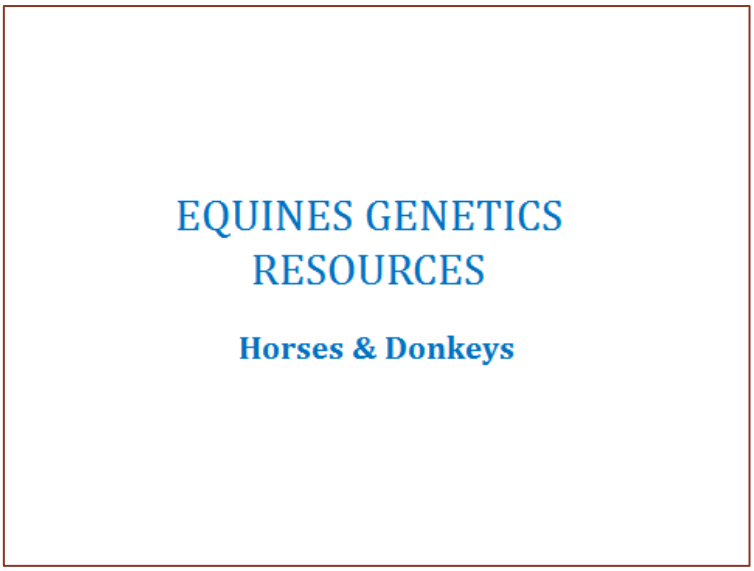
Biological samples

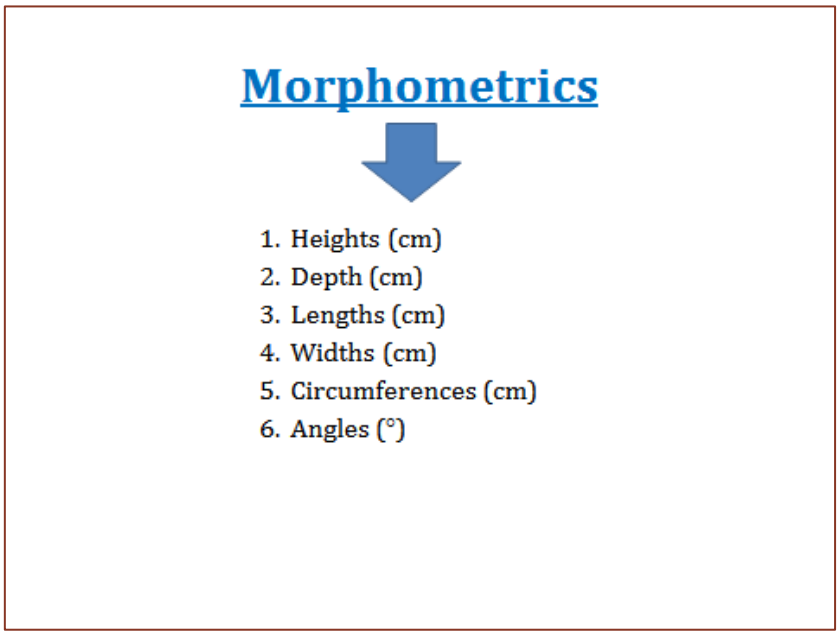
- Appropriate Sample size?
- Tissue (fin clips, muscle for DNA, pathogens. Muscle for organoleptic)
- Blood (for DNA, pathogens)
- Milt (DNA)
- Eggs (fecundity)
- scales (for aging,) and skin (parasites)
- gut (internal parasites)
- gill (DNA, pathogens)

Toolkit

box
venier calipers
measuring board/ruler
ice boxes
weighing scales(s)
tubs and water tanks
aeration equipment
note books and pens
fish baskets
nets (scoop and seine)
towels
anesthetics
dissection kit
gloves
oxygen cylinder(s)
diffusers
hormones
graph paper and petri-dishes
camera
under- water camera
sample bottles and containers (assorted)
swabs
disinfectants
reagents
measuring cylinders and beakers
compensation to buy fish as samples from farmers

Annex 4a. Group 7: phenotypic characterization guidelines – Equine (Horses and Donkeys)





Morphometrics

Breed			
Coat colors			
Age			
Measurements		**Dams**	**Sires**
Heights (cm)	Withers[a]		
	Sub-sternal flank[b]		
	Back[a]		
	Rump[a]		
Depth (cm)	Chest[a]		
Lengths (cm)	Head[a]		
	Neck[a]		
	Body[a]		
	Barrel[a]		
	Rearquarters[a]		
	Shoulder[a]		
	Humerous[a]		
	Radius[a]		
	Metacarpus[a]		
	Fore phalanx[a]		
	Small trunk[c]		
	Pelvis[a]		
	Femur[a]		
	Tibia[a]		
	Metatarsus[a]		

Morphometrics

Widths (cm)	Skull[d]		
	Chest[a]		
	Hips[a]		
	Thurls[a]		
Circumferences (cm)	Chest[a]		
	Forelimb cannon bone[a]		
	Hindlimb cannon bone[a]		
Angles (°)	Shoulder[a]		
	Shoulder joint[a]		
	Fore fetlock joint[a]		
	Fore hoof wall[a]		
	Croup[a]		
	Femur[a]		
	Hock joint[a]		
	Hind fetlock joint[a]		
	Hind hoof wall[a]		

[a]: Zechner et al. (2001)
[b]: McManus et al. (2005)
[c]: Komosa and Purzyc (2009)
[d]: Solé et al. (2013).

Conformation indices determined based on the measurements taken for dams and sires

Environmental

- GIS coordinates
- Management system (feeds and feeding systems)
- Housing types
- Feeding systems (miniral suplument.....)
- Watering systems

Production and reproduction

- Utility
- Meat
- Dressing percentage
- Mothering ability
- Age at first parturition
- Scrotal size
- Semen characteristics
- Abortion
- Draugth capacity

Adaptive

- Mortality/ survival rate
- Heat tolerance
- Mobility/Trekking ability
- Disease/parasite Resistance
- Feeding habit
- Drought Tolerance
- Ability to survive on poor forage
- Morbidity at herd level
- Body condition score (season, physiological stage, age and sex)

Biological samples

- Blood
- Hair
- Nasal Swaps
- feacals

Socio-Economic

- Objective of keeping
- Age of farmer
- Gender of family head
- Education level of Household Head(HH)
- Labour distribution
- Cultural valuation of equines
- Family income from equines
- Other sources of income
- Occupation of HH
- Decision making
- Price of Animal
- Age at market
- Number of animal
- Land size

Indigenous knowledge

- Traditional practices (Treatments to diseases, worms etc)
- Breeding strategies
- trait preference
- Selection criteria
- Identification criteria
- Indigenous feeds and Feeding practices
- Product management
- Product processing
- Housing
- Cultural beliefs/taboos
- Breed or type identification

Annex 3a. Inventory and monitoring

What is the difference between inventory and monitoring?

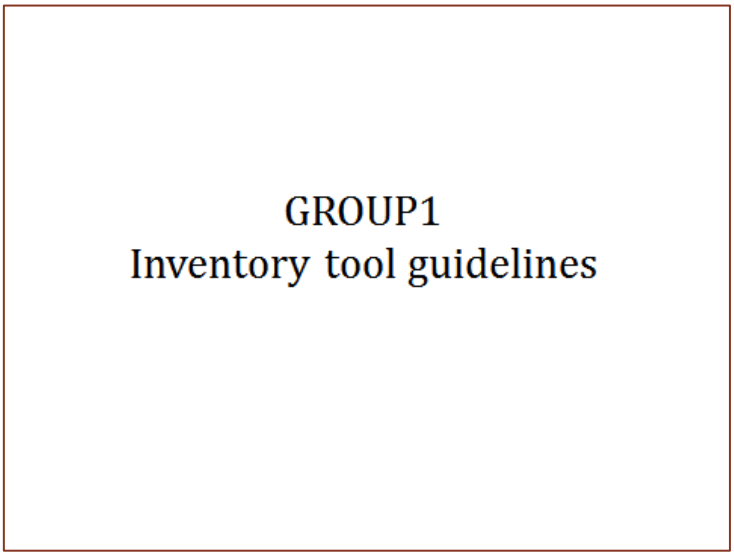
- Inventory and monitoring are often considered to be the same thing
- with little distinction drawn between them
- Two things reinforce this view
- Often, the type of information collected is the same
- and the methods used to collect it may also be similar.
- However, there are fundamental differences, as summarised below

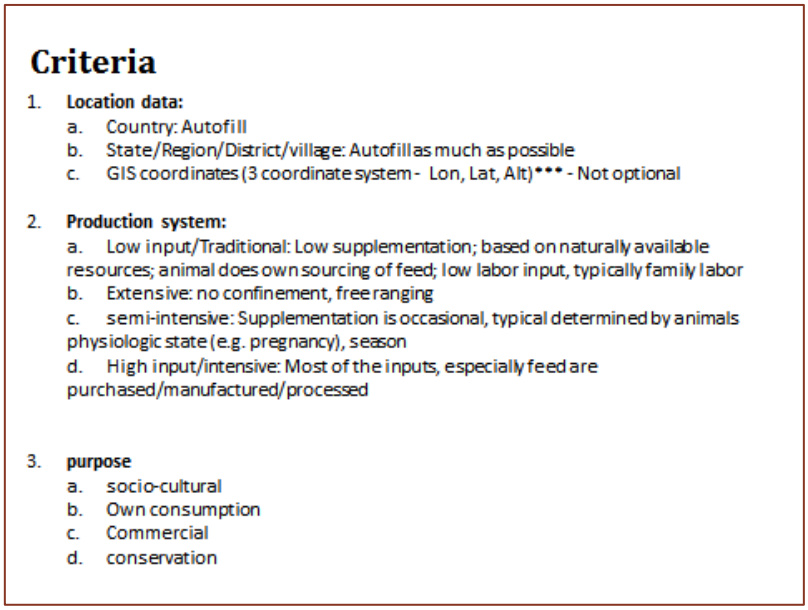
- An *inventory* is a stock take at a given point in time
- It does not imply any future re-measurement
- Usually the intent is to compile comprehensive information on the current state of an organism
- such as the presence or absence of a species or group of species or ecosystem component.
- A major assumption of the method is that all significant species are detected

- *Monitoring* focuses on system dynamics (changes in state).
- It usually compares measurements at different places and times.
- Remeasurement is a key part of a monitoring programme
- In population monitoring, the intent is usually to detect a trend and the rate at which change is occurring

- whether a population is stable, decreasing or increasing, and whether that change is slowing or accelerating
- The target may be
  - a population of a single species
  - populations of numbers of species
  - or composition of selected ecosystems

Annex 3b. Group 1 – draft inventory tools guidelines





Criteria

4. **Produce:**
   - Milk/meat/eggs/skin/wool/blood/Draught Power
   - Special attributes** - include broad categories and include 'other'
5. Status
   - Species: drop down list
   - Breed: drop down list; include 'other' for non-named breeds (e.g. Sanga, Zebu); for chicken/pigs/non-conventional species/, use exotic (use recognized breed names), crossbreed, or indigenous
   - Name of breed: common name, local name, other name (eg. Ankole, Sagalla, Inyambo)
   - Description of status (color, profile, photo etc..)
   - Grade level (Local, Cross, Exotic)
   - Threats (derived mostly from farmer Practices and natural phenomenon: Practices (mating e.g. AI), droughts, diseases, market forces, admixture, inbreeding)
6. **Flock size/herd size**

Criteria

7. **Number**** populate dropdown list based on species choice, to allow species specific terminology and gradation

- Pre-weaning males
- Pre-weaning females
- Young Males
- Young female
- Mature breeding males
- Mature breeding females
- Castrates
- Chicks – poultry Growers - poultry
- Pullets – poultry Layers - poultry
- Cocks - poultry
- Kits - cavies
- Young - cavies
- adult females – cavies
- adult males – cavies
- foals - equine
- mares - equine
- stallions - equine
- keet – guinea fowl Growers – Guinea fowl Pullet – Guinea Fowl

Annex 3c. Group 2 – draft inventory tools guidelines

HOUSEHOLD **General Information** **Page 1c**

Enumerators name_____ Contact information: Telephone_____
Date_____ Time interview was done(24 hr format)_____

1. Interviewee _____

Marital status
1. Single ☐
2. Married ☐
3. Divorced ☐
4. Widow/Widower ☐
5. Polygamous ☐
Other (specify) ☐
7. _____ ☐

2. Household head

Sex of head
Male ☐
Female ☐
Child headed ☐

Age (yrs)
≤18 ☐
19- 30 ☐
31-40 ☐
41-50 ☐
51-60 ☐
61-70 ☐
> 70 ☐
Not known ☐

3. Tribe

Name _____

Code ☐

*Religion of Farmer *collect this information if the farmer is willing to give it

4. Number of people residing in household

Adult Males ☐
Adult Females ☐
Children < 18 yrs ☐

5. Land holding / farm size
(enter X in box in first column if not known)

	Area	Units *(tick)*
Crops	☐	Acres ☐
Grazing *	☐	Hectares ☐
Forest	☐	

Land for grazing and for growing fodder

Total size ☐
* Other than communal

6. Land ownership
(Tick one or more)

Own ☐
Lease ☐
Freehold ☐
Other ☐ (specify) _____

7. Livestock activity

Is livestock the major activity on your farm?
Yes ☐ No ☐

8. Sources of income
(Tick first column as appropriate, rank level of source of income in second column – 1 highest.)

1. Crops
2. Livestock and livestock products *
3. Home industries

9. Livestock kept
(enter numbers in first column)

Most important species *(rank up to 3: (1, 2, 3)*

	Numbers	
1. Cattle	☐	☐
2. Sheep	☐	☐
3. Goats	☐	☐
4. Chickens †	☐	☐
5. Pigs	☐	☐
6. Donkeys	☐	☐
7. Camels	☐	☐
8. Cavies	☐	☐
9. Horses	☐	☐
10. Guinea fowl	☐	☐
Other (specify)	☐	☐
	☐	☐

4. Salary / wages

Other (specify)

5. _____

* Include the value of non-cash outputs or products e.g. manure, traction etc.

11. Educational Level

1 Illiterate
2.Non Formal education
3. Primary
4 Secondary
5.Post Secondary

12. Breed specific information

**Indicate the number of breeds if this information is known

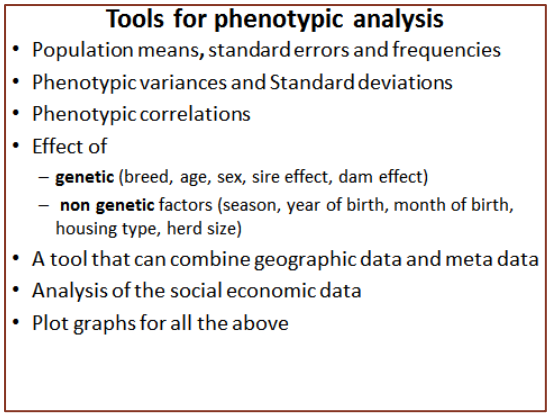
1. Common name
2. Local name
3. Origin of name (reason for giving the breed that name)
4. Unique characters of the breed (any adaptation traits, unique horn shape) -coat colour
5. Adaptive traits –heat stress
6. Threat of extinction (do you think the breed numbers are decreasing and what are the reasons)* put boxes

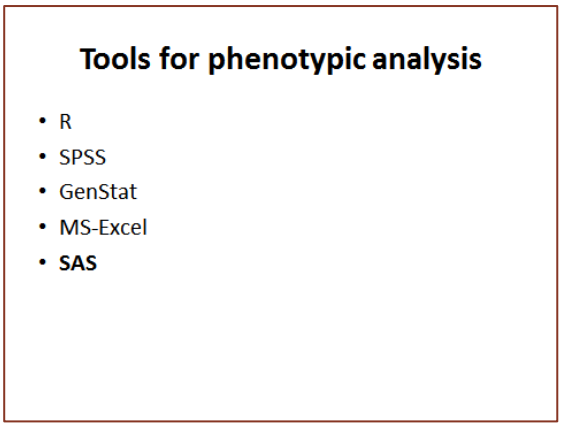
10. Livestock production category

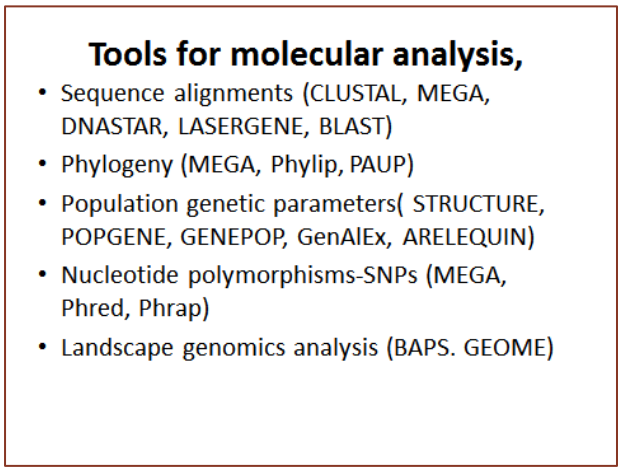
(Divide numbers given in question 9. into the following categories)

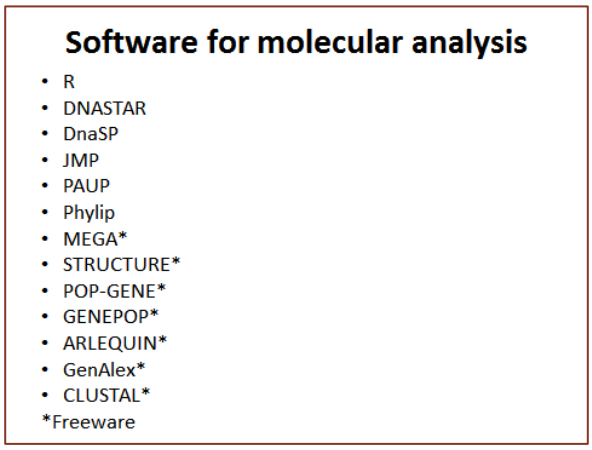
	Dairy	Meat	Dual purpose
1. Cattle			
2. Sheep			
3. Goats			
4. add as above			

Annex 4: Data analyses tools









Annex 5: List of participants

Writeshop on "Development of revised and harmonized characterization, Inventory and monitoring Animal Genetic resources tools' guidelines"
14th – 17th April, 2015

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