Animal Health and Production Improvement Module (AHPIM)

An Approach to Designing and Implementing Herd Health and Production Programmes in Developing Countries

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Preface

Reducing lost productivity requires informed decisions by livestock owners and the delivery of appropriate, cost-effective, health and production services. Herd Health and Production Programmes (HHPPs) have been developed for livestock systems with the intention of providing a framework for making sound decisions, implementing actions and measuring impact.

In the large-scale and more intensive production systems found in the developed world, HHPPs have been successful and self-sustaining. Although HHPPs have also been designed for use in the small-scale farming systems typical of developing countries, their application has had only mixed success. Why is this so?

There are of course many technical difficulties in applying HHPPs in a developing-country environment: small herd sizes require special data analysis techniques; lower levels of literacy and numeracy demand different data collection techniques; production targets for low-input/low-output systems are often hard to define; and farming systems are usually complex and reflect a myriad of agricultural, economic, cultural and food security considerations.

Many of the technical considerations can in fact be overcome. There are, for example, several computer-based packages available that have been tailored to smallholder production systems. But HHPPs are still not proving themselves in the development context. There is still something that is not being addressed. What is it?

The emphasis is now moving towards service delivery. Although we may have the technology to survey production, analyse constraints and devise solutions, at least at a gross level, we are still floundering when it comes to making the right services available to smallholders in the right place at the right time. Alternative ways of planning and financing service delivery are being developed and applied: privatisation, the utilisation of para-professionals and the empowerment of producer organisations are current trends. The underlying principle is one of decentralisation.

Decentralisation is all about strengthening the interface between farmer and service provider. It is about appraising constraints to, and opportunities for, local production and providing solutions to them locally. It is about improving the quality of service by ensuring that it is what the client wants. Importantly, it is about dealing with diversity and providing choice.

The Animal Health and Production Improvement Module (AHPIM) is a form of HHPP developed to strengthen this process of decentralised decision making and service delivery. It does not prescribe a uniform procedure or dataset. It is not accompanied by computer software. The Animal Health and Production Improvement Module is an approach. It is a set of guidelines for reorienting the delivery of health and production services on the basis of getting to know the client's needs better and formulating a response to those needs.

Part A of this paper looks at the development of HHPPs and reviews the way in which they have been applied. On the basis of key lessons that emerge from the use of HHPPs, a strategy for implementation is proposed to ensure that problems are anticipated and resolved and that the longer term development of the programme is properly managed.
A fundamental component of the strategy is the use of a 'decision tree' to help select an HHPP that is appropriate for the context in which it is to be used. The decision tree is described in Part B.

A review of HHPPs suggested there was a need for a programme that could be used in situations where technical resources are limited. The Animal Health and Production Improvement Module has therefore been developed. It is an approach to decentralised, participatory planning that makes minimal demands on physical and technical resources. A description of AHPIM, including protocols for data collection, analysis and interpretation, is presented in Part C.

An annotated bibliography of over fifty HHPPs is also provided and follows the main text.

Livestock In Development

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Part A

Review of
Herd Health and Production
Programmes
Introduction

Veterinary services are undergoing many changes. Fiscal pressures are leading to programmes of privatisation and greater cost-efficiency in the public sector. At the same time new technologies such as heat-stable vaccines are enabling farmers to take greater responsibility for solving their own production constraints. Farmers are now demanding a different and broader range of services from their veterinary service providers.

The livestock services face a difficult challenge: not only must they improve the effectiveness of existing disease control programmes and increase the range of services they offer to farmers, but they must do so with less support from the state. New models of service delivery are needed to help meet this task.

Herd Health and Production Programmes (HHPPs) provide a framework for improving the delivery of livestock services. They employ a set of techniques that encourage productive interaction between farmers and the livestock services. Livestock services are able to gain a better understanding of their clients’ needs and farmers are empowered to make more informed management decisions regarding the efficiency of their livestock enterprises.

This paper provides an overview of HHPPs and distils key lessons that have emerged from the use of such systems. On the basis of the experience gained from others, a strategy for implementation is proposed which avoids the pitfalls associated with HHPPs and makes the best use of their strengths.

A History of Monitoring Programmes

In the early part of this century, state veterinary services in industrialised countries were orientated towards the control of major epidemic diseases (e.g. rinderpest) and diseases of particular public health concern (e.g. tuberculosis). As these diseases came under control, attention shifted from area-wide campaigns towards the treatment of individual animals.

In the post-war years livestock production intensified and there was an associated rise in production-related diseases. Animals were more valuable and farmers increasingly demanded veterinary assistance in the treatment of clinical disease problems. A private veterinary service developed to cater for the needs of the rapidly commercialising livestock sector.

By the 1960's it became clear that sub-clinical diseases, and other factors such as poor management of reproduction were the main constraints to livestock production, especially in large, intensively managed dairy herds. Traditional veterinary services orientated towards the treatment and control of infectious disease no longer had the impact on production that they once achieved, and a wider range of services were required to increase farm profitability.

A concept of herd health and preventive medicine developed. Veterinarians began providing veterinary support for all animals in the herd, and offered management advice as part of their service. Records on individual livestock productivity improved the quality of herd health programmes and later comprehensive herd health and production programmes for commercial dairy enterprises were developed.

1 The term ‘farmer’ includes livestock herders and pastoralists
What are Herd Health and Production Programmes?

The term embraces a wide variety of programmes that have been developed for different reasons. All share a common approach and follow a cycle (Figure 1) of:

- data collection (sometimes called monitoring);
- data analysis to identify key production constraints, or opportunities for change; and
- most critically, the feed-back of results to farmers and others for subsequent action.

![Figure 1](image)

An array of methods exists to achieve this purpose. Methods of data collection can range from formal longitudinal surveys\(^2\), to cross-sectional surveys\(^3\) that use participatory rural appraisal\(^4\) (PRA); the type of data collected may include many variables collected from multiple sources, or just a few key indicators from a single source. Methods of analysis may include anything from complex computerised analysis at a central point to simple participatory analysis by the community.

Herd health and production programmes are however much more than a means of collecting and analyzing data: they provide a framework for communication between livestock services and farmers and introduce new concepts of service quality.

\(^2\) Longitudinal surveys record events over a period of time.

\(^3\) Cross-sectional surveys record events occurring at a particular time only.

\(^4\) PRA is a series of methodologies that facilitates farmers' participation in rural planning, whilst at the same time improving the efficacy of data collection (Young, 1993).
How have they been used?

Herd health and production programmes meet many different purposes. They have been used by:

- farmers to improve the day-to-day and seasonal management of their herds;
- veterinary practitioners to provide herd health and management advice, in addition to more conventional clinical treatments;
- co-operatives and farmer associations to target management and veterinary advice to individual farmers;
- local state veterinary services to target extension advice to farmers;
- national veterinary services to quantify disease losses and allow for the objective identification of other production-related constraints;
- universities and research centres as a tool for research and an aid for teaching.

**Examples of how HHPPs have been used to improve the delivery of Animal Health Services**

Herd Health and Production Programmes have been used to establish national disease control priorities by estimating the relative economic importance of different diseases. Schenkel et al (1993) describes how a cross-sectional disease survey, reports from veterinary visits and a longitudinal monitoring system were used in national disease control planning for small ruminant production in Jordan. In the US, the National Animal Health Monitoring System (NIAHMS) collects data from randomly selected farms and provides national disease and production summaries for different types and scales of production systems (King, 1990).

State veterinary services and non-government organisations (NGOs) use HHPPs to target their services towards the needs of the livestock industry. In Thailand, a ‘Health and Productivity Profile’ for village buffaloes was constructed from a 12-month longitudinal monitoring programme and used to establish an animal health service throughout the area (Leidl, 1989). The NGO Intermediate Technology developed an animal health service in Kenya on the basis of a cross-sectional study that made use of Participatory Rural Appraisal methods (Jones, 1993).

Individual farm management decisions can be assisted by the improved knowledge gained through longitudinal monitoring. In the UK, dairy farmers and private veterinarians use programmes such as DAISY (Stephens et al, 1997) to guide daily management decisions on individual cows with the aim of maximising profitability. In Colombia, a monitoring system run through veterinary diagnostic centres supports farm management decisions and the aggregated information guides local extension services (Hanks, 1993).
But have they worked?

Although HHPPs hold much promise for improving the quality of livestock services, and raising the management skills of the farmer, the use of such programmes in developing countries has not been without difficulty.

Many HHPPs were originally developed for intensive, large-scale commercial dairy and pig production units and the data they collect are rarely relevant to the needs and circumstances of small-scale farms (Pharo et al, 1990; Waltner-Toews & Bernardo, 1993).

A major problem has been the difference in herd size between commercial farmers, who have large herds, and smallholders, who often keep only a few animals. Monitoring programmes for larger, commercial herds typically calculate indicators of performance in the form of a rate for the herd (Blood et al, 1978) that is then compared with a pre-defined target. Fertility indices, for example, are often expressed as a rate which assumes a relatively large denominator. When similar rates are calculated for small herds, as are commonly found in smallholder farms in developing countries, they are subject to excessive variability which makes interpretation difficult (Dohoo & Ruegg, 1993).

The development of HHPPs has often been dependent on advancements in information technology and most systems make use of computers (Morris & Leidl, 1993). Some countries have neither the environment nor the resources to operate computer-based HHPPs, and where such programmes have been introduced, data have often not been analyzed.

Off-the-shelf computer-based HHPPs usually collect comprehensive data on day-to-day management events of individual animals and assume farmers are literate and able to keep detailed records. This is rarely the case on smallholder farms and enumerators must therefore be employed to collect data. Not only does this increase the cost of programmes (Pharo et al, 1990), but the large volumes of data can swamp the enthusiasm and limited resources of the livestock services (Christie et al, 1993; Bazeley, 1993).

Many HHPPs have suffered from poor data quality, invalidating the results of the analysis (Hutabarat et al, 1993). Data quality may be poor because data collectors lack the skills and equipment to collect accurate data, or because the farmers themselves are unwilling to divulge sensitive information.

Considerable institutional inertia has also been experienced (Ashdown, 1993). During the initial stages of an HHPP, users may not understand the potential value of results and may be reluctant to spend time analyzing data. This is particularly true where those who collect and analyse the data will not be using the results themselves but hand the results on to be used by others. In some cases farmers have been unwilling to co-operate in programmes (Pharo et al, 1990; Hanks, 1993), raising doubts over the longer term sustainability of the system.

Adequate financing is obviously essential, yet mechanisms for funding recurrent costs are rarely established and some HHPPs have been difficult to sustain.

HHPP are also called monitoring programmes.
What lessons can be learned?

Important lessons can be distilled from this experience. Herd health and production programmes will be more effective if:

- Programmes use methods of data collection and analysis that are appropriate for the resources of the implementing agency.
- Staff are trained in the skills that are required for data collection, analysis and interpretation.
- Institutions understand and support the changes in attitude and working practices that must accompany the implementation of an HHPP.
- Appropriate mechanisms for financing are established.
- Feedback is provided to farmers so that they are motivated to co-operate.

The Way Forward: A strategy for Implementation

A strategy for implementation is suggested as a means of addressing the technical and institutional issues that have been found to limit the use of HHPPs. The strategy ensures that problems are anticipated and resolved and that the longer term development of the programme is managed in a sustainable way.

The strategy is divided into four stages.

Stage One. Design an appropriate Herd Health and Production Programme

The first stage is to design or select an HHPP that matches the resources and skills of the implementing institution. A number of factors need to be taken into consideration, including the objectives and information needs of the programme, and the financial, physical and technical resources that are available for data collection, analysis and feedback.

A decision tree (described in Part B) has been designed to take these factors into account. It should be used by the implementing agent, in conjunction with the Annotated Bibliography, to select an appropriate programme.

The tree distinguishes between programmes that are public goods and those that are private goods. Services that are deemed to fulfil a public role require some form of collective financing, either through taxes raised by the government, or through a levy applied through co-operatives or producer associations (Claxton, 1993). Services that are private goods should be paid for by the consumer. If these services are new and unproven, then they may need to be subsidised until the farmer is fully aware of the benefits.
Public versus Private Goods

A private good is one where the consumer benefits exclusively from the service. The veterinary treatment of an injured animal is one such example. A public good is one where the provision of a service to one person is not exclusive; others may simultaneously benefit. An example of a public good would be the broadcast of an extension message on the radio or the control of an outbreak of disease that would otherwise sweep across the region.

To assist in the selection of an appropriate programme, over 50 programmes have been reviewed and categorised according to the purposes they fulfil (Table 1). Each programme has then been further characterised according to the method of data collection, analysis and feedback employed and the resources that each use (see Annotated Bibliography).

Nearly half of the HHPPs examined were used to improve the delivery of local livestock services. The majority of these programmes were dependent on computer technology and laboratory support: facilities that can be difficult to provide in many situations. A different approach that makes use of fewer technical resources has therefore been developed. This programme, called the Animal Health and Production Improvement Module (AHPIM) is described in detail in Part C.

The Animal Health and Production Improvement Module is a herd health and production programme designed to service the needs of smallholder livestock farmers whilst seeking to minimise the demands for technical and donor support. The programme is generic in design: it is not a list of rigid instructions but rather a collection of tools that can be tailored to a specific set of circumstances.

Stage Two: Identify initiators

Herd health and production programmes and the empowerment of farmers that they engender may require substantial changes to the attitudes and working practices of the implementing institution. Field staff need to be clearly motivated to provide a better service and understand how monitoring can improve their activities. New skills in data collection, analysis and interpretation may also be needed. A mechanism to introduce these changes is required.

A team of local 'initiators' should be identified and used a means of generating the necessary 'critical mass' needed to bring about institutional change. The team should preferably be selected from the implementing agency with responsibilities for introducing:

- new concepts of client-orientated service delivery;
- new skills of data collection, analysis and interpretation;
- changes in working practices so that the HHPP is incorporated into the routine activities of the services.

They would need to have:

- the management authority to oversee the institutional changes required to adopt an HHPP;
- the analytical capability to analyse and interpret data.

Table 1. Categorisation of Herd Health and Production Programmes by objective
<table>
<thead>
<tr>
<th>Objective</th>
<th>Number of Programmes</th>
<th>Reference</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>King et al, 1990.</td>
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<td></td>
<td></td>
<td>Schenkel, 1993.</td>
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<tr>
<td>Project Evaluation</td>
<td>4</td>
<td>Hanks &amp; Hogg, 1992</td>
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<td></td>
<td></td>
<td>Young, 1994, 1992</td>
</tr>
<tr>
<td>Targeting Local Disease Control and Production Advice</td>
<td>23</td>
<td>Ashdown, 1993</td>
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<tr>
<td></td>
<td></td>
<td>Bazeley, 1993</td>
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<tr>
<td></td>
<td></td>
<td>Broadbent, 1992</td>
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<tr>
<td></td>
<td></td>
<td>Christie et al, 1993</td>
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<td></td>
<td>Ghirotti, 1992 &amp; 1994</td>
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<td></td>
<td></td>
<td>Hadrill &amp; Yusuf, 1994</td>
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<td></td>
<td></td>
<td>Leyland, 1993</td>
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<td></td>
<td></td>
<td>Maloo et al, 1994</td>
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<td></td>
<td></td>
<td>Martin et al, 1988</td>
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<td></td>
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<td>McClure, 1989</td>
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<td></td>
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<td>Otte, 1989.</td>
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<td>Stem &amp; Sollod, 1991 &amp; 1994</td>
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<td>Swift &amp; Noor, 1991</td>
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<td></td>
<td></td>
<td>Supriatna &amp; Casolani, 1989</td>
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<td></td>
<td></td>
<td>Waltner-Toews, 1993</td>
</tr>
<tr>
<td>Farm Management Decision Support</td>
<td>20</td>
<td>Dijkhuisen et al, 1990</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gardner, 1992</td>
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<td></td>
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<td>Huirne et al, 1994</td>
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<td>Keirs et al, 1991</td>
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<td></td>
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<td>Marsh &amp; Morris, 1985</td>
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<td></td>
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<td>Mather et al, 1980</td>
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<td></td>
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<td>Pharo et al, 1990</td>
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<td>Stephens et al, 1979</td>
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<td>Udomprasert &amp; Williamson, 1990</td>
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<td></td>
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<td>Wongnarkpet et al, 1994</td>
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<tr>
<td>Research</td>
<td>6</td>
<td>Bekure et al, 1991</td>
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<td></td>
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<td>McDermott et al, 1993</td>
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<td>Anderson et al, 1993</td>
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<td>Adjid &amp; Daniels, 1993</td>
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<td></td>
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<td>Swane et al, 1991</td>
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*Stage Three: Training*
The third stage of the implementation strategy is to train the initiators so that they are fully equipped to introduce the HHPP.

Training should be provided through training modules interspersed with practical experience gained on pilot projects.

Each training module has two primary functions:

i. to discuss what has been achieved since the previous session;
ii. to learn new techniques needed for the next stage of the HHPP.

Each training module will consist of one or more intensive training sessions and field training.

*Training Module 1. An initiation course on client-orientated service delivery.*

The first course would introduce the concept of bottom-up, participatory planning as a means of improving the delivery of livestock services.

*Training Module 2. Initiation of the Monitoring Programme.*

The second course provides the tools needed to implement the HHPP. The content of the course should reflect the type of programme that has been selected under Stage One of the implementation strategy.

Following Training Module 2, initiators should establish a pilot HHPP. The data collected during the initial stages of the HHPP will be used in Training Module 3.

*Training Module 3.*

The initiators will need training in the methods of data analysis and interpretation. Practical examples, using data collected under pilot projects, should be used to ensure that initiators are fully familiar with the techniques.

On the basis of the data analysis, the initiators should seek causes to the problem, and identify potential solutions at each pilot project site.

*Training Module 4.*

The results of the further investigations are then discussed at a fourth training session and a programme for feed-back designed.

*Pilot Projects.*

The pilot projects are established as part of the training programme. They enable the participants to gain practical, hands-on experience and provide material that can be used during the training courses.

They also provide an opportunity to modify the chosen HHPP to the particular farming systems of the area, and devise a monitoring schedule that is appropriate for the work regimes of the service providers.

*Stage Four: Replication*
The pilot projects should be carefully evaluated and, if deemed successful, a programme of replication can then follow.

The initiators assume responsibility for coordinating the implementation of the HHPP on a wider scale. They will use their pilot project sites as training centres where other staff can learn at first hand the advantages of monitoring and the way in which data are collected, analyzed and used.

**Conclusion**

Herd health and production programmes fulfil many different purposes and make use of a range of methods to collect and analyse data and to respond to problems identified.

Herd health and production programmes have been most effective when the objectives have been clearly defined at the onset of the programme and when they have made use of existing resources for data collection and analysis. A decision tree (described in Part B) has therefore been developed to help select an appropriate HHPP.

Many programmes require sophisticated technology that may not be available. The Animal Health and Production Improvement Module has therefore been developed as an approach to implementing herd health and production programmes in situations where financial and technical resources are limited and where participatory, decentralised planning is the objective. The Animal Health and Production Improvement Module is described in Part C.

**References**


Hadrill & Yusuf, 1994; Mapping of Seasonal Migrations to the Sanaag Region of Somaliland, RRA Notes No 20. 1994.

Hadrill & Yusuf, 1994; Mapping of Seasonal Migrations to the Sanaag Region of Somaliland, RRA Notes No 20. 1994.


Part B

The Decision Tree

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Introduction

If the potential value of a Herd Health and Production Programme (HHPP) is to be exploited fully, a programme should be chosen that is ideally suited for the circumstances in which it is to be used. This means ensuring that every stage of the programme (Figure 1) can be carried out effectively.

![Figure 1](image)

The whole programme will fail if one stage is ineffective. Although this appears obvious, such failures can and do occur.

Data are not collected because:

- data collection is too burdensome or time-consuming;
- data collectors lack motivation.

Data are not accurate because:

- collectors lack skills and/or equipment to collect accurate data;
- farmers are unwilling to provide accurate data.

Data are not analyzed because:

- analysts lack the skills or experience to analyse the data;
- computers do not work.

Results have not been used because:

- the analysts do not understand the value of the results;
- analysts lack the skills to interpret the results, or the experience to identify problems.
or causes of problems;
• the results are not relevant to the farmer.

**These potential causes of failure occur because:**

*either* the purpose/objective(s) of the module have not been correctly defined;

*or* the demands/requirements of the module are outside the scope (financial, technical or skills) of those who implement the programme.

In order to avoid such failures, it is essential that the HHPP is tailored so that every stage is effective. A decision tree (Figure 2) has been developed to help design a programme with clear objectives that only makes use of collection and analytical procedures that are appropriate for the resources available.
The Decision Tree
The use of the decision tree is elaborated step-by-step.

What is the purpose of the programme?

The purpose or objective dictates the type of information the HHPP should produce. The first step is therefore to define the objectives(s) of the programme.
**Step 1. Define Objectives and Information Needs**

Herd Health and Production Programmes (HHPPs) can fulfil many different purposes, but they, and the information required for each, usually fall into one of five categories (Figure 3).

<table>
<thead>
<tr>
<th>Objective</th>
<th>Information Required</th>
</tr>
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<tbody>
<tr>
<td>To determine national policy</td>
<td>Regional/national statistics on disease incidence, livestock production, economic contribution.</td>
</tr>
<tr>
<td>To evaluate projects</td>
<td>With and without, or before and after comparisons on livestock productivity and farm income.</td>
</tr>
<tr>
<td>To target local disease control and production advice</td>
<td>Local farm comparisons of production and disease constraints.</td>
</tr>
<tr>
<td>To aid farm management decisions</td>
<td>Individual animal records on breeding, production history, etc.</td>
</tr>
<tr>
<td>Research</td>
<td>Specific according to the research programme</td>
</tr>
</tbody>
</table>

The objective should be set in consultation with those who will be using and benefitting from the programme, and can be determined by asking:

- Who will use the results?
- What will the results be used for?

Programmes that are designed to fulfil broad or multiple objectives will be more complex, depend more on advanced information technology and demand larger quantities of more varied data than programmes that are designed with a single objective, or cater for a single group of users. If resources are limited, it is best to focus on a single objective.
For example, King et al (1990) describes a system used by national veterinary planners to prioritise disease control programmes. The users of the results of the programme are national veterinary planners, and the results are used for national disease control planning. The objective of the programme is therefore to determine national policy, and the information required is national statistics on disease incidence.

DAISY (Stephens et al, 1979) is a monitoring system used by dairy farmers to record daily events of individual animals. The results identify animals that require particular action, such as individuals that need to be dried off, or cows that are expected to come into heat. The objective of the programme is to aid farm management decisions.

Some programmes have several objectives. An HHPP in Colombia (One, 1989; Hanks, 1993) produces data for different users and purposes. National planners use production and health data to prioritise national disease control programmes, local extension staff use production and health data to identify local animal health and production constraints, and information is also used to establish research needs. The programme makes use of several types of information, ranging from national statistics on economics and levels of production to information, on individual animal production histories.
**How will the information be produced?**

A method for producing the information is then determined. Information is generated by analysis of data. There are many possible sources of data and various methods of analysis. A programme must be chosen which will produce the information needed, within the capacity of the available financial, technical and human resources.

Morris & Leidl (1993) sums up this dilemma in "Finagle's Law":

- The information you have is not what you want;
- The information you want is not what you need;
- The information you need is not what you can get;
- The information you can get costs more than you want to pay!

Compromises may have to be struck in order to achieve a balance between the data and analysis needed, and the data and analysis that can be obtained.

An inventory of the requirements for data collection and analysis is outlined in Steps 2 and 3.
• **Step 2. Decide what data are required**

The data required to produce the necessary information is determined using Figure 4.

![Diagram](image)

**Figure 4**

It is easy to specify a wide range of variables, but this will increase the resources needed for data collection and analysis.

To avoid collecting too much data, for each variable ask:

- how are the data to be interpreted and used to provide advice?

If this question cannot be answered, then the variable should not be collected.
Efficient HHPPs are those that collect a few pieces of data that are strongly correlated with profitable (as opposed to productive) livestock, otherwise the information, and the recommendations made, will not be acted on.

Some variables, such as fast growth rates or high milk yields, may not always indicate profitability. On farms with high feed costs, for example, the most profitable farmers are those that achieve the greatest yield per unit of feed, as opposed to highest milk or meat production per animal.

Variables which reflect profitability are likely to be location specific, as livestock production systems vary enormously in the resources they employ, and the objectives they fulfil. Whilst the incidence of multiple births indicates profitable performance on sheep farms in Britain, high fecundity is considered a problem on smallholder sheep farms in Sumatra, Indonesia, because multiple births combined with insufficient feed leads to low birth-weight lambs and high mortalities.

Selection of variables should be made following careful assessment of the production system in question.

For example, a health and production profile of chickens in Thailand (Janviriyasopak et al. 1994) was compiled with the objective of targeting local disease control and production advice. The programme decided that data on disease, productivity, sales, livestock numbers and flock structures were needed to provide information for local farm comparisons of production and disease constraints.

Programmes with similar objectives and information needs can collect different pieces of data. For example, in Indonesia two monitoring programmes with established with common objectives and information needs. CHAPS (Christie et al. 1993) collected data on all 13 variables listed in Figure 4, plus additional data on socio-economic production characteristics, whereas the programme described by Ashdown (1993) monitored only five variables.
• **Step 3. Decide what analysis is required**

Having determined what data are needed, the type of analysis needed to convert the data to the required information can then be decided (Figure 5).

![Diagram](image)

Programmes that collect lots of data on many variables require more sophisticated forms of analysis compared to programmes that use smaller quantities of data on fewer variables.

For example, the CHAPS programme described earlier (Christie et al. 1993) collected large quantities of data on many variables. Complex multiple and logistical regression analyses were used to convert the data into information that could be used.

In contrast, the programme described by Ashdown (1993) collected fewer variables from a smaller sample of farms. The data were analyzed manually by simple ranking of means.
**Determine the resources available to produce the information**

The data and analysis that are needed are now compared against the resources available.

The decision tree is used as a guide (Steps 4 and 5) to compile a realistic and detailed catalogue of resources available for data collection and analysis.
Step 4. Decide what resources are available for data collection

The following questions must be answered:

- What data sources are available (Figure 61)?
- What resources are available for data collection? This should include an assessment of finances, labour and availability of necessary skills, and logistical considerations such as transport and geography (Figure 6).

Turner (1985) describes a system for pigs that uses abattoir data to measure sub-clinical disease. The system relies on individual animal tags that allow the origin of slaughtered animals to be traced to the farm. The system is used by veterinarians to target advice to pig farmers.

The use of HHPPs for research is illustrated by McDermott et al (1993) who used monitoring programmes as a research and teaching aid in Kenya. A research team collected data on a range of parameters from 90 dairy farms.
Selection of Resources Available for Data Collection

What data sources can be used?
- Farmers
- Key informants
- Laboratories
- Abattoirs
- Markets
- Feed merchants
- Drug sellers
- Veterinarians
- Co-operatives

Financial resources
- Self-financing
- Public / State

Labour inputs
- Existing staff part-time
- Existing staff full-time
- Additional staff
- Full-time team

Skills of the data collector
- Veterinarian
- Skilled technician
- Extension worker
- Paravet
- Literate farmer
- Illiterate farmer

Transport
- Car
- Motorcycle
- Bicycle
- None

Figure 6
• Step 5. Decide what resources are available for data analysis
• Who will analyse the data? (Figure 7)
• What resources are available for data analysis? (Figure 7)

MONITOR (Supriatna & Casolani, 1989) is an animal production and health information system for dairy cattle. It fulfils several objectives, chief of which is the targeting of local health and production advice. The programme provides local information on farm production. Extension staff collect production data from groups of 10 farmers. Data are analyzed at the district livestock office using a computer operated by a graduate veterinarian.
Choose an appropriate method of feedback

An inventory of the resources available for feedback (Step 6) is used to choose a method for providing results to farmers (Step 7).
- Step 6. Determine what resources are available for feedback
- An inventory of the resources available for feedback is made. (Figure 8)
Step 7. Select a Method of Feedback

A method of feedback is selected, appropriate to the resources available (Figure 9).

NAHMS (King et al., 1990) is a National Animal Health monitoring system in the United States that aims to assist national planning. It provides information on national disease incidence and associated losses in production. Farmers are paid to record production and health data, and animal samples are collected each month for laboratory analysis. A full-time veterinary officer is required for every four farms sampled. Analysis is by computers, and feedback provided monthly, semi-annually and annually using the postal system.
Identify an Appropriate Programme

A programme which makes the best use of available resources to produce the results that are needed can now be chosen.

The characteristics of existing programmes have been categorised so that they can be cross-referenced against the list of available resources in order to find the best match (Step 8).

Over fifty HHPPs have been categorised according to their main objective (Table 11).

Each programme that matches the required objective is then further characterised according to:

- the data it collects;
- the data sources utilised;
- the resources used to collect and analyse the data;
- the method of feedback employed.

A bibliography of the HHPPs reviewed is appended.

Step 8. Identify an appropriate programme

Compare the features of each programme against the available resources and find the best match.
An Example

The use of the decision tree to identify an appropriate Herd Health and Production Programme is illustrated using an example from Indonesia. The tree had not been developed at the time referred to in the example, but many of the decision-tree principles were used to select appropriate HHPPs.
Two Herd Health and Production Programmes in Indonesia

The Government of Indonesia had instigated programmes of decentralisation as a means of improving public-sector performance. The livestock services identified a need for planning tools to improve the relevance and impact of local planning.

A Herd Health and Production Programme was considered an appropriate means of better targeting local programmes for smallholder farmers. Two pilot projects were established: one for dairy production in Sumedang, a district in West Java, and the other for beef production in Wajo, a district in South Sulawesi.

The objective and information needs of the HHPP for both districts were the same, i.e. to target local disease control and production advice using information on local farm comparisons of disease and production constraints (Figure 10).

![Different objectives for HHPPs and the information each requires](image)

**Figure 10**
The type of data sources that could be used, and the availability of resources to collect those data were also the same at both sites (Figure 11):

- Farmers were the main source of data;
- The resources for data collection were public-financing, using existing staff on a part-time basis, whose skills were equivalent to those of a paravet, and who had motorcycles for transport.
There were however significant differences in the resources available for analysis:

Sumedang had the resources and the skills to analyse the data using a computer: the office had a veterinary staff member with a Masters degree in veterinary epidemiology, there was a reliable supply of electricity, and technical back-up for computers was readily available from a nearby city (Figure 121.)
In contrast, Wajo had no or insufficient electricity, no technical back-up, and no one had computer skills. The HHPP at Wajo would have to rely on manual analysis of data (Figure 13).

A review of monitoring programmes identified twenty three HHPPs that fulfilled the objectives of the HHPPs required in Indonesia (Table 1). Each of these programmes were further evaluated in terms of:

- data collected;
- data sources utilised;
- resources utilised for data collection;
- resources required for data analysis;
- method of feedback.

and categorised according to their key distinguishing features (Table 2).
Table 1. Categorisation of Herd Health and Production Programmes by objective

<table>
<thead>
<tr>
<th>Objective</th>
<th>Method of Analysis</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>King et al, 1990.</td>
</tr>
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<td></td>
<td></td>
<td>Schenkel, 1993.</td>
</tr>
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<td>Project Evaluation</td>
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<td>Hanks &amp; Hogg, 1992</td>
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<td>Oxby, 1994</td>
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<td>Schreuder et al, 1994</td>
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<td></td>
<td>Young, 1994, 1992</td>
</tr>
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<td>Targeting Local Disease Control and Production Advice</td>
<td>23</td>
<td>Ashdown, 1993</td>
</tr>
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<td></td>
<td></td>
<td>Bazeley, 1993</td>
</tr>
<tr>
<td></td>
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<td>Broadbent, 1992</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Christie et al, 1993</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ghirotti, 1992 &amp; 1994</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hadrill &amp; Yusuf, 1994</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Iles, 1993</td>
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<tr>
<td></td>
<td></td>
<td>Leidl et al, 1989</td>
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<tr>
<td></td>
<td></td>
<td>Leyland, 1993</td>
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<tr>
<td></td>
<td></td>
<td>Maloo et al, 1994</td>
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<tr>
<td></td>
<td></td>
<td>Martin et al, 1988</td>
</tr>
<tr>
<td></td>
<td></td>
<td>McClure, 1989</td>
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<tr>
<td></td>
<td></td>
<td>Otte, 1989</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stem &amp; Sollod, 1991 &amp; 1994</td>
</tr>
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<td></td>
<td></td>
<td>Swift &amp; Noor, 1991</td>
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<tr>
<td></td>
<td></td>
<td>Supriatna &amp; Casolani, 1989</td>
</tr>
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<td></td>
<td></td>
<td>Waltner-Toews, 1993</td>
</tr>
<tr>
<td>Farm Management Decision Support</td>
<td>20</td>
<td>Dijkhuisen et al, 1990</td>
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<td></td>
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<td>Gardner, 1992</td>
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<td></td>
<td></td>
<td>Huirne et al, 1994</td>
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<td>Keirs et al, 1991</td>
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<td>Marsh &amp; Morris, 1985</td>
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<td>Wongnarkpet et al, 1994</td>
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<td>McDermott et al, 1993</td>
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<td>Anderson et al, 1993</td>
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<td>Adjid &amp; Daniels, 1993</td>
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<tr>
<td></td>
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<td>Swane et al, 1991</td>
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</table>
Table 2. Herd Health and Production Programmes categorised by key distinguishing features

<table>
<thead>
<tr>
<th>Targeting Local Disease Control and Production Advice</th>
<th>Computer</th>
<th>Veterinary</th>
</tr>
</thead>
</table>
|                                                      |          | Bazeley, 1993  
|                                                      |          | Broadbent, 1982  
|                                                      |          | Christie et al, 1993  
|                                                      |          | Ghirotti, 1992  
|                                                      |          | Leidl et al, 1989  
|                                                      |          | Maloo et al, 1994  
|                                                      |          | Martin et al, 1988  
|                                                      |          | McClure, 1989  
|                                                      |          | Otte, 1989  
| Manual                                               | Veterinary | Turner, 1985  
|                                                      |          | Stem & Sollod, 1994  
| None                                                 | Veterinary | Waltner-Toews, 1993  
|                                                      |          | Hadrill & Yusuf, 1994  
|                                                      |          | Iles, 1993  
|                                                      |          | Leyland, 1993  
|                                                      |          | Swift & Noor, 1991  

Programmes were differentiated on the basis of two overriding criteria: the method of analysis and the level of diagnostic skills required, as these were found to be the most significant distinguishing features.

Nine programmes made use of similar resources to those available in Sumedang. Two of these programmes (Bazeley, 1993 and Maloo et al, 1994) were rejected because they collected data specific to other purposes, but the remaining seven, which collected health and productivity data from sample farms in a similar fashion, were used as a basis for designing a computer-supported monitoring programme for Sumedang (Supriatna & Casolani, 1989).

Only five HHPP matched the analytical resource of Wajo. These programmes used manual methods of data analysis and did not rely on sophisticated diagnostic skills. Three programmes were not considered appropriate as they only collected disease data, and the information was used for the specific purpose of designing paravet training programmes (Hadrill & Yusuf, 1994; Leyland, 1993; Iles, 1991). These programmes nonetheless employed novel data collection techniques (PRA) that could be usefully emulated in the HHPP in Wajo.
**Participatory Rural Appraisal (PRA)**

In contrast to conventional HHPPs which use data collectors to record production and health information using questionnaires, and depend on analysis to transform data into appropriate information for planning extension programmes, PRA enables farmers to compile and evaluate data themselves. PRA reduces the burden of data collection and data analysis, and increases the participation of farmers.

However, problems can arise between farmers’ perceived needs, as vocalised through PRA sessions, and actual needs, as defined through more rigorous data collection and analysis. For example farmers often consider rare, fatal, diseases of greater importance than common endemic diseases such as gastro-intestinal parasitism, despite the fact that the latter may cause greater economic loss.

The other programme used animal health and production data to target local extension advice (Waltner-Toews & Bernardo, 1993) and provided an interesting model upon which a programme in Wajo could be based. The programme collected data on a select number of "key variables" which indicated sub-profitable livestock production. Subsequent field investigations, in the form of farm visits, were initiated in response to adverse movements in the key indicators. The system was used on semi-commercial livestock units in the Caribbean, and the variables selected were not relevant to small-scale subsistence livestock units that predominated in Wajo. A different choice of data was required.

The programme subsequently developed in Wajo used a similar method of data analysis to that used by Waltner-Toews & Bernardo (1993), but collected a different set of variables. PRA techniques were used to collect and interpret data (Ashdown, 1993).
Part C

Animal Health and Production Improvement Module

An Approach to Herd Health and Production Programmes
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Step 2. Monitor Key Indicators .................................................................................. C - 5
Step 3. Analyse .......................................................................................................... C - 9
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Step 5. Find Solutions ............................................................................................... C - 13
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Introduction

A review of HHPPs (see Part B and Annotated Bibliography? identified twenty three programmes that were designed to improve the local targeting of production and health advice to farmers. The majority of these programmes required the use of computers to analyse data.

The AHPIM has been designed to be used in situations where resources for data collection and analysis are limited. It does not need sophisticated tools or require specialist expertise. It is operated on a part-time basis by semi-skilled paravets who do not have access to motorised transport. Data collection and analysis is simplified by restricting data to a few Key Indicators which are collected from smallholder farms and pre-printed forms aid manual calculations of data.

The AHPIM is a mechanism for encouraging effective interaction between farmers and the service providers. It is a tool for decentralised planning and as such encourages those who are at the front-line of service delivery to assume responsibility for improving the quality of the services they offer. It should be they who collect and analyse the data and they who respond to the problems identified by the programme.

The AHPIM provides a set of principles that can be applied to different situations. It consists of two components:

• A Monitoring System

• A programme of Quality Control

This section provides an overview of each component. More detailed protocols for data collection, analysis and interpretation are described in annexes to the report.
AHPIM
Monitoring System
The AHPIM: Local Monitoring System follows the monitoring cycle described in Part A. It is divided into seven steps (Figure 1).
Step 1. Situation Awareness

Field staff can learn from farmers' experience by talking to them. In this way an understanding of farmers is gained. A range of Participatory Rural Appraisal (PRA) tools are used to secure the participation of farmers in the monitoring programme and ensure that the module is tailored to the specific needs of the farmers.

A socio-economic profile of the community is obtained through wealth ranking. Wealth ranking ensures that a balanced group of farmers is included in the monitoring programme. At the same time it identifies poorer members of the community, who can, if required, be specifically targeted for assistance.

Farmers are then ranked in order of 'success' so as to identify individuals who may, through their superior farming techniques, be able to provide solutions to problems faced by other farmers in the locality.

The production priorities of the farmers are established through the ranking of inputs and outputs of the livestock enterprise. 'Key Indicators' that reflect profitable livestock production are identified and targets for intervention established.

The timing of data collection is determined through the use of seasonal diagrams that provide an overview of the annual production cycle. Seasonal diagrams are particularly useful for identifying opportunities for contact with pastoralists.

Further details of the techniques, and examples illustrating their use, are provided in Annex 1.

PRA is a method of learning from local people. It is based on the principle that local people know their own situation, understand their own problems, and often have a good idea of possible solutions.

PRA employs a range of tools that enable farmers to join in the collection and analysis of data and in deciding what to do. Techniques include: direct observation, informal discussions, ranking, mapping, diagramming and participative games (Young, 1993).
Step 2. Monitor 'Key Indicators'

Efficient HHPPs are those that collect a minimum quantity of data. Initial data collection for AHPIM is therefore restricted to a select number of parameters called 'Key Indicators:

Key Indicators are a sign of the relative 'economic health' of the livestock enterprise. They draw attention to those farms that are performing badly. Like the warning lights on a car, they will alert livestock workers to the presence of a problem, but will not necessarily provide information on the cause of the problem.

Key Indicators reflect economic performance (as defined by farmers) as opposed to livestock productivity.

The choice of Key Indicators is determined by the understanding gained during Step One, but is likely to include:

- Mortality rates
- Fertility rates
- Herd/flock reduction rates

Data on Key Indicators are collected at appropriate intervals (defined during Step One) using tools presented in Annex 2.

The formats for data collection and analysis are provided in Figure 2 and 3.
## Figure 2. Form for Collecting and Analysing Data

<table>
<thead>
<tr>
<th>Location:</th>
<th>Farmers Name:</th>
<th>Species:</th>
<th>Wealth:</th>
</tr>
</thead>
</table>

### Individual Farm Records

<table>
<thead>
<tr>
<th>Date</th>
<th>Total Herd Size</th>
<th>Births</th>
<th>Neo-natal deaths</th>
<th>Other Deaths</th>
<th>Sales</th>
<th>Purchases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Immature</td>
<td></td>
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<td>Female</td>
</tr>
<tr>
<td>1/1/94</td>
<td>A(^1)</td>
<td>B</td>
<td>C</td>
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<td>M</td>
<td>F</td>
</tr>
<tr>
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<td>B(^1)</td>
<td>C(^1)</td>
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<td>M(^2)</td>
<td>F(^2)</td>
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<td>21/9/94</td>
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<td>1/1/95</td>
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### Key Indicators

### Mortality

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### Change in Herd Size

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<tbody>
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* Animals which have given birth for the first time, therefore changing from an immature to mature animal.

**Average D = \((A' + A' + A' + A') / 4\)**

## Figure 3. An example of a farm record

<table>
<thead>
<tr>
<th>Location:</th>
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<th>Wealth:</th>
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### Individual Farm Records

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<th>Sales</th>
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<td>Female</td>
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<td>F</td>
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### Key Indicators

### Mortality

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</thead>
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### Birth

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### Change in Herd Size

<table>
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<tr>
<th>Change</th>
<th>B - B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Animals which have given birth for the first time, therefore changing from an immature to mature animal.
Illustrating the use of Key Indicators

1. Mortality, rates

The association between mortality and economic loss is intuitive. It is measured by the difference between the salvage value of the animal that died and the cost of replacing it with an identical animal.

The relative economic importance of mortality varies with the age and sex of the animal (Table 1).

<table>
<thead>
<tr>
<th>Purchase Price</th>
<th>Salvage Value</th>
<th>Cost of Mortality</th>
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<tbody>
<tr>
<td>Male Livestock</td>
<td>$150</td>
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<td>Female Calves</td>
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<tr>
<td>Dairy Cows</td>
<td>$1,000</td>
<td>$0</td>
</tr>
<tr>
<td>Mature Buffalo</td>
<td>$550</td>
<td>$0</td>
</tr>
</tbody>
</table>

Source: Data from a price survey in Indonesia. The value of the salvage animal is zero as the majority of Indonesians are Muslim and do not eat meat that has not been slaughtered in the appropriate manner.

In young stock, the cost of mortality can be minor. For example, in some dairy areas the value of males calves is low and so the cost of mortality is low. On the other hand, the cost of mortality is usually high in adults, because the difference between salvage and replacement value is large.

2. Reproductive Rates

Less obvious than mortality, but often of greater economic consequence, is the rate at which a female animal reproduces. Reproductive rates determine levels of milk production and the number of offspring. Poor reproductive performance not only reduces the number of animals available for subsequent sale, but also can significantly lower milk production. Poor reproductive performance can therefore have a considerable impact on income.

1 The exception to this rule is in herds where lactational anoestrus occurs. In such situations, which are common in semi-arid zones, the farmer must cease milking the animal in order for it to conceive. Frequent reproduction can only occur at a cost to milk production.
The impact of a high reproductive rate (100%) versus an low reproductive rate (50%) is illustrated in Table 2.

**Table 2. Effect of reproductive performance on value of sales per head over two years**

<table>
<thead>
<tr>
<th></th>
<th>Quantity of Milk</th>
<th>Value²</th>
<th>No. of Calves</th>
<th>Value³</th>
<th>Total Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>100% Calving Rate</td>
<td>7,228 ltrs</td>
<td>$1,084</td>
<td>2</td>
<td>$90</td>
<td>$1,174</td>
</tr>
<tr>
<td>50% Calving Rate</td>
<td>5,069 ltrs</td>
<td>$760</td>
<td>1</td>
<td>$45</td>
<td>$805</td>
</tr>
<tr>
<td>Difference in Value</td>
<td>2,159 ltrs</td>
<td>$324</td>
<td>1</td>
<td>$45</td>
<td>$369</td>
</tr>
</tbody>
</table>

Source: Data from dairy monitoring in Sumedang, West Java, Indonesia.

3. **Change in female herd size**

Female animals in a herd are the main assets of a livestock business. They are a resource which increases through births and decreases with deaths. The farmer can directly influence the size of the livestock enterprise by balancing purchases and sales against births and deaths to achieve a desired business size. Assuming mortality is normal, and that there are no compulsory sales to meet emergency demands for cash, a change in female herd size reflects the relative profitability of the enterprise. If livestock are unprofitable, farmers will leave the industry by selling their livestock assets and female herd size will decline. Conversely, if livestock become more profitable, then farmers will keep or even buy more animals and female herd size will increase.

Change in female herd size can indicate a range of problems that might otherwise go undetected. For example:

- In Sulawesi a sudden decline in herd size occurred in response to an irrigation programme that had reduced the availability of dry-season grazing.
- In Yogyakarta a sudden reduction in flock numbers and an associated rise in the number of hens sold at the market were the first indications of an outbreak of Gumboro disease.

² Value of milk is $0.15 / l
³ A calf sells for $45
Step 3. Analyse

Key variables are calculated manually using pre-printed analytical forms (Figure 2 and 3). The results are calculated for each farm, and for the group as a whole (See Annex 3).

Key Indicators are either:

- ranked in order of magnitude 4; or
- compared against target values.

Target values are set by balancing values established from analysis elsewhere with values achieved by top farmers locally. A more detailed discussion on target values is presented in Annex 4.

Farmers (or groups) who are performing better or worse than average are identified from either the ranking or from comparisons with a predetermined value and targeted for further investigation.

In Sumedang (a dairy district: icy WestJava, Indonesia), data revealed a low calving rate (Table 3) compared to accepted norms.

**Table 3. Calving rate, calculated for the group; compared against a target level**

![Calving rate graph](image)

The causes of this low calving rate were subsequently investigated.

4 If herd sizes are small, it is not possible to compare rates between individual farmers. The results either have to be pooled on a group basis, or several years' data used to calculate an individual rate.
In the same area, there were differences in annual change in female herd size $H$ (Table 4).

**Table 4. Comparison of change in female herd size between groups**

<table>
<thead>
<tr>
<th></th>
<th>Number of Cows 12/12/90</th>
<th>Number of Cows 12/12/91</th>
<th>Change in herd size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranca</td>
<td>78</td>
<td>91</td>
<td>+17%</td>
</tr>
<tr>
<td>Budikarya</td>
<td>120</td>
<td>94</td>
<td>-22%</td>
</tr>
<tr>
<td>Ciperdanta</td>
<td>130</td>
<td>70</td>
<td>-32%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>301</strong></td>
<td><strong>255</strong></td>
<td><strong>-15%</strong></td>
</tr>
</tbody>
</table>

The increasing herd size at Ranca suggest that farmers were confident in dairying. Ciperdanta and Budikarya on the other hand were rapidly reducing their herd sizes. If they continued to sell animals at this rate, then their herd sizes would have halved within two years. Causes for this high sale rate were therefore investigated.

**Table 5. Comparison of different key variables between groups**

<table>
<thead>
<tr>
<th>Farmer Groups</th>
<th>Tua</th>
<th>Ujunge</th>
<th>Inalipue buffalo</th>
<th>Inalipue Cattle</th>
<th>Padelo</th>
<th>Sompe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calving Rate</td>
<td>41%</td>
<td>45%</td>
<td>50%</td>
<td>35%</td>
<td>69%</td>
<td>67%</td>
</tr>
<tr>
<td>Calf Mortality Rate</td>
<td>11%</td>
<td>0%</td>
<td>67%</td>
<td>33%</td>
<td>18%</td>
<td>5%</td>
</tr>
<tr>
<td>Abortion Rate</td>
<td>5%</td>
<td>6%</td>
<td>4%</td>
<td>6%</td>
<td>0%</td>
<td>18%</td>
</tr>
</tbody>
</table>

In this example, farm groups performed differently according to each key variable. Cattle at Inalipue had the lowest calving rate, and a high calf mortality rate, suggesting that this group in particular had significant management problems. Buffalo at Inalipue also had a very high calf mortality rate. Sompe appeared to be suffering from high abortion rates. Each group was examined for different problems.
Step 4. Identify Problems

Farms or groups of farms that consistently under-perform are targeted for further investigation to establish the cause of the problem (see Annex 5).

The investigation takes the form of a series of farm visits. Using a standard check list of questions, under-performing farms are contrasted with 'leading' farms to identify differences in farming systems that might contribute to poor performance.

- In Afghanistan, pneumonia is a common problem among sheep. Farm visits show that the disease tends to occur where animals are housed in cramped conditions with inadequate ventilation, but does not occur where sheep are at pasture or housed with adequate airspace.

  Data from other sources, such as abattoirs or laboratories, may also assist the investigation.

- In Vanuatu, an investigation into the causes of low calving rate included an abattoir survey of cow genital tracts. Incidence of infection or abnormality of the genital tract was low, and many cows were found to be pregnant at slaughter. This showed that the problem was probably due to management deficits, rather than pathological causes, and that culling policy was faulty.

If no answer is apparent, then external assistance from the district veterinary office and/or diagnostic laboratory should be sought.

- Sudden increase in mortality of immature beef cattle in The Gambia coincident with the onset of rains was found to be due to an explosive increase in gastro-intestinal parasitism.

- In Brazil, a disorder characterised by poor growth rate and production was found to be associated with low serum levels of cobalt and copper.
Investigation of causes of low calving rate in dairy herds in Sumedang, Indonesia

Analysis of data indicated a low calving rate in dairy farm groups in Sumedang, Indonesia.

There were differences in reproductive performance between the groups (Table 6).

Table 6. Comparison of calving rates between groups

<table>
<thead>
<tr>
<th></th>
<th>Number of Cows</th>
<th>Number of Calves</th>
<th>Calving Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciperdanta</td>
<td>48</td>
<td>29</td>
<td>61%</td>
</tr>
<tr>
<td>Ranca</td>
<td>41</td>
<td>17</td>
<td>42%</td>
</tr>
<tr>
<td>Budikarya</td>
<td>38</td>
<td>15</td>
<td>39%</td>
</tr>
<tr>
<td>Total</td>
<td>127</td>
<td>61</td>
<td>48%</td>
</tr>
</tbody>
</table>

Further investigation into low calving rates compared reproductive management practices in Ranca and Budikarya groups (which had lowest calving rates), with those in Ciperdanta (which had the highest calving rate) to identify differences in management that might contribute to the better performance achieved in Ciperdanta.

Poor calving rates were investigated by looking more closely at the data. Analysis of individual cow fertility records showed that:

a) conception rate to service was low
b) the interval between inseminations was often prolonged and/or irregular
c) there was a long delay after calving before cows were inseminated
d) pregnancy test results were often inaccurate

The results (a) to (c) might indicate some infectious form of infertility, but might also indicate that cows were not being inseminated at oestrus. Both were further investigated:

- A KAP (Knowledge, Attitude and Practice) study of farmers showed that many did not fully understand the economic significance of regular breeding, and that in some areas farmers were dissatisfied with inseminator performance.
- Interviews with inseminators showed that many cows were being inseminated too late after oestrus, and that there was a lack of motivation among some operators.
Step 5. Find Solutions

Having identified the cause of the problem, solutions must be found. Inspiration may be found from innovative farmers in the community, or by using technologies developed elsewhere. By identifying 'good' farmers and using such farmers as role models for the community, the AHPIM capitalises on the use of local knowledge to solve problems.

Where solutions to the problem cannot be found in this way, field staff should refer the problem to colleagues. It is possible that other areas have overcome similar problems and that these solutions can be used. Periodic professional meetings and newsletters are therefore important elements to solving problems.

- Poor body condition of cows was commonly associated with low calving rate in Vanuatu. Some farmers cut an indigenous tree legume to feed their cattle during dry periods. Their cattle were in excellent body condition.

- In The Gambia, a few farmers store hay to feed their animals during the long dry season.

- Dairy cows in West Java were unable to show behavioral signs of oestrus because they were tethered in individual stalls. Some farmers allowed their cows access to yards or corrals where they could interact to show signs of oestrus. This technology was shown by field staff to their colleagues.
Step 6. Feedback: implementing solutions

Feedback is perhaps the most important step in the cycle. Without feedback the programme serves no purpose and farmers and staff alike will quickly lose interest.

There are two types of feedback:
a) providing farmers with measurements of Key Indicators b) providing solutions to problems which have been identified In Sumedang problems identified through further investigations were tackled by:

• providing extension messages to farmers,

• improving communications from farmer to inseminator so that messages were not lost,

• providing refresher training for inseminators and field workers carrying out pregnancy tests.

Feedback should be provided as quickly as possible. In this way the credibility of field staff will be enhanced, and the future participation of farmers will be encouraged.

Immediate feedback of results to farmers can be provided during data collection visits. Feedback can also take place when carrying out other activities, such as vaccination or treatment of animals. The advice provided can add value to the service. In time, farmers may even subscribe to the monitoring programme, where for a small fee the service provides the results of the ranking, and offers advice on reasons for poor performance.

If farmers are literate, results can be distributed using 'wall newspapers' which rank farmers according to performance, and compare group results with those of neighbouring groups.

Feedback can take place at group meetings, which are held at a time and place determined by the farmers. Group meeting provide an opportunity to discuss differences in performance among group members, and differences between other groups.

The way in which is feedback is provided is particularly important. A study of the traditional methods of communication and learning can help to design appropriate means of communication.

Designing methods of communication in Sumedang

In Sumedang farmers did not understand the economic consequences of low calving rates. Previous extension messages explaining the importance of regular calving had not succeeded in changing practices. A new form of extension was devised that made use of puppets and carved models, both of which were extensively used in local plays and pageants.

The model simulated the daily production of milk. It used milk churns and imitation money to demonstrate differences in cumulative milk production by cows with a long and short calving interval. The model not only acted as a demonstration aid, it was also used by individual farmers to calculate differences in the value of milk production. It was in the capacity of a ‘visual calculator’ that the model had greatest impact, as farmers were able to work out for themselves the economic significance of short calving intervals.
**Step 7. Evaluate Impact**

The impact of both treatments and advice must be evaluated.

Methods of evaluation include:

- Feedback from farmers: are they happy with the service provided?
- Demand for services: are they increasing?
- Key Indicators: are they improving with time?
- Comparison of performance with other areas.
- Case notes (see Quality Control Programme).

It is impossible to design a perfect monitoring system. The programme should therefore remain flexible enough to incorporate feedback from farmers and field staff and evolve overtime as it learns from its own experience.

- In Sumedang, Indonesia, field assistants found the collection of weight data (for estimating growth rates) time-consuming. Analysis of weight data showed that it was often inaccurate. This component of the programme was therefore abandoned.

- Conception to first service showed an improvement (Figure 4)

![Figure 4 Conception rate to first service](image)

The monitoring cycle is on-going. Some constraints are identified and resolved quickly, while others require more detailed investigation and are completed over a long period. As old problems are resolved, new priorities emerge.
AHPIM

Quality Control
The AHPIM Quality Control Programme

The Quality Control component of AHPIM is used by field staff to check the effectiveness of clinical veterinary services.

It can be used in conjunction with the monitoring system or on its own.

The programme of quality control engenders a philosophy of 'serving farmers' by encouraging staff to ask: "Have the services I provided had an impact, and if not, why not?"

Such questions help pinpoint those services that are not effective and therefore need to be improved. They also lead to recognition of the need for a wider understanding of the health and production constraints that farmers face.

Quality control encourages veterinary field staff to evaluate the effectiveness of their treatments using case notes. Case notes are records of disease diagnosis, vaccination and treatment, and follow-up of the outcome.

Field staff usually already keep records. These can be replaced by more detailed case notes (Figure 5) that not only record the outcome of the treatment, but also provide a means of improving differential diagnosis.

It is not practical for staff to follow-up each case by revisiting the farm. Results can however be evaluated by encouraging farmers to notify the service if a given treatment did not work, or if vaccination breakdown is suspected. Cases can also be assessed during subsequent visits to other farms in the vicinity of the treated animal.

Analysis of records should reveal treatments that have not worked, or animals that have died despite being vaccinated. It is important that the case notes are only analyzed by the record keeper, otherwise they will be viewed as means of external evaluation, in which case the record-holder will have little incentive to maintain accurate records.

Periodic meetings should be held to discuss problems and share experiences: some colleagues may already know of a way of treating a particular disease syndrome. At the same time, the meetings can help to identify common problems, which can be subsequently referred to veterinary laboratories 5(if available) for further investigation.

The veterinary laboratory in turn should ensure that its activities are directed by problems reported by field practitioners. Case notes provide the preliminary epidemiological data upon which laboratories can base their investigations.
Figure 5. Case Notes

Date:  
Species:  
Owner:  
Village:  
No. in Group:  
No. affected:  
Age(s):  

History:  
Onset - sudden / gradual  
Affecting others in group / spreading  
Appetite  
Thirst  
Fertility / Abortion  
Housed / not housed  
Feeding regime / changes  
Recent purchases / mixing of animals  
Weight loss  

Clinical Examination  
Standing / recumbent  
Moving / lame  
Body condition score  
Fever  
Mucous membranes  
Discharges - nose / mouth / skin / urogenital  
Respiration - fast / noisy / coughing  
Abdomen - bloat / rumen movement / pregnancy  
Faeces / diarrhoea / constipation  
Skin lesions  

Post mortem:  
Lungs  
Liver  
Gut  
Peritoneum  
Joints  

Lab results:  

Diagnoses considered:  

Final diagnosis:  

Treatment:  

Recommendations to owner:  

Outcome:  
Improved quickly / slowly  
No change  
Got worse / died  

C-18
Conclusion

A review of HHPPs in Part A and Part B concluded that the majority of existing monitoring programme make use of resources that may not always be available to veterinary services.

An alternative approach called AHPIM is proposed as a basis for constructing a simple HHPP which can be tailored to suit different situations.

The Animal Health and Production Improvement Module aims to establish a productive partnership between farmers and the livestock services so that collectively they are better able to exploit opportunities for development.

This is achieved by:

• Designing a monitoring programme in collaboration with farmers (Step One).
• Measuring Key Indicators on smallholder farms (Step Two).
• Analyzing data manually using pre-printed forms and recognizing problems through ranking and comparison against targets (Step Three).
• Investigating the causes of problems (Step Four).
• Identifying solutions using where possible local knowledge (Step Five).
• Emphasising timely and appropriate feedback (Step Six).
• Developing and improving the services through evaluation (Step Seven) and a programme of Quality Control.

In keeping with AHPIM's underlying philosophy of decentralisation, the methods of data collection, analysis and feedback ensure that the responsibility for providing better quality services remains in the hands of those closest to farmers.
Annex 1 PRA Tools

PRA TOOLS

■ Wealth Ranking

Wealth ranking categorises farmers by socio-economic status. It identifies those members of the village that are poor and those that are comparatively rich.

Wealth ranking provides a valuable insight into village production systems. Although households may often appear to be similar, wealth ranking usually exposes very large differences in asset ownership within a community. Farms of different socio-economic status often own different livestock species and have different production priorities.

Wealth ranking is used to ensure that a full range of farmers are included in the HHPP. It can also be used to target programmes towards particular socio-economic groups.

Method

• Identify a key informant who has an intimate knowledge of the village.

• Record the names of each household on individual cards, and list the number and type of animals owned.

• Ask the informant to sort the cards into groups according to the relative wealth status of the households.

• Identify key features that distinguish each category by selecting 2-3 households from each category and discuss their history.

Analysis

• Calculate the proportion of the households that fall into each category.

• Calculate the average number and type of livestock owned/reared per household in each category.

• Describe the key features of each socio-economic group.

• Select a production system for the HHPP that is either of relevance to all farmers, irrespective of wealth, or, if poverty alleviation is an important concern, target a production system that is of particular importance to poorer households.

• Ensure that a range of households are included in the HHPP.
Keneba is a village in The Gambia. It is located in one of the remotest regions of the country. Everyone in the village is a farmer. Groundnuts are the main cash crop, and a variety of livestock are to be found in and around the village. The majority of the houses are made from mud bricks and most have corrugated iron roofs. The village is considered poor and all the children receive food aid.

*Method of Wealth ranking*

The alkaloe (village elder) recalled the names of all the households in the village. Beside each name the number and type of livestock (excluding poultry) were recorded.

The households were divided into four categories. Poor, not so poor, very poor, and 'has nothing' (destitute).

*Results*

From this information, a socio-economic profile of livestock ownership was compiled (see Table 1).

**Table 1.** Proportion of village households classified as rich, medium, poor or destitute, and associated livestock ownership patterns.

<table>
<thead>
<tr>
<th></th>
<th>Not so Poor</th>
<th>Poor</th>
<th>Very Poor</th>
<th>Destitute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of Households in village</td>
<td>16%</td>
<td>37%</td>
<td>36%</td>
<td>11%</td>
</tr>
<tr>
<td>Cattle/Household</td>
<td>72.1</td>
<td>6.5</td>
<td>2.1</td>
<td>0</td>
</tr>
<tr>
<td>Small ruminants/household</td>
<td>35.3</td>
<td>14.2</td>
<td>5.1</td>
<td>0</td>
</tr>
<tr>
<td>Draught Animals</td>
<td>4.2</td>
<td>2.2</td>
<td>1.2</td>
<td>0</td>
</tr>
</tbody>
</table>


Discussions on selected households from each category revealed the following:

The richest households were those who could trace ancestral ties to the village. They usually assumed important cultural or religious roles in the community, and controlled the rights to land distribution within the village. Many of the families had children working elsewhere (including France), and some operated businesses outside of the village (one owned a taxi business in the capital city).
Annex 1 PRA Tools

Distinctions between the other three categories reflected access to land, age, and the ability to farm. Young farmers with recently established households were usually classified as very poor, although they were expected to improve their social standing with time. The destitute members of the village were either very old farmers who had no family to support them, or new comers to the village who had yet to establish land rights. Other farmers who were classified 'very poor' were described as 'bad farmers who are lazy; although subsequent visits to these households suggested that such farmers had a weak association with the village and as such received the worst land and the least support.

Outcome

Contrary to initial perceptions, there were marked differences in wealth within the village. Livestock ownership patterns differed: cattle and oxen were owned by richer households: donkeys and small ruminants were favoured by poorer households.

Previous livestock programmes had focused on cattle, and were therefore biased towards the richer members of the community, many of whom, with large capital resources, needed the least assistance.

Small ruminants were widely owned, and programmes directed towards these species would benefit most of the community, with the exception of the destitute. A small ruminant improvement programme was subsequently initiated in the village, and the programme designed to ensure that all members, including the more marginal, poorer households, were included.
• **Success Ranking**

Agricultural evolution is largely based on the spread- of farmer-derived technologies. Major improvements in British agriculture, for example, where made by farmers touring different parts of the country to discover new technologies (Pretty, 1991), and farming communities today continue to exchange ideas through farm groups, newsletters and agricultural shows. Sharing local ideas allows a community to improve its agricultural production without resorting to external sources of assistance.

Success ranking identifies those farmers who have proved particularly adapt at making the most of the resources available. Within every community there are farmers who have developed their own innovations that are of value elsewhere. Success ranking identifies these 'paragon' farmers and uses them as role models for the rest of the community.

**Method**

- Rank farmers by wealth
- Ask if there are any farmers who have improved his or her socio-economic status, i.e. change from one category to another.
- If individuals are identified, discuss reasons for their success.
- If no such farmer exists, discuss the nature of poverty and ask who, in each category, is thought to be the 'best' (not be confused with the richest). Discuss reasons why these farmers are considered 'good:
- Ask which farmer can act as a role model, and why.

**Analysis**

- Include 'innovative' farmers in the HHPP.
- Be sure to include other, more typical farmers.

---

**An Example**

Bulekumba is a rural village in South Sulawesi. Most families are farmers. Rice is the main crop, although horticulture and fruits are also an important source of income. Poultry, ducks and buffaloes are found in the village.

Three village elders produced a wealth ranking for the village. At the onset of the ranking, they claimed that no one in the village was poor. As the ranking progressed, and clear categories emerged, they dismissed farmers in the poorer categories as 'lazy' or 'incompetent:

Individuals were randomly selected from each pile and their family history discussed. It emerged that wealthy households, all of whom had historical ties with the village, were large land owners. In contrast, the poorest households (some of whom were strangers to the village), owned no land and worked as labourers for other, richer farms in the area.
The conversation turned to individuals who had been able to 'improve' their status. Out of the village of 120 households, not one had been able to 'climb up' the social ladder.

The discussion then focused on those farmers who 'had made the most of what they had: In each category the informant ranked farmers in order of 'success’. In doing so, two individuals emerged as potential innovators.

One farmer had been responsible for introducing onions into the village, and these were now a common crop for middle-income farmers.

Another farmer, classified as poor,- was also considered successful as he had developed a 'contract-rearing' enterprise whereby he raised animals on behalf of others, and in return was able to keep half of the calf crop. In this way he was building up capital assets in the form of cattle.

Conclusion

The information from the success ranking not only provided an insight into the nature of poverty, but also identified members of the community who could be included in an HHPP as potential 'paragon' farmers.
Annex 1 PRA Tools

Production Priorities

Monitoring should reflect farmers' reasons for keeping livestock. This often means making a distinction between economic productivity and biological productivity. For example, a cow that produces the most milk may not, in the farmers opinion, be the best cow if she requires a disproportionately greater quantity of feed.

'Key variables' are indicators of the economic health of livestock production. Two of these indicators, mortality and fertility, are biological parameters, but one, the change in herd size, can reflect both biological performance (mortality and fertility rates), and economic performance (sales and purchases).

In addition to these three fundamental key variables, an additional parameter can be monitored. This variable should be determined by the farmers and reflect their main reason for rearing livestock.

Method

Ensure that farmers from different socio-economic categories are present.

Outputs

- Ask the group to list the various outputs from their livestock enterprise.
- Mark each output on the ground, using either words or an object that visually represents the output.
- Ask each farmer to allocate a fixed number of beans (10 or 20) between the different categories, according the relative importance of each output.

Inputs

- Repeat the exercise, but this time list the various inputs. Be sure to include non-purchased inputs, such as labour, grazing and crop residues.
- As the farmers to rank the various inputs in order of magnitude. Which is the most significant input, i.e. the one which takes the most resources (money, time, etc.) to provide.

Analysis

- Produce an average ranking for the inputs and outputs
- Discuss the various factors that effect the production of outputs, drawing attention to the relationship between the inputs and outputs.
- Identify one variable, other than key variable listed earlier, which the farmers feel indicate the success of their system. This may be a product, or a ratio e.g. feed/milk.
- Include this variable as a key variable for the HHPP.
Sheep farmers in upland Java were asked to rank different inputs and outputs of their sheep enterprise in order of magnitude. These results were combined to produce an average ranking for the group.

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cut grass</td>
<td>16</td>
</tr>
<tr>
<td>Salt</td>
<td>1</td>
</tr>
<tr>
<td>Medicines</td>
<td>1</td>
</tr>
<tr>
<td>Manure</td>
<td>10</td>
</tr>
<tr>
<td>Culls</td>
<td>3</td>
</tr>
</tbody>
</table>

Cut grass represented the largest input. Farmers would spend between 2 to 6 hours a day cutting grass to feed their housed animals. The most valued output from the system was manure which was used to produce compost. Animal sales were of equal importance.

The farmers were interested to see what the relationship was between the quantity of grass they fed and the quantity of compost produced. A key variable was therefore defined as the ratio of grass: compost. Several farms were monitored, and the results then presented to the group for discussion.
Annex 1 PRA Tools

Setting Targets

Having established key variables, targets and intervention levels for each variable should be established.

Method

- Make a table with three headings: good, average and bad farmer.
- List the Key Indicators.
- Ask the farmer to estimate the value of each key indicator for a good, average and bad farmer.
- Repeat several times with different farmers.
- Review literature to identify values that have been obtained elsewhere.
- Discuss the results with the farmers, and select a target and intervention level for each indicator.

A fuller discussion on Targets is presented in Annex 4.

An Exam Ie

In The Gambia successful farmers sell steers for twice the average sale price. The extra value was because the animals were fat and because they were sold at a time when prices were high.

The sale price achieved by top farmers was set as a target for other farmers.
Seasonal Diagrams

Seasonal production calendars provide an overview of the annual production cycle, and can be used to identify key points in time at which it is important to collect data.

Method

- Start by recording the local annual calendar, using local terms to denote different seasons.
- For each of the key variables, ask the informants to rank, using a fixed number of beans, the relative occurrence of each variable during each season.
- If ranking is not appropriate, ask the informants to identify when events are most likely to occur.
- Indicate on the calendar main livestock movements.
- Identify key points on the calendar when it is most important to collect data (e.g. shortly after the main lambing season), and discuss with farmers how the data might best be collected (e.g. in evenings, or at seasonal migratory passes). Be sure that data collection is not going to conflict with other key farming activities. For example, farmers may not wish to spend time talking about livestock when they are planting their crops.

An Example

A seasonal diagram produced in The Gambia (Figure 1) revealed a number of important livestock cycles:

- The greatest proportion of calving occurred at the end of the harvest and reflected seasonal shortages in forage.
- Mortalities peaked at the end of the dry season when animals were in their worst condition.
- Animals were sold to purchase grain in the wet season: a time when stores of household food were in short supply.
The monitoring schedule collected data three times a year: in July - the mid rains, when sales were at their highest; in October, the post-harvest period, when calving peaked; and at the end of the dry season (April) when mortalities were at their highest.
Field staff should visit farmers who have been identified from the wealth and success ranking, at intervals defined by the seasonal calendar, and at times deemed most convenient by the farmer. Information on Key Indicators is collected using individual farm records.

The farmer is asked to recall significant events since the last meeting. To assist the farmers memory, some form of on-farm record keeping should be devised.

**Large flocks/ herds**

Where flocks are large, errors are likely to arise in the recall of events. If the shepherd- is illiterate then an 'indigenous' form of record keeping should be devised. If possible, the recording system should make use of existing methods of recording events or numbers.

For example, the Masai in Tanzania, who believe it unlucky to record the number of livestock they own, keep instead a collection of sticks, each stick representing an individual animal. When the herd returns to the corral in the evening, instead of the counting the animal, the herder throws a stick on the ground as each animal passes by. If there are sticks remaining in his hand after all the animals have passed, he knows that some animals are missing.

Key events such as births, deaths, purchases and sales can be recorded using four jars that represent each event. When an animal dies (for example), then a stone (or other marker) is placed in the relevant jar.

The livestock worker is then able to record the total number of markers in each jar when he/she visits the shepherd. The markers should then be removed so that only new events subsequent to the visit are measured.

It is important that the livestock worker cross-references the reported events with the new herd size, and clarifies any inconsistencies immediately.

**Small herds**

Where only a small number of animals are involved, problems of memory recall are not so great. An event calendar can be maintained. This can be in the form of a 'progeny history; where births and subsequent fate to offspring are recorded on a 'family history' chart for each breeding animal.

The charts can be recorded in a book, or kept as posters on the wall of the farm.

**Feedback**

To encourage accurate recording, the livestock worker should give immediate feedback of the previous visits results to the farmer/herder. The farmer should be told his/her relative standing within the group in terms of the key indicators, and the group's position with reference to neighbouring groups.
DATA ANALYSIS

**Between group analysis**

- Compare quarterly or annual group records.
- Rank according to relative size of each key variable or compare against a target level.
- Investigate causes of above and below average performance.

**Within Group Analysis**

- Compare individual farm records at the end of the year.
- Rank according to the relative size of each key variable.
- Investigate causes of above and below average performance.

**Example**

A monitoring programme for dairy cattle in Sumedang, Indonesia, recorded mortality and fertility rates in three different groups of farmers.

<table>
<thead>
<tr>
<th>Table i. Comparison of calving rates between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciperdanta</td>
</tr>
<tr>
<td>Ranca</td>
</tr>
<tr>
<td>Budikarya</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table ii. Comparison of mortality rates between groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciperdata</td>
</tr>
<tr>
<td>Ranca</td>
</tr>
<tr>
<td>Budikarya</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

Mortality does not appear to be a problem in any of the groups. Ciperdanta has the lowest mortality rate, and given that it also has the highest fertility rate, this group would appear to have the best livestock management skills. Budikarya, on the other hand, has the highest mortality rates and worst reproductive rates, suggesting that this group of farmers are having difficulties looking after their dairy animals.
Annex 3 Data Analysis

A Comparison of mortality rates between farmers

Data from smallholder beef farmers on Pentecost Island, Vanuatu, illustrates excess variation in rates between farms.

<table>
<thead>
<tr>
<th>Number of Cows</th>
<th>Number of Cows</th>
<th>Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>100%</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>100%</td>
</tr>
<tr>
<td>9</td>
<td>8</td>
<td>87</td>
</tr>
<tr>
<td>30</td>
<td>26</td>
<td>75</td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>75</td>
</tr>
<tr>
<td>21</td>
<td>15</td>
<td>71</td>
</tr>
<tr>
<td>18</td>
<td>12</td>
<td>67</td>
</tr>
<tr>
<td>21</td>
<td>11</td>
<td>52</td>
</tr>
<tr>
<td>19</td>
<td>9</td>
<td>47</td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>14</td>
<td>4</td>
<td>29</td>
</tr>
<tr>
<td>19</td>
<td>3</td>
<td>16</td>
</tr>
<tr>
<td>23</td>
<td>2</td>
<td>9</td>
</tr>
</tbody>
</table>

This variation could not be readily linked to differences in management (such as feeding practices, pasture condition, availability of a bull) even though these factors were significantly correlated with fertility rates among larger herds of cattle. The author concluded that the variation was a statistical phenomenon resulting from small herd sizes. To account for this problem, data was grouped according to herd size:

- Herds less than 10 cows: 58% (43 herds)
- Herds 10 or more cows: 55% (38 herds)
- Overall means calving rate: 56% (81 herds)

Beef herds can have calving rates of 100%, and so these figures were considered unacceptably low, and a further investigation conducted to identify causes of poor performance (see Annex 5).

Annex 4 Targets
TARGETS

The objective of an HHPP is to optimise production efficiency; an important component of any system is therefore to define optimal production. This is generally done by setting goals or targets for performance parameters, and goal-setting has been an integral part of herd health and productivity schemes used in Europe, North America and Australia since the 1960s. Herd records of management, health, production and financial aspects of the farm have accumulated into a vast database for many aspects of production, from which clear targets have been set by comparing the performance of a particular herd with mean values, or with the top 25% of herds. Some of these targets have been considered absolute, while others may vary with time or between herds.

Table 1. Suggested reproductive performance targets for a dairy herd in the UK (From Esslemont et al., 1985)

<table>
<thead>
<tr>
<th>Index Variable</th>
<th>Target</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Period of Lactation</td>
<td>305 days</td>
<td>300-320 days</td>
</tr>
<tr>
<td>Duration of pregnancy</td>
<td>282 days</td>
<td>Varies somewhat with breed</td>
</tr>
<tr>
<td>Dry period</td>
<td>60 days</td>
<td>42-75 days</td>
</tr>
<tr>
<td>Calving interval</td>
<td>365 days</td>
<td>350-380 days</td>
</tr>
<tr>
<td>Calving to first service</td>
<td>Not less than 50 days, and not more than 60 days</td>
<td></td>
</tr>
<tr>
<td>Calving to conception interval</td>
<td>83 days</td>
<td>69-98 days</td>
</tr>
<tr>
<td>Conception rate</td>
<td>60%</td>
<td></td>
</tr>
<tr>
<td>Heat detection efficiency</td>
<td>80%</td>
<td></td>
</tr>
<tr>
<td>Cows bulling by 60 days post-partum</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>Herd calving index</td>
<td>350-380</td>
<td></td>
</tr>
<tr>
<td>Involuntarily culls</td>
<td>&lt;10%</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Targets for a Scottish lowland sheep flock (per 100 ewes put to the ram) (From Linklater and Speedy, 1980)

<table>
<thead>
<tr>
<th>Index variable</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barren ewes</td>
<td>3%</td>
</tr>
<tr>
<td>Ewe deaths</td>
<td>2%</td>
</tr>
<tr>
<td>Productive ewes</td>
<td>95%</td>
</tr>
<tr>
<td>Total lambs born/ewe</td>
<td>1.91</td>
</tr>
<tr>
<td>Lambs born dead</td>
<td>4%</td>
</tr>
<tr>
<td>Perinatal lamb mortality</td>
<td>5%</td>
</tr>
<tr>
<td>Lambs surviving/ewe</td>
<td>1.72</td>
</tr>
<tr>
<td>Later lamb mortality</td>
<td>2%</td>
</tr>
<tr>
<td>Lambs weaned or sold/ewe</td>
<td>1.70</td>
</tr>
<tr>
<td>Lamb growth rate to 1 August</td>
<td>300 g/day</td>
</tr>
<tr>
<td>Target weight at 1 August</td>
<td>41 kg</td>
</tr>
<tr>
<td>Proportion sold fat at 1 August</td>
<td>50% (remainder by 30 September)</td>
</tr>
</tbody>
</table>
Targets developed for such large, commercial herds may be unrealistic or inappropriate for smallholder farmers in the developing world, where there are enormous variations in livestock production systems, purposes for which animals are kept, and resources available for change. Records of performance are not so generally available, so that there is no database from which appropriate local targets can readily be set.

A review of the literature has shown that most authors have avoided identifying the precise targets they have set. It can be assumed, however, that any intervention or investigation whose aim is to improve some aspect of productivity or profitability, is carried out because existing levels fall short of some unspecified target level.

In the absence of established targets, examples of recorded levels of production were examined to look for some pattern which might help with the setting of local targets. Two examples (Figures 1 and 2 below) show that the great variation in performance would make it difficult or impossible to set targets from the literature alone.

Figure 1. Pre-weaning mortality of small ruminants (derived from data in: FAO Animal Production and Health Paper 114, 1992, and Livestock Services for Smallholders: a Critical Evaluation, 1993)
In Afghanistan, few data are available. Cossins (1994) states that local fertility rates of 72% and one lamb or kid drop per year are very poor, and were increased by improving nutrition and parasite control. Lambing rates of 77-81% and kidding rates of 68-78% per year were recorded from a western Pushtun Duranni pastoral flock in a favourable season, with first parturition at 2 years of age. Mortality rates of 15-20% have been recorded for lambs and yearlings, and 10-15% for adults. Flock growth rates of not more than 10% per year have been recorded. Mortality rates of about 70% were recorded in the drought of 1970/71. Annual egg production of local Afghan hens is 30-90 eggs.

Such figures must be combined with local experience to produce targets. Farmers themselves may be able to define their own targets (long-term hopes for production) based on experience. They may also be able to define intervention levels, which are unacceptable performance levels requiring action. Targets set in this way will evolve over time: thus the process of goal-setting is not static, and targets will become more realistic as records and understanding of farming systems build up over time.
Annex 5 Further Investigations

FURTHER INVESTIGATIONS

Having established, using key indicators, that there is a problem, further investigations are made to establish the causes of the problem, so that options for solving the problem can be sought.

1. Compare herds with the problem with herds which do not have the problem and look for differences.
   - Use the checklist on farm visits to observe differences.
   - Ask farmers about management, feeding and opinions.
   - Organise farmers with the problem to visit herds without the problem to discuss differences.
   - Use further investigation protocol to help work out most likely causes of problems, but do not ignore other possibilities.

2. Map herds with a particular problem to find out whether they are all in one locality or scattered throughout the area.

   If they are all in one area, consider:
   - the likelihood of imported disease,
   - similarities of altitude, grazing and water availability, rainfall,
   - mineral deficiencies,
   - local similarities of management, feeding bi-products, other nutrition, treatments.

   If scattered throughout the region, compare herds with problem to herds without problem as above.

3. Plot time scale of emerging problem - particularly effective with infectious disease spreading between herds. This will become a useful tool once the herds have been monitored for some months/years.

4. Look at options for collecting further information:
   - abattoir
   - diagnostic laboratory
   - feed firm
   - local veterinarian or other animal health worker
   - existing data sources (markets, meat inspectors records, sale and purchase of feed etc.)
A further investigation of low growth rate

Meat production, either for sale or for domestic consumption, if often an important output from livestock production systems.

The value of meat production depends on:

- The price received for the animal.
- The number of animals sold or slaughtered.
- The weight of each animal.

The price received for the animal varies according to the season and market preference. White male rams for example can fetch more / kg bodyweight than brown females, and prices are usually higher during religious festivals.

The number of animals available for sale or slaughter depends upon breeding rate and mortality. If these are normal, then poor growth rate, which determines the final weight of each animal, is the likely cause of low output of meat.

Growth rates might be measured and recorded every three months and compared with locally established targets. Growth rates can be measured using:

- Scales (they are expensive, heavy to transport, delicate, and may not be available locally).
- Balances are likely to be available, are robust, easy to transport and inexpensive.
- Weigh-band. Must be calibrated for local stock.

If it is impossible to weight regularly on farm, then:

- Estimate weight and age at time of slaughter or sale.

If poor growth is a problem, then consider possible causes using Table I.
### Table 1. Causes of poor growth rates and associated signs

<table>
<thead>
<tr>
<th>Cause</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inadequate quantity of food</td>
<td>Condition score - all animals in poor body condition observed in front of animals, supplementary feed provided, pasture available</td>
</tr>
<tr>
<td>2. Poor feed quality</td>
<td>Condition score - growing and lactating animals in poor body condition, milk production, supplementary feed provided. No legumes or rate feed available</td>
</tr>
<tr>
<td>3. Inadequate milk supply</td>
<td>Condition of dams is poor, size of dams, young or very old dams, date water available, nodular, lumpy udders, watery or lumpy milk, disease</td>
</tr>
<tr>
<td>4. Birth weight lambs/calves</td>
<td>Them, find average and look for small ones at birth (ask farmers), low births - low individual birth weight but high weight of offspring born</td>
</tr>
<tr>
<td>5. Age</td>
<td>Incisor teeth (not very accurate), records, if highly seasonal breeding pattern</td>
</tr>
<tr>
<td>6. Water</td>
<td>Available at time of observation, the source, purue always available</td>
</tr>
<tr>
<td>7. Teeth</td>
<td>Examination for worn and broken teeth, especially</td>
</tr>
<tr>
<td>8. Work</td>
<td>How do animals walk to grazing, such draught work</td>
</tr>
<tr>
<td>9. Mineral deficiency</td>
<td>Laboratory diagnosis ONLY by laboratory analysis (blood or sample), eat with minerals (BUT sheep very susceptible to poisoning), mineral lick (but expensive and may eat to excess if mixed with molasses or urea), signs (emaciation, diarrhoea, swayback in lambs), depression, wool loss,</td>
</tr>
</tbody>
</table>
## Annex 5 Further Investigations

### Table 1. continued

<table>
<thead>
<tr>
<th>10. Disease</th>
<th>a) Clinical signs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>itchy skin</td>
</tr>
<tr>
<td></td>
<td>chronic diarrhoea</td>
</tr>
<tr>
<td></td>
<td>emaciation (not due to inadequate feed. Not all in group affected)</td>
</tr>
<tr>
<td></td>
<td>dull</td>
</tr>
<tr>
<td></td>
<td>inappetant</td>
</tr>
<tr>
<td></td>
<td>lagging behind / standing apart from others</td>
</tr>
<tr>
<td></td>
<td>wool falling out</td>
</tr>
<tr>
<td></td>
<td>breathing fast or with difficulty, coughing</td>
</tr>
<tr>
<td></td>
<td>lameness</td>
</tr>
<tr>
<td></td>
<td>deaths</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>b) Post Mortem</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>skin damage</td>
</tr>
<tr>
<td></td>
<td>external parasites</td>
</tr>
<tr>
<td></td>
<td>gut lesions (modules, inflammation)</td>
</tr>
<tr>
<td></td>
<td>liver lesions (abscesses, flukes, scarring from immature flukes)</td>
</tr>
<tr>
<td></td>
<td>lung lesions (dark, non-aerated areas, abscesses)</td>
</tr>
<tr>
<td></td>
<td>worms in gut / lungs</td>
</tr>
<tr>
<td></td>
<td>adhesions to gut and liver</td>
</tr>
</tbody>
</table>

|     | c) Test, treat and look for effect |
Annex 5 Further Investigations

An Example

Investigation into causes of poor fertility in Vanuatu

Data from smallholder herds in Vanuatu indicated low calving rates (see earlier example).

Subsequent investigations included:

1. Survey of smallholder and plantation herds to study various factors which are known to be linked with cattle fertility:
   • body condition of cows
   • breed of cows and bulls
   • pasture availability
   • water availability
   • availability of bull or bull:cow ratio
   • management practices (Weaning, separation of heifers to delay service until heifers reach target weight for conception)

2. Pregnancy test results related to management and body condition of cows.


5. Examination of data from the existing Brucellosis Eradication Scheme.

6. Examination of other existing data to look for evidence of mineral and trace element deficiency.

Poor body condition of the cows, and a lack of bulls, were the most commonly encountered problems.

Poor body condition reflected:

• overstocking
• poor quality pasture,
• undersized cows due to calving first when too young and small, aged cows

Lack of bulls occurred on outer islands because farmers found it difficult to obtain replacement animals.

The livestock services tackled these problems by:

• providing replacement bulls to smallholdings
• barging excess stock from the outer islands to growers and abattoirs on the main islands

Throughput of smallholder cattle to the abattoirs has continued to increase, which probably reflects an improvement in cattle fertility rates.
Herd Health and Production Programmes

An Annotated Bibliography
Herd Health and Production Programmes

An Annotated Bibliography


Ashdown, S 1993. Assistance to South Sulawesi Livestock Services. Final Report, ODA Animal Health Project, Indonesia. Describes a monitoring system aimed at identifying local animal health and production constraints, by on-farm longitudinal quarterly monitoring and collection of relatively simple data by grassroots extensionists. Analysis is simple and low-cost but does not provide feedback directly to individual farmers.

Audige et al 1994. Proceedings of the Seventh International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15-20th August, 1994. This health and productivity profile of farmed red deer in New Zealand is aimed at description and understanding of the production system. It involves the longitudinal recording of production and health events by the farmer, regular veterinary sampling and testing, and a one-off pregnancy diagnosis, requiring the commitment of considerable resources. Analysis by computer is complex and there is no direct feedback of results.

Bartlett et al 1985. Compendium on the continuing education for the practising veterinarian. Vol 7, No. 2, 1985. FAHRMX is a multipurpose system from the US for farm management which also allows aggregation of data across farms. Comprehensive longitudinal data is collected weekly by the farmer, and mailed to a local veterinarian who analyses it and provides rapid feedback. The data is collected by telephone and stored on a central mainframe computer which performs more detailed, and comparative, analyses.

Bazeley, K et al 1993. Two methods for investigating low reproductive performance in cattle. In: Daniels, P W et al (eds). Livestock Services for Smallholders: A Critical Evaluation. Proceedings of a seminar held in Yogyakarta, Indonesia, November 1992. This paper describes two alternative ways of investigating low reproductive performance in cattle. The first relates to Indonesia and has been described elsewhere. The second describes the process undertaken in investigating the smallholder beef system in Vanuatu. Various sources of data were used, comprising a recall survey, abattoir data, veterinary diagnosis and testing, analysis of individual cow data, and an animal census. The pros and cons of this method are discussed. No direct feedback was planned, but results were used to understand constraints in the system to be acted upon.
Blood et al 1978. A Health Program for Commercial Dairy Herds. Australian Veterinary Journal, Vol. 54, 1978. This paper describes one of the first commercial dairy herd programmes to be available, whose aim is to aid farm management. Longitudinal monitoring by the farmer and veterinarian provides comprehensive data which is analysed centrally by computer. An extensive discussion of the process of target setting and comparison with farm performance is included.

Bode et al 1994. Proceedings of the Seventh International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15 - 20th August, 1994. Monthly longitudinal monitoring of cross-bred dairy herds in Uganda was undertaken to improve extension services by increasing knowledge of the system. Limited production data was collected by a research team who interviewed farmers monthly. Complex clinical data was also collected monthly, before all was analysed on a central computer, with no farmer feedback.

Broadbent, 1982. "SALTWAY" - An integrated animal health system in a developing country. Proceedings of the Third International Symposium on Veterinary Epidemiology and Economics, Arlington. An animal health service was established in a large area of Argentina with little infrastructure and scarce existing knowledge of local conditions. A series of large cross-sectional surveys for each animal species were followed by longitudinal veterinary monitoring, reaching 25,000 head on 550 farms over a period of 4 years. A large and complex dataset was analysed centrally on a purpose-designed program, and data was used to train local private veterinarians in the major identified problems, and to set up a field investigation service for individual farmer problems.

Christensen et al 1994. Pig health and production surveillance in Denmark: Sampling design, data recording, and measures of disease frequency. Preventive Veterinary Medicine 20 (1994). The Danish pig 'Health and Production Surveillance System' (HEPS) is based on comprehensive longitudinal on-farm monitoring by farmers and use of abattoir data, to provide information at herd and national levels. Data is analysed and summarised by the local veterinary advisory service and is used to inform disease planning at all levels.

Christie et al 1993. The design and implementation of a cattle health and productivity survey (CHAPS) Nusa Tenggara, Indonesia. In: Daniels, P W et al (eds). Livestock Services for Smallholders: A Critical Evaluation. Proceedings of a seminar held in Yogyakarta, Indonesia, November 1992. CHAPS is a programme of longitudinal monitoring aimed at identifying production constraints in Indonesian smallholder cattle, some of which were initially provided through a rural credit programme. Very comprehensive physical and financial data are combined with sample testing and assorted animal measurements, collected quarterly and with inducements. A large team of professionals with transport and associated funding is required, and analysis is by centralised computer, using PANACEA. There is no apparent direct feedback to farmers (hence the inducements) and data collected is not being widely used.

Dijkhuisen et al 1990. Compendium of continuing education in veterinary practice, 1990. PORKCHOP is a computer decision support system whose aim is to optimise replacement decisions in intensive pig enterprises in the Netherlands. The comprehensive physical and financial data required is taken from existing longitudinal monitoring records, and is analysed so that culling decisions for individual sows are based on an economic calculation and maximise farm profitability.
APHIN (Animal Production and Health Information Network) is a system established on a Canadian island which aggregates a number of existing data sources to provide comparable longitudinal farm management information whilst also allowing regional disease and production planning for cattle and also pigs. Comprehensive herd level data, together with veterinary inspection data from the abattoir, diagnostic laboratory results and milk bulk tank data are combined in a central computer database where aggregate analysis is undertaken. Remote terminals are also able to access herd data for analysis and herd comparisons.

Fetrow et al 1987a, b and c. Dairy herd health monitoring. Part I, Part II and III. Compendium of Food Animal 373. 1987. This 3-part series of papers discusses the role of monitoring the productivity and health status of intensive US dairy herds. Part 1 discusses monitoring in general, criteria for designing a system, and sources of monitoring data, including description of the widespread Dairy Herd Improvement Association (DHIA) records in the US. Part 2 describes a spreadsheet model for monitoring - the Dairy Herd Health Monitor, or MONITOR. Part 3 discusses the setting of targets (goals) with which to compare herd performance.

Gardner 1992. Graphic monitoring of dairy herd performance. Compendium on the continuing education for the practising veterinarian, Vol 14, 1992. Shows how analysis of detailed farm management data available through routine monitoring programmes in the US can be rapidly, cheaply and effectively analysed and presented by use of graphs, avoiding the need for computerisation. The method is intended for use by the veterinarian to improve the quality of service provided to individual farmers during routine monthly visits, for which the farmer pays.

Ghirotti, M 1992. Rapid appraisal techniques: a tool for planning and managing animal health and production development programmes. Society for veterinary epidemiology and preventive medicine. Proceedings of a meeting held at the University of Edinburgh on 1 - 3 April, 1992. This paper present a generic method used by the author for planning and managing animal health and production programmes. A comprehensive array of formal and informal data is collected cross-sectionally from a number of sources and by numerous methods, which can be repeated periodically as desired. Motivated and trained data collectors are needed, and data is immediately analysed on-site, for verification with involved communities before the end of the data collection exercise.

Hadrill and Yusuf 1994. Mapping of seasonal migrations in the Sanaag region of Somaliland. RRA Notes, No 20. Heffernan 1994. Livestock healthcare for Tibetan agro-pastoralists: application of rapid rural appraisal techniques. RRA Notes, No 20. These papers describe the collection of seasonal disease incidence data by PRA methods in Somaliland and Tibet, respectively, in order to focus veterinary assistant training. This is done through individual and group farmer interviews requiring few resources but trained facilitators with veterinary knowledge. Feedback to farmers is immediate but has no direct impact.
Hanks, J and Hogg, R 1992. Livestock production and socio-economic monitoring in Somalia to assess the impact of Tsetse eradications. Draft Report to ODA, 1992. Transhumant Somali herds were monitored longitudinally to collect productivity data which allowed evaluation of the effect of tsetse control. Data was limited to key indicators most liable to change, including mortality, entries/exits, breeding and drug use, collected through periodic (approximately quarterly when possible) herder interview. Additionally, a cross-sectional socio-economic survey was administered annually. Data was analysed by computer.

Hay and Tantoni 1993. Data collection and utilisation as a tool for extension systems In: Daniels, P W et al (eds). Livestock Services for Smallholders: A Critical Evaluation. Proceedings of a seminar held in Yogyakarta, Indonesia, November 1992. This is a system of longitudinal monitoring of Malaysian sheep aimed at assisting farm management decision-making and simultaneously informing and improving local extension services. Simple production and management data is collected by the farmer and taken for analysis following monthly visits by a local extension worker. Analysis is undertaken centrally by computer and the output is relayed to the extension worker and then farmer by direct contact, thus increasing farm-level interaction.

Houben et al 1994. Proceedings of the Seventh International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15 - 20th August, 1994. This paper describes a farm management computer model for dairy farms in the Netherlands which allows optimisation of treatment and culling management decisions, by calculating the regime which maximises net returns per cow per year. Comprehensive data from longitudinal monitoring is required, and this undergoes a very complex analysis to provide output with a hitherto research function.

Huirne et al 1994. 7th Proceedings of the Seventh International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15 - 20th August, 1994. CHESS-RO is a combined computer decision support system and expert system for optimising management of intensive pigs in the Netherlands. It requires comprehensive physical and financial data which it analyses through its decision support system component, and interprets via the expert system, providing the benefits of complex farm management analysis without requiring a complex understanding by the user. It is being developed for on-farm use but is currently only used for teaching.

lies, K 1993. Understanding the constraints, needs and aspirations of Samburu pastoralists in a decentralised animal health project in Kenya. Animal Production in Developing Countries, Occasional Publication No 16. 1993. An Oxfam Samburu restocking programme asked ITDG to assist in directing an increased focus on animal health, and RRA/PRA methods were used to this end. These papers focus on the progeny history technique to assess productivity indices over a period of 5-10 years, and disease ranking. Group and individual discussions in a one-off cross-sectional study required minimal resources, but trained investigators and probably some veterinary input. There was no direct feedback to allow farmers to make improvements. Chronic diseases were largely ignored in disease ranking.

Jalvingh et al 1994. Proceedings of the Seventh International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15 - 20th August, 1994. TACT-DAIRY is another farm management computer simulation model which facilitates the evaluation of management alternatives for optimisation of production and reproduction in dairy cows in the Netherlands. It requires comprehensive longitudinal monitoring data and can be used through on-farm computers.
Janviriyasopak et al 1994. Proceedings of the Seventh International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15 - 20th August, 1994. A health and productivity profile was compiled with the aim of improving the Thai household poultry system. The composition of flocks was followed, and a sub-sample were tagged and details of productivity and disease recorded intensively on monthly visits to the farm by local staff. Clinical/postmortem testing was also undertaken, requiring veterinary skills and laboratory facilities. Analysis was by central computer, and there was no direct feedback to the farmer.

Keirs et al 1991. A new system for broiler flock-health monitoring. Preventive Veterinary Medicine, 11, 1991. This paper describes a system for longitudinal disease monitoring in very large intensive US broiler production for individual farms and for state disease control planning. A sample of 10 birds per farm per week are killed and sent to a central (academic) veterinarian who performs autopsies and computerises the results. Weekly results are mailed to the producers, and annual workshops are held with all producers to discuss common problems and their remedies.

Kaneene et al, 1988. Proceedings of the Fifth International Symposium on Veterinary Epidemiology and Economics, 1988. The National Animal Health Monitoring System (NAHMS) in the US aims to assist regional, national and local planning by providing national disease summaries by species including assessments of costs, prevalence and incidence. Small random samples of farmers, stratified by farm size, animal species and system are paid to continuously record comprehensive production data, and are interviewed monthly, when animal samples are taken for testing. Randomness means that results are generalisable and facilitate planning of services. One veterinary medical officer is required per 4 farms, making this a very expensive and resource-demanding approach. Feedback is by monthly, 6-monthly and annual routine reports back to farmers.

Leidl, 1989. Health and Productivity Profile of swamp buffalo in villages. International seminar on animal health and production services for village livestock. Khon Kaen 2 - 9 August, 1989. A profile is compiled for villages over a period of 12 months by a team of experts, in order to describe the animal health situation in the area. A buffalo population census is followed by seasonal (approx. quarterly) longitudinal monitoring involving collection of simple animal production data and complex veterinary diagnosis, with induced farmer co-operation, complex computer analysis and no direct feedback.

Leyland, T 1993. Participatory rural appraisal in Afghanistan. In: Daniels, P W et al (eds). Livestock Services for Smallholders: A Critical Evaluation. Proceedings of a seminar held in Yogyakarta, Indonesia, November 1992. A series of PRA methods were used in Afghanistan to identify problems related to animal health of community livestock, and potential solutions. Simple and informal cross-sectional information was collected through individual and group discussions, accounting for wealth and gender differences in response. Results were used to focus the training of VAHW on identified needs.

Maloo, S et al 1994. Proceedings of the Seventh International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15 - 20th August, 1994. A systematic process for the identification of health constraints in Kenyan coastal smallholder dairying is described, using on-farm veterinary data only. A skilled team visits farms and first conducts a stratified (by agroecological zone) cross-sectional disease survey to establish point prevalence rates. Secondly, a longitudinal monthly sampling of 30 animals is established, to investigate seasonal incidence, case fatality and mortality. Complex computer analysis gives an academic approach, but it is claimed that the research helped to reduce disease losses.
Marsh and Morris, 1988. *Proceedings of the Fifth International Symposium on Veterinary Epidemiology and Economics, 1988.* ORACLE is a computer software which uses comprehensive physical and financial information provided through longitudinal monitoring tools such as PIGCHAMP or DAIRYCHAMP to predict the effect of alternative management decisions on enterprise profitability, thus guiding herd management. Simulations can be run for up to 6 years using a personal computer, and the farmer or veterinarian interprets the output.

Martin et al, 1982. *Veterinary Record.* VIRUS is an animal health and production longitudinal monitoring regime which aids farm management decision-making for UK dairy farmers through computerisation. Comprehensive individual animal data from the farm is collected by the farmer but analysed centrally, and feedback is received via a monthly action list mailed to the farmer which also compares performance with defined targets.

Martin et al 1988. *Proceedings of the Fifth International Symposium on Veterinary Epidemiology and Economics, 1988.* BENCHMARK is a health and production monitoring programme for the beef cow-calf system in Canada. It is based on longitudinal recording of comprehensive data by livestock-keepers, supplemented by serological testing and other inputs by the local veterinarian. A cross-sectional questionnaire survey provides additional information, all of which is analysed by the veterinarian on a personal computer.

McClure 1989. *International seminar on animal health and production services for village livestock, Khon Kaen 2 - 9 August, 1989.* A data collection exercise was undertaken to direct the Boyolali smallholder herd health programme in Indonesia. A cross-sectional socio-economic and management survey was followed by a comprehensive longitudinal monitoring programme with data collection by 140 farmers plus also sample collection and analysis by a small dedicated team. Complex computer analysis was carried out centrally and feedback was by monthly veterinary visit including action lists, and occasional seminars.


Meemark, N. 1993. *A health and productivity information system through Thai village farmers. In: Daniels, P W et al (eds). Livestock Services for Smallholders: A Critical Evaluation. Proceedings of a seminar held in Yogyakarta, Indonesia, November 1992.* A pilot attempt was made to see if village 'keymen' who had been trained in basic animal health care for the ongoing programme in Thailand were able to implement a longitudinal animal health and production monitoring system, collecting simple quarterly on-farm data which are mailed to a central unit for analysis. Reporting rates were low and it was concluded that this is not a viable method of monitoring due to other demands on collectors' time.

Menzies et al 1991. *Proceedings of the Sixth International Symposium on Veterinary Epidemiology and Economics, 1991.* SHEPHERDS is the name given to a sheep health and productivity study in Ontario, Canada aimed at describing the production, disease and management status of sheep flocks. A random cross-sectional survey investigated management by questionnaire, and tested blood and hair samples. This was followed by longitudinal monitoring by the farmer and with periodic veterinary assistance, which added to data from a pre-existing monitoring programme. Analysis was by central computer, and there was no apparent feedback.
Noordhuizen et al 1986. VAMPP: A computer program to support veterinary herd health and production control in dairy farms. In Proceedings of the 14th World Conference on diseases in cattle, 1986. VAMPP is a computerised farm management and research tool which uses comprehensive data from continuous longitudinal monitoring by Netherlands dairy farmers. Data are analysed on decentralised computer by a veterinarian as part of routine service for which the farmer pays. Action lists and problem animals are identified to aid management.

Noordhuizen et al 1982. Veterinary herd health and production control on dairy farms. Preventive Veterinary Medicine. This and a series of companion papers describes a method of longitudinal monitoring whose aim is to improve management of Dutch intensive dairy farms. Comprehensive physical and financial health and production data are collected by the farmer with veterinary assistance through a privatised routine visit service. Data analysis is performed manually by the veterinarian in a low-tech but possibly cumbersome way, and is used to inform decision-making.


Hanks, 1993. The expansion of cattle monitoring activities initiated in veterinary diagnostic centres in Colombia, 1993. In: Daniels, P W et al (eds). Livestock Services for Smallholders: A Critical Evaluation. Proceedings of a seminar held in Yogyakarta, Indonesia, November 1992. These papers describe the process undertaken during the reorientation of Colombian veterinary diagnostic centres to become more demand-focused, so as to assist planning of research and extension at local and national level. A cross-sectional survey was followed by longitudinal monitoring of a small number of dairy farms, collecting comprehensive physical data but initially weak financial data. A third phase was experimental, testing remedial measures. Complex central data analysis fed back to government planners and extension workers, and ultimately back to farmers.

Oxby 1994. Restocking: A Guide. VETAID, 1994. The Oxfam Kenya restocking project established a system to monitor the success of the programme by following restocked herds. Simple information on herd structure, animal exits and their cause were collected monthly or whenever the transhumant herds were available, using project staff with a vehicle and local monitors. Attempts to assign the role of monitoring to committees proved unsuccessful.

Pharo et al 1990. Progress in the use of computerised recording systems in dairy cow monitoring and extension in Malaysia. Tropical Animal Health and Production, Volume 22. This paper describes an animal health and production monitoring programme for Malaysian smallholder dairy farmers aimed at improving farm management. Semi-comprehensive disease and production data is collected by literate farmers, since enumerators are too expensive, and passed to a central unit of the State Veterinary Office where it is analysed using PANACEA. Results are fed back to extension workers who should then advise individual farmers by use of action lists.

Reyes 1991. Proceedings of the Sixth International Symposium on Veterinary Epidemiology and Economics, 1991. MONTY is a computer programme which serves a longitudinal monitoring system established in Colombia aimed at identifying animal health and production constraints and therefore improving individual farm management for a small sample and planning research and extension more generally. Comprehensive physical and financial data are recorded for cattle farms, although difficulties arose, described in this paper, associated with farmer mistrust of the need for financial information. Monthly visits by regional veterinary centre staff and farmer records are combined and analysed centrally to give a thorough and complex description of the production system. Feedback allows focused improvements and informed decision-making.
Russell and Rowlands, J 1983. Veterinary Record; 1983. COSREEL is a computerised farm management monitoring system which was developed for use on Edinburgh University farms but could also be applied elsewhere. Comprehensive data on health, production and fertility from individual cattle, pigs or sheep are collected by the farmer, with particular emphasis on disease diagnosis and treatment, aided by a veterinarian. Remote terminals are used for data analysis to provide action lists and comparisons between herds to aid management.


Schreuder et al 1994. Proceedings of the Seventh International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15 - 20th August, 1994. A mortality survey was undertaken in Afghanistan to evaluate the effect of a veterinary programme compared with areas without a programme. A cross-sectional survey was used to ask farmers to recall mortalities over the preceding two years for various animal species, which allowed calculation of age and species specific mortality. It was found that there was a large difference between the two areas.

Sorensen and Enevoldsen 1994. Modelling the dynamics of the health-production complex in livestock herds: a review. Proceedings of the Seventh International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15 - 20th August, 1994. ESIMHERD is a computer programme for decision support in dairy herd health management. It uses comprehensive physical and financial data which has been collected by a longitudinal monitoring regime, and simulates the effect of alternative management strategies on a personal computer, thereby informing decision-making.

Stem and Sollod 1994. Rapid reconnaissance in animal health planning for pastoral production systems. Proceedings of the Seventh International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15 - 20th August, 1994. A process is described whereby animal health constraints for pastoralist livestock-keepers may be identified and subsequently addressed by focused intervention. Firstly an ethno-veterinary study investigates knowledge of disease amongst the pastoralists. This is followed by a second phase, the eco-epidemiological investigation, which involves sample analysis for disease verification etc. This information is used to plan limited field trials of possible interventions which are then made widely available if found useful. Other than the veterinary investigations, this is a relatively low-tech research method, not requiring computers, providing cross-sectional information.

Stephens et al, 1983. Proceedings of the Second International Symposium on Veterinary Epidemiology and Economics. Esslemont et al 1981. Dairy herd management. British Society of Animal Production, 1991. DAISY is a system for collection of comprehensive physical and financial longitudinal data from UK dairy farms, to aid management decisions and to provide a database for dairy research. Data are recorded by the farmer and is analysed on a personal computer on-farm or by a local commercial veterinarian. Immediate feedback with action lists and a comparison of performance in relation to targets informs management decisions.
Supriatna, N and Casolani, C 1989. Health and production monitoring of smallholder dairy farms in West Java. International seminar on animal health and production services for village livestock. Khon Kaen 2 - 9 August, 1989. A longitudinal smallholder animal health and production monitoring system was undertaken in Sumedang, Indonesia, with farm level improvement and broader planning as objectives. Comprehensive individual animal data including for dairy and draught animals are collected on monthly visits by a visiting government extensionist. Data are analysed centrally and relayed by monthly report to the extensionist who then passes results to the farmer.

Swane et al 1991. Proceedings of the Sixth International Symposium on Veterinary Epidemiology and Economics, Ottawa, 1991. Standard diagnostic tests for subclinical disease in the US dairy industry were used in Honduras to see if they were of use in animal health and production planning. Tests to estimate calf colostrum intake, presence of internal parasites and evidence of subclinical mastitis were related to production parameters collected on-farm and through existing data, and were found to be unconnected. It was concluded that these tests do not relate to important issues in Honduran systems and conditions.

Swift, J and Noor, A 1991. Participatory Pastoral Development in Isiolo district. Final Report for ODA, 1991. A combination of formal and informal methods were used to define the pastoral livestock systems and livelihoods in N. Kenya. A participatory ranking game, practised with groups stratified by wealth, was used to investigate problems felt by the pastoralists, and to discuss and prioritise possible solutions. Wealth was found to be a major determinant of the type of problem felt. The method requires several trained facilitators and is inexpensive. It does not lead to any obvious action to address individuals' needs, but may lead to joint action or projects focused on agreed priorities.

Thysen and Enevoldsen 1994. Visual monitoring of reproduction in dairy herds. Preventive Veterinary Medicine, vol 19, 1994. A method of presenting comprehensive Danish dairy fertility data on computerised graphs for ease of analysis is described. Data are assumed to have already been collected by a thorough recording scheme practised by the farmer. Analysis is performed by a local commercial vet, and aids management decisions.

Turner, 1985. The use of abattoir condemnation data in a pig herd health programme. Proceedings of the Fourth International Symposium on Veterinary Epidemiology and Economics, Singapore, 1985. A study is described whereby abattoir inspection data for South African pigs are related to the source farm to allow measures to be taken by the individual farmer, with veterinary advice, to correct the sub-clinical conditions observed.

Udomprasert and Williamson 1990. The DairyCHAMP program: A computerised recording system for dairy herds. The Veterinary Record, September 8, 1990. DAIRYCHAMP is a computerised dairy longitudinal monitoring system for aiding farm management, with a secondary aim of providing comprehensive data for research. Events are continuously recorded by the farmer with veterinary inputs, and are analysed on-farm or at the veterinary practice. Direct and immediate computer output guides daily management decisions.

Ushewokunze-Obatolu 1992. Data in animal disease monitoring. Zimbabwe Veterinary Journal, Vol 23, No 1. This paper describes the Zimbabwean national disease monitoring system, some of the problems it has faced and likely future developments. Currently it consists of assorted and uncoordinated routine data, collected by several government departments, which are not easily used since its purpose has been largely to report activities rather than to address important issues.
Waltner-Toews, D and Bernardo, T 1993. Record-keeping systems for small-to-medium scale livestock enterprises. In: Daniels, P W et al (eds). Livestock Services for Smallholders: A Critical Evaluation. Proceedings of a seminar held in Yogyakarta, Indonesia, November 1994. CARAPHIN is a versatile longitudinal livestock and agricultural monitoring system designed for use in the Caribbean to facilitate farm management and national policy. Six data collection prototypes allow the system to accommodate all species under a variety of different management systems. It is intended to be a slimline system, appropriate to local circumstances where only information on key indicators is collected on-farm. Logistical details of data collection are not discussed here, but analysis is at two levels of complexity: low-tech visual/graphic by the veterinarian for farm data, and high-tech central computerised analysis for aggregated national records. Feedback is to both individual farmers and national policymakers.

Wongnarkpet et al 1994. Proceedings of the Seventh International Symposium on Veterinary Epidemiology and Economics, Nairobi, 15 - 20th August, 1994. PIGFIX is an expert system for the personal computer which aims to make better use of the comprehensive monitoring data collected through programs such as PIGCHAMP. The analysis substitutes for the interpretative role of the veterinarian, allowing informed management decisions without requiring professional input.

Young, J 1993. In: Daniels, P W et al (eds). Livestock Services for Smallholders: A Critical Evaluation. Proceedings of a seminar held in Yogyakarta, Indonesia, November 1994. Alternative approaches to the identification of smallholder problems and opportunities. An evaluation of a village animal healthcare worker programme was conducted using a range of PRA methods to collect information on all aspects related to livestock from sources including individual and group farmer interviews, review of secondary data, workshops, and VAHW interviews. Data collection and analysis were relatively cheap and simple, requiring trained data collectors, and provided both qualitative and quantitative data covering a period of 10 years.