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DEVELOPMENT OF *FARM FIELD SCHOOL* METHODOLOGY FOR SMALL-HOLDER DAIRY FARMERS IN KENYA

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Abstract

Currently, over 500 Farmer Field Schools (FFS) on integrated pest management (IPM) and/or integrated soil management are being successfully implemented in Kenya and many more in Africa as a whole. The FFS methodology needs to be developed for similarly complex situations like animal health and production where responses to interventions may not be as fast.

In a recent study in Central and Rift Valley Provinces of Kenya, approximately 90% of rural households were agricultural and of these 73% had dairy cattle. In the DFID bilaterally funded Smallholder Dairy Project (SDP) characterisation and longitudinal monitoring of smallholder dairy farms has confirmed that in Rift Valley Province, smallholder farmers consider endemic diseases, particularly tick-borne diseases (TBD), and inadequate supplies of feed resources the major constraints to increased dairy production.

The livestock FFS project started in April 2001 and funded by the DFID Animal Health Programme and FAO, is adapting and testing the FFS methodology for animal health and production, focussing upon smallholder dairy farmers. Ten pilot FFS have been established in five different agro-ecological zones in Central, Rift Valley and Coastal Provinces of Kenya. Implementation of these FFS is allowing adaptation of agro-ecological system analysis (AESA) with the animal as a focal point and development of participatory technology development (PTD) to address livestock related issues. Approaches and methods to test and introduce integrated methods to control tick-borne diseases and helminth infections and to improve animal husbandry practices and the efficiency of utilization of available feed resources within the crop-dairy system are being developed.

Introduction

Considering the escalating population growth, shrinking grazing land and increased demand for animal products, sustaining livestock production through improved management is critical to the issue of food security and poverty alleviation in most developing countries. The challenge facing the research and extension services in these countries is to increase productivity in the livestock sector while sustaining and enhancing the productive potential of the available natural resources.

In a climate of declining governmental support for conventional means of extension and the evidence of lack of success of traditional methods, the need for alternative methods for disseminating technologies is recognised (Moris, 1991; Scarborough *et al.* 1997; Wambugu, 1999). Failure of these traditional methods, can be partly attributed to the fact that they have not always focused on farmers priority issues, or have given recommendation that were inappropriate or with no immediate tangible benefits (Heffernan & Misturelli, 2000). The underlying reason for these failings is that farmers were insufficiently involved, or not involved at all, in identifying their problems, or in selecting, testing and evaluating the possible solutions. Therefore the traditional extension system in Africa, based on a top-down approach, rarely delivers in an integrated manner the necessary information (Nyambo & Kimani, 1998). Livestock extension has focused on delivery of services such as artificial insemination rather than delivery of information on improved management practices and it is generally acknowledged that livestock production and marketing information has been poor or non-existent, particularly in comparison with the services offered to crop producers (Barton & Reynolds, 1996). Departments of Veterinary Services have historically not undertaken extension advisory work, focusing instead on provision of emergency health care services by animal health assistant often insufficiently supported and supervised by a veterinarian (Leonard, 1985 & 2000).

It is now generally recognised in extension and community development that a major means of ensuring sustainability and therefore success is to design programmes where the recipient is participating at all stages of their planning, implementation and evaluation (Axin, 1988). In such participatory approaches, farmers are participating in determining the agenda, the content, the dissemination pathway (Garforth, 1998) and sometimes the person to be responsible for the programme (Chambers 1983 & 1993; Chambers *et al.* 1989; Sutherland, 1998; Martin & Sherington, 1997). As for extension, very few example of participatory livestock research exist compared to crop production and protection (ICIPE 1992; Morton *et al.*, 1997; Jones *et al.*, 1998).

Although a growing number of organisations have sought models which might be both more effective in serving farmers' needs and institutionally more sustainable, most of these "farmer-led extension" projects described by Scarborough *et al.* (1997) have been in the voluntary sector and few as yet have been sponsored by government organisations. Yet, the only way for an extension programme to be sustainable and reach a significant number of farmers is to be integrated within a national programme agenda.

The Farm Field School (FFS) methodology originally developed by FAO in Asia for integrated pest management on rice was subsequently broadened to address other crops and topics (Matteson *et al.*, 1992; Ooi, 1996 & 1998, van de Fliert, 1993). Although, the FFS methodology can be implemented by NGO's or private institutions it can easily be integrated into the existing extension services. Currently, over 500 FFS on IPM and/or integrated soil management are being successfully implemented in Kenya and thousands of FFS involving millions of farmers have already been established in several African, Asian and South American countries. In an evaluation report in Uganda and Kenya, Fujisaka (2000) recognised the positive contribution of FFS (IPM, soil management and poultry) to sustainable livelihoods. Fujisaka (2000) observed that FFS clearly assisted in building social and human capital in terms of furthering collaboration within groups, information and decision sharing, group management of finances, trust among members and general dynamics.

The Kenyan context

In Kenya, it is estimated that 80% of marketed milk is produced by approximately 3 million dairy cattle (*Bos taurus* cattle and their crosses with *Bos indicus*) of which 2.5 million are found on smallholder farms (Omore *et al.,* 1999). Omore *et al.* (1999) observed that approx. 70% of all the marketed milk comes from smallholder farmers. In a systematic survey carried out in Central, Eastern and central Rift Valley Provinces of Kenya (Staal *et al.,* 1999), an increasing shift towards intensification of dairying through growing of fodder crops with "cut-and-carry" feeding systems and keeping of improved dairy breeds on the ever decreasing land available for agriculture was observed. This selection of crossbred and exotic dairy cattle has the potential to rapidly improve milk production but with the unwanted consequence of lowering resistance against diseases (Minjauw & de Castro, 1999) and increasing the need for quality forage and improved management practices. Staal *et al.* (1998) stated that the success of smallholder dairying would depend on the ability of producers to adapt to changes in available resources and market forces. Thus, the smallholder dairy farmer systems requires information and services covering a range of subjects including animal health, nutrition, breeding and marketing to increasing the productivity of their high potential animal (Barton & Reynolds, 1996; Schreiber, 2002.)

In a study of agricultural knowledge and information systems undertaken by the Kenya Agricultural Research Institute (KARI) and the Ministry of Agriculture and Rural Development (MoARD), field research conducted to assess the significance of different actors and organisations as potential dissemination pathways for agricultural technologies, the results showed that most farmers require information on technical details of farming. The study demonstrated the importance of participatory learning approaches as potential delivery systems and entry—points for knowledge dissemination (Rees *et al*., 2000).
In another study in Kiambu District, Wambugu (2000) exposed the deficiencies of the current extension services to provide the necessary information to dairy farmers and she suggested that participatory and interactive learning approaches should be promoted.

Furthermore, using PRA and survey techniques, Schreiber (2002) showed that lack of information is a major constraint to improved milk production in Kenya. In a formal survey carried out with dairy farmers in Western Kenya, the most important category of source of information, service or input needed by farmers to implement changes in their dairy management systems was extension services. This included information material, education and individual farm visits by extension officers. The most important areas where information is needed were cited as feeding and breeding, followed by information on how to improve general farm management (Schreiber, 2002).

Although, demand for FFS on livestock and particularly on dairy has been expressed by farmers in Africa and elsewhere, no curriculum has yet been developed. The main reason is that FFS was originally developed by agronomists specializing in integrated pest management (IPM). Following the success of crop FFS, FAO expressed the need to develop the methodology for livestock before implementation can take place. Experimental FFS on poultry already exist in Kenya and show promising results but it was felt that before cattle FFS could be implemented, some basic research has to be performed. Indeed, dairy cattle represent a high investment with a slow return and therefore a much higher risk than crop or poultry production. Responses to health and production issues may also be longer term therefore requiring adaptation of the single season cycles used in FFS for crop issues (Schmidt, 1997). Furthermore, the health and nutrition issues are both quantitatively and qualitatively more complex.

Therefore, the current ILRI/DFID-AHP/FAO livestock FFS project is adapting and developing the methodology specifically for livestock and particularly for the smallholder dairy production system focussed on animal health and production issues. The approach is applied to developing integrated methods to control vector-borne diseases and helminth infections and to improve the efficiency of utilization of available feed resources and the management of nutrients within the crop-dairy system. Using the FFS approach, the project develops an innovative process through which farmers adapt existing technologies and try out new ideas, which are developed through interactions between farmers, scientists and extension workers.

The Livestock Farm Field School activities contribute to the ongoing DFID bilaterally funded Smallholder Dairy Project (SDP), led by the Ministry of Agriculture Research & Development in collaboration with the Kenya Agricultural Research Institute (KARI) and the International Livestock Research Institute (ILRI).

On-going activities in the DFID Livestock FFS project

All facilitators were trained during a 2-week training of trainers (TOT) course. The TOT was run as a learning workshop, where participants learned and at the time used the basic principles of the FFS to develop specific examples of activities, tools and techniques suitable for the smallholder dairy production systems

Ten livestock FFS with similar characteristics (Table 1) and interests in dairy production were established in five different agro-ecological zones (Jaetzold & Schmidt,1983) in Central, Rift Valley and Coastal Provinces of Kenya:

- LH3: low highland; wheat/maize-barley zone; moderately cool and semi-humid
- LH4: low highland; cattle-sheep barley zone; moderately cool and transitional
- UH2: upper highland; pyrethrum-wheat zone: cool and sub-humid
- L4: lowland; cashewnut-cassava zone; hot and transitional.
- L 5:lowland; livestock-millet; hot and semi-arid.

Facilitators trained in FFS approaches worked with established groups to prioritise the main constraints to improved efficiency of milk production using participatory pair-wise and matrix ranking techniques. Issues highlighted for all groups were similar and, in order of priority included 1) Feeding strategies; 2) Fodder establishment and conservation; 3) Calf rearing and mortality; 4) Diseases (tick-borne and mastitis) 5) Water management and breeding (equal priority given). Based on the results of this exercise, individual grant proposals were prepared by each group including a detailed work plan with a corresponding budget.

Table 1 Characteristics of livestock FFS groups

	Total	Average
Original Number of males members	171	17
Number of female members	149	15
Total number of member	320	32
Average age of member		46
Average size of farm (acres)		3.3

Average number of cattle	2.8
Average number of milking cow	1.5
Average % of attendance	74
Average number of meetings in 8 month period	29

A grant of US$600 was deposited in an account controlled by elected members of the FFS group to cover the cost of field activities and the cost of facilitation, i.e. the transport and lunch allowances to enable the extension worker to visit. Management of this budget empowered the farmers to demand and control activities covered by the FFS and ensured that the extension services offered responded to farmers' actual priority problems and needs. FFS groups meet normally on a weekly basis but some vary their frequency to fortnightly. The main participatory techniques used, including agro-ecological system analysis (AESA) and participatory technology development (PTD) were adapted to suit the specific needs of learning about livestock issues. One major difference between crop and livestock FFS resides in the understanding of the impact of animal health on productivity and how to control diseases occurrence. Specific activities using participatory methods modified for basic epidemiology studies provide assistance to facilitators to integrated animal health activities in their FFS programme.

Agro-eco-system analysis (AESA)

The AESA exercise helps to establish, through a process of structured observation, the interaction between livestock and other biotic and abiotic factors co-existing in the field. The exercise is used to improve farmers decision making skills by developing a system whereby regular observations of the livestock and their environment are used as a basis for identifying problems, deciding on improvements and monitoring change. At each FFS meeting farmers are divided into sub-groups who visit neighbouring farms of some of the participants. Data is collected through observation of a single animal and its interaction with the environment. Decisions on interventions to improve the health and nutrition of the animal with a view to optimizing farming objectives are made and the conclusions presented back to the whole group for critique.

The AESA takes place in four steps using a record sheet prepared by the group (see Figure 1).

1) ***General Information***: Farmers interview the owner to get general background information on the animal examined.

2) ***Parameters*****:** Farmers record all parameter that can be measured or estimate. A weigh band system is used to estimate liveweight and recorded weights are compared to previous weeks. Milk production is recorded and reproductive status and management noted. Farmers also observe the type, quality and quantity of basal forage and supplements offered. This section should encourage the farmers to improve their record keeping.

3) ***Observations***: One of the objectives of the AESA exercise is to improve the observation skill of the farmer. This should become an automatic checklist that the farmer will mentally go through every time he sees his animal. Observations are performed in 3 steps: observations from a distance, close-up observation and attention to the environment.

Step 1: Hair/coat, body condition, rumination, movement/temperament, respiration

Step 2: Temperature, presence of ecto and endo-parasites, discharges, dung, urine, wounds, eye condition, mucus membrane color, lymph nodes, presence of diarrhea etc…

Step 3: Details of the production system (zero grazing, extensive, semi-extensive) for example infrastructure details, quality and quantity of available feed, water, shade, presence of other animal/insects, noises, etc…

4) Recommendations: The recommendations section gives an opportunity to the farmers to suggest some solutions to improve the overall condition of the animal examined. These might include how to improve the AESA through recording additional parameters or changing the way observations are made; suggestions for improving infrastructure or changes that could be made to improve productivity such as changes in fodder type or amount of supplement.

Figure 1: AESA format developed by the facilitators during the TOT

Aesa number

Week/date

Sub-group name

PARAMETERS

Body weight

Last weight

Weight gain:

Daily milk yield

Milk yield status:

(improving or decreasing)

Number of calves

Date of serving

Date last calving

Pregnancy status

Calving interval

Feed quality

Feed quantity

Supplement

Water quality

Water quantity

GENERAL INFORMATION

Breed

Name/tag

Sire name and breed

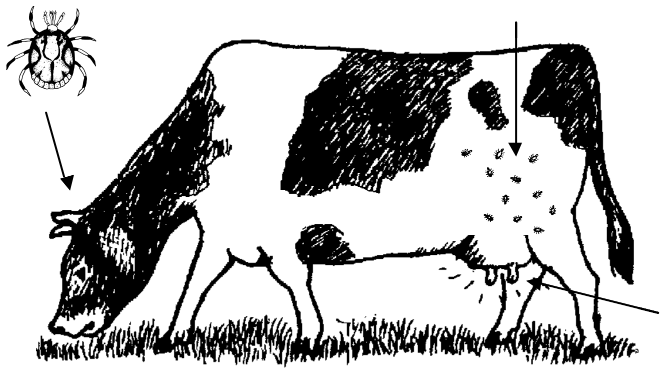
Dam name and breed

Date of birth and Age

Time of observation

Weather condition

Last treatment: date and drug used



OBSERVATIONS

Hair/coat

Body condition

Rumination

Movement/temperament

Respiration

Temperature

Ecto-parasites

Discharges

Dung

Urine

Wounds

Eyes condition

Mucus membrane color

Lymph nodes

Housing and shading conditions

•Presence of other animal/insects

Noises

RECOMMENDATIONS

How to improve the AESA records

•Parameter to be included

•Quality of observation

What need to be done to improve productivity?

Which treatment should be done?

Livestock Participatory Technology development (PTD)

The PTDs are implemented to empower participants (both farmers and facilitators) with analytical skills to investigate cause and effect relationships of problems in farming practices. Since the main objective of the PTD is to develop farmers learning skills rather than just increase knowledge of a particular technical issue, record keeping and accurate observation are an important component. For this the AESA technique is an integral component of the PTDs. The AESA technique is used to record and observe the results of the PTD experiments.

The establishment of PTD is on of the biggest challenges for livestock FFS. Indeed, while it is relatively easy to design comparative studies for crop integrated pest management, the high economical value of cattle does not allow any experiment involving risk or even short term productivity losses of the animal. Therefore, one of the objectives of the livestock FFS project, is to establish the type of PTDs that can be performed without any risk or detrimental effect and still allow farmers to experiment with new technologies. Three type of PTDs have emerged from on-going activities:

1) Classical PTDs Although livestock are the focus for the FFS, a lot of activities of the livestock keeper are crop related when they are focused on addressing food scarcity through improved fodder production and grazing improvement. PTDs that have been carried out include

1 Establishment of alternative sources of fodder. A range of fodders varieties are planted using different planting methods, treatments and/or different fertilizer regime.
2 Preservation of fodder using different techniques such as silage making and the box baler for hay are tested using material grown on the plots.

2) Comparison of existing farmer practices Observation and evaluation of the variation in strategies used by farmers both within the group as well as neighbours, provide the opportunity to address issues that do not lend themselves to experimentation because of the high risk in terms of animal well-being or high cost implications. Examples include:

1 Tick control: comparison of efficacy of different acaricides and/or of different application regimes.
2 Vaccination efficacy: comparison of disease incidence in immunised and non-immunised animals
3 Comparison of milk quality, animal health and losses due to milk spoilage in relation to the quality of the milking stall and zero grazing infrastructure.

3) Ex-post PTD analysis In ex-post analysis, farmers compare actual experimental results with practices that were used before. Results may be quantitative if records are available from the past or from similar situations or qualitative where farmer perceptions are evaluated. This also includes the "Stop and Go" method, where the treatment is stopped and re-introduced several times to show its effect using an animal as its own control. Those tested include:

1. Water availability: the amount of water available to the dairy animal is changed according to the calculated needs. Milk production on the new regime is compared with previous records of production on the old regime.
2. Genetic material: calf weights on farms where artificial insemination is used are compared with birth weights of calves from natural production methods, or the expected weights.
3. Prophylactic programmes: a prophylactic programme is applied to a group of cattle and their performance is compared with previous productivity and with neighbouring herds. This could include deworming, trypanocide and/ or vaccination against prevalent diseases.

Participatory epidemiology (PE)

PE is based on the use of participatory techniques for the harvesting of qualitative epidemiological data contained within community observations, existing veterinary knowledge and traditional oral history. It relies on the widely accepted techniques of participatory rural appraisal, ethno-veterinary surveys and qualitative epidemiology (Mariner, 2001). This information can be used by the facilitators to disseminate information on disease prevalence, to design relevant participatory technology development, and to introduce more successful surveillance and control strategies. Although PE is an adaptation of PRA methods to address animal health issues, these methods can also be used to identify, explore and score animal production issues. A range of techniques will be used in the dairy FFS to complement the AESA and examine specific issues or problems in more detail. Methods include the following.

Semi-structured interview: Interviewing is a specialised skill that improves with practise. Although just about any one can collect useful information through an interview, the amount and reliability of information obtained can be greatly improved with experience. In participatory assessment, an interview questionnaire is not used. Instead, the facilitator prepares a checklist of important points and exercises to be covered. This allows the interview to be flexible and permits the respondents to express their thoughts in their own words within their own conceptual frameworks.

Participatory Mapping: Mapping is a type of visualisation method is a popular participatory among animal health workers and livestock keepers. Examples of maps that could be used in the dairy FFS include, resource flow maps showing movement of resources within and between farms; movement of milk produced to explore and understand marketing issues and problems; opportunities and service maps to highlight where farmers obtain services and where the deficiencies lie; social maps to show where farmers obtain information and identify social support networks. Natural resource maps combining disease incidence for a community could help to highlight factors at a community level which influence disease.

Mapping is a useful method for the following reasons:

- both literate and non-literate people can contribute to the construction of a map (as it is not necessary to have written text on the map)
- when large maps are constructed on the ground, many people an be involved in the process and contribute ideas. People also correct each other, and make sure that the map is accurate
- maps can represent complex information that would be difficult to describe using text alone
- maps can act as a focus for discussion

Mapping is very useful during the ground-working stage of the FFS. The method tends to prompt much discussion and activity among farmers, and enables them to define the area under consideration. Although when copied to paper maps become useful outputs of mapping methods, it is important to note that maps can act as the focus for much discussion and follow-up questioning.

Pair-wise ranking and matrix comparison of diseases and indicator of diseases: This method is used for understanding local characterisation of livestock diseases and meanings of local disease-names (see Catley *et al.*, 2001 & 2002). The method can help to answer the question: "*Are the facilitators and livestock keepers talking about the same diseases?"*

Seasonal calendar:
Seasonal calendars to describe cropping activities, labour use, or feed use or availability are common, they can also be useful to facilitate farmers to explore issues relating to animal health. Temporal variations in disease occurrence are a common aspect of epidemiological investigation. Seasonal calendars are a useful method for understanding farmers perceptions of seasonal variations in disease incidence or populations of ticks, biting flies or other factors (Catley *et al.*, 2002). Seasonal calendars can also generate new hypotheses about associations between diseases, environmental factors, and interactions with wildlife and vectors.

Conclusions

If scientific research is to achieve real impact on farm productivity and livelihoods, new methodologies for dissemination of information have to be developed. Participatory approaches, which facilitate farmer demand for knowledge, give the opportunity to the end users to choose, test and adapt technologies according to their needs. Through participation in FFS, farmers develop skills, which allow them to continually analyse their own situation and adapt to changing circumstances. The livestock FFS facilitates in a sustainable manner the identification and exchange of knowledge on appropriate technologies for smallholders to improve their dairy production system in environments with high disease risk and nutrition stress. The ILRI livestock FFS project is testing and adapting a participatory method to create a sustainable relation between farmers, extension officers and research institutes. These relationships are thought to be a fundamental tool for scientists to collect appropriate data and to transform developed technologies into products adapted to the end user needs.
Not every problem can be easily dealt with by a "learning by doing" approach. Some problems, dealing with contagious diseases, for example, are not suitable or too dangerous for experiment. Others may be too abstract to be demonstrated physically, such as the importance of

epidemiological status or immunological reactions and these can be addressed in special topic sessions where issues are discussed. Since the facilitator cannot be an expert in every subject, he will help the farmer group to invite the right person to talk about the subject chosen by the farmers. This empowers the FFS group to contact other organisations such as NGOs, national or international research institutes to conduct a special topics. Special topics can also include livestock and non-livestock related issues, giving the chance to farmers to access the information responding to their priority at a particular moment. For example, talking to the community about trypanosomiasis when the village is threatened by a cholera outbreak is unlikely to be addressing a priority issue, when advice about cholera control may be more relevant.

During the course of the project a small number of farmer groups will be affected. However, manuals and tools will be developed that can be used by other groups of people responsible for delivering knowledge and in the long term large numbers of livestock farmers in Kenya and similar regions will benefit from the research findings.

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