



Are integrated crop-livestock clinics an option for Kenyan smallholder farmers to address One Health issues?

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Summary

The majority of smallholder farmers in sub-Saharan Africa rely on both crops and animals for their livelihoods. However, the scarcity of farmer advisory services leaves them with insufficient knowledge about crop and animal health, as well as the wider health issues emanating from farming. There is a need for adapted, innovative services to meet the needs of smallholders. CABI's long-standing work with plant clinics sparked new ideas on how to better serve smallholder farmers by including animal advice in the clinics. This, in turn, revealed a potential to explore 'One Health benefits' of such an integrated service. Uganda began piloting crop-livestock clinics in 2021, and Kenya followed in 2022. Before launching the Kenyan pilot, a study was conducted to ascertain farmers': (i) awareness of 'One Health issues' related to crops and animals, (ii) information needs on crop and livestock farming, and (iii) perceptions on joint crop-livestock clinics as a new type of integrated farmer service.

About 70% of the farmers, mainly from Trans-Nzoia and Machakos counties, were aware of some 'One Health issues', including mycotoxins such as aflatoxin as well as pesticide residues on food and fodder.

Information needs reported by farmers for both crop and livestock farming included good husbandry practices, disease prevention and safe use of pesticides and veterinary drugs. Farmers expressed a positive attitude toward the concept of combined crop-livestock clinics and were willing to pay for the services due to the convenience of obtaining advice from one place, if the information provided were considered trustworthy.

Joint crop-livestock clinics have the potential to augment conventional extension service delivery and help address knowledge gaps highlighted in this study. In addition to being a one-stop-centre for farmer advice, these integrated clinics present an opportunity to disseminate accurate information on One Health topics relevant to smallholder farmers, and to inform joint action with other sectors, such as public health and environment.

Highlights

- Majority of farmers (about 70%) were aware of the negative health effects of mycotoxins, notably aflatoxin. However, most farmers did not know that consuming milk, meat or eggs from animals fed on aflatoxin-contaminated grain or other feed can cause health problems to them, or that delayed harvesting of their grain may exacerbate the aflatoxin problem.
- More than 80% had heard about zoonotic diseases and mentioned brucellosis, anthrax and rabies as the main zoonoses they were aware of. They, however, failed to mention other prominent zoonoses, such as Trypanosomiasis and Rift Valley Fever.
- Farmers expressed their need for information on good crop and livestock husbandry practices, disease prevention and the safe use of pesticides and veterinary drugs.
- Farmers perceived the convenience of obtaining advice from one place, along with the ease of access to information as key advantages of joint crop-livestock clinics.
- More than 65% of the farmers expressed willingness to pay for joint clinics, if the services were satisfactory and of good quality.
- Sharing of costs and human resources across sectors to address common problems has the potential to enhance cost-efficiency and effectiveness.

Context

One Health is growing worldwide with a plethora of initiatives emerging across the globe. In sub-Saharan Africa, at least 14 countries have developed national One Health strategies or platforms (One Health Commission website¹), and the Africa CDC² works with public health institutes across the continent to strengthen multisector, One Health collaboration. Kenya was one of the first countries to develop a national strategy for One Health (2012-2017) (ZDU, 2014), setting the pace for the formation of the Zoonotic Diseases Unit (ZDU) in 2012 as the national One Health coordination office. One Health is evolving in scope, too. Over the last few years, new ideas and concepts are emerging beyond the conventional focus on zoonoses and antimicrobial resistance (AMR). The new definition launched by the OHHLEP in 2021

¹ One Health Commission: www.onehealthcommission.org/en/resources_services/one_health_strategic_action_plans/

² Africa CDC: <https://africacdc.org/>

reflects a broadening view on One Health, recognizing that “... the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent” (WHO-OHHP website³).

In spite of the widening scope of One Health, most conversations and actions, including in sub-Saharan Africa, remain overwhelmingly dominated by zoonoses and AMR, leaving other components under-examined (Fasina et al, 2021). Plants and farming systems, for instance, are central to One Health. Issues such as mycotoxins, pesticide misuse, poor soil and manure management greatly affect the health of people, animals, plants and the environment. Yet, these topics remain broadly invisible within One Health, although the majority of smallholder farmers in sub-Saharan Africa, including Kenya, depend on both crops and animals for their livelihoods.

The Platform for Agricultural Risk Management (PARM)⁴ identified pests and diseases in crops and livestock among the most important constraints to agricultural productivity in several African countries. At the same time, the crop and livestock/veterinary sectors face major challenges with regards to delivering timely and relevant quality services to smallholders (Ngoro et al., 2014; Ilukor, 2017; Nyawo & Mubangizi, 2021). Kenya’s public agricultural extension system is challenged by years of substantial underfunding and staff scarcity as well as the protracted effects of institutional reform (MoALF&C, 2022).

The need for adapted, innovative services to safeguard rural livelihoods and health is huge. Integrated, cross-sectoral, service delivery has proven beneficial, especially in low-income settings where resources are scarce. Zinsstag et al. (2005) found that the integration of human and animal vaccination campaigns in pastoralist areas in Chad led to increased vaccination coverage. Likewise, a study by Griffith et al. (2020) in Turkana County, Kenya, highlighted better access to, and availability of healthcare, cost sharing among the different service providers, increased reach and streamlining of services as some benefits of integrated service delivery within a One Health framework.

CABI’s work with plant clinics over the last two decades triggered new ideas on how to serve smallholder farmers better. Feedback from farmers and clinic staff in various countries laid the ground for expanding the plant clinics to also provide advice on animals by enabling crop and animal health extension officers to collaborate in new ways. This, in addition, provided an opportunity to explore potential ‘One Health benefits’ of such integrated services (Danielsen et al., 2019). With funding from Biovision Foundation, pilot crop-livestock clinics were established in 2021 in selected districts in Uganda to explore how such integrated services can be effectively delivered⁵. Early results are showing a number of emerging added benefits: cost-sharing among sectors, ‘cross-learning’ between clinic staff and farmers, enhanced efficiency and effectiveness in targeting farmers’ problems, as well as joint clinics acting as an entry point to inform further action, including on One Health issues (Danielsen et al., 2022). An additional effect of the joint clinics is a growing awareness and interest in including plant health/ plant health management in One Health.

CABI, in partnership with the respective county governments began piloting crop-livestock clinics in Elgeyo Marakwet and Trans-Nzoia counties of Kenya from 2022 with additional

³ One Health High Level Expert Panel: www.who.int/groups/one-health-high-level-expert-panel

⁴ Platform for Agricultural Risk Assessment: <https://www.p4arm.org/>

⁵ CABI projects website: <https://www.cabi.org/projects/joint-crop-and-livestock-services-for-smallholder-farmers-in-uganda/>

funding from Biovision Foundation and Welttierschutz Stiftung, Germany (WTS). Prior to starting the pilot in Kenya, a study was carried out in 2021 to ascertain: (i) farmers' level of awareness with regard to 'One Health issues' related to crops and animals, (ii) farmers' information needs on crop and livestock farming, and (iii) farmers' perceptions on joint livestock-crop clinics as a new type of farmer service.

What we did

A household survey was carried out among 319 farmers (56% male, 44% female) in Elgeyo Marakwet, Isiolo, Machakos, Narok and Trans-Nzoia counties in July and August 2021. Two of these counties, Elgeyo Marakwet and Trans-Nzoia, were chosen to pilot the joint crop-livestock clinics as they have experience running plant clinics. Quantitative data were collected using a structured questionnaire. Analysis of data was done using STATA 16.1 statistical package.

Study findings

Livestock and crop production

Overall, 90% of the households surveyed owned poultry, about half owned small ruminants (sheep and goats) and multipurpose cattle, while dairy cattle were represented by about 1/3 of the households surveyed. Trans-Nzoia county had the highest percentage of dairy farmers (81%) and Isiolo county the highest percentage of goat farmers (83%). Maize was the most commonly grown food crop (88% of households), followed by beans (66%). Potatoes were also mentioned but mostly grown in Narok and Elgeyo Marakwet. Other crops mentioned included kales, tomatoes and indigenous vegetables. The average area cultivated for maize, beans and potatoes was 2.8 acres, 1.4 acres and 1 acre respectively (Table 1). Apart from Isiolo county where about 15% of the farmers interviewed did not grow any crops, respondents from all counties practised mixed farming, indicating that joint crop-livestock advisory services are likely to be beneficial to the majority of farmers.

Table 1: Surveyed farmers' livestock and crop production, by county.

Characteristic	Elgeyo Marakwet (n=62)	Isiolo (n=63)	Machakos (n=68)	Narok (n=68)	Trans Nzoia (n=58)	Total (n=319)
Livestock ownership (average number owned)						
Dairy	4	5	2	12	5	6
Cattle	4	6	3	32	3	11
Goats	6	14	5	51	3	19
Sheep	5	12	6	59	5	21
Poultry	21	15	21	24	33	23
Livestock ownership (% of respondents)						
Dairy	53	13	7	28	81	35
Cattle	40	54	65	57	21	48
Goats	5	83	68	49	12	44
Sheep	66	79	10	62	43	52
Poultry	94	84	96	78	98	90
Top crops cultivated (acreage)						
Maize	1.6	0.8	1.7	5.8	3.7	2.9
Beans	1.00	0.6	0.9	2.7	1.5	1.4
Irish potato	0.6	0.1	0.0	1.4	0.4	1.0
Top crops cultivated (% of respondents)						
Maize	97	60	99	82	100	88
Beans	66	60	65	66	74	66
Irish potato	27	4	0	41	5	16

Multiple responses

Farmers' awareness of 'One Health issues' related to crops and animals

Farmers were asked whether they were aware of problems in crops/grain/fodder that could affect animals or people. About 70%, mainly from Trans-Nzoia and Machakos said they did. When probed further, 80% mentioned mycotoxins such as aflatoxin, 26% mentioned pesticide residues on food and fodder and 10% mentioned feeding livestock with cassava that has cyanide, leading to bloating. The main reasons given for the occurrence of mycotoxins were: poor drying of grain (75%), poor storage of grain (57%), and feeding livestock with spoilt grain (20%). Farmers were asked to mention the practices they undertook to tackle or prevent mycotoxin problems, and the results are presented in Table 2.

Table 2: Percentage responses on practices to tackle mycotoxin problems in grain (n=253)

Management practice	Elgeyo Marakwet	Isiolo	Machakos	Narok	Trans Nzoia	Total
Managing moisture content (proper drying)	93	100	99	91	88	94
Cleaning and aeration of stores	63	52	51	59	75	60
Storing cereals off the floor	41	19	15	30	50	31
Controlling rodents and storage insects	7	4	0	5	10	5
Use of Aflasafe (field management of fungi)	0	4	3	9	6	4

Multiple responses

Inasmuch as there appears to be a high level of awareness of the mycotoxin problem among farmers, there are doubts as to the accuracy and completeness of this information. Most farmers for instance were not aware that consuming milk, meat or eggs from animals fed on aflatoxin-contaminated grain or other feed can cause health problems to them, or that delayed harvesting of their grain may exacerbate the aflatoxin problem (Negash, 2018). Njugi et al., (2018) found out that some farmers mix mouldy cattle feed with fresh feed to "dilute" the contamination. Further, Collins et al. (2010) report that farmers sometimes consume their own mouldy grain, taking it to be safe because they are the ones that produced it, but will not consume mouldy grain bought from the market. These practices point to glaring knowledge gaps on aflatoxin contamination, that are potentially damaging to the health of livestock and humans, and can lead to huge losses to the economy (Negash, 2018).

Generally, farmers were relatively well informed about diseases in animals that can affect humans (zoonoses), most probably due to the prominence given to these diseases in the country. More than 80% of the respondents had heard about zoonotic diseases, and mentioned brucellosis, anthrax and rabies as the main zoonoses they were aware of. The top five zoonotic diseases in Kenya are anthrax, trypanosomiasis, rabies, brucellosis and Rift Valley Fever (Munyua et al., 2019, Keshavamurthy et al., 2021). The surveyed farmers may not have heard about trypanosomiasis and Rift Valley Fever, or do not consider them as zoonoses of importance to them. Farmers were asked to mention causes of zoonotic disease infection, and the responses are shown in fig. 1. 'Consuming poorly cooked animal products' and 'exposure to infected animals' were by far the most common responses, indicating that farmers' understanding of zoonotic risk relates to *behaviours* and *practices*, rather than *disease agents* (bacteria, viruses).

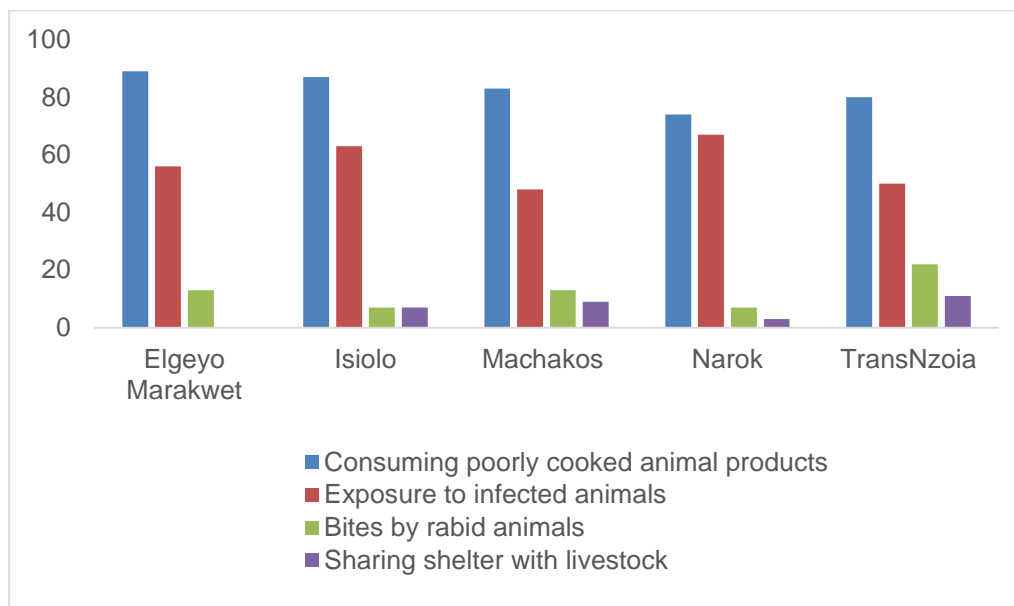


Fig. 1: Farmers' responses (%) on causes of zoonotic disease infection, by county (n=319, multiple responses)

Thorough cooking of animal products (83%), avoiding handling of dead animals (54%), and vaccination (12%) were the main practices that farmers said they applied to counter the zoonoses problem. This calls for more awareness creation on these practices, along with

others such as observing proper hygiene when handling animal products, not handling carcasses or dead fetuses, not consuming meat that has not been inspected, among others.

Information needs on livestock and crop farming

Farmers were asked what information and advice they would need to boost their crop and livestock production, but currently don't have sufficient access to. For crop farming, respondents mainly mentioned good agronomic practices, recommended agro-inputs, safe use of pesticides and disease prevention. For livestock farming, good livestock husbandry practices, safe use of veterinary drugs, selection of good breeds and disease prevention were the most frequently mentioned information needs (table 3). Hence, for both crops and livestock, information on good husbandry, disease prevention and safety in use of pesticides and drugs is highly requested by farmers.

Table 3: Farmers' information needs (% responses, n=319)

Crops	% responses	Livestock	% responses
Good agronomic practices	103	Good husbandry practices	65
Recommended agro-inputs	51	Safe use of drugs	49
Safe use of pesticides	42	Selection of good breeds	44
Disease preventive measures	37	Disease preventive measures	41
Pest and disease alerts	26	Proper feeding of livestock	40
Market information	15	Disease alerts	14

Multiple responses

Perceptions on joint livestock and crop clinics

Farmers were asked what they thought would be the advantages and disadvantages of joint crop-livestock clinics. The perceived advantages comprised obtaining both animal and crop health advice from the same place, easy access to trustworthy information and boosting farmer knowledge (Table 4). The disadvantages included concerns about limited personnel to attend to a probable large number of farmers, and that it would be difficult to bring a sick animal to the clinic, the way they did with crops (data not shown).

Table 4: Farmer perceptions on advantages of joint crop-livestock clinics (percentage)

Perceived advantages	Elgeyo Marakwet	Isiolo	Machakos	Narok	Trans-Nzoia	Total
Both animal and crop health advice is obtained from same place	60	46	60	44	53	53
Boosts farmers knowledge in management of crop and livestock diseases	52	63	57	47	43	53
Easy access to information from trusted sources	40	51	46	51	38	45
Saves time	48	41	38	40	60	45
Saves money from transport to source advice from different places	24	27	22	29	22	25

Multiple responses

Farmers were also asked what would motivate them to participate in these joint clinics. The main motivating factors mentioned were:

- quality and timeliness of advice provided,
- clinics to be located in places where farmers can easily access, them,
- proper awareness creation on the clinics and their value,
- provision of inputs/vaccination services at subsidized prices at the clinic,
- follow-up visits to farms

These motivating factors align well with findings from other studies on plant clinic operations and performance (e.g. Kansime et al, 2020).

The average distance farmers were willing to travel from their homes to the joint clinics was 2.7km, with a noticeable gender difference between male (3.3km) and female respondents (1.9km), confirming that women are generally more restricted in their mobility compared to men. Almost 50% of the farmers would like the joint clinics to operate weekly, while 34% mentioning that they would prefer the clinics to run monthly.

Farmers were also asked whether they would be willing to pay for joint clinic services, and if yes, how much they would be willing to pay. Almost 70% of the farmers would be willing to pay for such services. The indicated amounts are presented in fig. 2. The majority of farmers (56%) stated KES100-200 (~USD1-2) as an acceptable amount. There were significant differences ($p = .01$) between men and women farmers with more women than men willing to pay KES100-200 (~USD1-2), and more men than women farmers willing to pay the higher amounts of KES201-500 (~USD2-5), KES 501-1000 (~USD5-10) and KES1000 (>USD10). This willingness to pay for integrated crop-livestock services can be leveraged upon to contribute to sustainability of the service.

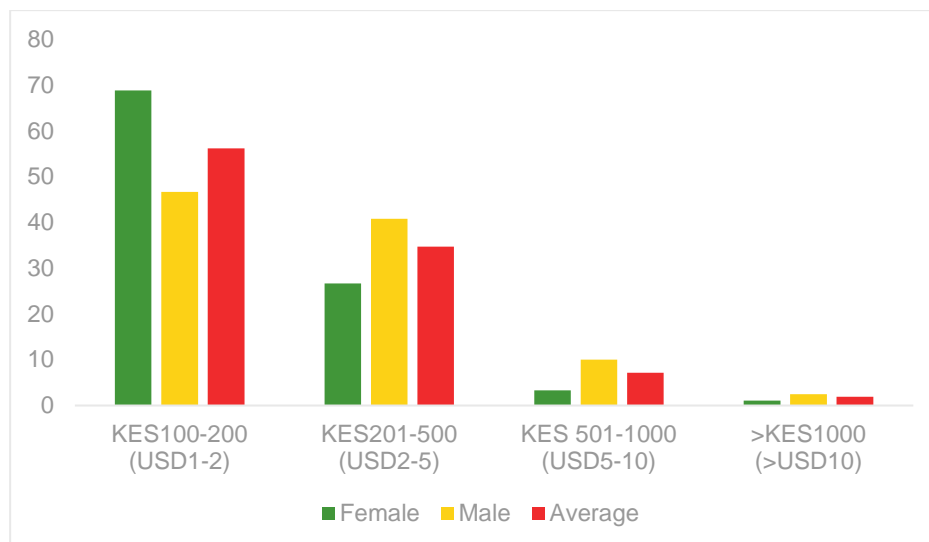


Fig. 2: Farmers' willingness to pay for joint crop-livestock clinics (%)

Farmers were further asked to state their considerations to pay or not pay for joint clinic services. The majority said they were willing to pay if the services were satisfactory and of good quality. Other considerations for those willing to pay were the value of knowledge to be gained from this service, and if there would be agro-inputs at the clinic. On the other hand,

farmers who were not willing to pay for these services felt that it was the government's responsibility to provide extension services to farmers free of charge, others said they could not afford to pay while some would only pay if their neighbours paid.

The way forward

Kenyan smallholder farmers have limited access to information and advice on both crop and animal health, as well as the effects of plant and animal health and production practices on the health of people and the environment. Joint crop-livestock clinics are a new type of integrated advisory service that aims to use existing resources and capacities to better meet farmers' needs for information and advice, bringing the services closer to the farmers. The surveyed farmers, the majority of whom are smallholders who practice mixed farming, were positive about the idea of receiving advice on both crops and animals, stating time saving as an immediate advantage. In addition, farmers' demand for information on how to prevent occurrence or recurrence of health problems in both crops and animals was evident. As such, crop-livestock clinics are a relevant option for Kenyan farmers.

The joint clinics provide an opportunity for county governments, in coordination with the central government, to explore how best to create actions and synergies across sectors and disciplines to create awareness on One Health problems such as mycotoxins, zoonoses, hygiene and pesticide and vet drug misuse. Livestock/vet and crop production professionals may run the clinics together with public health, environmental and/or fishery officers. Or, the different professions may find other ways to leverage knowledge across the traditional sector divides, and where insufficient, build the required capacity. County One Health Units and Food Safety Committees, where they exist, are obvious entry points to examine possibilities for addressing health problems that traverse sectors.

Kenya's county governments are invariably constrained by scarcity in funding and staffing. Evidence shows that sharing of costs and human resources across sectors to address common problems can enhance cost-efficiency and effectiveness. Yet, the exact shape of such cross-sector, multi-disciplinary collaboration must be decided by each county, so that it aligns with the organizational structures, county policies and priorities as well as available resources. Further, county governments can leverage farmers' willingness to pay to provide joint clinic services to farmers at a small fee, to contribute to make the services sustainable.

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