Out with the old and in with the new: better extension

RIU

Validated RNRRS Output.

A new style of extension work has been developed in Kenya to overcome shortages of extension workers and avoid the age-old problem of workers pushing technologies that producers don't really want and may not use. The FARM-Africa farmer-to-farmer extension (FFE) model involves extension workers training interested farmers in the use and application of a technology for which there is a demand. The system has a range of benefits, greatly increasing the number of people acting as extension workers and ensuring that technologies are better tailored to local needs. It also creates networks of people willing and able to exchange information. FFE is being used to make people aware of a wide range of things that can improve their everyday lives—from better goat production to improved HIV awareness.

Project Ref: **LPP18:**
Topic: **2. Better Lives for Livestock Keepers: Improved Livestock & Fodder**
Lead Organisation: **FARM-Africa, Kenya**
Source: **Livestock Production Programme**

Document Contents:

Description, Validation, Current Situation, Current Promotion, Impacts On Poverty, Environmental Impact,

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Research into Use
NR International
Park House
Bradbourne Lane
Aylesford
Kent
ME20 6SN
UK

Geographical regions included:

Kenya, Tanzania, Uganda,

Target Audiences for this content:

Livestock farmers,

Description

LPP18

A. Description of the research output(s)

1. Working title: Improving Information and Communication for the Smallholder Farmers in Kenya through FARM-Africa's Farmer-to-Farmer Extension Model

2. Commissioning Programme: Livestock Production Programme

3. R number and partners: FARM-Africa's farmer-to-farmer extension model was developed and validated by FARM-Africa through collaborative research involving the University of Reading, World Agro-forestry Centre (ICRAF), Mediae and the Ministry of Livestock and Fisheries Development. DFID sponsored the study under project R2555. The project's contact persons were Dr. Boniface Kaberia of FARM-Africa, Prof. Chris Garforth of the University of Reading, Steve Franzel of ICRAF and David Campbell of Mediae.

4. Description of the model

FARM-Africa's **farmer-to-farmer extension** (FFE) model addresses two common problems: a low ratio of extension providers to farmers, and a supply driven approach to research and extension.

The FFE model involves extension professionals training **willing farmers** on **demand-driven technologies** and encouraging them to serve their communities voluntarily as **community extension workers** (CEWs) [1]. This supplements public and private extension in a **sustainable** manner. Through FFE, researchers, farmers and extension agents can jointly identify research problems, adapt improved technologies to local conditions and provide **feedback on adoption**. R**esource-poor farmers' capacity** to manage extension activities is built and **application of area-specific recommendations** facilitated.

FFE increases the number of practically-oriented farmers and widens extension coverage of farmers reached by new and **improved agricultural technologies** through the **multiplier effect**. It addresses resource-poor farmers' information needs by enabling CEWs and learners to interact and know one another well, choose appropriate times and venues for training, and make use of indigenous technical knowledge. It is cheaper and demand driven. Using local people minimises conflicts with local culture, norms and traditions and enhances farmers' sense of belonging and sustainability of extension services. Through it, farmers ask the question: If other farmers have successfully carried out an improved agricultural practice, why not me? This motivates them, raising their commitment to achieve their goals.

Cost sharing, inbuilt in the model and supported by many farmers, ensures sustainability while reducing dependency, increasing accountability and farmers' motivation to work. Participating in FFE enables farmers to discover, identify and understand their needs and problems; appreciate themselves, respect one another's opinions, do their own research, and follow up on CEWs' performance by ensuring that they practice in their farms what they teach and remain good community **role models**.

Using FFE increases resource poor farmers' access to people with useful information and knowledge and makes extension more responsive to farmers' needs, interests, problems and aspirations. Through the CEWs, extension professionals teach farmers how to use new technologies; network with helpful individuals, groups and institutions; improve their agricultural products' quantity and quality; and also improve and expand their technical

knowledge, skills and self-confidence in production, processing, packaging, and marketing of agricultural products. They advise farmers on how to access suitable markets for their crops, control losses in storage, and ensure higher incomes from local and export sales of their produce through better quality and safety of products that meet stringent consumer requirements. *(Word count: 398)*

[1] In R2555, the term "Farmer Extension Worker (FEW)" was used. The stakeholder workshop on 13/10/2006 suggested the alternative term "Community Extension Worker (CEW)" to avoid confusion with the designation "Frontline Extension Worker (FEW)" already being used by government departments and NGOs.

5. Type of outputs being described by FARM-Africa's farmer-to-farmer extension model:

Product	Technology	Service	Process or methodology	Policy	Other: Please specify
	X	X	X		

6. Focus on commodities: FARM-Africa's farmer-to-farmer extension model focused on promoting improved breeding, management and marketing of dairy goats and their products for improved livelihoods in Kenya and beyond but it can be used, and is being used, to provide extension education in other enterprises. Ripples International (RI), for instance, is using the model among 517 households in Meru South and Meru Central Districts to create HIV/Aids awareness while a Kisumu community is using the model to mobilise its members against desertification. By its design, FFE is not limited to a specific commodity but could be applied to a wide range of enterprises, production systems and farming systems.

7. Production systems: FARM-Africa's farmer-to-farmer extension model focuses on the following production systems:

Semi-Arid	High Potential	Hillsides	Forest-Agriculture	Peri-urban	Land water	Tropical moist forest	Cross-cutting
X	X	X	X	X	X		X

In R2555, the focus was on semi-arid, high potential and hillside production systems. FFE could, however, be used with equal effectiveness in the other systems ticked above.

8. Farming systems: FARM-Africa's farmer-to-farmer extension model focuses on the following farming systems:

Smallholder rainfed humid	Irrigated	Wetland rice based	Smallholder rainfed highland	Smallholder rainfed dry/cold	Dualistic	Coastal artisanal fishing
X	X	X	X	X	X	X

In R2555, the focus was on smallholder rainfed highland and dry/cold. Other organisations are now using it in smallholder rainfed humid and irrigated systems (Kisumu). It could be used with equal effectiveness in the other systems ticked above.

9. Adding value to FARM-Africa's farmer-to-farmer extension model

R2555 research findings show that value addition to FFE can come from improving horizontal (between farmers) and vertical (between farmers and researchers and extension agents) information flows, which lead to successful up-scaling of the impact; creating refresher courses for CEWs; increasing farmers' involvement in technology development and providing feedback on adoption; and improving CEWs' capacity to do what is required.

Appropriate print material for training and educating farmers would therefore make CEWs more effective. Using illustrated booklets, as evaluated by R7425, would be useful in this context.

Increasing information and awareness of opportunities in CEWs' communities would also enhance their effectiveness. Lessons and outputs from DFID-supported projects in the region could be combined with further scaling up of FFE: e.g. Makutano Junction (funding from CPP, Central Research); Tembea na Majira; and Pilika Pilika. This would combine increasing the *demand* for advice, information and training (through mass media) with increased *supply* (through FFE).

Outputs from R7634 would enhance future FFE scaling up by providing CEWs with more productive technologies to promote.

CEWs' effectiveness in giving advice promptly is limited because they work at their convenience, seeking first to improve their farms and families. Compensating them for their time and transport, where necessary, and the materials they use for teaching would motivate them to work harder or spend more time on extension. To scale up FFE further, stakeholders, particularly beneficiaries, should develop sustainable mechanisms for compensating CEWs for the opportunity cost of the time away from their farms.

FFE can address knowledge and skill constraints identified in other RNRRS projects. For example, NRSP's Youth Livelihoods Project showed lack of access to knowledge and information prevents young people improving their livelihoods: FFE could relieve this constraint, enabling young people to manage their livelihood sources more effectively, thus becoming more self-reliant and less dependent.
(Word count: 300)

Validation

B. Validation of the Farmer-to-Farmer Extension Model

10. How and by whom was the farmer-to-farmer extension model validated?

R2555 tested the validity of the FFE model based on the lessons learned from the earlier Meru goat project. The research design (data collected before and after implementation; stratification of respondents into group members and non-group members; stratification by production system) provided a robust basis for validation. Implementing and assessing FFE involved both qualitative and quantitative methods and data. A checklist was used to ensure

the project included only resource-poor households, with women deliberately included to ensure their participation in extension. Validation sought to determine the level and extent of information flow, which varied with age, sex, marital status, education and household assets. Eight dairy goat groups comprised the sample in the two phases with ten respondents from each group and ten matched non-group members.

Evidence of FFE's effectiveness includes [2] increase in the number of farmers' groups, which rose from 44 to 170; sale of improved dairy goats, a total of 1136 were sold in less than 3 years with demand currently exceeding supply by 75%; increase in adoption of dairy goat technologies that stood at 64.5% and 71.4% in Meru South and Meru Central respectively; sale of agro-vet products; and demand for fodder planting materials.

Subsequent validation has come from the experience of other stakeholders (RI, AMREF, MDF [3], RPK [4], NMK [5], AN [6], CPDA [7] and MoLFD [8]) who have used FFE in other contexts. Use of the model by these organisations attests to its usefulness and effectiveness.

Validating people and organisations included beneficiaries, FARM-Africa and RI, an International Agricultural Research Centre (ICRAF), Community-based organisations such as goat groups and MGBA [9], government departments such as the MoA and MoLFD, research by University of Florida, a National Agricultural Research System institute (KARI), and the private sector (agro-vet companies). Although FFE was developed specifically in the context of the dairy goat project, its basic elements can be, and are being used to support dissemination of other technologies in other smallholder farming systems in sub-Saharan Africa.

Based on the evidence, in project reports, of farm productivity and goat sales the model was found to work effectively in improving resource-poor people's standard of living.

Research information gathered during the validation process shows that in addition to the direct impact the dairy goats have on families' standard of living, the FARM-Africa model helps the rural poor overcome their shyness and lack of confidence making it possible for them to interact with others freely without feelings of inferiority and social stigma as they identify and address their own development problems.

Through the training conducted by FARM-Africa on Dairy Goat Management, the poor learn from their own neighbours, brothers, in-laws and parents. They have crossed their goats with new breeds and are now reaping benefits from high yielding crosses. The farmer-to-farmer extension model is simple and manageable because of the institutional structure (MGBA), which is managed solely by the farmers themselves after FARM-Africa exited. MGBA is proactively supporting its farmer groups and linking them to different and relevant stakeholders for information, resources and training. *(Word count: 500)*

[2] These data are taken from the Final Technical Report for R2555.
[3] Meru Dryland Farming
[4] Resource Project Kenya
[5] Njaa Murufuku Kenya
[6] Africa Now
[7] Christian Partners Development Agency
[8] Ministry of Livestock and Fisheries Development

[9] Meru Goat Breeders Association

11. Where, when, and in which production and farming systems, has the farmer-to-farmer extension model been validated?

FFE was validated from 2002-2005 in Meru Central and Meru South Districts in Eastern Province of Kenya. This included implementing the model for 6 months among farmers in mixed farming systems and assessing its impacts through a second survey. Visiting individual households assessed the knowledge and adoption of improved agricultural practices in three dimensions: Lower Potential (Marginal) areas and high Potential (Midland) areas in dry areas and near the forest respectively.

More widely, the model has been validated by its use between 2004 and 2005 in a range of production and farming systems in Kenya (Eastern, Western, Central and Nyanza provinces), Uganda and Tanzania.

In terms of the RIUP categories, FFE has been validated in the following systems:

- production systems: high potential, semi-arid, hillsides and peri-urban
- farming systems: smallholder rainfed (highland, humid and dry/cold) and irrigated.

Validation has targeted the following groups: the resource-poor, particularly women, children and people with low literacy levels; and HIV/AIDS victims and orphans (by AMREF in Kibwezi, RI in Meru and CPDA and RPK in Kisumu). *(Word count: 173)*

Current Situation

C. Current Situation of Using the Farmer-to-Farmer Extension Model

12 How the Farmer-to-Farmer Extension Model is currently being used and people currently using it

MGBA continues to use the FFE model, now that R2555 project activities have ended. They collaborate with other stakeholders to support CEWs with technical information and training as well as organisation of markets and marketing within and outside Kenya. MGBA members who include men, women and youth, currently use the model to promote people-centred sustainable development and reach fellow farmers with veterinary and livestock production messages on breeding, healthcare, nutrition and routine management of dairy goats. Dairy goat group members and non-members are using FFE by continuing to access information, advice and training from CEWs.

FARM-Africa is using the FFE model in other projects in Kenya, Uganda and Sudan by building key features of the model into project design and implementation, including identifying CEWs and providing them with training and support.

Other organisations are using the model in Kenya. *Ripples International* in Meru South and Meru Central Districts are using it to promote HIV/AIDS awareness and improve goat production among HIV/AIDS orphans and their guardians. *Meru Dry Land Farming* is promoting improved dairy goat production in semi-arid areas of Eastern Province. *Resource Project Kenya, Africa Now* and *Christian Partners' Development Agency* are promoting improved goat production in Western and Nyanza Provinces. *JICA* uses FFE to promote rice production in Kisumu. *AMREF* is encouraging people to keep improved goats and drink goats' milk to boost their bodies' immunity againt HIV/AIDS in Kibwezi. *Njaa Marufuku Kenya* are promoting activities to improve food security and reduce poverty in most parts of Kenya. *(Word count: 250)*

13. Places where the model is currently being used

Members of the Meru Goat Breeders Association (MGBA) use the model to reach men, women and youth with dairy goat production and other related technologies while extension agents in Meru Dry Land Farming (MDLF) and in the Ministry of Agriculture (MoA) and Ministry of Livestock and Fisheries Development (MoLFD) use it to carry out extension. Ripples International (RI) is using farmer-to-farmer extension in Eastern Province to create HIV/Aids awareness among orphans and to teach them how to improve their diets in order to boost their body immunity. Other organisations using farmer-to-farmer extension include AMREF in Kibwezi where it is encouraging HIV/Aids' victims to boost their body immunity by drinking goat's milk; Njaa Marufuku Kenya (NMK) in various parts of the country, JICA among rice farmers in Kisumu, the Methodist Church and Kaaga Training Centre in Meru, the Christian Partners' Development Agency (CPDA) in Vihiga to promote dairy goat production technologies, Plan International in Mbeere and Siakago districts of Eastern Province. FARM-Africa is using the model to arrange exchange visits in which the poorest of the poor and most vulnerable groups learn and share experiences on how to improve their farms and livelihoods by applying modern technologies. It also uses the model to organise regular consultative meetings and joint monitoring and evaluation of field activities with individual farmers, their leaders, farmers' and community-based organisations and stakeholders from the public and private sector in Mwingi, Kitui, Meru Central and Meru South Districts in Kenya; Mbale and Sironko Districts in Uganda; and Sudan. *(Word count: 250)*

14. The scale at which the farmer-to-farmer extension model is currently being used, speed with which it was established and whether usage is spreading

Scale can be assessed partly in terms of geographical coverage. FFE has spread widely in a short space of time. Within two years (2004-2006) use of the model has moved from one to four of Kenya's provinces (Eastern, Central, Nyanza and Western), and from one to four countries (Kenya, Uganda, Tanzania, Sudan). An additional country (Burundi) has requested training in FFE. Within each province and country, however, the proportion of households currently reached through the model is small. Ripples International, for instance, is using the model to reach 517 households in 12 locations with dairy goat technologies and HIV/Aids awareness information. *(Word count: 101)*

15. Programmes, platforms, policy and institutional structures that have assisted promotion and adoption of the farmer-to-farmer extension model

MGBA has provided a supportive institutional framework for the development and use of the model in Meru South

and Meru Central Districts. Through MGBA and its member groups, technical support from public research and extension and from private sector veterinarians has been channelled to CEWs. MGBA has also been instrumental in the promotion of FFE: the success of MGBA has attracted other organisations to find out how the structures and the model work, and through MGBA, CEWs have been identified as trainers of those other organisations' beneficiaries. MGBA is able to seek collaborative partnerships with NGOs – e.g. Meru South Agricultural Stakeholders Forum and other development partners – to promote and support the uptake of FFE.

Within R2555, stakeholder workshops at the start and key stages of the project were important platforms which helped to build a broad-based support for the objectives and modalities of the model.

The support of MoA and MoLFD extension staff at district, division and location level, and of research staff of KARI, has made technical expertise available to CEWs. This support is built on close collaboration with the ministries throughout the earlier dairy goat project.

At policy level, Kenya's National Agricultural Extension Policy (since 2001) has explicitly supported the concept of pluralistic extension delivery and demand-driven extension; this will be reinforced in the 2006 National Agricultural Sector Extension Policy. Recent reforms of extension and advisory services in Uganda and (ongoing) in Tanzania are similarly supportive of the FFE approach, through the emphasis on farmers' groups and organisations driving the whole extension delivery system. As the number of public sector extension staff continues to decline in line with these reforms, the use of the FFE model is likely to become increasingly attractive.

The success of FFE is due largely to the fact that it works closely with local institutions that are accountable to the people they serve and responsive to their concerns. It integrates gender concerns; uses key traditional channels of communication identified by the communities (including churches, chief's barazas, market places); engages farmers in planning and implementing the model and establishes linkages with extension and research systems. *(Word count: 350)*

Current Promotion

D. Current Promotion / Uptake Pathways

16. Current promotion of the farmer-to-farmer extension model: the people involved and scale of current promotion

R2555 produced promotional and information materials, which have subsequently been used in promotion. These include two CD-ROMs, a VHS video ("Growing Impact") and a manual for development workers on how the model works.

FFE model is a key component of the training package delivered by FARM-Africa Kenya's Training and Advisory Unit on dairy goat development. This training has been conducted in Kenya, Tanzania and Uganda. It is likely that 2007 will see similar training in Sudan.

At the Agricultural Society of Kenya International Trade Fair Nairobi in October 2006, the FARM-Africa stand displayed the manuals, videos and CDs on FFE and gave them out to interested development workers. FARM-Africa personnel were on hand to discuss the model with interested participants. Videos were sold at KSh 200.

R2555 Project Leader was incorporated into the membership of the National Thematic Working Group on Research and Extension for the purpose of articulating policy issues that should be addressed by government from the private sector and NGO perspective, to ensure extension can become more responsive to farmers' needs.

MGBA's Extension Workers' Unit has facilitated the involvement of FARM-Africa trained CEWs in training other organisation's beneficiaries as CEWs (e.g. Ripples International and Meru Dryland Farming). *(Word count: 200)*

17. Current barriers (institutional, policy, marketing, infrastructure or social exclusion) preventing or slowing down adoption of the model

Social: Some CEWs might be unpopular with community members, which may limit their effectiveness. Furthermore, some farmers resent visits from male CEWs for fear that they might develop a relationship with their wives. However, farmers have no problem receiving visits from male government officers.
Culture: In communities such as the Maasai, where women are not allowed to interact with men freely in public meetings, women CEWs are less effective.
Commoditisation of knowledge: Tendency of some CEWs to see their knowledge as a commodity which they can sell rather than share freely.
Infrastructure: Lack of transport and telephones for CEWs and impassable roads especially in the rainy season limit effectiveness.
Marketing: Inappropriate markets negatively affect the rate of technology adoption.
Activism: CEWs might change role from facilitator to activist.
Policy: No policy guidelines on how CEWs are to be institutionalised within NASEP, e.g. their registration as extension providers bearing in mind their lack of formal training.
Level of education: Capacity to understand and apply technologies limits effectiveness.
Donor dependence limits sustainability.
Limited funds to do what is intended limit effectiveness
Distances: The longer the distance CEWs cover the harder it is for them to apply the model easily.
(Word count: 197)

18. Changes needed to remove or reduce barriers to adoption (include perceived capacity-related issues)

Changes needed to improve adoption include developing and institutionalising a policy that recognises CEWs, having modalities for sustaining extension activities and a monitoring and evaluation system, linking farmers to public extension and markets, providing funds for training materials (books, videos and charts) by CEWs, and initiating income generating activities. These issues are being addressed in the new (2006) National Agricultural Sector Extension Policy (NASEP).

A sustainable mechanism is needed for compensating CEWs for doing extension.

Developing a revolving community fund could increase poor farmers' adoption of modern technologies, which is limited by their inability to afford. Planning regular refresher courses for CEWs would improve their performance. CEWs' should not be expected to cover long distances unless facilitated to do so. Their technical expertise should not be overrated as some might be tempted to save face by guessing answers to questions unfamiliar to them. Resource-poor farmers usually apply recommendations that produce immediate results. Therefore, CEWs should only ask them to adopt new technologies after assessing their capacity to do so.

Promotion would be facilitated by resources to reproduce existing video and print materials, which are still in high demand, to allow wider distribution (q. 16 above) *(Word count: 195)*

19. The best ways to get the model used by the largest number of poor people

In general, this requires ensuring content available through the model is appropriate to the poor; recruiting the right CEWs with appropriate attitudes towards the poor; and addressing poor people's constraints in the adoption of improved technology and enterprises.

Reduce distances that CEWs cover and deliberately target rural women and youth. Women are more effective in disseminating information than men because of their interest in extension and readiness to share information. Women belong to many groups and interact with other women in many places, which include market places, water collection points and churches.

Ensure CEWs use an approach that *motivates target clients* to seek for more information and use locally available technologies and materials that resource-poor farmers can afford; and that they are genuinely committed to serving all farmers without discrimination and possess the necessary knowledge and skills required by the majority of their clients.

Recruit *CEWs who are of good moral character and well respe*cted by the community, who are able to create trust and are willing to make follow-up visits when necessary.

Ensure *CEWs know and meet local people's needs* e.g. for markets. This requires capacity building of CEWs to understand fully the needs of the poor. Training is also needed in group dynamics, specifically on how to target messages and extension activities to resource-poor people.

Sensitise the resource-poor to seek information from their fellow farmers and other sources. This requires more investment in promotion campaigns. Helping them to acquire mobile phones for SMS use would also enhance their ability to seek and receive information and advice.

Increase variety of extension messages so that CEWs can reach resource-poor farmers engaged in different production and farming systems.

Target the model also on *non-renewable natural resource activities* such as business and trade.

Second public extension workers specifically to train CEWs. *(Word count: 299)*

Impacts On Poverty

E. Impact on poverty to date

20. Studies with evidence of impact on poverty

The information in section 21 below comes from the following sources:
(1) Final Technical Report for R2555
(2) Project monitoring reports during implementation of R2555 (FARM-Africa unpublished reports)
(3) Consultations with stakeholders during preparation of this proforma.

21. Positive impacts on livelihoods: how the poor have benefited from the application of the farmer-to-farmer extension model

Overview: FFE has had positive impacts on the financial, physical, social and human capital of poor people in the communities covered by R2555 and has reduced their vulnerability. It has strengthened institutional structures that support their efforts to sustain their livelihoods. Although no documented evidence exists of impacts in other areas where FFE has been adopted, reports from stakeholders suggest similar impacts elsewhere. Households who experience these impacts fall into the moderate poor, extreme vulnerable poor (women headed households) and to some extent children of the extreme poor.

Impacts on household income and living conditions: Selling dairy goats and their products generated from applying FFE over the last 2 years has improved poor people's incomes and livelihood sources, enabling them to build better houses, get piped water, eat improved diets, pay school fees for their children, and live in better houses. Some who previously lived in mud houses now live in timber houses, which are relatively more expensive.

Impacts on local people's knowledge: Teaching the farmers subjects ranging from dairy goats' management to HIV/Aids, group facilitation and leadership has significantly improved their general level of knowledge and skills as well as self-confidence making them better managers of their resources, health and the environment.

Impacts on people's finances, social organisation and networking: Applying FFE has made poor people better organised through farmers' organisations such as MGBA and the Meru Animal Health Workers Group. Through these farmer-managed organisations, the people have reliable markets for their livestock products. They were able to sell 315 dairy goats in 2004, 407 in 2005, and 415 in 2006 to buyers from in and outside Kenya (Uganda, Burundi and Rwanda) and within 3 years the demand for these improved dairy goats has increased by 75%, which exceeds current supply.

Financial and health impacts on women and children: Although applying FFE has impacted positively on all household members, women and children have benefited most. While in the past they relied mostly on men for every household need and often felt frustrated when these needs were not met adequately and on time, they are now able to sell milk or goats to earn money for buying essential household items such as tea, sugar, soap, tooth paste, paraffin, clothes and groceries. Women living in areas where FFE is being applied are now better able to feed their families on more balanced diets as a result of increased milk consumption and through income generated from milk sales. Using money generated from dairy goats, for instance, a lady from Kithwene sub-location constructed a shop, installed piped water in her farm and bought cattle and a car for her family. In Kaithe village in Meru Central, dairy goat farmers got piped water because they were organised through FFE, which enabled them to sell goats to raise the 30% of the money required by the donor. Men have welcomed women's increased contribution to household income because it has reduced poverty level in the household and enabled men to concentrate on their jobs and businesses. *(Word count: 500)*

Environmental Impact

H. Environmental Impact

24. Direct and indirect environmental benefits related to the farmer-to-farmer extension model and its outcomes

Direct benefits: FFE has already enabled farmers to learn how to protect, conserve and improve the environment in a sustainable manner. Information on agro-forestry helps them plant more trees for fodder, home construction and soil conservation. Farmers benefit directly from improved soil fertility provided by leguminous nitrogen-fixing plants, improved water-holding capacity of the soil provided by humus derived from decaying tree leaves and branches, reduced water runoff resulting from better vegetation and ground cover, better soil and water conservation and increased overall land productivity. Farmers who prepare land using farm machinery learn why and how to plough across, rather than down the slope. Farmers advised against deforestation become cautious when cutting down trees for timber, charcoal, building, firewood or cultivation, which accelerates drying of water sources negatively affecting rainfall patterns. Farmers using energy-saving jikos (cooking stoves) reduce requirement for firewood and slow down negative consequences of deforestation. Further promotion of FFE has potential to spread these benefits, provided that those who train and support CEWs give adequate emphasis to pro-environmental behaviours.

Indirect benefits: FFE creates an effective two-way flow of information. CEWs are in a good position to report any local environmental problems to government departments so that appropriate responses can be put in place promptly. *(Word count: 206)*

25. Adverse impacts related to the farmer-to-farmer extension model and its outcomes

FFE may speed up the adoption of modern inputs. Use of agro-chemicals to control farm pests and diseases negatively affects the environment indirectly as residues find their way into water sources leading to pollution and possible poisoning of important micro-organisms. Repeated use of borehole water for irrigation may lead to water

salinity that ultimately causes soil infertility indirectly. Implementation of FFE must therefore promote proper environmental management, safe use of agro-chemicals, and non-chemical alternatives where feasible. To pass accurate, high quality and appropriate messages, CEWs must be well trained in the subject matter and communication. *(Word count: 95)*

26. Whether the FFE model increases poor people' capacity to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience

Through the model, people learn better care of their livestock in times of plenty and scarcity, which could prevent livestock deaths during drought. They learn how to improve farm fertility through mixed farming and growing appropriate crop mixtures and how to plant drought-resistant crops that are suitable for their agro-ecological zones. This increases their food security during drought. Information on controlling post-harvest pests and diseases improves farmers' capacity to store farm products longer in order to sell at better prices later. In Kisumu, communities use the model to mobilise their members against desertification.

Through the model, farmers learn strategies for forming and managing organised groups that increase their bargaining power, improve produce marketing and market linkages and spread costs of obtaining useful information and technical support from public and private sources to improve their livelihoods through better resource management. Through the groups, the poor can initiate income generating activities such as bee-keeping, baling crop residues for sale, seed banks, trade in cereals, tree nurseries and savings and credit schemes that would improve their capacity to cope with the effects of climatic change and reduce the risks of natural disasters. Groups may also seek government support for the most vulnerable members. *(Word count: 200)*