COHESA

Capacitating One Health in Eastern and Southern Africa

Report of the regional workshop on 'building the capacities of higher educational institutions to educate, train and empower the next generation workforce to tackle One Health issues.'

Gaborone, Botswana, 22-24 November 2022

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Executive Summary

A three-day workshop was held in Gaborone Botswana and jointly hosted by COHESA and the Botswana University of Agriculture and Natural Resources (BUAN). The aim of the workshop was to facilitate planning of activities for COHESA Work Package 3 (WP3)– Building the Future One Health (OH) Workforce. Attendees from Botswana, Ethiopia, Kenya, Malawi, Mozambique, Namibia, Uganda, Tanzania, Zambia, and Zimbabwe represented COHESA country partners; and CIRAD, ILRI, and University Pretoria represented the COHESA team. External participants from FAO, WOAH, World Bank, Inter-University Council of East Africa (IUCEA), and Southern African Regional Universities Association (SARUA) were also in attendance.

WP3 aims to build the future OH workforce by understanding the OH higher education landscape in Eastern and Southern Africa (ESA), to identify and fill gaps in OH education, to benchmark curricula in OH, and to capacitate research institutes to train the next generation of OH workers.

Plans are already in place with IUCEA to benchmark curricula for OH, and in this workshop, SARUA was identified as a potential collaborative partner to facilitate inputs and utilization of benchmarks in the Southern African region. AFROHUN was also identified as potential collaborative partner for WP3 moving forward.

Participants at the workshop identified that there are many available OH teaching resources, courses, and modules available, and WP3 aims to facilitate development of a database of these resources with a matching tool to assist learners to select relevant programs. WP3 team members will review these resources and identify where gaps may exist to produce new materials. These materials will help across five levels (primary/secondary, undergraduate, graduate/postgrad, HEI educators, in service professionals).

1. At primary and secondary education levels COHESA will work to achieve OH integration in curricula and capacitate teachers.
2. At undergraduate level, COHESA will facilitate implementation of a general OH module that can be implemented across disciplines.
3. At graduate and postgraduate levels, the use of a survey is already in progress to identify gaps and strengths in OH education. From this review COHESA WP3 team members can develop a stand-alone OH program and/or OH modules as best suited to ESA.
4. Within higher education institutes, it will also be relevant to improve capacities of those implementing OH education through use of existing resources and building skills around communication, collaboration, coordination, and resource mobilization.
5. Finally at the level of in-service professionals, continuous professional development (CPD) on OH at both the basic and advanced/applied level will be applied/developed/adapted as needed with the plan to have CPD accreditation to ensure the active workforce is capacitated in OH in their respective fields.

This workshop provided opportunities for regional collaboration and strengthened existing capacities in OH education and training in the ESA region. COHESA aims to understand the OH education landscape and build upon numerous already existing OH education programs/courses/modules to adapt solutions for ESA. When gaps are identified, COHESA will work with country partners and stakeholders to develop new OH education materials (considering benchmarks) and facilitate implementation to ensure the future workforce can work locally, regionally, and across disciplines in the OH field.

Background

As we increasingly recognize the inter-connecting factors that influence the health of people, animals and the environment, 'One Health' – defined as *an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems* – is seen as a very promising way to frame and take action at different levels – international, regional, national and local.

Essentially, the argument for One Health says that successfully reducing future health risks and impacts for people and livelihoods, as well as for animals and ecosystems, is most likely to come when we bring together and draw on diverse expertise across public, veterinary and environmental health.

The importance of adopting the One Health approach has been reinforced by lessons from recent disease outbreaks including COVID-19, Ebola and avian influenza. In addition, One Health thinking is embedded in current efforts to reduce the spread of antimicrobial resistant pathogens, to ensure food safety, reduce water and waste-borne contamination, manage human and livestock interactions with wildlife, and reduce aflatoxin contamination in crops and livestock products, to name only a few examples. It can also be seen in structural efforts to establish 'One Health' collaborative, cross-departmental organizational structures, and the like. To succeed, all require a triple 'input' of public, veterinary and environmental health expertise together with an understanding of the wider systems involved.

While the overall approach has been around for some time, implementation of genuine **One Health faces several challenges**, key being the many sectoral, domain, disciplinary, academic, organizational and investment silos that limit the necessary cross-communication and integration of efforts and which ultimately segregate people and their ideas, restricting the development of integrated, comprehensive solutions.

Furthermore, while each domain or discipline – such as medicine, public health, veterinary science or ecosystems health – has its own specific organizations and expertise, there are **individual and institutional gaps in One Health capacities** both at the various between-domain interfaces and more globally around how people think think about, plan, and implement health 'as one.'

Capacitating the next generation

With funds from the European Commission OACPS Research and Innovation Programme, the 'Capacitating One Health in East and Southern Africa' (COHESA) project is tackling key One Health capacity gaps in the region. This is implemented through enhancing the knowledge base for research and policy-making, strengthening national and subregional cross-sectoral collaboration, building academic and research capacities and One Health education, and growing the abilities of government and non-governmental actors to deliver One Health solutions.

COHESA is led by the International Livestock Research Institute (ILRI), the French Agricultural Research Centre for International Development (CIRAD - *Centre de coopération internationale en recherche agronomique pour le développement*) and the International Service for the Acquisition of Agri-biotech Applications (ISAAA).

Convened by ILRI and CIRAD and hosted by the Botswana University of Agriculture and Natural Resources (BUAN), this workshop of project partners and 'multipliers' (local project implementors) brainstormed and set priorities for the COHESA 'education' work package to equip higher education institutions to train the next generation in the One Health approach. Under this package, COHESA aims to benchmark tertiary One Health training, identify and co-develop new short courses and content to fill priority gaps, capacitate secondary and tertiary education institutes and research institutions to deliver One Health courses and content, train the next generation of One Health researchers and trainers, strengthen One Health research better connecting research and policy.

Over three days, some 50 people (47% women; 53% men) from eleven ESA countries (Rwanda participants were unable to secure visas in time) examined One Health problem scenarios, identified target actors and stakeholders requiring training and education in One Health, mapped country capacity and curriculum efforts. The team additionally reviewed ways to benchmark and develop One Health curricula, identified essential capacities of One Health training efforts, set out curriculum development priorities of key groups, and identified some initial One Health research collaboration areas to follow up.

Opening session

Participants were welcomed by Flora Pule-Meulenberg from the Botswana University of Agriculture and Natural Resources (BUAN). She explained the importance of the One Health agenda for the country and region, emphasizing the important roles of academic institutions to develop necessary capacities in students and the wider society and workforce.

Official opening remarks were provided by Professor Keta Mosepele, Vice Chancellor of the Botswana University of Agriculture and Natural Resources (see Annex 1).

Theodore Knight-Jones of ILRI and Alexandre Caron of CIRAD reminded participants of the definition of One Health[1] and introduced the objectives and structure of the COHESA project with its four work packages[2]:

1. OH Knowledge: Increased relevance of One Health research and policies in Eastern and Southern Africa.
2. OH Governance: Enhanced national and subregional cross-sectoral collaboration between government entities with OH mandates and OH stakeholders across society.
3. OH Education: Educational and research institutes equipped to train the next generation workforce in tackling OH issues.
4. OH Delivery: Increased capacity of government and non-governmental stakeholders to identify and deliver OH solutions to final beneficiaries.

The specific aims and objectives of the 'education' work package was introduced by Florence Mutua of ILRI, with its focus on four activities[3]:

1. Benchmarking of tertiary One Health training.
2. Identifying and co-developing new short courses and content to fill gaps – school children, higher education, and professionals.
3. Capacitate secondary and tertiary education institutes to deliver One Health courses and content.
4. Capacitate research institutes to train the next generation of One Health researchers and trainers.

She also introduced an ongoing survey of universities in Eastern and Southern Africa to identify the various courses offered with One Health elements,specific opportunities they provide to grow the One Health workforce, existing extension and training materials they have, short and long courses provided, as well as resource needs for One Health training. The report of this survey is expected in early 2023.

[1] One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems. It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and interdependent. https://www.who.int/publications/m/item/one-health-high-level-expert-panel-annual-report-2021

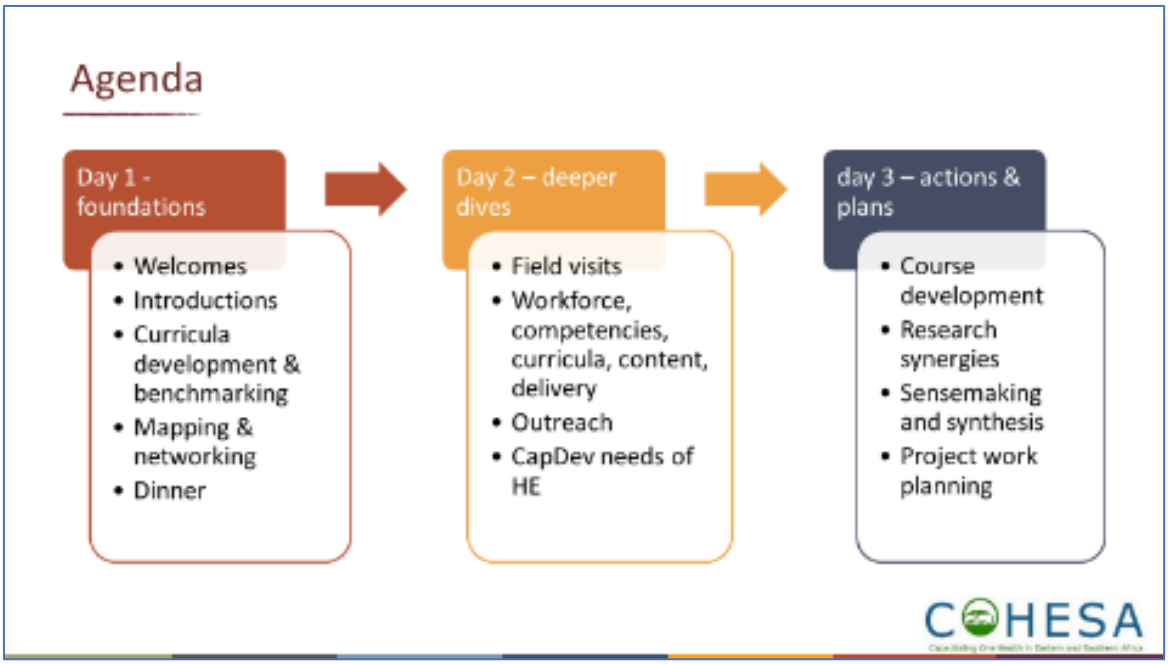
[2] See related slides at https://hdl.handle.net/10568/125583

[3] See related slides at https://hdl.handle.net/10568/125581

An introductions exercise asked participants to explain where they fit on spectrums of their involvements in One Health domains (animal, human, environment) and across different roles (policy, evidence, capacities).

Thereafter, the facilitator introduced the overall agenda of the three days in relation to the formal objectives of the workshop:

- Develop a stronger Work Package team with increased mutual understanding.
- Team members have an agreed plan and way forward.
- Agreed key action points and milestones for 2023.
- New collaborative opportunities identified for the team.



Wider perspectives and inspiration for COHESA

As inputs for the country teams to develop their work plans, the agenda included several short presentations designed to frame the discussions and inspire the participants.

After the day one introductions, the morning session comprised the following presentations;

- World Bank One Health Initiative for East and Southern Africa - by Ana Cristina Canales Gomez and Dipti Thapa of the World Bank [Download: https://hdl.handle.net/10568/125998]
- Southern African Regional Universities Association (SARUA) introduction and roles in curriculum harmonization and development – by Nomazile Chicho of SARUA [Download: https://hdl.handle.net/10568/125999]
- Inter-University Council of East Africa (IUCEA) introduction and experience in curriculum benchmarking – by Michael Mawa of IUCEA [Download: https://hdl.handle.net/10568/126000]

These were followed by reflection and discussion to identify the key points relevant to the objectives of the work package teams.

Reflecting on the initial set of presentations, participants noted several key insights and implications for the project, including:

- SARUA offers an existing framework and model for curriculum development that can be leveraged and adapted to develop a One Health curriculum
- This is a packed space and One Health players should aim to coordinate and shift to prevention as well as mutual information sharing between the players
- IUCEA benchmarking is inspiring, and the Southern African countries would benefit from it through shared learning
- Involvement of local regulatory entities as well as alignment to regional and continental bodies is important
- There are convergence points for multi-disciplinary, common modules hence room for innovation
- Open curriculum module approach is desirable
- Having the right policies will facilitate the process
- Avoid duplication of efforts by institutionalising One Health
- Harmonisation of curriculum can facilitate labour force i.e., professional mobility
- Capacity building critical from all the 3 presentations
- World Bank presentation and data is impressive but there needs to be a mutual information sharing between players
- World Bank has resources available to support One Health activities, and countries need to leverage on this

Some key questions arising:

- To what extent are social science aspects included in the various efforts?
- What is benchmarking and how does it result in the new courses taught in the countries?
- Can IUCEA and SARUA harmonise their assessments?
- Are IUCEA benchmarks shared between EA and SSA?
- Does SARUA mandate extend to benchmarking and harmonisation?
- Do we need a regional approach for benchmarking for Southern Africa Countries?
- Where does Ethiopia fit as they are not members of IUCEA or SARUA?
- How do we ensure sustainability in an open-source platform?
- How does the curriculum development fit into the international setting standards such as WOAH, WHO?
- Are the two regions going to harmonise the curriculum?
- Where is the community involvement and impact?
- How does the World Bank initiative fit into the plans from the Quadripartite?

Reflecting on the presentations and participant discussions, a panel comprising Erastus Kangethe (World Bank), Helene de Nys (CIRAD), Mohamed Sirdar (WOAH) and Nlingisisi Babayani (University of Botswana) shared their conclusions. They highlighted the importance of soft as well as technical skills to be able to work across One Health, systems thinking to see the whole picture and effect change in complex interconnected world, being able to balance different problems and trade-offs, reaching beyond academia, promoting open curricula, and the necessity for skilled individuals as well as smart institutions to enable cross-sectoral and domain engagement. Delivery of these OH skills (both core and cross cutting competencies) with an integrated and inclusivity approach of the 3 aspects (human, animal and environment), platform for both theoretical and practical learning/training, and incorporation at early-school level (Primary and Secondary schools) were also underlined.

Later in the workshop, two presentations provided further lessons and insights:

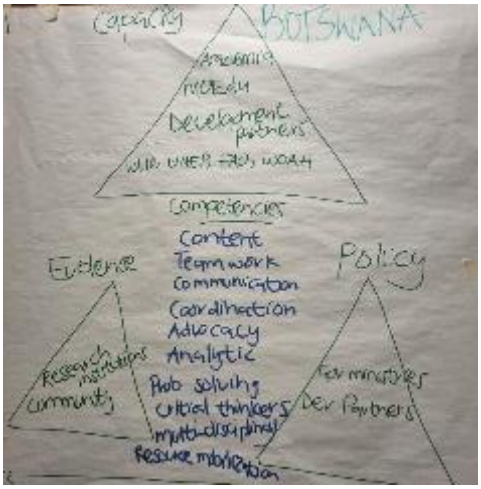
Lessons on academic curriculum development was provided by the University of Gondar (*by Seleshe Nigatu)* demonstrating how more integrated public health/veterinary public health courses were developed alongside veterinary science course updates to meet World Organization for Animal Health standards, combined with summer courses, community outreach and skills upgrading for university staff. [download: https://hdl.handle.net/10568/125997]

A case study from the United Kingdom's Royal College of Veterinary Surgeons (by Jill Macdonald) illustrated the development of an outreach scheme employing 'veterinary nurse ambassadors' and other communication efforts to bring key messages to target groups in schools, as an example of how One Health messages might be communicated more widely. [download: https://hdl.handle.net/10568/126001]

Mapping One Health competencies and curriculum development

As a networking and sharing exercise, participants formed groups to create country-specific 'One Health curricula profiles' as posters to cover the following elements:

- Who are your primary One Health actors / workforce components?
- Which One Health competencies do you need them to have?
- How well are these competencies provided and who by? How do you measure this?
- What are your top priorities?
- Which 'magic beans' could grow your next generation One Health capacities?
- One strong capacity linked to One Health that you / your team/ can bring to COHESA



Example map of country capaicties

The tables below translate the visual posters into structured text.

Uganda	
Primary actors	• Academia (Universities, research institutes) • Professional/Regulatory bodies (NCHE, UMA, UVA,) • NGOs and private sector • Sector ministries • Communities • OH initiatives such as AFROHUN
OH competencies	• Appropriate curriculum • Pedagogy skills • Communication skills • Training materials • Standard setting • Assessment/Evaluation • Ethics • Identification of community OH needs • Facilitation skills • Reporting • Managing expectations
Measuring Competencies	Set level of qualification, Capacity building, Assessment frameworks (Universities/Research institutes, Sector based, Silos standards, Experience, Qualification, Honesty, Social Capacity, Political Buy in
Priorities	OH curriculum Capacity building Research OH policy Awareness Coordination Framework
Magic beans	Critical mass OH experts in Uganda (Change agents)
OH capacities for COHESA	Expertise, Leadership and strong coordination capacity

Zimbabwe	
Primary actors	Academia ; Relevant ministries (Ministry of Education, agriculture MoHCC)
OH competencies	Collaborative teamwork Advocacy Communication Policy development
Measuring competencies	Academic benchmarking Net mapping of stakeholders -collaboration
Priorities	Short courses OH master's program by several universities Outreach program for schools OH materials for teaching in education
Magic beans	School education curriculum including OH and system thinking OH case reports- Success stories-evidence
OH capacities for COHESA	Research platform "Production and conservation in partnership" (PCP)-Network
Malawi	
Primary actors	government (PHIM, DAHLP/Fisheries, EAD/DNPW Research/Development (Mission rabies, ILRI, WHO/FAO/WB, MLW/UNC/Liverpool/LWT Academia (Luanar, MUST, KUHES, Primary and secondary schools
OH competencies	Collaboration (regional, local, international), Research/Science grounding Communication
Measuring Competencies	
Priorities	NZD/Foodborne illness, AMR, Environmental degradation, Climate shocks, Data/Surveillance
Magic beans	Incentivize and facilitate collaboration (government, academia, private) Implement joint projects Curriculum review and fill expert gaps Co-supervision postgraduates/CPD Research project and dissemination
OH capacities for COHESA	Young institution/new programmes Small world existing Luanar partnerships Research -rabies, AMR, HAT
Kenya	
Primary actors	Academia, Research institutes, Relevant ministries (MoALF, MoH, Education, Trade), National and international bodies (WOAH, WHO, FAO,WWF), Private sector (Conservancies), professional bodies (KVB,KMPDU)
OH competencies	Multisectoral/Interdisciplinary/transdisciplinary skills, System thinking, inclusivity, communication skills, self-development skills, social and cultural competencies
Measuring Competencies	Limited, Various initiatives (AFROHUN), Joint trans disciplinary efforts Appropriate communication skills (policy briefs)
Priorities	Technical knowledge and skills (Zoonotic diseases, AMR, Food safety, Environmental contamination/pollution), Communication skills, Social and Cultural competencies
Magic beans	All inclusive OH curricula and training across board (Community- higher education including policy makers
OH capacities for COHESA	Social and cultural competencies Advocacy and policy OH Coordination platforms (ZDU, NASIC) Technical knowledge and skills

Mozambique	
Primary actors	MoH, MoE, MoA, Ministry of Fisheries, Research institutes, Academia
OH competencies	Scientific evidence strengthening and capacity building in AMR, food safety, zoonotic disease surveillance, diagnosis, response OH curriculum in place
Measuring Competencies	Academia, Research institutes and relevant ministries (number of publications) Academia and Research institutes (Number of people trained) Academia (Number of OH courses, modules approved)
Priorities	Zoonotic diseases, Food Safety, AMR
Magic beans	OH curricula at each level (Primary, Secondary, Tertiary levels) Common OH module for relevant faculties
OH capacities for COHESA	Experience in facilitating OH module in higher education OH activities coordination
Zambia	
Primary actors	Human, Animal, Environment
OH competencies	Early detection, Disease reduction and response Laboratory capacity Communication training
Measuring Competencies	ZNPHI primary coordinator, linking primary and secondary actors (universities, UN agencies etc) Developing systems which will be measured by M&E framework of the OH strategic plan
Priorities	Emerging zoonotic diseases, AMR and food safety Align institutional collaboration on OH Increase knowledge base by incorporating OH in preservice and in service curriculum Create awareness at grassroot
Magic beans	Institutionalisation of OH backed with legislation
OH capacities for COHESA	Research and Training
Botswana	
Primary actors	Academia, MoE, Development partners, International bodies (WHO,WOAH, FAO, UNEP)
OH competencies	Content Teamwork Advocacy Coordination Communication skills Analytical skills Critical thinking Resource mobilisation Multidisciplinary Problem solving
Measuring Competencies	Coordination, Content (Technical), Communication and Resource mobilization competencies should be measured by multi players but are not since all partners work in Silos
Priorities	Coordination-Policy/legislation Integrated OH curriculum Advocacy/Awareness
Magic beans	OH policy Technical department
OH capacities for COHESA	Good governance Strong community structure Resilient community response structure

Tanzania	
Primary actors	Ministries, Research institute, Academia, NGOs, Private Sector, AHWs, CHWs, EO
OH competencies	Technical knowledge in the field Communication skills Able to work under multisectoral/transdisciplinary (coordination and synergy)
Measuring Competencies	Unclear measurements from Ministry of Health/CHW NGOs/Private Sector (CAHWs) Ministry of Agriculture/Academia-Diploma, Certificates
Priorities	Common OH courses (Technical and approach)
Magic beans	Ministries/Education authorities to buy in the idea
OH capacities for COHESA	OH curriculum for EO and HHP(AFROHUN) OH course at MSc level SACCIDS (Afya data)
Ethiopia	
Primary actors	Community level- *Vet technical team, Agriculture, Public Health (Health Extension workers)* Supervision- relevant sector supervision Advocacy/Legislation- *NOHSC (Rabies TWG, Anthrax TWG, Brucellosis TWG, Pandemic threat task force etc)*
OH competencies	Content Communication New knowledge on emerging issues Competence to look for K.A.S-levels
Measuring competencies	Schools, Colleges, Universities, Research institutions, Development partners provide the competencies
Priorities	OH course to all undergraduate programs (common courses) Speciality track in OH In service (CPDs, mass campaign etc) OH chapter in some subject (High schools)
Magic beans	Institutionalised/accountable agent (independent) In service (CPDs) OH chapter in subjects
OH capacities for COHESA	OH initiatives at national and regional levels Several Higher Training Institutes (Capacity building) Scale up potential (university networks)

Namibia	
Primary actors	MoHealth, MoAWLR, UNAM, NEMA, VTC,METF,MOEAC, NUST, IUM, MoMHEIT,NANGOF, Donors (EU, WHO, WOAH) Private sector
OH competencies	***Current Competencies*** Soft competencies – *Collaboration, Communication, Networking, Awareness, Advocacy, Transdisciplinary,* Technical competencies- *Curriculum development, Research skills and Disease surveillance* ***Future competencies*** *Increased collaboration* *Increased advocacy* *Increased data collection (continuous)* *Increased awareness/public education* *Increased resource pooling* *Transdisciplinary* *Integration (national, regional, and international)* *Clinical trials (as well as infrastructure)* *OH policy* *M&E skills*
Measuring competencies	Regional governance Traditional authorities Media (public education on OH and awareness) NSA(statistics) Parliament Office of PM MoF
Priorities	Human health labs, food safety, finance collaboration with technical t, disease surveillance, technical training, Medical emergencies/regulation, teaching and learning research
Magic beans	Indigenous Knowledge Systems Contextual knowledge Baseline OH knowledge National and international networks Infrastructure for collaboration Co-funding UNAM-buy in, neutrality and trust Vet and Human med merger-experience Learning materials
OH capacities for COHESA	Indigenous Knowledge Systems Contextual knowledge Baseline OH knowledge National and international networks Infrastructure for collaboration Co-funding UNAM-buy in, neutrality and trust Vet and Human med merger-experience Learning materials

One Health deep dives: Field visits

Visits to academic groups at University of Botswana and Botswana University of Agriculture and Natural Resources were used to expose participants to real One Health 'problem scenarios' and provide space to dive deeper into the types of capacities and competencies needed and implications for One Health curriculum development. Seven problem areas were interrogated (see Annex 6.1 for the group products):

- Domestic animals, challenges at the human-animal-environment interface.
- Human, wildlife, domestic animals' interaction.
- Climate change and mycotoxin contamination on cereals and groundnuts.
- Excessive use of pesticides in agriculture.
- Engineering FMD vaccine appropriate for southern Africa.
- Antimicrobial Resistance (AMR)
- Animal and human zoonoses

Reflecting on them all as a group, participants highlighted the following:

- Despite the diverse themes, there are common competencies, especially across soft skills like communication and collaboration
- Similar competence gaps were encountered, particularly domain/organization silos, recurring capacity needs, and non-existing One Health implementation platform.
- Some of the cases identified many actors involved and potentially needing capacities, raising a question of who to prioritise.
- Where curriculum changes or innovations may be needed, it is important that academic curriculum regulatory bodies are involved.
- While One Health needs were often recognized, there are many gaps in the knowhow needed to implement them.
- Looking beyond research and academia, we need to find promising ways to connect to grassroots audiences.
- Features that participants wanted to see included: Integrated approaches, enhanced collaboration and awareness, cost-benefit analysis tools, and expanded access to resources and information.

Tertiary education capacity building needs

Reflecting on their field visits and other discussions, participants brainstormed in small groups to identify some necessary **academic capacities to be able to design and deliver One Health** curricula, courses and content.

Essential capacities we need to have or enhance to be able to effectively DESIGN One Health curricula, courses and content:

- Needs assessment to determine baseline.
- Clear county specific objectives – be good listeners.
- Curriculum development specialist.
- Integration of subject matter experts (curriculum coordination).
- Curriculum development expertise/skills.
- Wider capacity content (detail), different stakeholders (talented).
- OH sensitization of faculty members (so they can see their roles within OH).
- Systems thinking capacity.

Essential capacities we need to have or enhance to be able to effectively DELIVER One Health curricula, courses and content:

- Relevant content knowledge, personal skills (multidisciplinary, vets, environmentalists, medics).
- Influence to enact change.
- Pedagogical induction/short course.
- Universal cross cutting curriculum for academic institutes.
- Intellectual and infrastructural capacity.
- OH scenarios for problem based learning to support v. active learning methods.
- Good pedagogical skills.
- Coordination and networking advocacy.

Essential capacities we need to have or enhance to be able to effectively REACH OUT to One Health professionals:

- Advocacy on social media, newsletters, online platforms.
- Advocacy and communication.
- Networking capacity.
- Dedicated platform (CPD, research group, network).
- Accessible platform for multiple sectors.
- Digital networking tools.
- Advertising/marketing CPD opportunities.
- Soft skills – communication and facilitations, linkages.

Capacity-enhancing ‘magic beans’ we can grow together:

- Create community of practice (COP) for continued engagements.
- Continuous professional development.
- One health resource platform (online/distance).
- Adaptable material (open source).
- Develop information sharing platform (COHESA project level).
- Open-source ambassadors (advocacy).

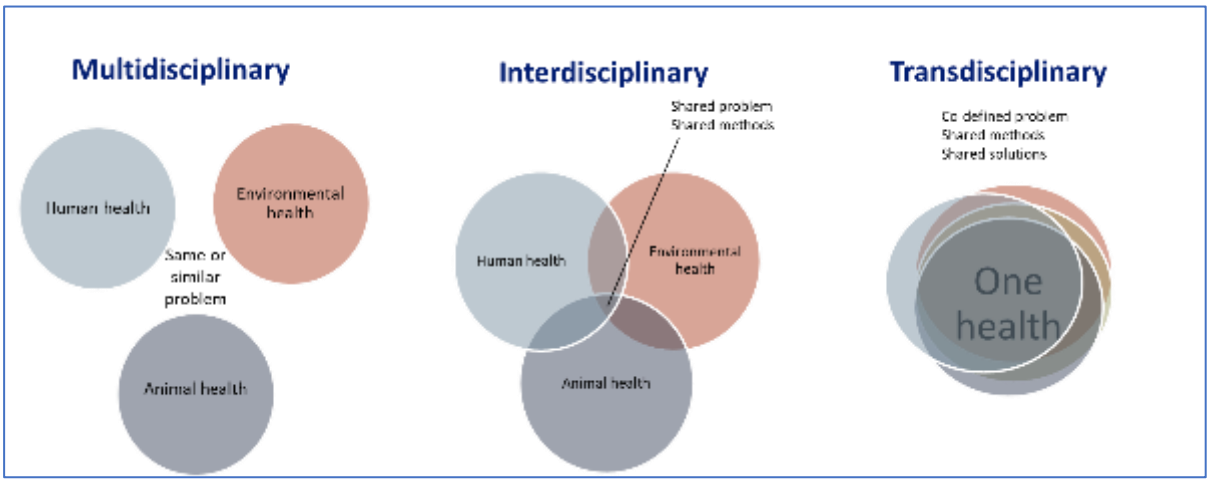
Research synergies and cooperation

Siobhan Mor of ILRI framed this session with a short presentation outlining some important elements of One Health research (see Annex 6.2)

She introduced the notion of '**One Health-ness'** developed by the Network for Evaluation of One Health (NEOH) as a useful framework and set of questions that could be used to help determine the extent that an intervention – a course or a piece of research for example – truly meets 'One Health' outcomes or is just focused on a single domain issue or question.

Building on the frequently-used image of One Health as a series of overlapping circles (see page 1) where the different domains intersect and where activities in the center show high degrees of integration and 'One Health-ness', participants noted that developing capacities to integrate around the core is critical within COHESA.

To achieve this integration, Dr Mor explained that people employ different modes of collaboration – Multidisciplinary, interdisciplinary, transdisciplinary. The degree of togetherness is highest in transdisciplinary work – where One Health aspires to be – and where the frequently-mentioned soft skills are necessary for productive interaction and integration.



Schematic illustrating approaches to research collaboration

John Becker reported the results of a short survey of participants to determine their interest in collaborating on different research ideas (see Annex 6.3). Thereafter participants formed groups around self-identified potential collaborative research issues and sketched potential areas of work, see below.

Developing a One Health investment roadmap

- **Problem:** Incentives, Global Public Mood, Competing priorities
- **Research approach:** Modelling (Economic, Mathematical, Monetizing/DALYs), productivity losses; Scenarios; Data- Harmonization, "Plugging"
- **Potential outcome-** Financing, Increased efficiency in public expenditure on One Health), Collation for data
- **Output:** Impact evaluation – Investment Predictive
- **Potential funding:** 'Jumpstart" funding already there by World Bank

Impact evaluation of One Health interventions

- **Problem:** How do we measure impacts of One Health interventions across levels of society; which investments have the biggest return?
- **Focus**: One Health education, One Health governance,
- **Timeline**: 2-3 years after intervention
- **Outcomes:** National, International, Local, Environmental/Wildlife, Human, Animal, Indirect can be big advocacy; Pick range of case studies in different countries-develop metrics and methods -filed models- health -qualitative and quantitative
- **Potential funding**: Seed from COHESA- Extra funds to expand and join other projects

Exploring communities' understanding and perceptions of One Health

- **Problem**: Lack of grassroot involvement; Low understanding the local representation of Health (Animal, Human, Environment); Understanding KAP, behavior; Lack of indigenous knowledge
- **Research approach:** KAP/perceptions behaviors skills (KAPBS); Multiple sites
- **Potential outcomes:** Insights and indigenous knowledge; Relationship of human and environment and animal health; Co-creation of One Health interventions
- **Potential funding:** Work package of larger project; Local government; Relevant bodies; SIDA Sweden)
- **Magic beans:** One Health day/festival/fairs; One Health community ambassadors

Taking stock of small mammal related zoonotic risks in diverse socio-ecosystems

- **Problem:** Habitat/environment change and linkages – Human behavior/cultures/practices-small mammal and other wildlife ecology- Zoonotic pathogen ecology/Transmission risks/Drivers
- **Approach:** Diverse habitat selection and continental level; Biodiversity gradient; Standardization of protocols and ethical clearance; Strong sociological component - Response of communities to environmental changes and disease risks—Sustainable solutions; Strong environmental component; And virology and public health and disease ecology
- **Outcomes:** Improved zoonotic disease surveillance and prevention/control-improved human health ; Adopted solutions by communities /context related solutions ; Enhance/initiate multisectoral collaborations ; Increased awareness of linkages between human-animal-environmental health-evidence
- **Potential funding :** Multisource (local and international) – Network for collaboration and harmonization of protocols ; Various ongoing projects ; Network of expertise in small mammal ecology and virology - Perhaps gap with environment and socioecological experts

Studying the impact of physical barriers at animal-human-environment health interfaces

- **Problem :** Despite physical barriers, diseases incidences are on an increasing trend, what could be the trigger?
- **Research approach :** KAP survey
- **Potential outcome:** Baseline information on the status quo; Impact on the environment; Human-Wildlife Conflicts; Socioeconomic impacts; paradigm shift/new thinking
- **Evidence:** National strategy on CBPP control; Information from the community
- **Potential funding**: Government; World Bank; EU; KAZA; FAO
- **Current funding**: Govt (Resources), Neighboring countries, Bilateral agreements
- **Future funding**: COHESA (Support), Transdisplinary approach involving various stakeholders

Mitigating zoonotic neglected and poverty related diseases through water, sanitation and hygiene

- **Problem:** Neglection of NTDs and PRDs linked to water and sanitation issues such as leishmaniasis, Leptospirosis, Schistosomiasis, Tryps, Salmonellosis, VLM, Elephantiasis, Worms, Soil borne helminths etc ; The potential for WASH to mitigate emerging zoonotic diseases eg COVID-19 was recently demonstrated - we need to sustain this intervention
- **Approach:** Map the key actors (multidisplinary) - Design and implement study
- **Outcomes:** Recommended interventions approaches (Appropriate to the specific subjects) ; Baseline and Endline data (Reduction in the burden) ; Sustained disease surveillance system ; Evidence-review current literature
- **Potential funding:** Government; Donors; Mainstream NTD and PRD Control strategies

Understanding the resistance in buffalo metabolomics/AMR

- **Problem statement:** Environmental antimicrobial contamination
- **Research approach:** Evaluate the extent of AMR in wildlife species in a 'pristine' environment; 300 Km N/S transect ; Dart 450 buffalos ; Faeces and serum ; Metagenomics-resistance ; Metabolomics -Anthogenesis chemical /drugs; Water/Soil Sample
- **Research team**: UP, Edinburgh/Metabolomics, KWP, Ministerial AMR committee, Community, NAS/ Metagenomics
- **Outcomes:** Qualify AMR in environment and wildlife ; Evidence informing policy (Ministerial committee) ; Community awareness
- **Potential funding:** Piggyback on USD 2 million NIH (Funds to darting the buffalo) ; Multi-Transdisciplinary ; Potential additional funding: UKRI official development assistance ; HSRC(SA); USAID ; IDRC (Canada) ; All European

Facilitating One Health collaboration in crisis and shock situations

- **Problem**: Shocks- Drought, Floods, Epidemic ; Death (livestock), Land degradation ; Malnutrition, Migration, Displacement, Diseases, Loss of livelihood; Famine, Death
- **Partners:** Local NGOs, MSF, ICRC, WHO, UNICEF, WFP, Government at all levels
- **Proactive investment:** Upstream approach/prevention
- **Coordination mechanism:** Decision making ; Power imbalance by sector ; Resource allocation ; Policies/Strategies
- **Development partners:** Coordination? Communication ; Trigger point of intervention
- **Barriers/ Enablers**: Evidence needed to move towards upstream approach
- **Methods:** Desktop review; Interviews ; Delphi ; PhD student

Mycotoxin threats to livelihoods in the face of climate change

- **Problem:** Increased incidences of mycotoxins in the harvest (cereals and groundnuts) ; Mycotoxins are known to affect human and animal health. Incidences are likely to be perpetuated by climate change.
- **Research Approach:** Horizon scaling to establish the extent of the problem, understanding and mitigation measures; Targeted sample collection ; Analysis to establish levels of fungal and toxin profile
- **Potential outcomes:** Characterization of prevailing mycotoxins; Extent of the problem ; Evaluation of harvesting and preservation practices in the face of climate change ; Tentative remedial measures that can benefit human, animal, and environment
- **Potential funding:** Consultancy through line ministries ; Grants; Current and future resources and support mechanisms; LIMID and ISPAAD (Government support programmes for smallholder farmers)

Synthesizing and prioritizing curriculum development needs

In a final session, participants zoomed in on 5 priority groups to identify curriculum development priorities and how to approach/deliver them.

Tables below provide the detailed group notes, the key points are summarized below:

- For **schools**, integrate One Health into their curricula and activities, training teachers, providing model assignments, and explore the potential for games and out of school activities.
- For **undergraduate students**, produce a joint module that many organizations can use, making the courses open access, fostering a One Health education network, supporting independent research/ extension projects and providing a One Health 'bootcamp' or practical training.
- For **graduate and postgraduate students**, review and identify gaps, developing these students as part of a specialized workforce for One Health with a standalone One Health program, develop new (open) One Health modules, including online, to include into existing programs, explore joint delivery and supervision as well as centers of excellence and providing practice-based innovation awards.
- For **training/education institutions**, enhance capacities in communication (risk communication, advocacy, awareness), collaboration (knowledge sharing), coordination (conflict resolution, inclusive participation), resource mobilization and evidence-based policy making. Based on mapping and a joint action plan, adapting and tailoring existing resources including training of trainer courses.
- For **in-service and working professionals** (such as veterinarians, doctors, environmental scientists, nurses, wildlife personnel, lecturers and teachers, etc.), provide an introductory (basic concepts) and an advanced course (more applied). Based on mapping and a joint action plan, adapt and tailor existing training resources. Delivery could be via an online short course (introductory and advanced) run over several weeks, or a one-week face to face course, or hybrid blended with occasional group meetings. It will offer CPD credits to participants. Ideally the course can be run across the countries and translated into other languages if needed. Participants could be invited to join transdisciplinary CoP/groups/platforms following on from courses.

Primary and secondary schools

Which priority results do we want to achieve?	Which actions or steps do we need to take?	Which innovative or promising options or models do we want to prioritise?
Integrated One Health subject into the program integration One Health in field practical's Integration One Health in assignments Extracurricular 'clubs' for One Health Awareness on One Health (children and household)	Training of teachers Produce context adopted material Consultation of stakeholders (Buy in of citizen) Buy-in of school governing bodies Awareness (Using context adapted evidence Design One Health assignments Framework to assess impact on One Health awareness	Include One Health topics in existing subjects Partnerships with private sector example based on commonly used products by children (value chain) Extracurricular activities Educational games (Board games) Interschool One Health events

Undergraduate students

Which priority results do we want to achieve?	Which actions or steps do we need to take?	Which innovative or promising options or models do we want to prioritise?
Joint module (human, animal, environment)-One Healthiness Joint lecturers OER Develop capacity of education	Identify gaps and strengths OER platform One Health case studies/community outreach	Develop OER material One Health education network Independent research/ extension projects One Health bootcamp/practical training

Graduate and postgraduate students

Which priority results do we want to achieve?	Which actions or steps do we need to take?	Which innovative or promising options or models do we want to prioritise?
Review and identify gaps in relation to One Health Specialised workforce for One Health Standalone One Health program New One Health modules infused into existing programs	Needs assessment Survey of existing capacity Design relevant programs Validation of program (Curriculum) Approval from university senate etc Registration and accreditation Promotion	Joint delivery and supervision Centres of excellence Open Source (Online) Innovation- Award based on practise rather than thesis

Institutional capacities

Which priority results do we want to achieve?	Which actions or steps do we need to take?	Which innovative or promising options or models do we want to prioritise?
Communication (Risk communication, advocacy, awareness) Collaboration (knowledge sharing) Coordination (conflict resolution, inclusive participation) Resource mobilisation Evidence based policy making (Data management, Analysis/Reporting, M and E)	Mobilise funds Joint action plan between all institutions (Net mapping of stakeholders) Adaptation and tailoring of existing training resources Training of trainers	Role playing games Theatre forums Case studies Story telling/poems/songs Foresight/Anticipation

Professionals

Who do we want to reach?	What do we want to deliver?	How can we best deliver this?
Transdisciplinary Practitioners (vet, medics, environmental health, nurses, wildlife personnel, plant health, social workers, sociologists, lecturers and teachers?.) – gov, private, education Introduction to One Health – awareness of One Health concepts, capacity in One Health, advocacy Advanced One Health – ability to apply One Health, capacity in One Health	Online short course in One Health (intro and advanced) Hybrid blended with occasional group meeting 6 weeks – 4 hrs a week Same course but delivered in 5 day course – developed by working group =- delivered by multipliers, cascaded through institutions using ToTs One Health sensitisation day worth CPD points	Assess which professions lack One Health – to target – check demand – long-term sustainability Register with CPD bodies – body has to see value to register (not essential) – scope requirements per country – advocate with professional bodies and associations Also have available as non-registered CPD for those interested Some countries and professions this will be easier than others Review existing One Health courses and do not replicate – pick up and use existing course or make for new Form working group per course from multiplier-consortium with lead – timeline – activity plan – develop in-person and online in parallel initially – contract someone to help Course in English – also Portuguese – in person can use local language Set up transdisciplinary CoP/groups/platforms following on from courses

Official closing

The official closing was preceded by a short self-assessment of the meeting to highlight stronger and weaker points. Inspired by the earlier discussion around the concept of 'One Health-ness', participants also ranked their overall assessment of the meeting in terms of our aspirations to include all One Health domains and be integrative in our deliberations. The table below captures that assessment together with some comments of participants

Rating of the 'One Health-ness' of the workshop

5 Excellent	4	3	2	1 Very poor
13 responses	**20 responses**	**5 responses**	**1 response**	**0 responses**
1. Energizing One Health network 2. Interdisciplinarity in action-incredible 3. Tuesday to Thursday moved from 1 to 5 4. Cohesive meeting-Enlightening 5. Great engagement and diverse participants 6. Strengthened both national and regional cooperation	1. Skewed representation of primary players of One Health 2. Need more environmental involvement 3. Need to include wildlife and plant life professionals 4. More vets 5. Environment is missing 6. Integrative but space to include more professionals/disciplines 7. Vet skewed 8. Widen/Need broader stakeholder 9. Multidisciplinary, Interdisciplinary and Transdisciplinary strengthened 10. Better balance with sector implementation	1. Skewed towards vets 2. Many vets 3. Mostly technical thinking but in the right direction 4. Too many vets 5. Few environmental practitioners 6. Great networking session	1. Mostly veterinarians	No comments

Closing remarks were provided by Theo Knight-Jones of ILRI and Flora Pule-Meulenberg of BUAN. Both thanked participants for their high energy and active commitment to the discussions. Speaking on behalf of the Botswana Ministry of Health, Dr. Malebogo Kebabonye expressed the strong commitment of her Ministry to the aims of COHESA and its willingness to work with other partners in the country and regionally. She appreciated the many disciplines represented, recognizing this as a model for true One Health collaboration in which 'magic beans' from any sector can grow and flourish together.

Project team planning

Recognizing the powerful network effect of enhanced collaboration among participating countries and institutions, the planning session began with a group exercise to identify innovative actions or ideas that can reinforce collaboration among the Education work package team. The ideas included:

1. Act as a collective/collaborative advocacy forum on One Health education
2. Co-design the programme using online and face to face participatory approaches
3. Enhance relationships and institutionalize partnerships between multipliers and in-country partners
4. Capacity sharing and mentoring
    - Facilitate CPD accreditation at COHESA workshops and events
    - Develop a scoring system for performance and career development in One Health
    - Pair learning of multipliers between centers
    - Foster bilateral arrangements and joint supervision; staff/student exchange
    - Periodically report progress; sharing and comparing goals
5. Communicating and sharing
    - Fast track and operationalize the COHESA observatory and populate with relevant content to increase networking and participation
    - Package and share One Health training materials
    - Organize regular interactive webinars
    - Establish a virtual library/repository of One Health learning tools
    - Convene regular meetings on emerging issues and challenges of network participants
    - Facilitate knowledge sharing and a discussion platform
    - Set up a communication platform for networking, eg SLACK
    - Facilitate a community of practice with frequent online seminars
    - Organize COHESA sessions at third party conferences; linking with other One Health actors

Theo Knight-Jones gave an overview of the COHESA organizational structure and managing principles in terms of roles of consortium, country coordinators, and multipliers. There is an expectation for activity tracking at the country level and monthly meetings for the country coordinator and multiplier to track progress and ensure activities are being completed. Project reporting is also upcoming and requests from ILRI have been made to countries for inputs.

Shauna Richards reviewed activity tracking excel documents for each country to use and track activities. WP3 activities were reviewed by Florence Mutua. Countries were reminded of variability of activities depending on deep dive, standard of focussed categorization of their country.

Country teams sat with their country coordinator (when possible) to look at WP3 activities and consider: 1. Who will do the activity in your country (i.e. team members)?; 2. What do you need to do this activity – resources, logistics etc?; 3. What challenges have you faced in COHESA to date?; 4. What challenges do you see in WP3?; 5. Any questions/concerns about implementing WP3?

Focussed and Standard countries had some similar concerns in that they have very little to do in WP3 – mainly they will be consulted by ILRI when needed, but do not lead many WP3 activities. Country coordinators can work with WP3 leads and multipliers to determine where ‘deep dive’ activities may be of value and possible in standard and focused countries.

Challenges for countries included multiple requests from different work package leads, and lack of harmonization and streamlining across work package implementation. Countries are also struggling to determine where they lead activities versus assist with them as directed by the COHESA consortium. Some countries also identified ongoing issues with the baseline (ethics, information sharing from key informant interviews). Country leads identified that the project having a clearer streamlined communication strategy/platform would help to facilitate smoother implementation and expectations moving forward. Country leads and COHESA consortium members also highlighted the benefit of regular in person workshops rotating between COHESA countries on relevant topics.

Conclusions

WP3 aims to Build the Future OH Workforce, and COHESA is well placed to facilitate this through assessing currently available OH education resources, activities, and courses/programs, and filling the gaps where necessary. Specific actionable items noted for the work package are:

- There is need for early training in OH which can be achieved through OH integration in curricula, activities at primary and secondary education levels and capacitating teachers in proper OH training delivery. This can include exploration of potential OH games and extracurricular activities to engage pupils to better their OH understanding as well as 'hands-on' experience. We can leverage existing activities such as upcoming curricula review (Kenya), or already existing OH education.
- Development and implementation of a general joint open access OH module that can be implemented across different disciplines at undergraduate levels that can be used by different institutions in the region for their specific OH education needs and sustainability.
- The ongoing OH HEI survey findings can facilitate development of standalone OH program and/or OH modules as best suited to Eastern and Southern Africa at graduate and postgraduate levels. The findings can help to tailor the modules to the needs of each country's education by identifying gaps, strengths, integration of existing modules etc.
- Within HEIs, it will also be relevant to improve capacities of those teaching OH through use of existing resources and building skills around communication, collaboration, coordination, resource mobilization and evidence-based policy making. Necessity in capacitating of the implementers of OH education with both OH technical and soft skills to enable cross-sectoral and domain engagement. Development and implementation of Training of Trainers (ToTs) OH courses and modules.
- Delivery of both OH technical and soft skills to students and trainers with an integrated approach comprising both theoretical and practical learning/training for a more skilled workforce.
- In Service training of working professionals through continuous professional development (CPD) on OH at both basic and advanced/applied levels through online short courses or hybrid blended with CPD accreditation to ensure the active workforce is capacitated in OH in their respective fields.
- Both SARUA and IUCEA offer an existing framework that can be leveraged to develop a One Health curriculum for EA and SA countries. Shared learning between the IUCEA benchmarking and the Southern African countries as well as Ethiopia can avoid duplicating work. An IUCEA model for curriculum development is available to develop curricula on One Health
- Collaborate with AFROHUN moving forward to leverage their existing OH education activities and align with COHESA WP3 activities.
- Involve local regulatory entities as well as aligning to regional and continental bodies to ensure sustainability.

Across these actions, the workshop participants felt it was imperative to involve local regulatory entities, as well as regional and continental bodies to ensure sustainability of WP3 initiatives. This will also help to harmonize curricula and facilitate professional mobility in the One Health field. To this end it may also be helpful to map the education stakeholders and develop a mutual information sharing system (this could be the COHESA Observatory) to promote One Health institutionalization and reduce duplication of efforts.

Annex 1: Opening remarks by BUAN Vice Chancellor

I am happy that my university is participating in this very important project as the country lead multiplier.

The Botswana University of Agriculture and Natural Resources came into existence when the then Botswana College of Agriculture transformed into a university in 2016 through an Act of Parliament.

Although as a University we are almost seven years old, the history of my institution spans over sixty (60) years.

Our mandate as a university is to provide high education and training in the fields of Agriculture and Natural Resources through innovative teaching and research.

To operationalize that mandate, BUAN has a strategy which is based on four key pillars; Research Intensification, Academic Excellence, Entrepreneurial Drive, and Agile Operations.

One of the thematic areas of the Research Intensification pillar is to have increased collaboration with external partners.

It is my firm belief that this COHESA project is helping us to achieve that thematic area.

The COHESA project also talks to our pillar of Academic Excellence.

I am informed that curricula development in the 11 COHESA countries is one of the key discussion items in this workshop.

This project has come at the right time. Currently, the world is faced with unprecedented, inter-connected threats to the health of people, animals, and the environment; addressing these threats requires cross-sectoral, systems-wide approaches.

One Health Approach

According to the World Health Organization, “One Health is an approach to optimize the health of humans, animals and ecosystems by integrating these fields, rather than keeping them separate”.

It is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals, and ecosystems. One Health recognizes that the health of humans, animals, plants, and the environment are closely linked.

Essentially, One Health unpacks the Agricultural and Natural Resources sphere across its value chain and therefore presents a compelling argument for multidisciplinarity in research.

One Health is an issue of global concern. According to the Center for Disease Control (CDC), Scientists estimate that “more than 6 out of every 10 known infectious diseases in people can be spread from animals, and 3 out of every 4 new or emerging infectious diseases in people come from animals”.

The World Bank reports that “the pace of (Emerging Infectious Diseases) EID outbreaks has increased at an average annual rate of 6.7% from 1980 and is compounded by the global movement of goods and people, which enables local outbreaks to spread worldwide”.

In fact, the next outbreak might be just around the corner.

Furthermore, the World Bank highlights that, “COVID-19 killed more than 6.3 million people as of June 2022, with true mortality being possibly three times higher and numbers continuing to rise. The

IMF projected the cumulative output loss from the pandemic through to 2024 to be about $13.8 trillion".

The One Health Approach can prevent the next epidemic. According to the World Bank, "One Health is designed as an integrated, practical, multisectoral framework for pandemic prevention".

The key words here are "Integrated", "Practical" and "Multisectoral". Preventing the next pandemic cannot be a one person show, but should rather be a holistic, diverse multi-stakeholder approach.

Therefore, in our case here in Botswana, gone are the days when Ministries of Health, Agriculture, Environment and Education planned in silos. One Health forces us to adopt multifaced intervention measures against the next pandemic.

What does this mean to BUAN?

Food production, which is the source of life, happens at the interface of Agriculture and the Environment, which is a prefect crucible for zoonosis.

Therefore, mitigation against Emerging Infectious Diseases (EID's) outbreaks, or should I say the first responders, are those involved in food production systems. This is where we need cutting edge research and innovation to assist us to foretell the future, so that we are better prepared.

This thinking is aligned to a recommendation from the World Bank which advises that the foundations for global health security should be implemented at the country level.

It is difficult (of course) to predict where the next pandemic is necessarily going to come from, therefore, countries are encouraged to mainstream One Health into their development frameworks.

Therefore, it is inevitable that a university like BUAN should be in the forefront of this initiative (in Botswana).

Because of its special nature, as a university whose mandate encompasses both Agriculture and Natural Resources, I urge government to facilitate the development of a Center of Excellence on One Health in Botswana at BUAN.

As a public institution, it is our responsibility to be an implementing partner of government initiatives.

Therefore, assisting government to mainstream the One Health approach into its development framework dovetails into our mandate.

Our aim is to drive technology and knowledge transfer to stakeholders across the entire value chain, from a cattle herder in the communal areas, to commercial cattle ranches, to arable farmers at all levels, to communities that subsist on natural resources, to scientists in state-of-the-art facilities.

BUAN can use this platform to facilitate knowledge transfer and generation about potential EID's in Botswana.

We are ready, willing, and waiting.

With these few remarks, I declare this workshop open.

Annex 2: Media and online coverage

1. Botswana University of Agriculture and Natural Resources and Capacitating One Health in Eastern and Southern Africa (COHESA) workshop (22 November 2022): BUAN news item. https://www.buan.ac.bw/index.php/buan-news-details/id/202/botswana-university-of-agriculture-and-natural-resources-and-capacitating-one-health-in-eastern-and-southern-africa-(cohesa)-workshop/
2. Botswana to develop holistic environment, health curriculum (25 November 2022): *Botswana Guardian*
3. BUAN hosts COHESA workshop (28 November 2022): *The Monitor (Botswana)* https://www.pressreader.com/similar/281672553948680
4. Botswana University of Agriculture and Natural Resources hosts Capacitating One Health in Eastern and Southern Africa (COHESA) workshop (7 December 2022): *Botswana Gazette*
5. New project explores approaches to build capacity of next-generation One Health professionals (19 January 2023): ILRI News. https://www.ilri.org/news/new-project-explores-approaches-build-capacity-next-generation-one-health-professionals

Annex 3: Meeting agenda

Time	Tuesday 22 November	Presenter(s)
09:00	Welcome	Flora Pule-Meulenberg, Botswana University of Agriculture and Natural Resources
09:10	Overview of the COHESA project	Theo Knight-Jones, ILRI Alex Caron, CIRAD
09:25	Overview of this work package	Florence Mutua, ILRI
09:40	Official opening	Keta Mosepele, Vice Chancellor, Botswana University of Agriculture and Natural Resources
10:00-10:30	COFFEE BREAK	
10:30-10:40	Agenda and process introduction	
10:40-11:10	Participant introductions exercise	
11:10-11:30	World Bank One Health activities in the region	Ana Cristina Canales Gomez, Dipti Thapa, World Bank
11:30-13:00	SARUA introduction and roles in curriculum harmonization and development	Nomazile Chicho, SARUA
	IUCEA introduction and experience in curriculum benchmarking	Michael Mawa, IUCEA
	Panel: One health workforce and competencies	Erastus Kangethe (World Bank), Helene de Nys (CIRAD), Mohamed Sirdar (WOAH), Nlingisisi Babayani (UB)
13:00-14:00	LUNCH	
14:00-16:00	Mapping One Health competencies and curriculum development in Southern Africa - networking exercise	
16:00-16:30	COFFEE BREAK	
16:30-17:00	One Health curriculum development case study	Seleshe Nigatu, University of Gondar
17:00-17:30	Preparation for field visits	
Evening	Group Dinner at Grand Palm Hotel	

Time	Wednesday Nov 23	Presenter(s)
08:30-13:00	Field visits Group 1 BUAN Natural Resources/Vet Faculty Group 2 UoB Medical Department Group 3 UoB Biological Sciences Group 4 BUAN Crops and Soil Sciences	
13:00-14:00	LUNCH	
14:00-15:15	Debrief from Field Visits	
15:15-15:45	COFFEE BREAK	
15:45-16:15	One Health outreach case study: RCVS vet nursing outreach	Jill Macdonald (via zoom)
16:15-17:00	Group work on tertiary education capacity building need	
16:30-17:00	Key results of WP3 Survey	Florence Mutua, ILRI

Time	Thursday 24 Nov	Presenter(s)
09:00-0915	Process update and plans for the day	
09:15-09:45	One Health research	Siobhan Mor, ILRI
09:45-10:30	Ideas for research synergies and cooperation	John Becker, University of Pretoria
10:30-11:00	COFFEE BREAK	
11:00-13:00	Synthesizing and Prioritizing: Curriculum development priorities and how to approach/deliver them?	
12:30-13:00	Reflections and Official Closing	
13:00-14:00	LUNCH	
14:00-17:00	Project team planning Exercise – Adding value through network collaboration Presentation – COHESA organizing and managing principles Presentation – WP3 administration and reporting Updating plans Close	

Annex 4: List of participants

Name	Institute
Alexandre Caron	Centre de coopération internationale en recherche agronomique pour le développement - Mozambique
Alexandre Hobeika	Centre de coopération internationale en recherche agronomique pour le développement - France
Ana Cristina Canales Gomez	World Bank
Boingoto Sebolai	Botswana University of Agriculture and Natural Resources
Boitumelo Mokiya	Food and Agriculture Organization of the United Nations - Botswana
Brighton Gorejena	University of Namibia
Buke Yussef	International Livestock Research Institute - Kenya
Catherine Wood	Lilongwe University of Agriculture and Natural Resources - Malawi
Chiku Mtegha	Lilongwe University of Agriculture and Natural Resources - Malawi
Clovice Kankya	Makerere University - Uganda
Davies Pfukenyi	Botswana University of Agriculture and Natural Resources
Dipti Thapa	World Bank
Erastus Kangathe	World Bank
Flora Pule-Meulenberg	Botswana University of Agriculture and Natural Resources
Florence Mutua	International Livestock Research Institute - Kenya
Gabriel Shirima	Nelson Mandela African Institution of Science and Technology - Tanzania
Gaebonwe Baikitse	Ministry of Education - Botswana
Helene De Nys	Centre de coopération internationale en recherche agronomique pour le développement - Zimbabwe
Henriette Vanheerden	University of Pretoria - South Africa
Inocencio Chongo	Instituto Nacional de Saúde - Mozambique
Jill MacDonald	Royal College of Veterinary Surgeons - United Kingdom
John Becker	University of Pretoria - South Africa
Keneilwe Mmopi	University of Botswana
Keta Mosepele	Botswana University of Agriculture and Natural Resources
Kilano Ntshiamisang	Ministry of Environment - Botswana
Lucinda de Araujo	Universidade Eduardo Mondlane - Mozambique
Malebogo Kebabonye	Ministry of Health - Botswana
Melvyn Quan	University of Pretoria - South Africa
Michael Mawa	Inter-University Council of East Africa - Uganda
Mirgissa Kaba	Addis Ababa University - Ethiopia
Moatlhodi Kgosimore	Botswana University of Agriculture and Natural Resources
Mohamed Sirdar	World Organisation for Animal Health - Botswana
Musso Munyeme	University of Zambia
Nlingisisi Babayani	University of Botswana
Nomazile Chicho	Southern African Regional Universities Association - Botswana
Onalethata Lesetedi-Mafoko	Ministry of Health - Botswana Public Health Institute
Peter Ballantyne	International Livestock Research Institute - Facilitator
Rachel Freeman	University of Namibia
Rachel Madekurozwa	University of Zimbabwe
Raymond Hamoonga	Zambia National Public Health Institute
Rosekellen Njiru	International Livestock Research Institute - Kenya

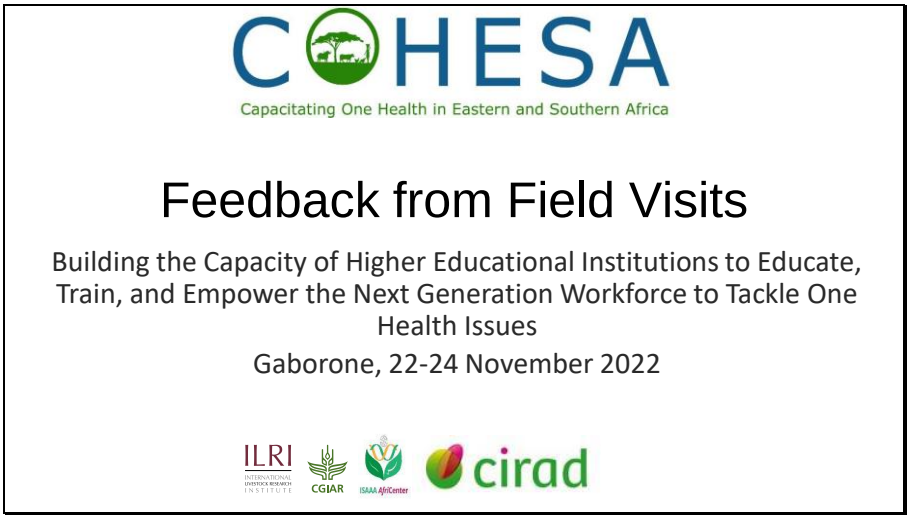
Salome Bukachi	University of Nairobi - Kenya
Seleshe Nigatu	University of Gondar - Ethiopia
Setshego Phokoje	Ministry of Agriculture - Botswana
Shauna Richards	International Livestock Research Institute - Kenya
Simon Angombe	University of Namibia
Siobhan Mor	International Livestock Research Institute - Ethiopia
Tedson Nkoana	University of Pretoria - South Africa
Theo-Knight Jones	International Livestock Research Institute - Tanzania
Tirelo Muthupi	Botswana University of Agriculture and Natural Resources

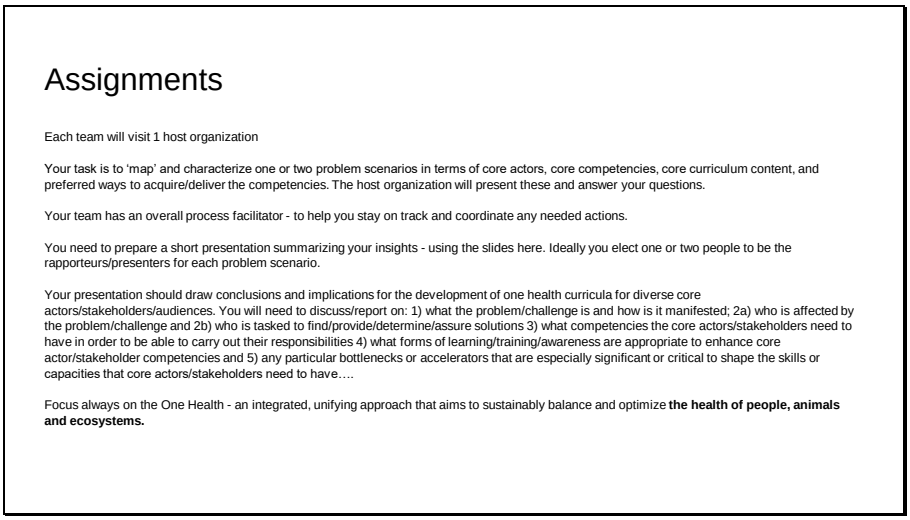
Annex 5: Group picture

Annex 6: Slide presentations

General introductions and other material from the project are available online at https://cgspace.cgiar.org/handle/10568/117514. Here are provided some slides not published online.

Annex 6.1: Feedback from workshop field visits





Team 1: Problem Scenario 1: Domestic animals, challenges at the human-animal-environment interface

Sketch the scenario/problem: Inadequate/insufficient collaboration in delivering academic activities (teaching and **research**) and curriculum development

What drives the problem/challenge?

Inadequate collaboration and communication across sectors in academia in One Health aspects. Trickles down to:

- Sharing results
- Liasing with government
- Departments are in different Faculties (that have trouble communicating and sharing expertise)
- Inadequate implementation of research output
- (Lack of) Access to molecular diagnostics

Who is affected by it?

- Different involved sectors; animal, human, and environmental health in the Academia context (although it reflects into government/policy).
- Community, farmers, general public (particularly when it comes to sharing/implementing results)
- Research institutes

Scenario 1 OH Workforce - core actors

Who is tasked to work on this problem/scenario and what roles/decisions do they need to play or take? - i.e. what fields are they in/what do they contribute?

This should briefly 'map' the core actors in the problem scenario - who they are and what they do.

- **Academia**
- **Research Institutions (public and private)**
- **Students**
- Professional bodies
- Decision/policy makers
- Farmers and public (at risk of contracting zoonotic disease)
- Government Departments Ministries of Agriculture, Health and Wellness, Environment and Tourism, Education
- Regulatory bodies
- Traders/private sector

Scenario 1 Core Competencies - Technical

For the core actors involved (see previous slide), list the core technical competencies they need to have to carry out their roles

Optional: are there any stand-out strengths or gaps you observe?

Technical core competencies present:

- Human expertise molecular diagnostics, epidemiology, mathematical modelling, public health,
- Academic programmes related to One Health (Diploma in Animal Health; basic epidemiology; wildlife utilization; wildlife and range management; wildlife/animal welfare, wildlife diseae, range development and improvement, plant pathology)

Technical core competencies needed:

- Need expertise in curricula development
- One Health principles and concepts
- Social and economic human resources (behavioural economics, behaviour, social inclusion, etc.)

Scenario 1 Core Competencies - Cross Cutting

For the core actors involved (see earlier slide), list the core technical competencies they need to have to carry out their roles

Optional: are there any stand-out strengths or gaps you observe?

Needed:

- Soft skills for collaboration, coordiantion, communication, and advocacy
- Systems thinking/approach- would help in write comprehensive proposals; and facilitate whole-of-value-chain understading (farm to fork)
- Resource mobilization

Scenario 1 Summary Table

Core Actor	Role(s)	Core competencies needed (technical)	Core competencies needed (other)	Observed strengths or gaps
Academia	Capacity building; Produce evidence and research for decision-making	-Systems approach -Curricula development -One Health principles and concepts -Social and Economic -Laboratory/ analytical capacity to enhance teaching and epidemiology	-Soft skills -Resource mobilization	-Human resources in different areas -One Health-related academic programmes

Scenario 1 OH Curriculum Implications

What is needed in the OH curriculum to address this scenario/problem?

- Assess to determine the changes that need to be addressed
- Change subject to stakeholder needs and regulatory requirements
- Leverage even small-scale changes that can iteratively build on to strenghtening core competencies
- Identify what is missing and implement (with a phased approach)

Content?

- To be defined by competencies and needs

Delivery?

- Make use of technologies to widen range of participating expertise (geographically, across sectors, etc.)

Outreach?

- Collaboration/communication of research results; bring guest lecturers for an integrative approach

Team 1: Problem Scenario 2: Wildlife-based problem/scenario

Sketch the scenario/problem: habitat loss and ever-increasing water scarcity increase interactions between human, wildlife, and domestic animals and thus multiply hotspots

What drives the problem/challenge?

- Climate change
- Resource (water) scarcity
- Rangeland degradation
- Bush encroachment
- Habitat loss

Who is affected by it?

- Producers, general public, academia, students

Scenario 2 OH Workforce - core actors

Who is tasked to work on this problem/scenario and what roles/decisions do they need to play or take? - i.e. what fields are they in/what do they contribute?

This should briefly 'map' the core actors in the problem scenario - who they are and what they do.

- Academia researches
- Decision policy makers
- Farmers public at risk of contracting zoonotic disease
- Government departments, ministry agriculture, health and wellness, environment and tourism, education
- Students
- Private sector: traders, conservation agencies/services, game rangers
- IDIs, NGOs
- **Tourism: Tourists operators, tourists,**

Scenario 2 Core Competencies - Technical

For the core actors involved (see previous slide), list the core technical competencies they need to have to carry out their roles

Optional: are there any stand-out strengths or gaps you observe?

Existing technical competencies:

- Human expertise available wildlife management and range management.
- Academic programs cover relevant issues but students sill don't get to the final level.
- Have programs that help address problems

Needed technical competencies:

- One Health principles and concepts
- Social and economic human resources (behavioural economics, behaviour, social inclusion, etc.)

Scenario 2 Core Competencies - Cross Cutting

For the core actors involved (see earlier slide), list the core technical competencies they need to have to carry out their roles

Optional: are there any stand-out strengths or gaps you observe?

- Soft skills for collaboration, coordiantion, communication, and advocacy
- Systems thinking/approach- would help in write comprehensive proposals; and facilitate whole-of-value-chain understading (farm to fork)
- Resource mobilization

Scenario 2 Summary Table

Core Actor	Role(s)	Core competencies needed (technical)	Core competencies needed (other)	Observed strengths or gaps
Academia	Capacity building (broader groups); Produce evidence and research for decision-making	-Systems approach -Curricula development -One Health principles and concepts -Wildlife and environment	-Soft skills -Resource mobilization	-Human resources in different areas -One Health-related academic programmes

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Team 2: UoB - Medical focus

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Team 2: Problem Scenario 1: AMR

Scenario/problem:
- silos, not easy to share data, funding of AMR and One health is not sustainable – grant dependence, intergration of AMR into existing curricula of diff degree and postgrad programs

Drivers of the problem/challenge?

- Institutions not working together, time it takes to implement changes

Who is affected by it?

- Wider community (humans and animals in Botswana and spreads across regions)

- AMR surveillance, colonization rates, clinical blood cultures and hospital wastewater, MDR gran neg bacteria, AMR prescription patterns and sucseptibility, AM extracts in indigenous plants for MDR actinobacter.
- National Action plan for AMR and health security, national one health committee (across ministies)– overseen by AMR techinical team
- Need plans that budget for activities related to plan – multisectoral plans –
- AMR plans have budget lines – through national action plan for health security
- AMR is urgent and awareness growing- - leverage this environment to combat AMR using One Health approach across sectors
- Teaching – include in primary secondary and tertiary
- Research – incorporate into AMR research aims
- Currently teach about AMR in health professionals, pharmacy, biomed sciences, pathology – focus is on Human health
- Problem: how to integrate OH into AMR teaching
- How to link AMR reporting – currently have a program SHARE – aim national surveillance system but currently only in Gaborone
    - Currently health focused and narrow on AMR (could be other areas), grant dependence currently
- Strengths of UoB: expertise in research and teaching – have infrastructure (labs), have national documents to support actions in AMR
- Gaps and challenges; silos, not easy to share data, funding of AMR and One health is not sustainable – grant dependence, intergration of AMR into existing curricula of diff degree and postgrad programs
    - Intersciplinary teaching, alignment of exsiting programmes to fit AMR, tighlghty packed curricula, convulted program to add programs

Scenario 1 OH Workforce - core actors

Who is tasked to work on this problem/scenario and what roles/decisions do they need to play or take? - i.e. what fields are they in/what do they contribute?

This should briefly 'map' the core actors in the problem scenario - who they are and what they do.

- Teaching staff on AMR at UofB
- lab, clinicians/healthcare workers, pharmacy – broadly all human health providors/contributors
- Private sector hospitals
- community

Scenario 1 Core Competencies - Technical

For the core actors involved (see previous slide), list the core technical competencies they need to have to carry out their roles

Optional: are there any stand-out strengths or gaps you observe?

- HCP have technical skills around AMR – except some clinician level understanding is lacking (front line with patients need sensitizing on testing procedures and general data on AMR in Botswana to know resistance patterns)
- Teachers have technical capacity on AMR
- Community needs to be aware of when AMU is prudent
- Tradiitional healers – need to work together

Scenario 1 Core Competencies - Cross Cutting

For the core actors involved (see earlier slide), list the core technical competencies they need to have to carry out their roles

Optional: are there any stand-out strengths or gaps you observe?

- Interprofessional training – some of this is happening in UofB already but needs to be scaled up
- Problem based learning in more skills
- Skills in networking and collaboration, and partnership
- Advocacy

Scenario 1: AMR Summary Table

Core Actor	Role(s)	Core competencies needed (technical)	Core competencies needed (other)	Observed strengths or gaps
Teaching Staff UoB	Teach students	Currently have needed technical skills	Interprofessional, problem based learning, networking, collab, partnership advocacy	Great technical knowledge and capacity
Healthcare providers	Prescribe, diagnose, labs etc	Rational AMU and diagnostics		Patient facing staff limited AMR/AMU knowledge
Private sector hospitals	As above	As above		As above
Community members	Use AM	Rational AMU	n/a	Lack of awareness of prudent AMU

Scenario 1 OH Curriculum Implications

What is needed in the OH curriculum to address this scenario/problem?
- OH is a core theme that runs throughout programs in problem based learning scenarios
- Expand examples already in curriculum to avoid complete restructuring
- Can add more on transdisciplinary skills as opposed to technical skills

Content? – transdisciplinary skills integrated into techinical skills, some content on PBL, technical and clinician level

Delivery? – need connection with other faculties and with other schools, CPD, getting all faculties under one roof to learn together. Integration into current program and potentially shared module across faculties.

Outreach? Community, traditional healers, private hospitals

Team 2: Problem Scenario 2: Zoonoses research

Sketch the scenario/problem
- Zoonoses
- Lack of integration between animal and human zoonoses fields
- Have BPHI and national public health lab are meant to link to other systems – mini CDC for coordinate reporting between human and animal field and ag field

What drives the problem/challenge?

- Limited communication between med and animal health fields

Who is affected by it?

- Human health and animal health – and spin offs

- Currently: covid 19, sars cov2 wastewater and microbiome, schistosomiasis, malaria
- National surveillance plan on 7 zoonoses: AI, rabies, brucella, TB, Cystercersosis, RVF, anthrax
- Botswana vaccine institute
- Botswana national vet lab
- FMD surveillance and vaccine, rabies sporadic, anthrax outbreaks
- Challenges: minimal Research and teaching on zoonoses at UofB, little relationships with other institutes that do more on zoonoses, multi-sectoral collab needed
- - don't know what they don't know – BUAN BIUST

Scenario 2 OH Workforce - core actors

Who is tasked to work on this problem/scenario and what roles/decisions do they need to play or take? - i.e. what fields are they in/what do they contribute?

This should briefly 'map' the core actors in the problem scenario - who they are and what they do.

- Teachers – who teach at UoB
- Students of UoB

Scenario 2 Core Competencies - Technical

For the core actors involved (see previous slide), list the core technical competencies they need to have to carry out their roles

Optional: are there any stand-out strengths or gaps you observe?

- Teachers: technical skills: awareness of current policy and legislation,awareness of national and regional networks, zoonoses epidemology/symptoms and various types that are relevant in local context
- Students: technical skills: integration of work to avoid duplication of work

Scenario 2 Core Competencies - Cross Cutting

For the core actors involved (see earlier slide), list the core technical competencies they need to have to carry out their roles

Optional: are there any stand-out strengths or gaps you observe?

Skills: policy, problem solving, systems thinking, dissemination of research – implementation, networking, communication, conflict resolution

Scenario 2 ZOONOSES Summary Table

Core Actor	Role(s)	Core competencies needed (technical)	Core competencies needed (other)	Observed strengths or gaps
Teachers UoB	Teach students about zoonoses	Zoonoses epidemiology and symptoms of relevant zoonoses - Policy and legislation on zoonoses - Regional networks working on zoonoses	policy, problem solving, systems thinking, dissemination of research – implementation, networking, communication, conflict resolution	Focus currently from HH perspective but limited on AH - Limited awareness of ability to work multi-sectors
Students UoB	Provide Healthcare with awareness of zoonoses	As above	As above	Opportunities to train many from different faculties at once

Scenario 2 OH Curriculum Implications

What is needed in the OH curriculum to address this scenario/problem?

Content? Technical knowledge of zoonoses, awareness policy/legislation that is relevant, general OH techinical approaches

Delivery? Shared between vet/med and based in problem based learning and integration in already existing courses (for students). CPD through quailification authorities – accreditation via modules that can lead to MSc or lower levels (for teachers across sectors), Networking opportunities/research symposiums,

Outreach? – legal frameworks and advocacy to have shared systems of reporting and action – and if it already exists ensure it is applied . Research symposiums

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Team 3: UoB - Biological Sciences focus

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Team 3 Problem Scenario 1: Engineering FMD vaccine appropriate for southern Africa

Sketch the scenario/problem
Control of FMD in Botswana

Adapting cost-effective vaccine to the circulating strain creating an outbreak (multi-valent)/ complicated by safety issues / costly / environmental risk / cold chain / turn-around time

What drives the problem/challenge?

Need to control FMD in Ngamiland/Chobe area for commercial export & local community livelihoods & well-being

Who is affected by it?

Rural/commercial farmers/associations / Export market - Botswana economy / DVS / Tourism industry / Pharmaceutical company (producing normal vaccines) / BVI

Scenario 1 OH Workforce - core actors

Who is tasked to work on this problem/scenario and what roles/decisions do they need to play or take? - i.e. what fields are they in/what do they contribute?

This should briefly 'map' the core actors in the problem scenario - who they are and what they do.

Herders / Farmers/owners → detect & report

Border control → detect & report to DVS

Veterinary extension officers → sub-district → report to DVS → "suspicion of FMD outbreak" → DVS disease alert team (lab, epidemiologist, BVI) to take samples + media communication → (Bots Nat Vet lab) & BVI confirm or not the diagnostic → report to DVS → media communication

Botswana Animal Traceability System (30 days tracing of mvt of animals)

UoB / BVI / Merial → vaccine development & production

DVS vaccine delivery & surveillance follow-up

Wildlife department (when wildlife e.g. buffalo are involved)

Scenario 1 Core Competencies - Technical

For the core actors involved (see previous slide), list the core technical competencies they need to have to carry out their roles
Optional: are there any stand-out strengths or gaps you observe?

Herders / Farmers/owners → basic disease knowledge / Identification clinical disease / record keeping (traceability - stock cards) / disease risk management / first-line reporting

Veterinary extension officers → handling infected animals / basic epidemiology / disease risk management (including communication) / second line reporting – report writing / monitoring & evaluation (CPD inadequate) /

sub-district / DVS central → data management & analysis / information dissemination / data interpretation / outbreak response (including IPC) /monitoring & evaluation / capacity building in human capital

BVI – Vet Lab → risk assessment / diagnostic capacity (qualified personal, biosafety issues, quality control) / data management / calibration & maintenance / FMD Ref laboratory certification / acquiring new accreditation (of other diseases)

UoB → risk assessment / diagnostic capacity (qualified personal, biosafety issues, quality control) / data management / calibration & maintenance / research skills / training capacity

Scenario 1 Core Competencies - Cross Cutting

For the core actors involved (see earlier slide), list the core technical competencies they need to have to carry out their roles
Optional: are there any stand-out strengths or gaps you observe?

Herders / Farmers/owners → communication skills / collaboration / networking / gender mainstreaming

Veterinary extension officers → risk communication skills / collaboration / networking / gender mainstreaming / trust building – inter-personal relationship / feedback to maintain bi-directional relationship / social mobilisation (CPD inadequate)

sub-district / DVS central → communication skills (to politician especially) / decision making / staff management / ressource mobilisation / project management

BVI – Vet Lab → communication skills / decision making / staff management / resource mobilisation / project management

UoB → communication skills / decision making / staff management / resource mobilisation / networking / leadership / project management; advocacy skills (e.g. for student accreditation)

Core Actor	Role(s)	Core competencies needed (technical)	Core competencies needed (other)	Strengths or gaps
Herders / Farmers/owners	Detect & report	basic disease knowledge / Identification clinical disease / record keeping (traceability - stock cards) / disease risk management / first-line reporting	communication skills / collaboration / networking / gender mainstreaming	In red
Veterinary Extension officers	Detect / Communicate / Manage & Report	handling infected animals / basic epidemiology / disease risk management (including communication) / second line reporting – report writing / monitoring & evaluation	risk communication skills / collaboration / networking / gender mainstreaming / trust building – inter-personal relationship / feedback to maintain bi-directional relationship / social mobilisation	CPD inadequate
DVS (district-national)	Manage / Analyse / Report / Take decision / Communicate	data management & analysis / information dissemination / data interpretation / outbreak response (including IPC) /monitoring & evaluation / capacity building in human capital	communication skills (to politician especially) / decision making / staff management / ressource mobilisation / project management	In red
Nat Bots Vet Lab BVI (FMD Ref Lab)	Diagnose / Calibrate / Maintain . Communicate	risk assessment / diagnostic capacity (qualified personal, biosafety issues, quality control) / data management / calibration & maintenance / FMD Ref laboratory certification / acquiring new accreditation (of other diseases)	communication skills / decision making / staff management / resource mobilisation / project management	In red
University of Botswana	Develop Research & technology	risk assessment / diagnostic capacity (qualified personal, biosafety issues, quality control) / data management / calibration & maintenance / research skills / training capacity	communication skills / decision making / staff management / resource mobilisation / networking / leadership / project management; advocacy skills (e.g. for student accreditation)	In red

Scenario 1 OH Curriculum Implications

What is needed in the OH curriculum to address this scenario/problem?

Content?

record keeping (traceability - stock cards) / disease risk management (local community / farmers)

capacity building in human capital (DVS)

acquiring new accreditation (of other diseases) (Lab)

communication skills / collaboration / networking / gender mainstreaming (local community / farmers)

trust building – inter-personal relationship (extension officer)

staff management / resource mobilisation (DVS / UoB)

advocacy skills (e.g. for student accreditation) (UoB, professional councils/bodies)

Delivery?

CPD (DVS, Lab) ; combined inter-faculty modules (curriculum)

Outreach? extension services (local community farmers); social media;

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Team 4: BUAN - Crops focus

ILRI CGIAR ISAAA AfriCenter cirad

Team 4: Problem Scenario 1: Climate change and mycotoxin contamination on cereals and groundnuts

What drives the problem/challenge?

- Excessive rain -> crops wet at harvest time -> fungus growth incl. mycotoxin- producing fungi
- Food produced through subsistence farming is not tested -> human exposure
- Downgrading of crops -> sold to animal feed producers, local consumption -> human/animal exposure
- Lack of proper storage -> post-harvest loss
- Lack of knowledge amongst actors, lack of evidence

Who is affected by it?

- Humans – cancer
- Animals – nephropathy, estrogenic syndrome, cancer
- Environment/plants

Scenario 1 Summary Table

Everyone needs knowledge on: OH, mycotoxins, CC

Core Actor	Role(s)	Core competencies needed (technical)	Core competencies needed (other)	Observed strengths or gaps
MoA	Regulation, testing, solutions e.g. early warning, research	Testing, participatory approaches, risk analysis, risk communication	Communication Cross-sectoral collaboration Systems thinking	
MoH	Sensitise public	Data collection/ analysis skills, risk analysis, risk communication		
M of Trade & Industry	Standards, regulation	Assessment/ evaluation, trade facilitation		

Scenario 1 Summary Table

Core Actor	Role(s)	Core competencies needed (technical)	Core competencies needed (other)	Observed strengths or gaps
M of Local Government	Waste management	Knowledge of regulations; K&S in environmental management, risk analysis, risk communication	Communication Cross-sectoral collaboration Systems thinking	
M of Education	Standards, needs assessment	Pedagogy skills		
M of Environment, Wildlife & Tourism	Solutions e.g. early warning	Data collection/ analysis skills, assessment/evaluation		

Scenario 1 Summary Table

Core Actor	Role(s)	Core competencies needed (technical)	Core competencies needed (other)	Observed strengths or gaps
Border inspectors	Inspecting/testing	Sample collection, testing		No test kits
Agriculture officers				
Street vendors				
Brewers				

Scenario 1 Summary Table

Core Actor	Role(s)	Core competencies needed (technical)	Core competencies needed (other)	Observed strengths or gaps
Police/byelaw office	Law enforcement			
Farmers		Proper storage (K&S)		
Traders (subsistence + commercial)		Awareness of issue health issues		
Spiritual/traditional healers				

Scenario 1 OH Curriculum Implications

What is needed in the OH curriculum to address this scenario/problem?

Short courses

- Storage and handling (farmer)
- Standards and regulation (extension officers)
- Identification and testing (border/crop inspectors)

Team 4: Problem Scenario 2: Excessive use of pesticides in agriculture

What drives the problem/challenge?

- Farmers overuse pesticides to intensify production -> residues in food, pollution of water bodies and soils -> human/animal exposure
- Regulation exists (usage, disposal of containers) but there is no monitoring or law enforcement at farm level

Who is affected by it?

- Humans - kidney, cardiovascular disease, cancer, endocrine exploitation, mental disorders
- Animals? (bees)

Scenario 2 Summary Table

Everyone needs knowledge on: OH, pesticides

Core Actor	Role(s)	Core competencies needed (technical)	Core competencies needed (other)	Observed strengths or gaps
MoA	Regulation, testing, solutions e.g. early warning, research		Communication Cross-sectoral collaboration Systems thinking	
MoH	Sensitise public			
M of Environment, Wildlife & Tourism				

Scenario 2 Summary Table

Everyone needs knowledge on: OH, pesticides

Core Actor	Role(s)	Core competencies needed (technical)	Core competencies needed (other)	Observed strengths or gaps
M of Trade & Industry				
Botswana Bureau of Standards				
Law enforcement officers				
Academic/ research institutions				

Annex 6.2: What is One Health research? By Siobhan Mor

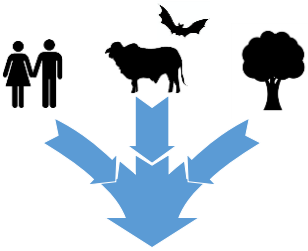
UK Research and Innovation

What is One Health research?

Siobhan Mor
Reader in One Health at University of Liverpool &
International Livestock Research Institute (ILRI)

One Health is…

…an **integrated, unifying approach**



At a thematic level, OH is about tackling threats to health and ecosystems (e.g. zoonoses, AMR, safe/nutritious food, clean water/air/energy, action on climate change)

At a practice level, OH is about multiple sectors, disciplines and communities working together (i.e. overcoming disciplinary siloes)

that aims to **sustainably balance and optimize** the health of **people, animals and ecosystems**

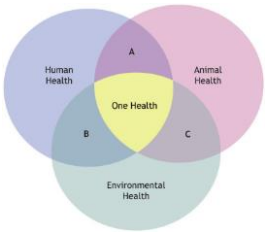
One Health research…

- "…involves **combined assessment of health risks** across the three domains of humans, animals, and the environment, and it involves design and implementation of intervention and prevention strategies that address all three sectors with a goal to produce **integrated knowledge**" (Davis et al., 2017)
- "…aims at **generating change** in a social-ecological system (context) towards **improved health** of humans, animals and/or ecosystems" (Rüegg et al.[eds.], 2018)

COHERE: Checklist for One Health Epidemiological Reporting of Evidence

COHERE reporting guidelines

- Developed by international expert review group
  (from United States, Canada and Switzerland)
- Similar model as STROBE, CONSORT, PRISMA
  - checklist to guide design and planning of studies as well as manuscript preparation
- Goals:
  - **improve the quality** of reporting of observational or interventional epidemiological studies
  - promote the concept that One Health studies should integrate knowledge from **all three** domains



COHERE reporting guidelines (cont'd)

	Data reported			Researcher expertise		
						
One Health	X	X	X	X	X	X
One Medicine	X	X		X	X	
Environmental health	X		X	X		X
Veterinary preventive medicine		X	X		X	X

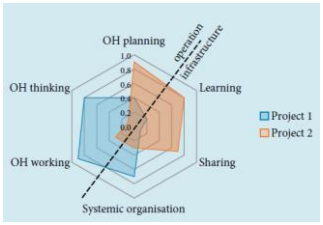
One Health evaluation framework

- Developed by Network for Evaluation of One Health (NEOH)
  (from Switzerland, UK, Denmark, Italy, Belgium…)
- Elements:
  1. **Define One Health initiative and its socio-ecological context**
  2. Describe the Theory of Change (i.e. roadmap)
  3. **Assessment of "One Health-ness"**
  4. Compare One Health-ness and outcomes and develop recommendations

Rüegg, Häsler, Zinsstag (edi). Available online here.

One Health evaluation framework (cont'd)

- Degree of "**One Health-ness**" relates to:
  - One Health **thinking**
  - One Health **planning**
  - One Health **working**
  - **Sharing** infrastructure and processes
  - **Learning** infrastructure
  - Systemic **organization**



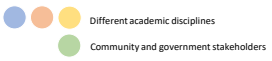
Example of the One Health spider diagram for two fictive One Health projects. (Rueg et al., 2018)

Rüegg, Häsler, Zinsstag (edi). Available online here.

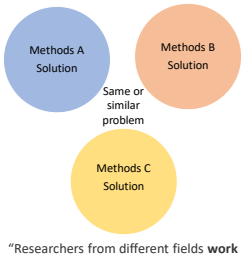
One Health evaluation framework (cont'd)

Area	Evaluation elements/questions (examples)
One Health thinking: systems thinking, match between context and initiative	How well does the initiative consider One Health (human, animal, plant and environmental health aspects) and the three pillars of sustainability (society, environment and economy)?
One Health planning: cross-sectoral, integrated planning	How well does initiative engage stakeholders (participation in implementation, planning etc) Adequacy of time and budget Flexibility and adaptability
One Health working: transdisciplinarity	To what extent do the different disciplines work together? Are meetings with all disciplines (face-to-face or virtual) held frequently? Are aims and objectives shared and clear to all? Is there joint decision-making?

Different ways of collaborating

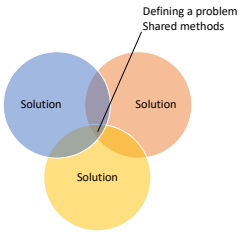


Multidisciplinary



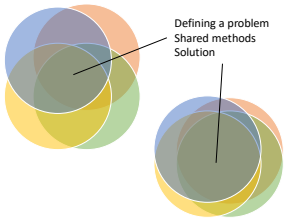
"Researchers from different fields **work independently or sequentially**, each from their own disciplinary perspectives" (Allen-Scott, 2015)

Interdisciplinary



"Researchers share more information and **coordinate more closely** with researchers from various fields, but their research is still guided by their own discipline-specific theories and frameworks" (Allen-Scott, 2015)

Transdisciplinary



"Researchers work jointly using **shared conceptual framework** drawing together disciplinary-specific theories, concepts, and approaches to address common problem" (Rosenstein, 1992) ± involvement of community and government **stakeholders**

Annex 6.3: Research synergies and opportunities: Survey feedback by John Becker

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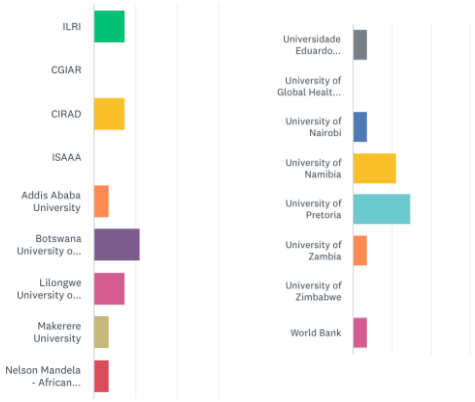
Research synergies and opportunities: Survey feedback by John Becker

Building the Capacity of Higher Educational Institutions to Educate, Train, and Empower the Next Generation Workforce to Tackle One Health Issues

Gaborone, 22-24 November 2022

Responses/representation

- ✓ 27 delegate responses
- ✓ Institutional representation



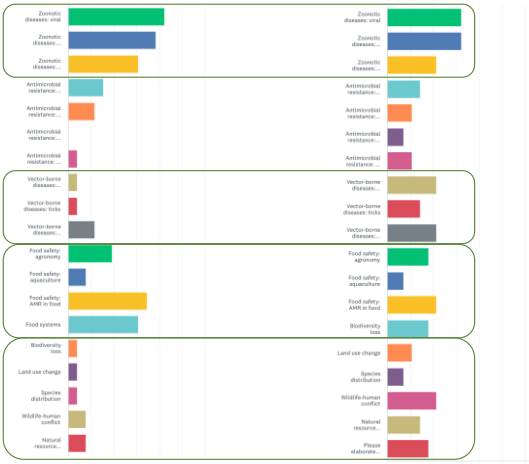
Research: Current Future

Zoonoses

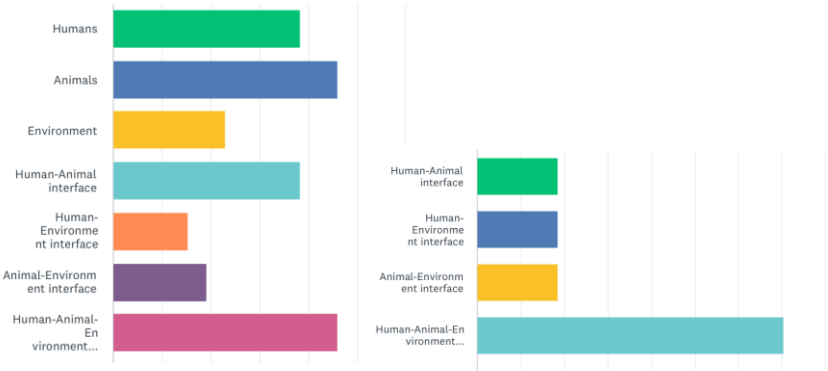
Vector-borne diseases

Food safety/systems

Environment



OH elements: Current Future



Expertise: Current Required

Medicine

Veterinary

Environmental sciences

Governance and policy

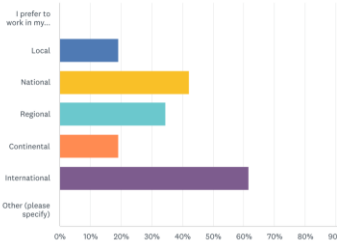
Informatics

Finance

Collaborative outlook: level and funding

How would you describe your level of collaboration?

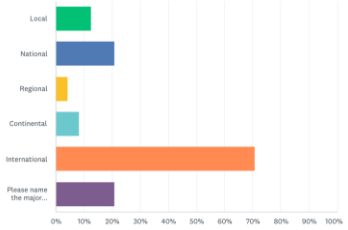
Answered: 26 Skipped: 1



Please indicate where the majority of your research funding is sourced fr

Please indicate where the majority of your research funding is sourced from?

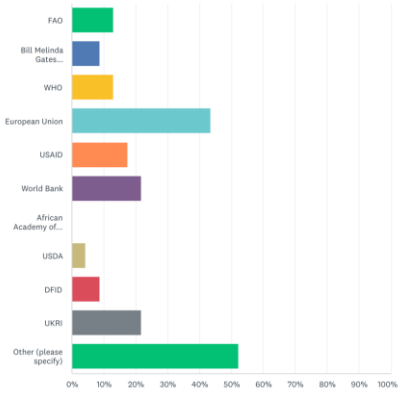
Answered: 24 Skipped: 3



Funding for OH research

Have you been successful in securing funds from the following entities?

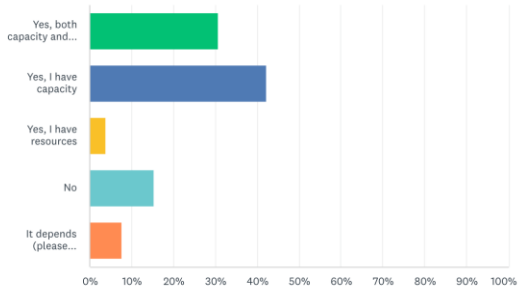
Answered: 23 Skipped: 5



Collaborative willingness

Do you have capacity and resources to accommodate collaborators on your current research projects to advance the One Health approach?

Answered: 26 Skipped: 1



The Capacitating One Health in Eastern and Southern Africa (COHESA)project is financed by the European Union.

The objectives of the project, 'to facilitate the raid uptake, adaption and adoption of solutions to One Health (OH) issues, with the OH concept embedded across Government & Research entities, Educational and training institutes, Public-Private Partnerships in Eastern and Southern Africa (ESA)' is jointly implemented by the International Livestock Research Institute (ILRI), CIRAD and ISAAA AfriCenter. The lead implementer of the COHESA project is the International Livestock Research Institute.

All information material, reports, publications and other media-related information produced as part of the implementation of this project funded by the ACP Innovation Fund will include the following phrase: *"ACP Innovation Fund, OACPS Research and Innovation Programme. A programme implemented by the Organization of African, Caribbean and Pacific States, with the financial contribution of the European Union".*

In collaboration with

This project is supported by the European Commission OACPS Research and Innovation Programme: ACP-EU initiative co-founded through ILRI and CIRAD