ALIVE
PARTNERSHIP FOR LIVESTOCK DEVELOPMENT, POVERTY ALLEVIATION & SUSTAINABLE GROWTH

LIVESTOCK SECTOR INVESTMENT AND POLICY TOOLKIT

LSIPT

Manual 2

Modules 3&4
Diagnostic Phase

January 2013

M3

Household level

Module M3: Household level

You should identify the arguments for including livestock production in the poverty reduction strategy paper (PRSP). You have identified the best stakeholders for preparing the strategy and the action plan (M2).

You will now conduct a micro-economic analysis in order to specify the role of livestock production in the household economy and the stakeholders in the sector (M3).

1. Objective

1. Specify livestock production's role and position in the household economy.
2. Identify the household categories for which livestock production represents an essential part of subsistence.
3. Identify the risk factors that increase the vulnerability of households.
4. Evaluate the direct and indirect effects of the livestock production activities on the stakeholders across the livestock value chains.
5. Consider the weight of the institutional and political constraints at a household level.
6. Identify how to increase and secure livestock production's contribution to the household economy in order to improve living conditions.

2. Expected outcomes

This module will provide the following information for the production stage and for value chains of the livestock sector

- Indicators of technical and economic performances of the livestock farming systems, of products processing and marketing activities at household level. Once aggregated, they will be used to develop macro-economic indicators of the performance of the livestock production sector (contribution to national added value, sector's competitiveness) in M4;
- Indicators of impact on the vulnerability of households that will be used for:
- The national analysis of livestock contribution in terms of the objectives of poverty reduction (M4).
- The development of a well-argued message for the "advocacy group" (M2).
- The development of the strategy and the action plan (M5).

- The baseline situation and the indicators of monitoring and evaluation (M6), which provide the basis for envisaging some scenarios of intervention (M5).

3. Method and tools

Methodology

Two options are proposed according to the availability of data in the country:

- **Option 1 "expert method"** : the entire analysis is built around representative groups (typology), where the model's parameters and the results are average indicators for a given group.
- **Option 2 "survey data method"** : the methodology is based on the complementarity that exists between modeling performances of certain types of livestock farming systems (typology) and the analysis of household survey data, with individual observations, which results indicate the heterogeneity of incomes within each type of household studied.

Before starting any activity in this diagnostic phase (M3 and M4), please read the general approach proposed in M3 and M4:

- M3&M4_NOT_1_general_guidelines_EN.pdf

Tools

At the different stages of M3 and M4, several Excel tools are proposed to support your analysis. You can access them individually, but to insure the automatic transfer of parameters and outputs between the different activities of M3 and M4, it is highly recommended that you download them at once through the **zip files** in the "download" section.

Before starting the analysis process, please read carefully the guidelines regarding the use of the excel tools:

- M3&M4_NOT_2_guidelines_Excel_tools_EN.pdf

A table listing all the tools and the interlinkages among them is provided here:

- M3&M4_NOT_3_Tools_list_EN.xlsx

M3&M4_NOT_1_general_guidelines_EN.pdf [176 kB]

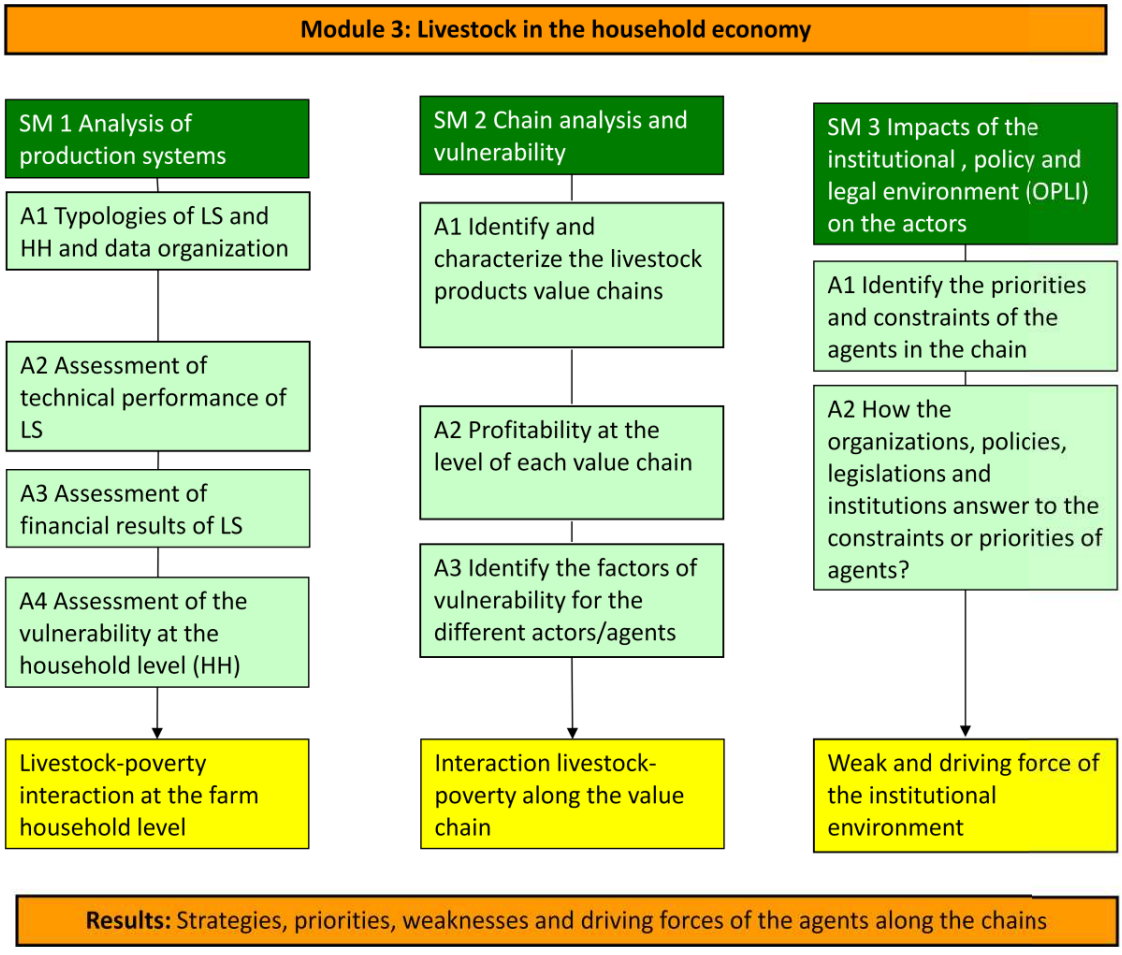
M3&M4_NOT_2_Manual_Excel_tools_EN.pdf [477 kB]

M3&M4_NOT_3_Tools_list_EN.xlsx [15 kB]

4. Sub-modules

- Analysis of the production systems (SM1)
- Analysis of the livestock value chains (SM2)
- Evaluation of the stakeholders' OPLI (SM3)

M3_full_text_EN.pdf [631 kB]



M3&M4_NOT_1_general_guidelines_EN.pdf

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PARTNERSHIP FOR LIVESTOCK DEVELOPMENT, POVERTY ALLEVIATION & SUSTAINABLE GROWTH

GUIDE FOR THE INCLUSION OF LIVESTOCK IN PRSPs

GENERAL GUIDELINES

ANALYSIS: MODULES M3 AND M4

1. ORGANISATION OF M3 AND M4

The two modules that involve conducting the analysis of livestock production in the country (M3 and M4) are organised in a matrix according to two main areas:

- Level of analysis:
  - Micro and Meso for module 3
  - Macro (national) for module 4
- Themes:
  - Identify the main production systems in the country and the representativity of each livestock farming sub-system.
  - The technical and economic performance of livestock farming systems and the economic wealth they generate on a national level (LS)
  - Evaluate the contribution made by the livestock production activities to the household income and living conditions (in terms of financial and food security) and the aggregated contribution for the country.
  - Analyse the organisation of the value chains, evaluate the economic wealth generated along the product-related chains and identify the constraints and opportunities for their future development.
  - Evaluate the sectorial policies and the legal and institutional context to improve further understanding of the actions that could help the livestock production sector.

	M3 (micro / meso)	M4 (macro)
Typology of systems and centralising information	M3-SM1 (A1)	
Technical and financial performance of livestock farming systems (LS)	M3-SM1 (A2, A3)	M4-SM1 (A1, A2)
Household vulnerability and equity (HHI and HHD)	M3-SM1 (A4)	M4-SM1 (A3, A4)
Sector and sectorial opportunities (VC&S)	M3-SM2	M4-SM1 (A1) M4-SM2
Policies and institutions (OPLI)	M3-SM3	M4-SM3

A satisfactory overview of the structure of both modules is important for organising work:

- Establishing typologies (M3-SM1-A1) is an essential activity, which provides the basis for the keys of aggregating livestock production at a macro level. It is important that all members of the expert team start with this activity and agree on results.
- The analysis of the performance of livestock farming systems (LS) precedes that of household vulnerability at the level of M3-SM1. However, they are closely interconnected and should, therefore, be conducted by the same team of experts. They can be conducted independently at the level of M4-SM1.
- The analyses of the sector (M3-SM2) and the sectorial opportunities (M4-SM2) are relatively independent of the previous sub-modules and could be conducted by a different team.
- The OPLI section at the M3 level corresponds to a summary of the results for the preceding sub-modules. Therefore, it should be dealt with once the results from the sub-modules have been checked. At the M4 level, the OPLI section is totally independent from the other activities and could be analysed by an independent team simultaneously. However, make sure that the interactions with modules 2 and 5 are taken into account.

2. TWO OPTIONS PROPOSED

2.1 Two options proposed

Two hypothetical cases have been envisaged for the appraisal depending on access to data bases for conducting the analysis:

- **Option 1**: the country does not have representative household survey data in which data for livestock production and household economics has been collected simultaneously. Therefore, the analysis in module M3-SM1 should largely be based on the expert team's knowledge and the summary of existing data. In addition, every analysis is built around representative groups (typology: see m3_sm1_a1_NOT_typology&data_EN.pptx). The typology's detail (level of disaggregation) is limited by the possibility of obtaining statistics that show the level of representativity for each group.

- **Option 2**: the country does have access to representative household survey data in which livestock production is reasonably well accounted for or else the data could be collected in the framework of this analysis of livestock production (on the basis of aids that are proposed in this guide). The methodology is based on the complementarity that exists between modelling the types of livestock farming systems (conducted on the basis of average / aggregated parameters) and the analysis of household survey data (with continuous data, that is specific to each observation).

Therefore, the household survey data bases are not mandatory for conducting the proposed analysis. However, they do mean that a more detailed analysis can be conducted in terms of household vulnerability. In particular, the fact that income distribution can be reconstituted for the households surveyed means that indicators for poverty (incidence, severity), as well as inequality (GINI coefficient) can be calculated. In addition, the results could be organised according to several types of criteria (livestock farming systems, main household activity, level of global income) according to the needs identified by the team.

Therefore, from M3-SM1-A1, you should choose one of the options. The choice of tools and the processes for data transfer between tools depend on the option chosen.

2.2. The approach: basic principles depending on the two options

Option 1: so-called expert.

- Data:
  - Bibliographical data, surveys (farming, livestock), secondary data or aggregated results from surveys.
- Tools:
  - Download the zip file "Alive_TOOL" on the page "download".
  - M3-SM1:
    - All input and output parameters are synthesized in the synthesis tool in M3-SM1-A1.Select "Option1: without survey data" on the worksheet "About".
    - The analysis of the technico-financial performances of the LS's and household vulnerability will be conducted using the Excel tools proposed in M3-SM1-A2. Select "option1" on the home page "About" for each of these tools.
  - M4-SM4: select "option1" on the worksheet "About" of m4_sm1_a4_TOOL_poverty_inequality.xls
  - For the other models and activities, check that "option 1" has been properly selected when you use the import/export buttons.

Option 2: based on survey systems.

If you wish to work from the household survey data base, there are two possibilities:
Option 2a: Surveys already conducted
Option 2b: Surveys to be carried out in the framework of this analysis.

- Data:
  - Data from individual surveys (raw data), as well as data from bibliographic and secondary surveys.
  - Option 2a. A minimum set of data collected at household level is mandatory (otherwise, choose option 2b): amount of farm land, cropping plan, herd composition (species, size, sex, age), household composition (size, sex, age), amount of off-farm income.
  - Option 2b. Data collected from the questionnaire m3_sm1_a1_TOOL_2b_hhsurvey_questionnaire.xls

- Tools:
  - Download the zip file "Alive_TOOL" on the page "download".
  - M3-SM1:
    - All input and output parameters are synthesized in the synthesis tool in M3-SM1-A1Select "Option2: with survey data" on the worksheet "About".
    - The analysis of the technico-economic performances of the LS's will be conducted using the Excel tools proposed in M3-SM1-A2. Select "option2" on the home page "About" of each of these tools. **Note**: the analysis of **specialised systems** should always be conducted according to the methods in **option 1**.

        - The analysis of household vulnerability should be conducted using a tool specific to this option: m3_sm1_a4_TOOL_households.xls
    - M4-SM4: select "option2" on the worksheet "About" of m4_sm1_a4_TOOL_poverty_inequality.xls
    - For the other modules and activities, check that "option 2" is properly selected when you use the import/export buttons.

3. PRINCIPAL HYPOTHESES AND RECOMMENDATIONS FOR USING THE GUIDE

3.1. Different units of analysis and the corresponding typology have been defined at each stage of the analysis (M3-SM1-A1)

- The agro-ecological zones or **main production systems as defined by Seré & Steinfeld** (**MPS**)
    - The main indicators will be compared here i.e. at the most aggregated level under the national level. The household surveys will also be designed at this level.
    - Typology MPS: grassland systems (LG)/ mixed rainfed (MR)/ mixed irrigated (MI)/ and intensive/specialised.

- **Livestock systems (LS)**
    - The livestock system or the herd is the smallest unit of analysis. The technico-economic performances of livestock production are determined at this level. Once these systems have been aggregated, the contribution made by livestock production to the national economy can be estimated (GDP).
    - Typology: MPS*species*herd size

- **Households (HH)**
    - Key unit for understanding the role of livestock production in poverty alleviation. The role of the dominant herd will be considered (for which intervention could be envisaged), as well as all the animal species reared together.
    - Typologies:
        - **HHD/S:** MPS*dominant species*herd size
        - **HHI**: MPS* main source of income* level of poverty

- **Value chains**
    - The animal product (or commodity) is the unit of analysis at the value chain level.
    - Typology**:** meat / milk / eggs / leather and skin / organic matter / energy

3.2. Technico-financial performance of livestock farming systems (M3-SM1-A2&A3)

- Beware of bias: large herds of cattle. Past experience has shown that considerable attention was focused on large herds and cattle species when livestock production in a country was examined. However, in many parts of the world, most households have only a few head of cattle, which play a vital role in the household economy. In northwest Burkina Faso, for example, two thirds of households have less than 10 heads of cattle.
- Although few references exist that divide technical parameters as a function of herd size, we propose varying the main technical parameters here (herd structure,

offtake rate, etc.) according to herd size. The ECORUM demographic model and survey data will help you estimate these parameters as accurately as possible.

- Inputs and all other input parameters: make sure you use the average value for the livestock farming systems considered and not for a representative farm. For example, for the costs of herd & animals keeping (herder, shepherds..), do use the average cost for producers who employ a herder plus as well for those who do not employ one in the given system; and do not use the average cost of herding for those only who employ just a single herder.
- In the case of 1-20 year forecasts for the technico-financial models for ruminants (ECORUM), the prices of animals and the animal products, as well as the costs of inputs are set at the same amount for the entire period. It is also advisable to consider the average prices for the entire period and not the prices in a given year.

3.3. Calculation of household income (M3-SM1-A4)

- Two different hypotheses for work are considered depending on the chosen option:
- **Option 1**: For the same category of households, the productivity and income per animal is identical, the same applies to the average animal numbers. In this way, the average income from livestock production is estimated for the species studied for all the households in the category.
- **Option 2**: For the same category of households, the productivity and income per animal is identical. The income from livestock production for the species studied varies for each household as a function of the numbers of animals owned.

- Other sources of household income (apart from that from the dominant livestock farming system) consist of:
  - Other livestock farming activities: envisaged for ruminant livestock production systems LG/MR/M, semi-urban dairy and the village traditional monogastric systems (non-ruminant). However, they do not exist for specialised systems (fattening, intensive pigs and poultry).
    - Option 1: average income generated by each species for all the households in the category studied.
    - Option 2: income specific to each household as a function of the other species that are owned.
  - Other On farm activities: envisaged for all the systems.
    - Option 1: average income for all the households in the category studied
    - Option 2: income specific to each household estimated as a function of the area of land cultivated and the average yields in the main production systems MPS.
  - Off-farm activities: envisaged for all the systems.
    - Option 1: average income for all the households in the category studied
    - Option 2: income specific to each household.
- During the analysis of the technico-financial performances of traditional monogastric non-ruminant systems (P1OM, P2OM, V1OM, V2OM), the systems are analysed independently of the MPS. The hypothesis is that a traditional pig/poultry system within a pastoral system functions in the same way as a traditional pig/poultry system in a mixed rainfed or irrigated zone. During the

analysis of household vulnerability (M3-SM1-A4), in the case of option 2, we will analyse the economy of households with dominant traditional non-ruminant systems in each of the three main zones (MPS). The results will then be aggregated within a single system in module 4 (calculation of GDP, inequalities, etc.).

- The analysis of household income with specialised livestock production systems is **always** conducted according to the methods set out in **option 1** (even when you choose option 2). No survey system is planned in this case.

3.4. Sectorial analysis (M3-SM2)

- Calculations of the flows of animal products circulating in the commercial value chains: there has to be a trade-off between the national statistics and the flow of potentially commercialised products as calculated in the guide (production – home-consumption – direct sales to consumers).

M3 and M4 technical note
Management and use of Excel tools

Summary:

1. Setting the computer environment
2. Organising the Excel files
3. Selecting the buttons according to the option chosen (Option 1/ Option2)
4. Reporting the parameters/results between Excel files (Import - Export).

M3&M4_NOT_2_Manual_Excel_tools_EN.pdf

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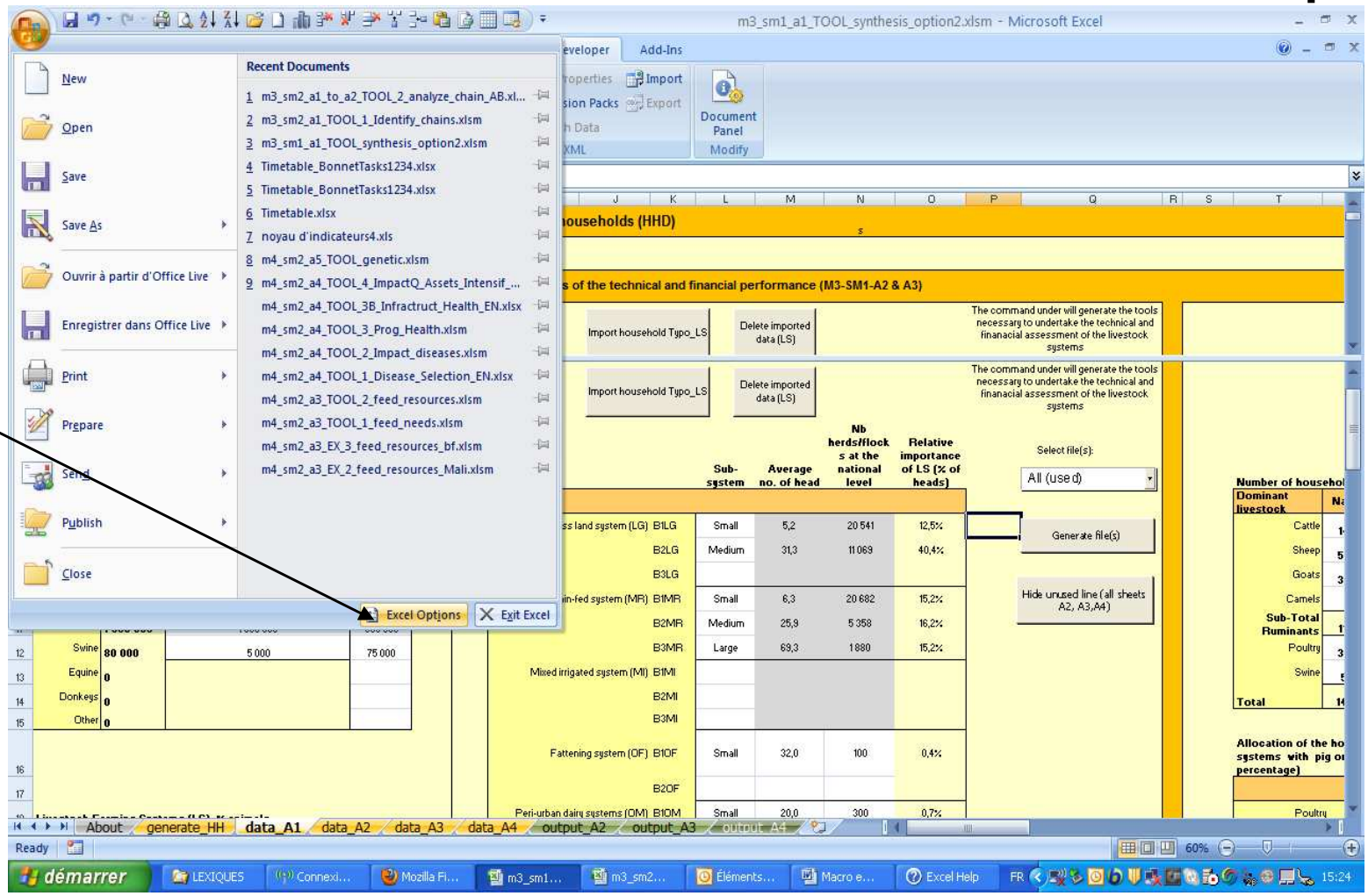
Introduction

- The tools proposed in the framework of the modules M3 and M4 have been specially designed so that they are easy to modify and adapt to users' needs.
- Nonetheless, some tools are closely linked: the results (outputs) for some correspond to the input parameters for others.
- Reporting parameters / data between tools is automatic in the modules M3 and M4.
- This requires respecting certain rules for managing the "tools" files.

1. Computer environment

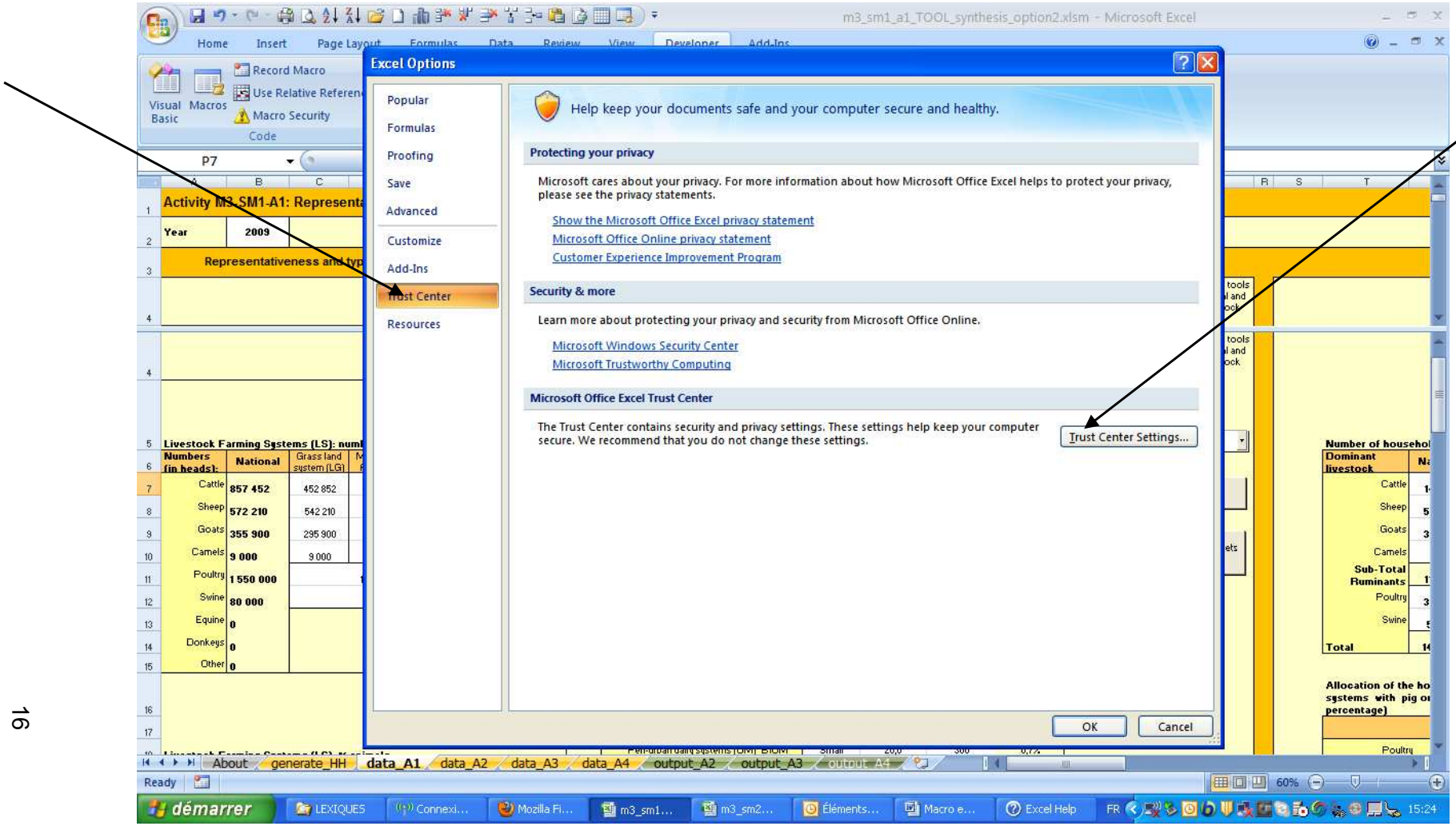
- Excel 2007
- Activate the macros:

1. Click the **Microsoft Office Button** , and then click **Excel Options**.



1. Computer environment: activate the macros (con't)

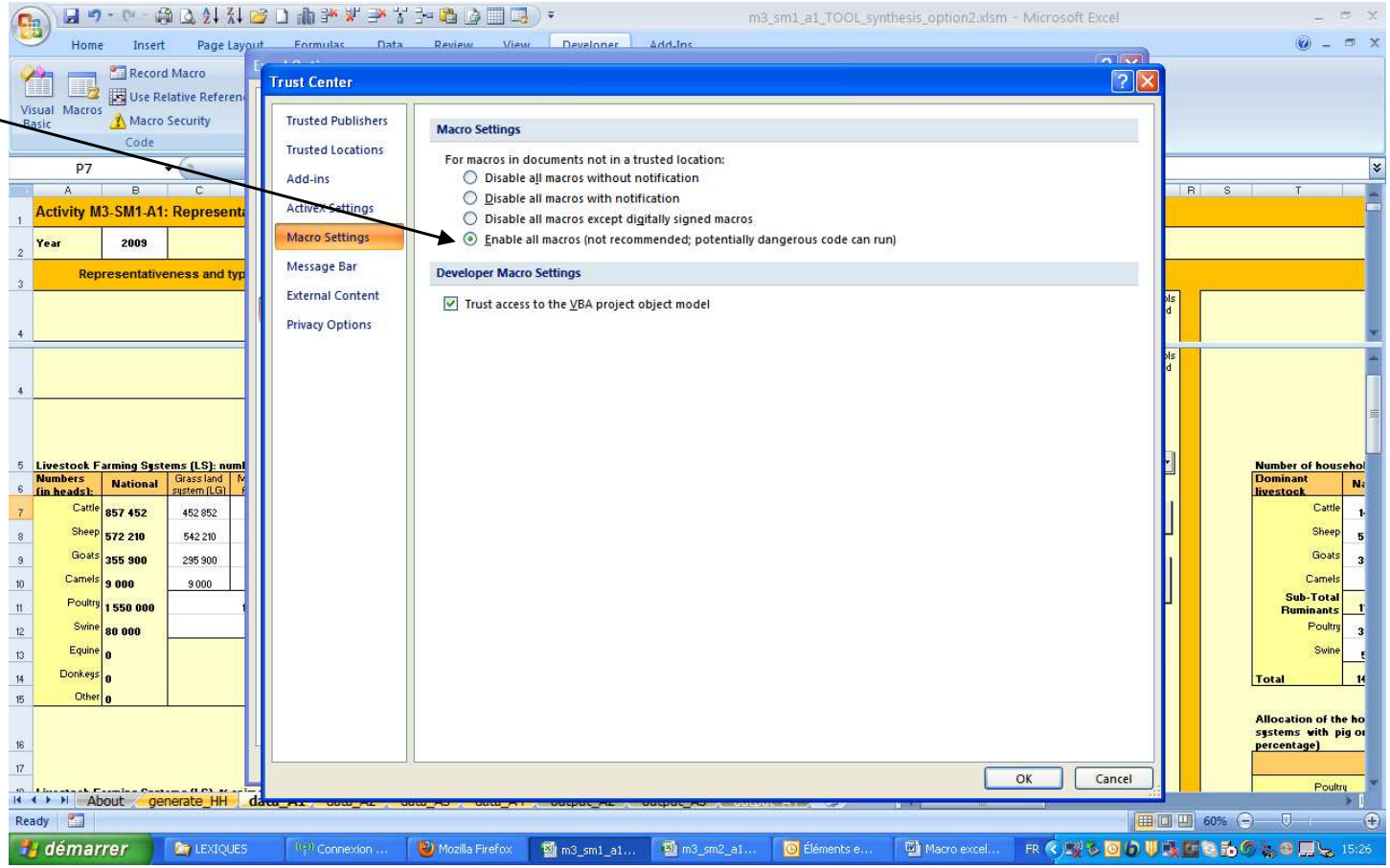
2. Click **Trust Center**, click **Trust Center Settings**, and then click **Macro Settings**.



1. Computer environment: activate the macros (con't)

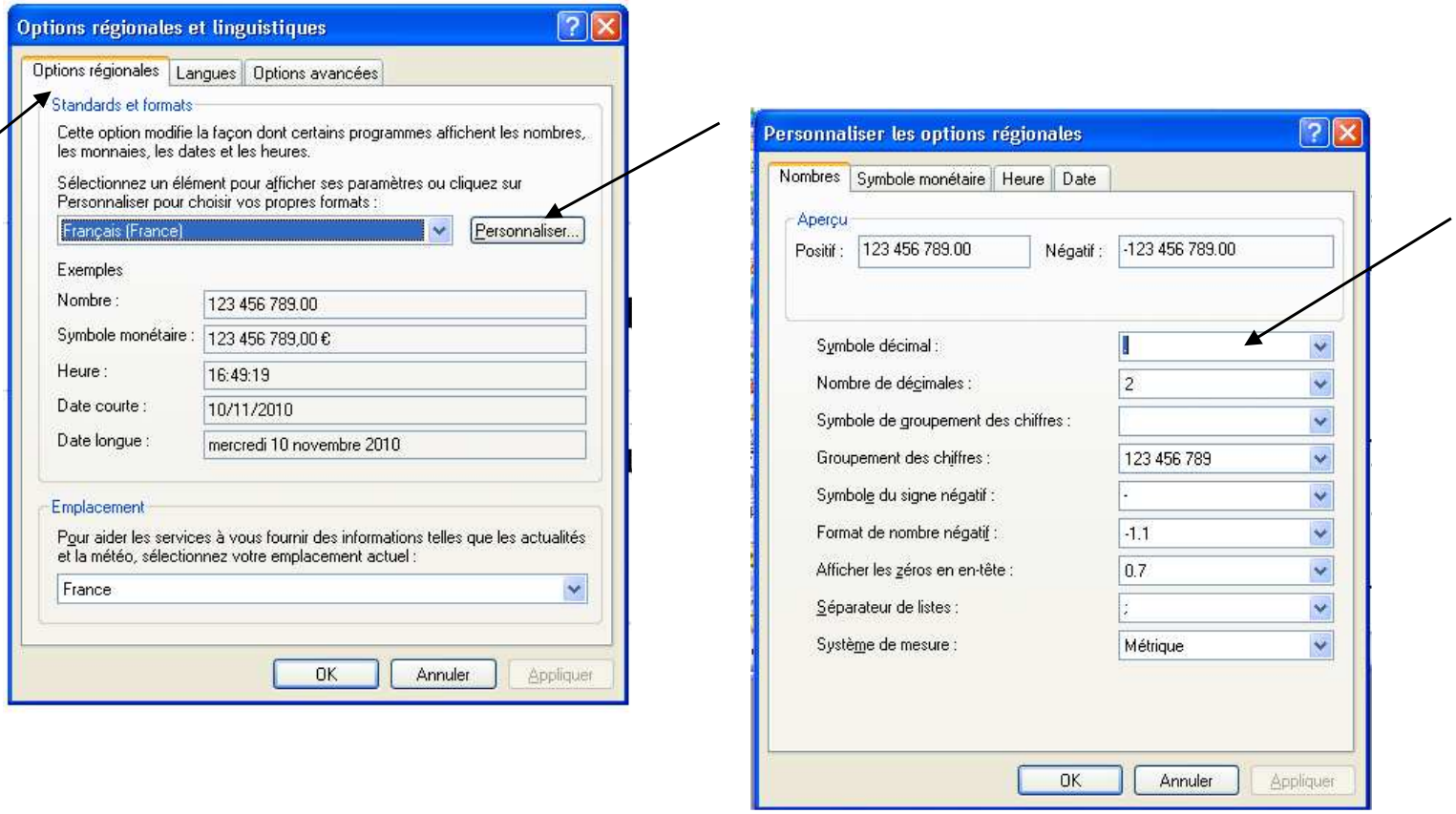
3. Click the options:

   – **Enable all macros (not recommended, potentially dangerous code can run)** Click this option to allow all macros to run. This setting makes your computer vulnerable to potentially malicious code and is not recommended.



1. Decimal Separator: the point

- If the decimal separator is not the point by default (Anglo-Saxon Word environment)
- Select the regional and linguistic options in the control panel. Then:



2. Organising the Excel files

The Excel tools are named: “mx_smx_ax_TOOL_xxx.xlsm”

Download the tools from the ‘Download’ page online:

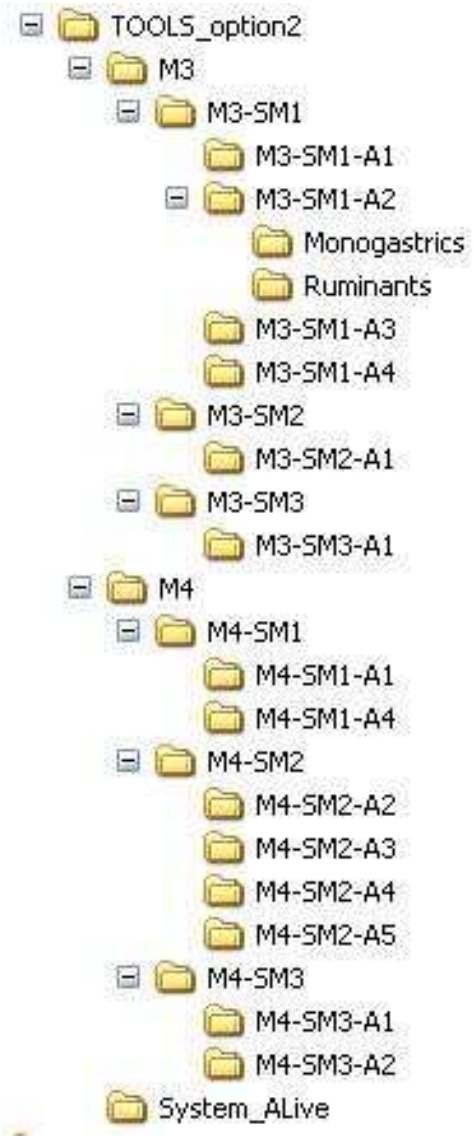
- They are organised according to a **SET tree structure**
- Make sure that the commands for transferring parameters between files are working.
- **Do not modify the location of the files**

Certain tools are illustrated with examples: “mx_smx_ax_EX_xxx.xlsm”

- They are accessible online directly from each activity page

- **Do not use them for your own analysis** as they might not be formatted with the last version

2. Tree structure



Refer to
M3&M4_NOT_3_EN.xls
for a full list of tools.

2. Multiplying Excel tools

- During some stages, you are requested to create/multiply the tools
- Objective: to facilitate the downloading of tools and future management of files (file coding)
- The source files are in the folder “System Alive” (extension .modz): these files should never be modified or moved.
- Example:
  - M3-SM1-A1: the files “m3_sm1_a4_TOOL_households” (option 2)
  - M3-SM1-A2: the files “m3_sm1_a2_TOOl_ruminants / village_chicken / pigs_mixed”
  - M3-SM2-A1: the files “m3_sm2_a2_TOOL_analyse_chain”

3. Special features of tools depending on the chosen option: Option 1 / Option2

- Some files only exist in relation to a specific option:

  m3_sm1_a4_TOOL_households (option 2 only)

- Some files propose two sections depending on the option chosen (select “option 1” or “option 2” in **About**)

  m3_sm1_a1_TOOL_synthesis

  m3_sm1_a2_TOOL_ruminants

  m4_sm1_a4_TOOL_poverty_inequality

- Some buttons (import) are specific to the option chosen (select the **button** “Import option 1” or “Import option 2”).

  m3_sm3_a1_TOOL_HH&VC

  m4_sm1_a1_TOOL_GDP

4. Automatisation of reports

In some files (such as m3_sm1_a1_TOOL_synthesis) you will find the buttons “import data” or “export data”.

They make it possible to transfer parameters or results (outputs) to/from other files.

The aim of automatisation is to facilitate:

- The input of parameters in the Ecorum files
- The internal report within the files M3-SM1-A2/A4
- The data report between tools (for example between the analysis of livestock farming systems LS and that of value chains or between the analysis of LS performances and the calculation for GDP)
- The summary of results (m3_sm1_a1_TOOL_synthesis)

5. Golden rules

- Organising the files
  - Respect the files' tree structure
  - Never change the file names
  - Do not modify or move the files "*.modz" in the folder "System Alive"
- Import/Export Process
  - Save the source file(s) before starting the process
  - Wait until the task has been carried out (do not start any other operations in other files).
- Examples:
  - Do not use the example files (EX) to build your analysis (they may not be based on an up-to-date version of the tools).

Listing and organization of M3 & M4 tools (Excel files "TOOL")

Objective / Description	Tool names	Nb files*	LS tools	HH tools	VC tools
M3: Micro and meso economy					
Develop multiple indicators of technical and economic performances of the livestock systems, of products processing and marketing activities at chain level, and impact on the vulnerability of households					
M3-SM1 Analyze the livestock and household systems					
M3-SM1-A1: Typologies and data management					
Synthesizes all input and output parameters from LS and HH analysis	m3_sm1_a1_TOOL_synthesis.xlsm		X	X	X
M3-SM1-A2: Performance of livestock systems (LS)					
ECORUM: assess the performance of ruminant systems (bovine, ovine, caprine, camel) with 20 years demographic projection.ears.	m3_sm1_a2_TOOL_ruminant.xlsm	36		S	S
Performance of ruminant fattening systems (bovine, ovine)- one year analysis	m3_sm1_a2_TOOL_ruminant_fattening.xlsm	4		S	S
Performance of poultry backyard systems (meat and eggs production integrated) - one year analysis.	m3_sm1_a2_TOOL_chicken_village.xlsm	2		S	S
Specialized broiler units (one year analysis)	m3_sm1_a2_TOOL_chicken_modern_broiler_V2OF.xlsm	1			S
Specialized layer units (one year analysis)	m3_sm1_a2_TOOL_chicken_modern_eggs_V2OL.xlsm	1			S
Performance of pig backyard systems (production and fattening integrated) - one year analysis.	m3_sm1_a2_TOOL_pig_mixed.xlsm	2		S	S
Specialized fattening units (one year analysis)	m3_sm1_a2_TOOL_pig_fattening_P2OF.xlsm	1			S
Specialized breeding units (one year analysis)	m3_sm1_a2_TOOL_pig_production_P2OS.xlsm	1			S
M3-SM1-A3: Financial performance					
In 'Diagnostic' sheet of tool	Financial perf: same tools than *M3-SM1-A2*				
Assess the crop systems (net income from various crops) and draft animal cost structure	m3_sm1_a3_TOOL_crops.xlsm				
M3-SM1-A4: Household vulnerability (HH)					
	Option1: *With M3-SM1-A2*				
Once raw household survey data entered by S&S systems, generate the LS and HH typologies and automatically derive vulnerability indicators	Option2: m3_sm1_a4_TOOL_household.xlsm	3			
M3-SM2 Analyze the livestock value chains					
M3-SM2-A1: Value chain characterization (VC)					
Identify main commodity chains in the country and generate files	m3_sm2_a1_TOOL_1_Identify_chains.xlsm				
Conduct a financial analysis of the commodity chains once sub-chains are characterized	m3_sm2_a1_to_a2_TOOL_2_analyze_chain.xlsm	14			
Summarize all import/export statistics of animal products	m3_sm2_a1_TOOL_3_import_export.xlsm				
Overview of the availability and quality of livestock market infrastructure	m3_sm2_a1_TOOL_4_Market_Infrastructure.xlsx				
Synthesize the non-price international competitiveness of animal product chains	m3_sm2_a1_TOOL_5_competiveness.xlsx				
M3-SM2-A2: Performance value chains					
	With 2_analyse chain				
M3-SM3 Evaluate the stakeholders' OPLI					
M3-SM3-A1: synthesis					
Assess the relative contribution of each household categories to each animal product chain	m3_sm3_a1_TOOL_HH&sector.xlsm		S	S	S

M3&M4_NOT_3_Tools_list_EN.pdf

Listing and organization of M3 & M4 tools (Excel files "TOOL")

	Objective / Description	Tool names	Nb files*	LS tools	HH tools	VC tools
M4: Livestock in the national economy						
	Evaluate the contribution made by the livestock sector to the national economy and its potential for growth					
M4-SM1	**Specify the livestock sector's contribution to the creation of wealth (GDP), food security, and the reduction of poverty and inequalities**					
	M4-SM1-A1: GDP					
	Assess total value added generated by the livestock sector at the production stage and downstream value chain	m4_sm1_a1_TOOL_GDP.xlsm		**S**		**S**
	M4-SM1-A2: indirect GDP					
	Assess contribution in terms of employment and environmental services and diservices	m4_sm1_a2_TOOL_INDIRECT.xlsm			**S**	**X**
	M4-SM1-A3: Food safety					
	Assess current suply/demand of animal products	*With GDP*			**S**	**X**
	M4-SM1-A4: Poverty					
	Assess poverty incidence and inequality at national level	m4_sm1_a4_TOOL_poverty_inequality.xlsm			**S**	
M4-SM2	**Simulate the livestock production sector's potential**					
	M3-SM2-A1: Demand & supply projections					
	Project supply/demand of animal product in 15 years horizon	*With GDP*				
	M3-SM2-A2: Competitiveness					
	Estimate the Domestic Resource Costs Ratio of main animal commodity	m4_sm2_a2_TOOL_DRC.xlsm		**(X)**		
	A Policy Analysis Matrix for animal products	m4_sm2_a2_TOOL_PAM.xlsm		**(X)**		
	M4-SM2-A3: Feeds					
	Evaluate the feed requirements of the national herd	m4_sm2_a3_TOOL_1_feed_needs.xls				
	Simulate the feed resources available at the national level	m4_sm2_a3_TOOL_2_feed_resources.xlsm				**X**
	M3-SM2-A4: Health					
	Select animal diseases according to their national importance	m4_sm2_a4_TOOL_1_Disease_Selection.xlsm				
	Assess the impact of a selection of animal diseases in terms of "assets", "markets and VC" and "intensification"	m4_sm2_a4_TOOL_2_Impact_diseases.xlsm				
	Inventory animal health preventative programmes and OIE Standards	m4_sm2_a4_TOOL_3_Prog_Health.xlsm				
	Inventory the major animal health infrastructures and measure their activity	m4_sm2_a4_TOOL_3B_Infractruct_Health.xlsm				
	Quantitatively assess animal diseases that exacerbates assets insecurity and hamper intensification	m4_sm2_a4_TOOL_4_ImpactQ_Assets_Intensif.xlsm		**(S)**	**(S)**	**(S)**
	M3-SM2-A4: Genetic					
	Inventory and characterize animal genetic resources	m4_sm2_a5_TOOL_genetic.xlsm		**(X)**		
M4-SM3	**Appraisal of the political and institutional environment in the livestock production sector**					
	M4-SM3-A1: Policies					
	Appraisal of policy instruments	m4_sm3_a1_TOOL_policies.xlsm				
	M4-SM3-A2: Institutions					
	Institutional diagnostic	m4_sm3_a2_TOOL_institutional_diagnosis.xlsm				

* refers to files that need to be generated accoring to the number of systems (LS, HH or VC) to be studied
X: direct link
S: link through m3_sm1_a1_TOOL_synthesis.xlsm tool

Sub-module M3-SM1: LS performance & HH vulnerability

You will study the economy of households involved in activities linked to livestock production (module M3) in order to identify the arguments to support the inclusion of this sector in the poverty reduction strategy paper.

Here (M3-SM1), you should work at the level of production systems where you will first study the livestock farming systems, then the income structure and the vulnerability of households. Thus, you will obtain an overview of the interactions between poverty and livestock production at the level of the production stage.

1. Objective

- Identify the livestock farming systems that represent the diversity of the constraints and opportunities for households having a livestock production activity and determine their relative technical and financial performances.
- Identify the households for which livestock production represents a priority in terms of their living conditions using the weight represented by livestock production in their income and overall level of vulnerability.

2. Expected outcomes

A grid to evaluate the technical and financial performances of livestock farming systems and the household vulnerability. The main indicators provided are:

- The technical performances of the livestock farming systems: level of inputs used, simulation of levels of livestock production yields (meat, milk) including its derivatives (organic matter, animal energy);
- The financial performances of the livestock farming systems: gross margin, net margin, rate of profitability;
- The contribution made by the livestock production activities to the households' income and living conditions (in terms of food and monetary security).

This analytical grid provides a visual representation of the levels of poverty for each household category considered on the basis of the differences (negative or positive) between the household income and the poverty threshold determined by the poverty reduction strategy paper (PRSP). It also provides elements for consideration concerning

the interactions between livestock production and poverty, particularly in terms of the income generated and food security.

Activity M3-SM1-A1: Typologies and data management

You will conduct the very first step of this phase of the analysis using the modules M3 and M4. This step is essential because it sets the basic principles and organisational methods for the analysis, as well as the units/groups of stakeholders targeted by the interventions.

1. Objective

- Identify and determine the representativity at the national level (as % of numbers) of the livestock production systems (LS) that have similar functions/production methods and, consequently, which are likely to share the same concerns in terms of socio-economic constraints and have similar options for improvement. The study of technical and financial performances (M3-SM1-A2 and M3-SM1-A3, respectively) will be conducted for each LS.
- Identify and determine the representativity at a national level (as % of households) of the households (HHD) that have the same dominant livestock production system and, consequently, are likely to share the same constraints and options for improving their living conditions. The study of poverty and vulnerability (M3-SM1-A4) will be conducted for each HHD.
- Organise and concentrate all the input and output parameters for the models in order to facilitate summarising and comparing the results, as well as the transfer of data between the different tools in M3-SM1 and with the M4 tools.

2. Expected outcomes

1. A typology of the livestock production systems, which reflects the diversity and representativity of the livestock production systems at a regional or national level.
2. A typology of households with a livestock production activity, which reflects the diversity and representativity of households on a regional or national level
3. A main file that centralises the input parameters and the results from the tools proposed in M3-SM1.

Example of a typology for dairy systems in Uganda:

- m3_sm1_a1_OUT_typo_Uganda.pdf

m3_sm1_a1_OUT_typo_Uganda.pdf [212 kB]

3. Method and tools

Using the main livestock production systems defined by Serré and Steinfeld (1996), the guide proposes defining three sub-systems (LG, MR, MI) as a function of the agro-ecological conditions within each one:

- Livestock production systems (LS) defined according to the animal species and the sub-systems as a function of herd size.
- Household categories (HHD) defined according to the dominant species reared, as well as its herd size. These different household categories can be defined and characterised using a so-called expert approach (Option 1) or a system for surveying households (Option 2).

Using these typologies, the guide proposes a method for extrapolating data on a national scale, with a view to aggregating the results per LS in order to calculate GDP (M4-SM1-A1) or aggregating the results per HHD in order to calculate the indicators of nutritional security, poverty and inequality (M4-SM1-A3 and A4).

The "synthesis" tools proposed centralise all the automatic transfer links between the M3 and M4 tools, which makes aggregation easier.

Methodological guides:

- m3_sm1_a1_NOT_typology&data_EN.pdf
- m3_sm1_a1_NOTC_steps_EN.xlsx

Tools:

- Option 1: Worksheet "Data_A1" of m3_sm1_a1_TOOL_synthesis.xlsm (select option1 in About)
- Option 2:
  - Worksheet "Data_A1" of m3_sm1_a1_TOOL_synthesis.xlsm (select option2 in About)
  - Worksheets "Option2a/b" and "Typo_LS" of m3_sm1_a4_TOOL_household.xlsm
- Option 2b: m3_sm1_a1_TOOL_household_survey_option2b_EN.xlsm

m3_sm1_a1_NOT_typology&data_EN.pdf [560 kB]

m3_sm1_a1_NOTC_steps_EN.xlsx [15 kB]

4. Further information

Going further: Three methods for conducting a typology of production systems: segmentation / expert / automatic classification.

- m3_sm1_a1_ANN_typo_methodology_EN.pdf

m3_sm1_a1_ANN_typo_methodology_EN.pdf [456 kB]

m3_sm1_a1_NOT_typology&data_EN.pdf

Methodological Note
Typologies and data management

Activity M_3-SM_1-A_1

1. Objectives:

1. Typology of livestock farming systems (LS) and households (HH)
2. Organise the summary of the models' input parameters and the results (outputs) generated.

2. Basic notions

3. Organisation of the sub-module M3-SM1 and basic principles

4. Methods: identifying typologies

5. Method: Estimating the representativity of each LS and HHD on a national level

6. Details of steps to follow

Reminder: before starting, have you read the **general approach** and the instructions for **using the tools** **M3&M4 carefully?**

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1. Objectives

The objective in the first activity is **twofold**:

- To obtain a clear idea of the diversity of livestock farming systems (LS) and households (HH) in the main agro-climatic zones concerned with a view to analysing the vulnerability of households and the potential of production systems in terms of poverty alleviation.
- To summarise the information at the level of the sub-module M3-SM1, particularly the data that will be used as input data for the models in A2, A3, A4 and the results generated in order to facilitate:
  - the supply of input parameters for numerous files of tools
  - the transfer of results from one activity to another (the outputs of one tool sometimes constitute the inputs of another tool) within M3-SM1 and later with the M4-SM1 tools
  - the analysis of the variability of results between LS and HH, using the intermediary data summary tables.
  - Back to index

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2. Basic notions

The characterisation of production systems PS is based on different fundamental concepts:

- Livestock farming system
- Crop production system
- Production system
- Household
- Typology
- Functional typology
- Structural typology

Continue to 3. Methods
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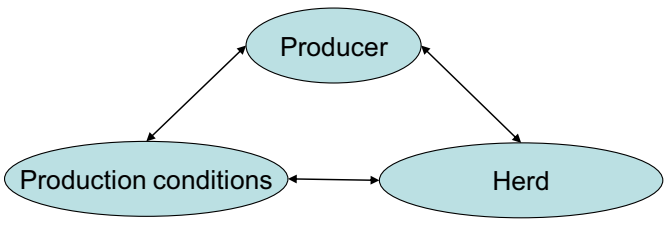
A livestock farming system

A livestock farming system is defined as the interaction between 3 “poles”, namely the producer, the herd and the production conditions (land etc..) in order to meet the needs of economic efficiency, social status and natural resource management

A livestock farming system can also be a production system that only focuses on the livestock production activity



Diagram

A crop production system

A crop production system is defined “as a series of technical itineraries, in other words ordered and dated successions of cropping practices and techniques applied to plant species that are cultivated to obtain products for sale or transfer”.

Source: Sébillotte, 1994, Agronomie et agriculture. Essai d’analyse des tâches de l’agronome, cah. ORSTOM sér. Biol., n°24: 3-25

A production system

“On a farm scale, the production system can be defined as the combination (in space and time) of the available resources, and of plant or animal productions themselves.

It can also be conceived as a more or less coherent combination of different productive sub-systems:

(i) crop production systems, defined at the level of a plot or groups of plots that are treated in a homogenous way (...);

(ii) livestock farming systems, defined at the level of herds or parts of herds (lots);

(iii) “on-farm” primary processing systems for agricultural (including livestock) products.

Source: “Les projets de développement agricole - Manuel d’expertise” (Dufumier, 1996)

A household

"The household is the basic unit of residence within which economic production, consumption, inheritance, children's education and housing are organised and achieved"

Source: Haviland, W.A. (2003). *Anthropology*. Wadsworth: Belmont, CA.

The following are analysed at a household level:

- the diversity of sources of income from livestock production (species, products)
- livestock production's contribution as a source of income
- livestock production's contribution as a source of cash flow
- livestock production's contribution as a source of calories and proteins in household food consumption
- livestock production's contribution to family and salaried employment.

Typology

A typology is an approach that seeks to identify homogeneous groups of individuals (farms) that are similar in terms of their structure or function:

- ❑ notion of structural typology
- ❑ notion de functional typology

Structural typology

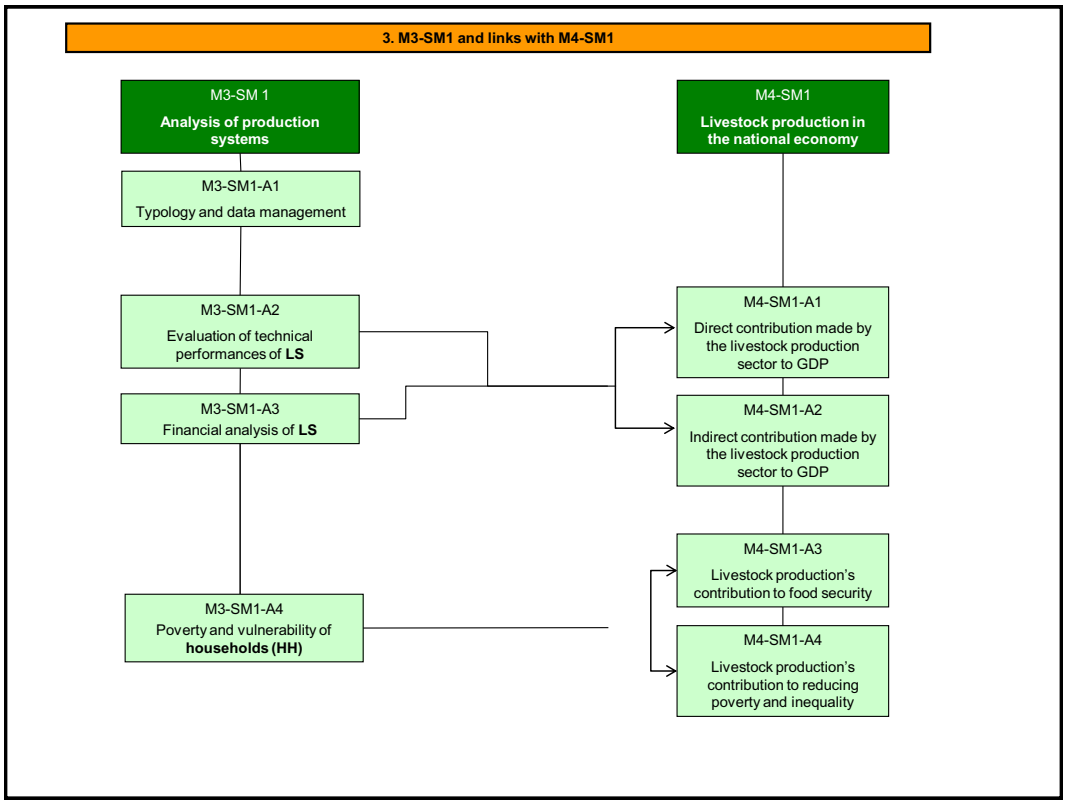
Structural typology:

- Meets objectives for identifying types based on farm structure, farm size, herd composition or plot distribution as a function of their use.
- Generally reflects the economic "weight" of farms (typically, the "large", "medium" and "small") or their main livestock production method ("nomadic pastoralists", "sedentary producers", "agro-pastoralists", etc.).
- Structural typologies are rather static. However, when developed at intervals of several years, they can be used to identify structural trajectories (changes).

Functional typology

Functional typology:

- Meets objectives for identifying types based on the diversity of practices, herd management method, mobility or feeding management, health care or culling practices.
- Generally reflects systems of practices (typically "traditional livestock production", "modern systems" or "systems undergoing intensification") or the farmers' socio-economic goals ("savers", "opportunists" or "diversified").
- Functional typologies are rather dynamic and can show changes in practices over several years.



3. Basic principle for defining typologies

- The analysis essentially concerns the systems of production, however it focuses on two main levels in this sub-module:
  - livestock farming system (LS)
  - household (HH)

  A specific typology corresponds to each level of analysis (LS/HH).

- Semi-fixed typologies:
  - There are different methodological approaches for developing a typology (see file: m3_sm1_a1_ANN_typo_methodology_EN.pdf)
  - The overall structure has been fixed to ensure that parameters/results are automatically transferred from one tool to another.

- LS and HHD typologies are identified:
  - Simultaneously if option 1
  - LS for M3-SM1-A1 and HHD for M3-SM1-A4 if option 2

3. Organisation of M3-SM1 and links with M4

- M3-SM1 is organised into 4 activities corresponding to 4 stages of the analysis:
  - A1: Identify the main production systems in the country and the representativity of each livestock farming sub-system
  - A2: Evaluate the technical performances of the livestock farming systems: level of inputs used, simulation of yields levels of animal production (meat, milk) and its by-products (organic matter, animal energy/power)
  - A3: Evaluate the economic performances of the livestock farming systems: gross margins, net margins, rate of profitability
  - A4: Evaluate the contribution made by livestock production activities to household income and living conditions (in terms of monetary and food security).

3. Organisation of M3-SM1 and links with M4

- M3-SM1-A2&A3 focus on the analysis of livestock farming systems (LS) by estimating the production generated by each system (meat, milk, skins and wool, manure, energy) and the resulting net income.
  - These elements are aggregated in the tool M4-SM1-A1 in order to calculate the direct and indirect contributions made by livestock production to the national GDP. Within this framework, it is the distribution of the numbers of animals in the LS, which is key to aggregation.
- M3-SM1-A4 considers the production system, as well as the overall household economy (agricultural and non-agricultural activities) in order to analyse livestock production and its interaction with the financial and food vulnerability of households.
  - The main results will then be aggregated at the national level in the activities M4-SM1-A3 and A4. For this, the households can be grouped according to the production system: size of dominant herd (option1&2), composition of herds with several species (option2) or according to a household typology: according to the household's main activity or to their level of income (option2).

4. Methods: identifying typologies

Stage 4.1: Define each main production system (MPS)

Stage 4.2: Define the livestock farming systems (LS)

Stage 4.3: Define the types of households (HH)

Note: all the typologies are shown in the file
m3_sm1_a1_NOTC_typo&steps.xlsx

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Stage 4.1- the main production systems: methodological choices

- The guide proposes using the main ruminant systems identified by Seré and Steinfeld (1996).
  - Grassland systems (LG)
  - Mixed rainfed (MR)
  - Mixed irrigated (MI)
  - Specialised or landless (LL/ LS in the guide)
- For the short cycle systems, the guide distinguishes between
  - Traditional systems
  - Specialised intensive or industrial systems.

Table 1. Livestock production systems—description and examples (Seré and Steinfeld, 1996)

First System Breakdown	Second Breakdown	The Eleven Systems	Examples
Grassland-based systems (LG): >90% of dry matter fed to animals comes from rangelands, pastures, annual forages and purchased feeds and < 10% of total value of comes from crops. Annual average stocking production rates are <10 livestock units (LU) ha^{-1} agricultural land (i.e. high degree of importance of livestock in farm household economy, relatively high land $head^{-1}$ of cattle)		1. Temperate and tropical highlands (LGT)	• Mongolia's steppe system • Dairy systems near Bogota, Colombia; Peru and Bolivia Altiplano camelid and sheep-grazing systems • Chinese Merino wool sheep on communal grazing
		2. Humid/subhumid tropics and subtropics (LGH)	• Extensive ranching South American lowlands • Ranching systems in West and Central Africa • Amazonian ranching
		3. Arid/semi-arid tropics and subtropics (LGA)	• Pastoralists in the Sahel • Near East and North Africa pastoralists • Beef–milk systems on pastures in Mexico, Venezuela • Southern Africa ranches
Mixed farming systems (M): >10% of the dry matter fed to animals comes from crop by-products and stubble or >10% of the total value of production comes from non-livestock farming activities (i.e. another source of income besides livestock, relatively low land $head^{-1}$ of cattle)	Mixed rainfed systems (MR): > 90% of the value of crops comes from rainfed land use	4. Temperate and tropical highlands (MRT)	• Smallholder peasant farmers in northern China • Smallholders in Ethiopian highlands where oxen for traction are important • Mixed crop–livestock smallholders in highlands of Central and South America • Small-scale peri-urban dairy farmers in East African highlan
		5. Humid/subhumid tropics and subtropics (MRH)	• Areas of South America where rainforests are being clear
		6. Arid/semi-arid tropics and subtropics (MRA)	• Large areas of SSA (tsetse 'belt') • Dryland farming–sheep systems in WANA and India • Small ruminant–cassava systems in northeastern Brazil • Mixed crop–livestock farms in Burkina Faso, Nigeria • Dairy farms in Senegal and Mali
	Mixed irrigated (MI): > 10% of the value of crops comes from irrigated land	7. Temperate and tropical highlands (MIT)	• Mediterranean region • Far-East Asian irrigated rice/dairy farms
		8. Humid/subhumid tropics and subtropics (MIH)	• Irrigated rice–buffalo systems of The Philippines, Vietnam and India • Irrigated rice, pig and poultry enterprises in Asia
		9. Arid/semi-arid tropics and subtropics (MIA)	• Small-scale buffalo milk production, Pakistan and India • Animal-traction based cash-crop production in Egypt and Afghanistan • Intensive dairy systems in California, Israel, Mexico
Landless (LL): <10% of the dry matter fed to animals is produced on the farm where the livestock are located, and where annual average stocking rates are above 10 LU ha^{-1} of agricultural land		10. Landless mono-gastric systems (LLM): where value of production of the pig/poultry enterprise is higher than that of the ruminant enterprises	• Pig production in Asia • Poultry production in Central and South America
		11. Landless ruminant systems (LLR): where value of production of the ruminant enterprises is higher than that of the pig/poultry enterprises	• Landless sheep production systems in WANA • Sheep-fattening operations in Syria or Nigeria (peri-urban dairy systems are not included here because the manure is typically used on home gardens or used as fuel and feeds)

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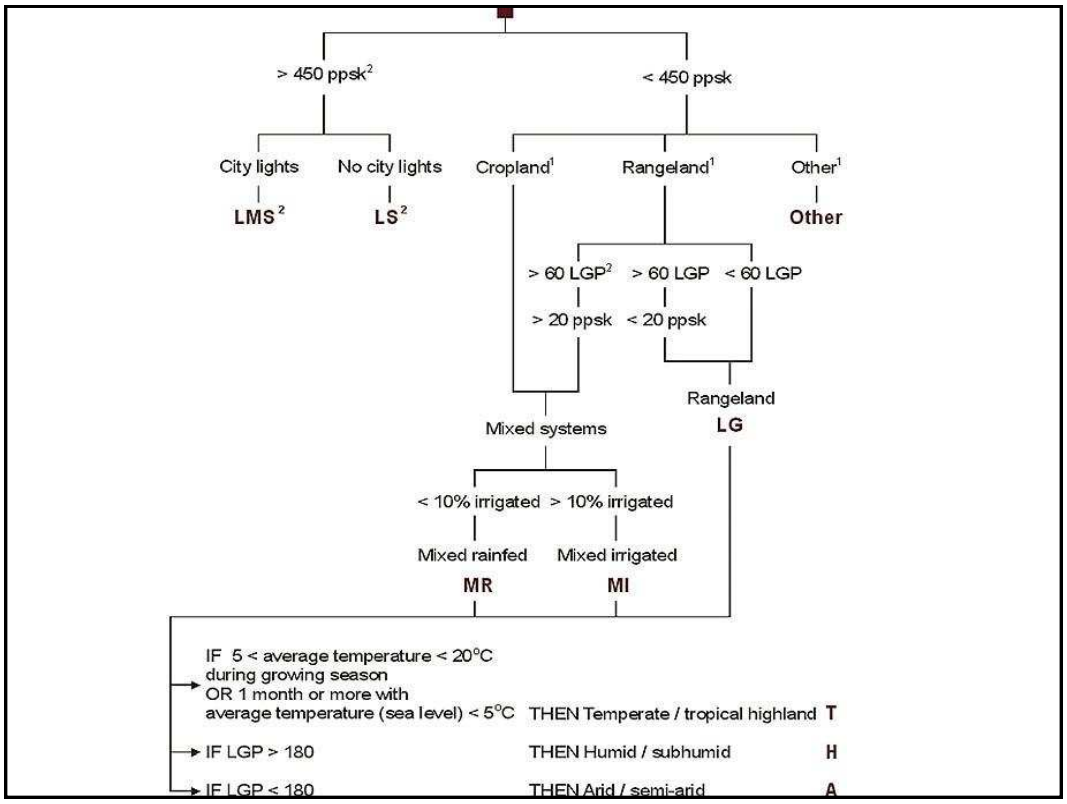

Stage 4.2- the livestock farming systems (LS): methodological choices

- First, the livestock production systems are defined according to the main production systems (LG / MR/ MI/ O /LS) and the main animal species (cattle, sheep, goats, camels, poultry, pigs) and the marginal species (donkeys, horses, other).

Stage 4.2. Livestock systems (LS): the species

- Grassland systems (LG)
  - cattle, sheep, goats, camels
- Mixed rainfed (MR)
  - cattle, sheep, goats, camels
- Mixed irrigated (MI)
  - cattle, sheep, goats, camels
- Other rural (O)
  - Traditional poultry
  - Mixed pigs
- Specialised systems (L(M)S)
  - Ruminants (fattening / Semi-urban dairy)
  - Poultry (layers / broilers)
  - Pigs (piglet production / fattening)

Fish excluded!

Stage 4.2- livestock farming systems (LS) continued…

- You should then define the sub-systems. As shown in the bibliography, there are tremendous differences in management and performance depending on herd size.
  - Option 1: we strongly recommend choosing the criterion for average herd size
  - Option 2: this criterion is chosen by default.

Stage 4.2: A rule for the guide

To link module 3 and module 4, the number of livestock farming systems should not exceed a certain number for each species.

	Grassland(LG)	Mixed rainfed(MR)	Mixed irrigated(MI)	Fattening systems (FAT)	Semi-urban dairy systems
Cattle	3	3	3	2	2
Sheep	3	3	3	2	
Goats	3	3	3		
Camels	3	3	3		

	Traditional systems	Laying systems	Broiler systems	Young animal breeding system	Fattening system
Poultry	2	1	1		
Pigs	2			1	1

	System
Donkeys	1
Horses	1
Other	1

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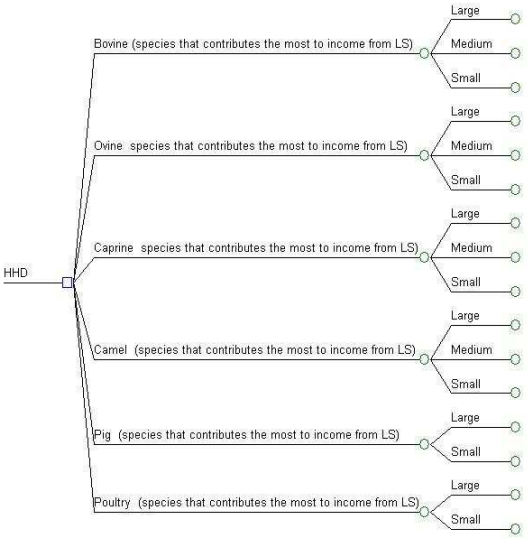
Stage 4.3- Typology of households (HH): methodological choices

- The household categories are first defined according to the main production systems (LG / MR/ MI/ O /LS)
- In the case of option 1, as well as option 2, the guide proposes a main typology by default as the basis for the rest of the analysis (**HHD**).
- **HHD** is based on 2 main criteria:
  - The *species* that contributes the most to the income derived from livestock production and the herd's *size* category

Stage 4.3 –HHD typology: modalities

Variables	Type of variable	Modalities
Variable 1: animal species that contributes the most to the income derived from livestock production (maximum)	qualitative	The four main species are considered to be: -Cattle -Sheep -Goats -Camels Plus two species from traditional systems : -Pigs -Poultry
Variable 2: Size of herd of the main species associated with maximum income	qualitative	Three size groups for ruminants: -Large -Medium -Small For pigs and poultry, we only consider the following groups: -Large -Small

Stage 4.3 – HHD typology



Stage 4.3: HHD: number of classes

- As for the typology of livestock farming systems, we, therefore, have a total of:
  - 12 classes (4 species* 3 sizes)*3 MPS = 36 potential types for the species BOV, OV, CAP, CAM
  - 4 classes (2 species* 2 sizes) *3MPS for the species pigs and poultry. Attention: they will be aggregated on a national level so that they do not depend on the MPS, therefore there are only 4 in total.
- For the households with specialised systems, the HHD typology is the same as for livestock farming systems because such households only have one activity and one animal species.
  - For the species BOV there are 4 classes in total (1 species* 2 systems* 2 sizes)
  - For the species OV there are 2 classes in total (1 species* 1 system* 2 sizes)
  - For the species Pigs and Poultry there are 4 classes in total (2 species* 2 systems* 1 size)

Stage 4.3- Other HH typologies with option 2

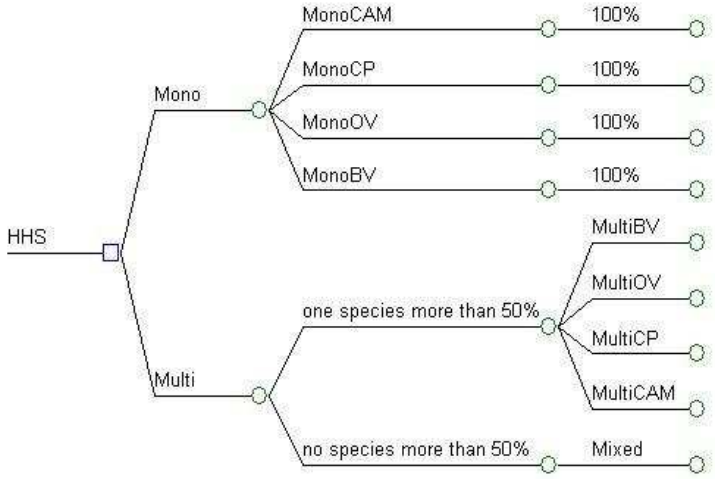
- In the case of option 2, two other methods for classifying households are proposed for the LG, MR, MI and traditional non-ruminant systems (monogastric):
  - HHS: an alternative method to HHD
  - HHI: a method based on the level of household poverty

- They are automatically generated in the files m3_sm1_a4_TOOL_households

Stage 4.3 –HHS Typology: modalities

variables	type of variable	modalities	comments
Variable 1: Mono-specific or multi-specific character of livestock production in the household	Qualitative	Five (5) modalities: -Mono-specific (for which the species is specified): -monoBV, -monoOV, -monoCP, -monoCAM -multi-specific (Multi)	
Variable 2: Share of total income from livestock production	Quantitative	If there is a dominant species, we have 100% of the income (mono-specific livestock production), leave the terms used for the first variable: -monoBV, -monoOV, -monoCP, -monoCAM For those that are multi-specific: indicate the species if one species generates over 50 % of the income from livestock production: -MultiBV -MultiOV -MultiCP -MultiCam In the absence of a single species that generates over 50% of the income from livestock production classify as mixed -Mixed	The mono-specific livestock production units automatically generate 100% of the income For multi-specific livestock production units all depends on the degree of dominance in relation to a 50% threshold of total income

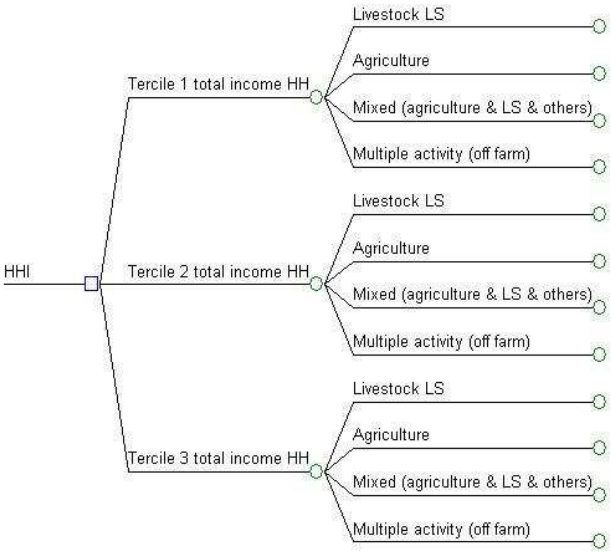
Stage 4.3 –HHS Typology



Stage 4.3 –HHI Typology: modalities

variables	type of variable	modalities	Comments
Var 1: Total household income	Quantitative to be divided into classes	Three (3) classes: tercile 1, tercile 2, tercile 3	Alternatively, we can use percentiles or the choice of operator. Therefore, the number of modalities can change
Var 2: household activity that contributes over 50% to total household income	Qualitative	Four (4) modalities: -Livestock -Agriculture (crops) -Mixed (crops & livestock) -Part-time (off-farm)	

Stage 4.3 – HHI Typology



5.Method: Estimation of the representativity of each LS and HHD on a national level

Stage 5.1. Option 1: there is no up-to-date database

Stage 5.2. Option 2: there is an up-to-date database (agricultural census / surveys or general census)

Stage 5.3. Supplement: characterisation of the strengths and weaknesses of the LS

The weighting of the LS and HHD is conducted using the spreadsheet "data_A1" of the file m3_sm1_a1_TOOl_synthesis (previously select option1 or option2 in "About")

Continue to Stage 6
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Stage 5.1. Weight of LS & HHD with option 1

- You will work based on farming or livestock survey & census data, as well as on what experts say.

- Weighting the LS:
  - Per species and for each LS, you will identify the % of the number in the given LS in relation to the total number of the species.
- Weighting the HHD
  - Per main system and for each HHD, you will identify the % of households whose main livestock production system constitutes the LS given.

Example:
Relative importance of the LS with cattle production

Species	Systems from the typology provided by Seré and Steinfeld (1996)	Model	Sub-systems	% of animals in the sub-system/ total number of species
Cattle				
	Grassland system (LG)	BGLS	small	0%
		BGLM	medium	12%
		BGLL	large	8%
	Mixed rainfed system (MR)	BMS	small	42%
		BMM	medium	12%
		BML	large	6%
	Mixed irrigated system (MI)	BIRS	small	14%
		BIRM	medium	2%
		BIRL	large	0%
	Fattening system (FAT)	BFATS	small	5%
		BFATM	medium	1%
Total				*100%*

Stage 5.2. Weight of LS & HHD with option 2

- You will work based on survey data on condition that it is representative on a national scale.

- Weighting of LS:
  - Per species and for each LS, using the “households” files, you will import the % of the number in relation to the total number of the species.

- Weighting of HHD
  - Per main system and for each HHD, using the “households” files, you will import the % of households whose dominant livestock production system constitutes the LS given.

Stage 5.3. Identify the constraints, strengths and weaknesses of the LS

1. Distribute the input keys for the LS
2. For each key and each LS:
   i. Identify the extent to which the input key constitutes an advantage for the LS considered
   ii. Identify the constraints linked to the input key.
3. Summarise the strengths and weaknesses for each input key in relation to each LS in the table
4. See example: m3_sm1_a1_EX_caracterisationLS_Ouganda_EN.pdf

6. Details of steps to follow

6.1. Option 1: using an expert system

6.2. Option 2: using a survey system

6.1. Steps to follow – Option 1

1. Open the sheet “data_A1” of the file: m3_sm1_a1_TOOl_synthesis (previously select option1 in “About”)

2. Fill in the national numbers per species and main production system in the table A6-F15. This data is available on the website: Mapping poverty and Livestock in the Developing World (ILRI, 2002)

3. Characterise the existing livestock farming systems: name and average size of herd for each LS (columns L and M).

4. Estimate the importance of each LS as a % of the number in relation to the total number for the species.

6.1. Steps to follow – Option 1 (continued)

5. Check that the total numbers estimated in this way correspond to those initially put into table A6-F15. Adjust the size of herds or their weight if necessary.

6. Create the tools for the livestock farming systems (m3_sm1_a2_TOOL_**) by clicking on the button “generate files”. The files are created automatically with the right code in M3/M3-SM1/M3-SM1-A2/ “Ruminants” and “Non-ruminants” of your tools folder.

7. Fill in the number of households per main production system in the table U6-Y15. This data is available on the website: Mapping poverty and Livestock in the Developing World (ILRI, 2002)

6.1. Steps to follow– Option 1 (continued)

8. Estimate the number of households per main system (MPS) for each HHD.

9. Complete the following table with the average number of other animals for each HHD.

10. Check that the total numbers estimated in this way (column AW) correspond to those initially put into the table A6-F15. Adjust the weighting for the household, the livestock farming system or the size of herds if necessary.

6.2. Steps to follow – Option 2

1. Open the spreadsheet “generate_HH” of the file: m3_sm1_a1_TOOl_synthesis (previously select option2 in “About”)

2. Fill in the information on the main existing production systems and create the tools m3_sm1_a4_TOOL_households by clicking on the button “generate HOUSEHOLD files”. The latter are created automatically with the right code in M3/M3-SM1/M3-SM1-A4 of your tools folder.

3. Open each of the m3_sm1_a4_TOOL_households files and select option 2a or 2b in the sheet “About”.

6.2. Steps to follow – Option 2 (continued 1)

4. Organise your data, <u>if option 2a:</u>

- Open the spreadsheets “Option_2a” of the Household file.
- Identify the essential variables for the analysis (columns A to AE) and the secondary variables. Once aggregated, these can be used to complete the spreadsheets “data_A2, A3, A4” of the “synthesis” tool.
- Split your national sample according to three main systems (MPS) or compose your three samples as a function of existing survey data.
- Import the raw variables to the three spreadsheets “Option_2a”. Do not change the order of the columns.

6.2. Steps to follow– Option 2 (continued 1)

4. Organise your data, if option 2b:

- Create your survey questionnaire by completing the file m3_sm1_a4_TOOL_household_survey_option2b.xlsm, if necessary. However, do not delete any questions.
- Define your target population: all households with animals (including those with just a few animals or poultry), as well as the limits of the three MPS zones.
- Define your sampling strategy: count 200 to 500 households per main production system.
- Apply your survey system.
- Enter and then clean the data in the spreadsheets “Option_2b” of the three Household files.

6.2. Steps to follow – Option 2 (continued 2)

5. Open the spreadsheet “typo_LS” of the file m3_sm1_a1_TOOl_household

6. The tool automatically generates the LS typology by creating three sub-systems “small, medium, large” on the basis of terciles of herd size. You can modify these categories or the number of classes by proposing intervals for each class (section I39-J69).

6.2. Steps to follow– Option 2 (continued 3)

7. Open the spreadsheet “data_A1” of the file:
   m3_sm1_a1_TOOl_synthesis (previously select option2 in “About”)

8. Fill in the national numbers per species and main production system in the table A6-F15. This data is available on the website: Mapping poverty and Livestock in the Developing World (ILRI, 2002)

9. Import the LS typology from the file “households” by clicking on the button ”Import Households Typo_LS”

10. Create the tools for the livestock production systems (m3_sm1_a2_TOOL_**) by clicking on the button “generate files”. The latter are created automatically with the right code in M3/M3-SM1/M3-SM1-A2/ “Ruminants” and “Non-ruminants” in your tools folder

6.2. Steps to follow – Option 2 (continued 4)

Attention: the HHD typology is only created after completion of the M3-SM1-A2 and A3 activities

11. Therefore, once you have completed the stages A2 and A3 of the module M3-SM1 (and imported the results in the file m3_sm1_a1_TOOL_synthesis, spreadsheets: “output_A2” and “Output_A3”), open the spreadsheets “Param_A3” of the files m3_sm1_a4_TOOL_households. Click on the button “Import data from synthesis_option2”

12. Open the sheets “typo_HHI” of the Households files. By default, the HHI typology is created on the basis of income terciles (lowest 33%, average 33%, highest 33%). However, you can modify the intervals in section D13-D15.

13. The HHD and HHS typologies are automatically generated in the spreadsheets “typo_HHD”. The sheet “typo_HHDxI” crosses the two typologies for HHD and HHI to help you complete the analysis.

6.2. Steps to follow– Option 2 (continued 5)

13. Return to the spreadsheet “Data_A1” of the synthesis file.

14. Fill in the number of households per main production system in the table U6-Y15. This data is available on the website: Mapping poverty and Livestock in the Developing World (ILRI, 2002)

15. Import the elements relating to the HHD typology (representativity of types, herds’ average numbers) by clicking on the button “Import Household typo_HHD”.

16. Check that the total numbers estimated in this way (column AW) correspond to those initially in table A6-F15. Adjust the weighting for the households, the livestock production systems or the size of herds, if necessary.

M3-SM1-A2 tools for livestock production systems generated in the spreadsheet data-A1/synthesis

System concerned	Description of system	Model to use	No. systems
Rural/traditional systems			
Ruminants	Rearing ruminants in 3 main agro-ecosystems	m3_sm1_a2_TOOL_ruminant_.xlsm	36[a]
Poultry	Continuous poultry production (farmyard or “traditional” production).	m3_sm1_a2_TOOL_chicken_village.xlsm	2
Pigs	Specialised piglet production/ partial fattening unit	m3_sm1_a2_TOOL_pig_mixed.xlsm	2
Intensive/specialised systems			
Semi-urban dairy	Specialised peri-urban ruminant milk production systems. Attention: same file as “ruminants”.	m3_sm1_a2_TOOL_ruminant.xlsm	2
Ruminant fattening	Specialised cattle or sheep fattening unit	m3_sm1_a2_TOOL_ruminant_fattening.xlsm	4[b]
Layers	Specialised egg production unit (functions per batch)	m3_sm1_a2_TOOL_chicken_modern_eggs_V2OL.xlsm	1
Broilers	Specialised broiler production unit (functions per batch)	m3_sm1_a2_TOOL_chicken_modern_broiler_V2OF.xlsm	1
Sow rearing	Specialised sow breeding and piglet production unit	m3_sm1_a2_TOOL_pig_production_P2OS.xlsm	1
Fattening piglets	Specialised pig fattening unit	m3_sm1_a2_TOOL_pig_fattening_P2OF.xlsm	1

[a] Possibility of 3 main systems (LG, MR, MI) and 3 sub-systems for 4 species (cattle, sheep, goats, camels)
[b] Possibility of 2 ruminant fattening systems and 2 sheep fattening systems

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Example of a typology

Identify the main characteristics of the production systems

Example from a typology of dairy systems in Uganda
(M'barara Milk Project, CIRAD/ French Embassy)

m3_sm1_a1_OUT_typo_Uganda.pdf

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Stage 1: DEFINE THE CONTEXT

Equatorial zone with short dry season and very diverse ecosystems, interaction between agriculture/livestock, dairy and cash crops (coffee) or food crops (plantain)

Ranching system

"Modern" dairy system

Pastoral system

Mixed agro-livestock system

Agro-pastoral system

Stage 2: SUMMARY OF THE SYSTEMS

			Size(category)	Average number	Producer	Animals	Management
Cattle							
	Grass system (LG)	B1LG	small				
		B2LG	medium	55	Mobile herdsman/ accumulation of cattle	Ankole breed cows, sometimes a few exotic breeds	Reduction of mobility, sale of surplus milk
		B3LG	large	100-150	Very mobile herdsman/ integrated into commercial circuits	Ankole breed cows exclusively and large herd	Transhumance, self-consumption of milk, sale of cattle
	Mixed rainfed system(MR)	B1MR	small	15	Diversified non-transhumant, integrated into marketing chains, starting accumulation of cattle	Cross-bred cows	agriculture with cash crops (coffee), milk sales, supplementary feed
		B2MR	medium	30-40	Settled herdsmen/ starting dairy specialisation, integration into milk market	Ankole or cross-bred cows	agriculture with food crops ("matooké"), regular milk sales, fertility transfer (soil)
		B3MR	large	80	Diversified & settled, milk producers integrated into commercial networks	Pure Friesian cows	Improved feeding, artificial insemination, veterinary inputs

Stage 3: IDENTIFICATION OF STRENGTHS AND WEAKNESSES

		Size(category)	Average number	Advantages	Weaknesses
Cattle					
Grass system (LG)	B1LG	small			
	B2LG	medium	55	Access to a free grazing resource	Problems of access to water/problems of market access for milk (poor value adding for milk)
	B3LG	large	100-150		
Mixed rainfed system(MR)	B1MR	small	15	Diversified settled, integrated into marketing chains	Absence of mobility forces these production systems to produce their own feed and to use the market regularly => consequently there is an increase in market dependence: risk on price and risk on availability of feeds
	B2MR	medium	30-40	Settled herdsman, start of milk specialisation	
	B3MR	large	80	Specialised settled, predominantly dairy, adoption of new technology (fodder crops)	

M3-SM1 methodology according to the option chosen

OPTION 1 - WITHOUT HOUSEHOLD SURVEY DATA			OPTION 2a - WITH EXISTING HOUSEHOLD SURVEY DATA			OPTION 2b - WITH HOUSEHOLD SURVEY TO BE IMPLEMENTED		
Step description		**File name**	**Step description**		**File name**	**Step description**		**File name**
M3-SM1-A1 : Typologies & data management								
Step 1a	Select option1 in **About**	m3-sm1-a1_TOOL_synthesis	Step 1a	Select option2 in **About**	m3-sm1-a1_TOOL_synthesis	Step 1a	Select option2 in **About**	m3-sm1-a1_TOOL_synthesis
Step 1b	ENTER data in **data_A1_opt1** (left part: representativities of SE and SP)	m3-sm1-a1_TOOL_synthesis	Step 1b	ENTER data in **data_A1_opt2** (left part: representativities of SE and SP)	m3-sm1-a1_TOOL_synthesis	Step 1b	ENTER data in **data_A1_opt2** (left part: representativities of SE and SP)	m3-sm1-a1_TOOL_synthesis
						Step 1c	IMPLEMENT survey questionnaire in selected agro-ecosystems	m3-sm1-a1_household_survey
			Step 1d	SELECT "option 2a" in **About**	m3-sm1-a4_TOOL_household	Step 1d	SELECT "option 2b" in **About**	m3-sm1-a4_TOOL_household
			Step1e	ENTER survey data in **option_2a**	m3-sm1-a4_TOOL_household	Step1e	ENTER survey data in **option_2b**	m3-sm1-a4_TOOL_household
			Step 1f	DEFINE the classes of flock/herd size if default not relevant in **typo_LS**	m3-sm1-a4_TOOL_household	Step 1f	DEFINE the classes of flock/herd size if default not relevant in **typo_LS**	m3-sm1-a4_TOOL_household
M3-SM1-A2: Technical Performances of livestock systems								
Step 2	ENTER data in **data_A2**	m3-sm1-a1_TOOL_synthesis	Step 2	IMPORT data in **data_A2** and complete with missing parameters	m3-sm1-a1_TOOL_synthesis	Step 2	IMPORT data in **data_A2** and complete with missing parameters	m3-sm1-a1_TOOL_synthesis
Step 3a (ecorum)	SELECT "option 1" in **About**	m3-sm1-a2_TOOL_ruminants*	Step 3a (ecorum)	SELECT "option 2" in **About**	m3-sm1-a2_TOOL_ruminant*	Step 3a (ecorum)	SELECT "option 2" in **About**	m3-sm1-a2_TOOL_ruminant*
Step 3b (ecorum)	IMPORT data (only natural parameters) in **Projection (without)**	m3-sm1-a2_TOOL_ruminants*	Step 3b (ecorum)	IMPORT data (only natural parameters) in **Projection (without)**	m3-sm1-a2_TOOL_ruminant*	Step 3b (ecorum)	IMPORT data (only natural parameters) in **Projection (without)**	m3-sm1-a2_TOOL_ruminant*
Step 3c (ecorum)	CALIBRATE the model	m3-sm1-a2_TOOL_ruminants*	Step 3c (ecorum)	CALIBRATE the model	m3-sm1-a2_TOOL_ruminant*	Step 3c (ecorum)	CALIBRATE the model	m3-sm1-a2_TOOL_ruminant*
Step 3d (ecorum)	IMPORT other data in **projection (with)** and complete with missing parameters	m3-sm1-a2_TOOl_ruminants	Step 3d (ecorum)	IMPORT other data in **projection (with)** and complete with missing parameters	m3-sm1-a2_TOOL_ruminant*	Step 3d (ecorum)	IMPORT other data in **projection (with)** and complete with missing parameters	m3-sm1-a2_TOOL_ruminant*
Step 4 (others)	ENTER parameters if different from default in **projection (with)**	m3-sm1-a2_TOOL_chicken*/pig*/ fattening	Step 4 (others)	ENTER parameters if different from default in **projection (with)**	m3-sm1-a2_TOOL_chicken*/pig*/ fattening	Step 4 (others)	ENTER parameters if different from default in **projection (with)**	m3-sm1-a2_TOOL_chicken*/pig*/ fattening
Step 5	Main results exported automatically to **output_A2** to be analyzed and compared	m3-sm1-a1_TOOL_synthesis	Step 5	Main results exported automatically to **output_A2** to be analyzed and compared	m3-sm1-a1_TOOL_synthesis	Step 5	Main results exported automatically to **output_A2** to be analyzed and compared	m3-sm1-a1_TOOL_synthesis
Later on (with intervention)	IMPORT data from "projection (without)" in "projection(with)" : import button	m3-sm1-a2_TOOL*	Later on (with intervention)	IMPORTdata from "projection (without)" in "projection(with)" : import button	m3-sm1-a2_TOOL*	Later on (with intervention)	IMPORTdata from "projection (without)" in "projection(with)" : import button	m3-sm1-a2_TOOL*

M3-SM1-A3 : Financial and economic performances of Livestock systems

Step 6	ENTER data in **data_A3**	m3-sm1-a1_TOOL_synthesis	Step 6	IMPORT data in **data_A3** and complete with missing parameters	m3-sm1-a1_TOOL_synthesis	Step 6	IMPORT data in **data_A3** and complete with missing parameters	m3-sm1-a1_TOOL_synthesis
Step 7	IMPORT data in **diagnostic** and complete with missing parameters in part I and II	m3-sm1-a2_TOOL*	Step 7	IMPORT data in **diagnostic** and complete with missing parameters in part I and II	m3-sm1-a2_TOOL*	Step 7	IMPORT data in **diagnostic** and complete with missing parameters in part I and II	m3-sm1-a2_TOOL*
Step 8	Main results exported automatically to **output_A3** to be analyzed and compared	m3-sm1-a1_TOOL_synthesis	Step 8	Main results exported automatically to **output_A3** to be analyzed and compared	m3-sm1-a1_TOOL_synthesis	Step 8	Main results exported automatically to **output_A3** to be analyzed and compared	m3-sm1-a1_TOOL_synthesis
Later on (with intervention)	IMPORT data from "diagnostic (without)" in "impact analysis": import button	m3-sm1-a2_TOOL*	Later on (with intervention)	IMPORT data from "diagnostic (without)" in "impact analysis": import button	m3-sm1-a2_TOOL*	Later on (with intervention)	IMPORT data from "diagnostic (without)" in "impact analysis": import button	m3-sm1-a2_TOOL*

M3-SM1-A4: Vulnerability of households

Step 9	ENTER data in **data_A4_opt1**	m3-sm1-a1_TOOL_synthesis	Step 9	DEFINE the classes of income level if default not relevant in **typo_HH**	m3-sm1-a4_TOOL_household	Step 9	DEFINE the classes of income level if default not relevant in **typo_HH**	m3-sm1-a4_TOOL_household
Step 10	IMPORT data in **diagnostic** and complete with missing parameters in part III	m3-sm1-a2_tools*	Step 10	ANALYSE results in sheets **typo_*** / **V_*** / **Poverty&GINI**	m3-sm1-a4_TOOL_household	Step 10	ANALYSE results in sheets **typo_*** / **V_*** / **Poverty&GINI**	m3-sm1-a4_TOOL_household
Step 11	Main results exported automatically to **output_A4** to be analyzed and compared	m3-sm1-a1_TOOL_synthesis	Step 11	Main results exported automatically to **output_A4_opt2** to be analyzed and compared	m3-sm1-a1_TOOL_synthesis	Step 11	Main results exported automatically to **output_A4_opt2** to be analyzed and compared	m3-sm1-a1_TOOL_synthesis
Later on (with intervention)	IMPORT data from "diagnostic (without)" in "impact analysis": import button	m3-sm1-a2_tools*	Later on (with intervention)	ANALYSE results in sheets **typo_*** / **V_*** / **Poverty&GINI** (parts with intervention)	m3-sm1-a4_TOOL_household	Later on (with intervention)	ANALYSE results in sheets **typo_*** / **V_*** / **Poverty&GINI** (parts with intervention)	m3-sm1-a4_TOOL_household

Activity M3-SM1-A2: LS technical performance

1. Objective

Estimate the technical performances of the livestock production systems identified previously (M3-SM1-A1). These technical performances are estimated in terms of the production of meat, milk, eggs and products derived from the animal activities (animal draught, organic matter, production of hides, skins and wool).

They can be used to estimate the financial performances (M3-SM1-A3) and the contribution made by the animal production activities to reducing the vulnerability of households (M3-SM1-A4). On a national scale, the GDP for livestock production (M4-SM1-A1) is also calculated by aggregating these parameters.

2. Expected outcomes

- Determining the demographic parameters and the production parameters for ruminant systems (camels, cattle, small ruminants) over 20 years. m3_sm1_a2_OUT_ruminants_bov.xls
- Determining the parameters for food production and consumption in non-ruminant systems (poultry, pig) and ruminant fattening systems. m3_sm1_a2_OUT_chicken_village.xls
- The main results are summarized in the table "Output_A2" of the tool m3_sm1_a1_TOOL_synhesis.xls (previously select option 1 or option 2 in "About") "

m3_sm1_a2_OUT_ruminants_bov.xls [2 MB]

m3_sm1_a2_OUT_chicken_village.xls [1 MB]

m3_sm1_a2_OUT_perf_technical_EN.jpg [282 kB]

3. Method and tools

Here the analysis is conducted at the level of the **livestock production systems (LS)**. In the case of option 1 ("expert method") or option 2 ("survey data method"), the same process is used for estimating the technical performances of livestock production systems. It differs slightly depending on the species studied.

Stage 1. Create and identify the appropriate tools

Create the tools using the sheet "**Data_A1**" of the tool m3_sm1_a1_TOOL_synthesis.xlsm (previously select option 1 or 2 in "About") and identify the one that will be suitable for each livestock production system (LS) depending on the codes assigned to each one.

Tools :

- Ruminant systems (excluding fattening systems) ECORUM: m3_sm1_a2_TOOL_ruminant.xlsm
- Ruminant fattening systems (cattle, sheep): m3_sm1_a2_TOOL_ruminant_fattening.xlsm
- Modern broiler production systems: m3_sm1_a2_TOOL_chicken_modern_broiler_V2OF.xlsm
- Modern layer production systems: m3_sm1_a2_TOOL_chicken_modern_eggs_V2OL.xlsm
- Family poultry production systems (village): m3_sm1_a2_TOOL_chicken_village.xlsm
- Pig fattening production systems: m3_sm1_a2_TOOL_pig_fattening_P2OF.xlsm
- Piglet production systems: m3_sm1_a2_TOOL_pig_production_P2OS.xlsm
- Mixed pig production systems (village): m3_sm1_a2_to_a4_TOOL_pig_mixed.xlsm

Methodological guide:

- Recall: before going further, make sure you have read the user manual and the recommendations for using the Excel tools in M3: M3&M4_NOT_1,2,3
- Methodological guide: m3_sm1_a2_NOT_technical_perfLS_EN.pdf

Stage 2. Calibrate the ruminant models (ECORUM)

For the ruminant systems, calibrate a model in the "steady state" for each species as a function of the demographic parameters. This stage should be conducted at the same time as stage 3.

Methodological guide:

- Calibration of the ECORUM model: m3_sm1_a2_NOTC_ECORUM_calibrating_EN.pdf

Stage 3. Put the input parameters into the models

- Ruminant systems (excluding fattening): Provide the main demographic and zootechnical data for each livestock production system, according to species, production system (LG, MR, MI) and herd size (or sub-system) in the sheet "**Data_A2**" of the "synthesis" file in M3-SM1-A1. Export these parameters from "synthesis" in the tools m3_sm1_a2_TOOL_ruminant_[CODE].xls
- Non-ruminant and ruminant fattening systems: technical reference parameters are proposed in the tools by default. Check that they are pertinent to the country context.

Stage 4. Complete the models using the tools available in the file M3-SM2-A2.

- Ruminant systems: project the imported parameters on the desired duration (2 to 20 years) for each tool separately. Complete and modify the model's parameters.
- Non-ruminant and fattening systems: complete and modify the model's parameters for each tool separately.

Examples:

- Sahelian cattle system: m3_sm1_a2_EX_1_ruminants_bovsahel.xlsm
- Family poultry production systems: m3_sm1_a2_EX_2_chicken_village.xlsm

Stage 5. Summarize and compare the results.

Export the main results for all the LS (ruminants and non-ruminants) from the sheet "**Output_A2**" of the tool m3_sm1_a1_TOOL_synhesis.xls

m3_sm1_a2_NOT_technical_perfLS_EN.pdf [209 kB]

m3_sm1_a2_NOTC_ECORUM_calibrating_EN.pdf [142 kB]

m3_sm1_a2_EX_1_ruminant_bovsahel.xlsm [2 MB]

m3_sm1_a2_EX_2_chicken_village.xlsm [1 MB]

4. Further information

Complete user's manual for DynMod (version 2):
m3_sm1_a2_ANN_1_manual_dynmod.pdf
Survey methods for collecting the parameters for animal production: LIVTOOLS

Technical references:
From international bibliographical references (FAO):

- Small ruminants in tropical Africa (R. Trevor Wilson, 1991)

- Cattle and Small ruminants in Sub-Saharan Africa (M.J. Otte and P. Chilonda, 2002)

Other technical indicators: m3_sm1_a2_to_a3_ANN_default_value.xlsm

m3_sm1_a2_ANN_1_manual_dynmod.pdf [548 kB]

m3_sm1_a2_to_a3_ANN_default_value.xlsm [325 kB]

m3_sm1_a2_NOT_technical_perfLS_EN.pdf

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GUIDE
FOR THE INCLUSION OF LIVESTOCK PRODUCTION IN THE PRSPS

METHODOLOGICAL NOTE – EVALUATION OF THE TECHNICAL PERFORMANCES OF LIVESTOCK FARMING SYSTEMS

ACTIVITY M_3-SM_1-A_2

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1. OBJECTIVES

The objective of the activity "Analysis of the technical performances of the livestock farming systems" is to estimate the main performance parameters for the different livestock farming systems, particularly in terms of the production and regarding consumption of inputs. This will help determine the contribution that livestock production makes to household income and the contribution that livestock farming systems make to the GDP (M4-SM1-A1).

This activity provides a set of tools for modelling zootechnical performances for the main livestock farming systems encountered as a function of the typology proposed in m3_sm1_a1, for which the main parameters are summarised in the file m3_sm1_a1_TOOL_synthesis.xls, spreadsheet 'Data_A2'.

The tools proposed also make it possible to simulate the technical changes (such as a change in the feeding method) or economic changes (such as a change in prices or costs), or social changes (changing modes of consumption) on the variability of the contribution that livestock production makes to households (m3_sm1_a4) or to the country (module 4).

2. DESCRIPTION

2.1. Introduction before using the "tools" files

In order to use the tools in this module, certain modalities should be followed. Before starting, refer to the explanatory note: M3&M4_NOT_1/2/3_EN on the front page of M3.

The overall approach used to evaluate the zootechnical performances of the livestock farming systems is based on two approaches:

- A *dynamic* approach of the herd demography for ruminants in the framework of traditional production systems;
- A *steady state* approach for poultry, pig and fattening systems based essentially on the animals' performances.

In general the cost of feed constitutes the main expense for semi-intensive and intensive systems. It can be as little as zero in pastoral systems where the main feed resource comes from collective natural grazing land. For simplicity, in semi-intensive and intensive systems, the cost of the feed ration is estimated on the basis of the herd's requirements and the average cost of the basic feed. In extensive ruminant systems, the cost of feed is estimated on the basis of dry matter requirements per kg of live weight and from the share that comes from the market. A supplementary feed can also be added to the basic ration.

2.2. Dynamic model for ruminant systems: cattle, sheep, goats, camels

2.2.1. General principle of the model

"EcoRum" is a tool for simulating the bio-economic performances of livestock. It is based on the demographic model drawn form the software DynMod (a Microsoft Excel © simulation tool for the livestock demography of tropical domestic ruminants; CIRAD, ILRI). EcoRum uses the DynMod spreadsheets for demographic projection and includes additional spreadsheets for calculating the economic performance indicators and indicators of vulnerability. It can be used to compare two scenarios, for example: scenarios with and without a project, scenarios with and without drought, etc.

The demographic calculations used in EcoRum (identical to those in DynMod) are shown in detail in the DynMod handbook: section "For further information" (m3_sm1_a2_ANN_1_manual_dynmod.pdf). The demographic model can represent all the ruminant species kept in the livestock production systems in which reproduction is subject to little or no control and occurs throughout the year. It will be used for all of the ruminant systems with the exception of fattening systems:

(i) Pastoral or Grassland-based system (Seré and Steinfeld, 1996). It can also be used to study semi-intensive ranches or intensive farms if reproduction is spread throughout the year.
(ii) Mixed rainfed systems
(iii) Mixed irrigated systems
(iv) Specialised semi-urban dairy systems

For the cattle or sheep fattening systems, the user should refer to section 2.2.8.

In the model, each herd is divided according to sex and three age groups (young/juveniles J, sub-adults S and adults A). The users should set the age class' limits. EcoRum can be used to simulate projections for a period ranging from 1 to 20 years.

The spreadsheets "Projection (Without)" and "Projection (With)" in EcoRum contain the input parameters and results (demography, production and feed requirements) for the projections. The spreadsheet "Projection (Without)" corresponds to a reference situation, which can be used to evaluate the animals' performances without any external intervention. The results obtained from this spreadsheet will provide the basis for the economic analysis. The spreadsheet "Projection (With)" corresponds to a scenario in which the user simulates a change: either an improvement linked to a livestock production programme, for example, or to an external shock, such as a drought or an epizootic disease. The results obtained from this spreadsheet will be used to test the impact of a plan of action to improve the households' standards of living. The other EcoRum spreadsheets concern the calculations of economic performances and vulnerability.

The model's parameters can be obtained in several ways: i) extracts from references in the scientific literature, ii) aggregation after data collection in the field, iii) estimates based on experts' comments. This skilled work is often necessary for adapting a given parameter to the different livestock production systems, iv) lastly, the team will have access to data by default proposed by international studies (FAO) in the category "For further information". However, priority should always be given to the use of national parameters.

For demographic parameters, there are three main methods for field surveys: 1) individual monitoring of animals; 2) herd monitoring with no identification of individual animals; 3) cross sectional retrospective surveys. Some of these methods are presented in the category "For further information": LIVTOOLS. In sub-Saharan Africa, demographic data collection in the field is difficult because of the scattering and mobility of herds and the lack of written records on animal demography within the livestock production units. The lack of data is a recurrent problem for the operational use of forecasting models.

Before reaching the steady state, the model goes through a transitional phase (the 1st, 2nd, 3rd, 4th years depending on the parameters envisaged). In addition, in order to calibrate the model before envisaging modelling drought impact (see the example "drought" proposed in M3-SM1-A4) or impact of an intervention (with), refer to the additional methodological note m3_sm1_a2_NOTC_ECORUM_calibrating_EN.pdf

2.2.2. Summary of the spreadsheets "Projection (Without)" and "Projection (With)"

These two spreadsheets are identical. Each spreadsheet contains a "Model" section, a "Results" section and a "Graphics" section.

The "Model" section consists of inputting the parameters into the model. It is organised into four sub-sections: 1) general parameters, 2) demographic parameters, 3) production parameters and 4) parameters linked to feed requirements.

The general parameters concern the duration of the age groups, the size of the herd and the number of years of projection. The age group "Adult" corresponds to all the animals that have reached the reproduction phase (in the model, the class "adult females" defines the reproductive females).

The demographic parameters include:

- The parameters of reproduction:
  - The annual birth rate (average number of parturitions per female in the herd throughout the year). This rate is applied to adult females;
  - The net prolificacy rate (average number of live offspring born per parturition);
  - The proportion of females at birth;

- The probability of intrinsic natural mortality (mortality that would be observed if there was no offtake by the farmer). For a given age group, this probability corresponds to the period between the start and the end of the age group if the group's duration is <12 months, and between the start and the end of the year if the class is >=12 months (the principle is the same for the probability of offtake below);

- The probability of offtake (slaughter, sales, barter, lending, etc.). The offtake can represent a "**net** offtake", in other words a balance between the offtake and "imports" into the herd (purchases..);

- The number of animals acquired during occasional replacement (supposed to occur in the middle of the year by convention), for example, when replacements are made to rebuild a herd after a drought.

The production parameters include:

  - The average live weight of an animal at the start of an age group ("LW") and the dressing percentage ("Carcass yield") ;

- The average selling price of an animal or the purchasing price of an animal bought for replacement ("Offtake value" and "Intake value");
- The average milk yield per lactation (the duration of lactation and the milk yield per lactation should be inputted);
- The average weight of hide and skin produced per animal slaughtered ("Skin");
- The average weight of wool produced per animal and per year ("Wool");
- The average weight of manure produced per animal and per day ("Manure");

The parameters for estimating the feed requirements are based on the dry matter requirements per kg of live weight.

The “Results” section summarises the results of the projection. It is made up of three sub-sections: the demographic results, the results for production and the results for feed requirements (some results are provided for the “time t”, which corresponds to the start and end of the year, others are per “year t”, which corresponds to the period [t – 1, t [).

The “Graphic” section provides summary graphs that make it possible to visualise the livestock dynamics for the period considered, as well as the annual growth rates.

For further information
Refer to the DynMod users’ handbook for more details on the demographic section, for numerical examples and for calibrating the model. Given that DynMod is evolving in the framework of several research projects, the available handbook may not correspond to the latest version of the demographic spreadsheets.

2.3. Models for poultry, pig and ruminant fattening systems

2.3.1. General approach and choice of the model

Although their scales and types of operations are sometimes different, poultry, piggery and fattening units have indeed a number of points in common. One of the most important characteristics of these systems is that the evolution of their size and their demographic patterns is linked more to practices of purchasing and selling animals than to natural demographic parameters. Therefore, exploring scenarios of evolution for these systems is more effective when two successive states are compared than when a continuous evolution is considered. For this reason, the units will be presented in the form of a spreadsheet representing an annual technical appraisal.

The spreadsheet’s general form is the same for the different production systems considered and includes:
- A section dedicated to the description of the herd: number of animals per category, purchases and sales, average age in batches, etc.
- A section dedicated to the parameters of production and feed consumption.
- A section converting the data for a 1-year period. In fact, in the case of production cycles that are shorter (broilers, porkers) or longer (layers) than 1 year, the economic calculations would not be pertinent without scaling up or down to this 1-year timescale.
- A section stating the main indicators/data that will be used in module 4.

The spreadsheets have three columns of numerical data.
- The first column includes input parameters that the user should indicate in order to conduct a simulation.
- The second column indicates the default values that will be used if the user omits an input parameter. The parameters that the user provides are always given priority over the default values. For normal functions, the user should not alter this column.
- The third column is the summary of the information that will be used for the economic calculations: it gives priority to the value entered by the user and, failing that, the parameter’s default value. When a value is missing and, therefore, the parameter is taken by default, the corresponding box is highlighted (in red). Some input parameters, such as the initial number of animals do not have a default value and must be provided.

In the spreadsheet that corresponds to the scenario after changes, the default values are those in the spreadsheet without change. Thus, the user only provides information on the parameters that have changed between the two simulations.

In all cases, the numbers are kept as they are (not rounded up/down). Thus, there can be fractions of animals (e.g. 26.3 chickens!). This would be senseless on a real farm (values should be rounded up/down) but is significant in the study of average populations for which the approximation of rounding numbers up/down would distort the results.

2.3.2. Specialised egg production unit (layers)

21. A specialised layer unit is a unit that functions in batches of layers of the same age. There can be several units per farm, with different ages. However, an egg production unit that functions with a mixture of ages should be processed in the module for farmyard or "village" production systems.

The main features of the parameters and calculations used are explained below. However, the clearly formulated parameters that have no special options are not detailed here.

- "Number of places in the hen house". This is the theoretical size of the unit: "the building is designed for 50, 100, 1 000 layers". It is possible to specify a different number of chicks at the start "Initial number of chicks". This notably takes into account a batch that is not filled completely, or the purchase of pullets on the point of lay that is planned later, or on the contrary, the purchase of a number of chicks that exceeds the theoretical housing capacity.
- "Age at point of lay (months)" is the age at the start of lay. Physiologically, chickens of modern genotype start laying at around 18 weeks and lay a significant quantity of eggs at around 20 weeks. Therefore, we can take 5 months as a standard age, although this parameter can be modified in the case of different genotypes or with slow growth that would lead to a different age for the start of lay. "Duration of lay (months)" can be adjusted according to practices. Although moulting is not often practiced in specialised units, this parameter makes it possible to record a total duration including several laying seasons. "Length of cleaning period between batches (months)" corresponds to the depopulated period between two batches.
- "Number of hens at point of lay" is normally deduced from the preceding parameters. However, this parameter can be readjusted manually if this is the information available in practice as opposed to information on the mortality rates and purchases. This indication will then be given priority in the calculations for production.
- Feed consumption is indicated as a global quantity during the rearing period (before lay):"Feed consumption during rearing (g/animal)" and as a daily quantity during lay: "Feed consumption during lay (g/animal)". The plan is to introduce two types of feed (commercial and produced on-farm), which have a different cost in the economic calculations. This will make it possible to simulate the use of a resource that is produced on-farm (e.g. a cereal) and of a commercial supplementary feed.
- "Number of eggs produced for the entire laying period (eggs/hen)" is the number of eggs produced per animal over the laying period ("Duration of lay (months)"). If this value is not indicated, the production is estimated according to the laying rate entered by the user "Peak laying rate (eggs/100 hens/day)" or taken by default.
- Home consumption ("Number of eggs/year" and "Culled hens/year") will be used for the economic calculations.

2.3.3. Specialised poultry meat production units (broilers)

A specialised broiler production unit is a unit that functions in batches (of homogenous age). There can be several units with different ages per farm. However, a production unit that functions with a mixture of ages should be processed in the module for farmyard and "village" production.

The main features of the parameters and calculations used are explained below. However, the clearly formulated parameters that have no special options are not detailed here.

- "Number of places in the poultry house". This is the theoretical size of the poultry house: "the building is designed for 100, 1 000 chickens". It is possible to specify a number of chicks that is different at the start ("Initial number of chicks") in order to take into account a batch that is not completely filled or on the contrary the delivery of a number of chicks that exceeds the theoretical housing capacity.
- Production phases. In broiler production, several phases are often distinguished that may correspond to different feeds: starter, grower and finisher. The model proposes using these different phases in association with the demographic parameters (mortality), feed consumption and different types of feed. Nonetheless, the model can also be applied to a unit with a single phase: it is simply a question of not recording the ages of transition between the phase "Age at the starter-grower transition (days)" and "Age at the grower-finisher transition (days)" and only providing an age at sale ("Age at sale (days)"). Therefore, you should not indicate the values for mortality and feed consumption for these phases: the corresponding boxes appear in grey.
- Feed consumption is recorded globally for each of the three periods and not per day because the quantities consumed are not constant over a period. In the case of a single production period, only the parameter "Feed consumption at finishing (g/animal for the period)" should be provided. Default values are proposed, although it is preferable to avoid using them because they fail to take into account the duration of each period and, therefore, are imprecise. The plan is to introduce two types of feed (commercial and produced on-farm), which have a different cost in the economic calculations. This will also mean that the use of a resource produced on-farm (e.g. a cereal) and a commercial supplementary feed can be simulated.
- Live weights and carcass weights of chickens produced can be indicated. If a single value is reported, the other is estimated with an approximate dressing percentage of 65%. If both the figures are omitted, the default values are used.
- Home-consumption ("Number of chickens/year") will be used for the economic calculations.

2.3.4. Specialised unit for continuous poultry production (village system): farmyard or "village" production system

A continuous poultry production unit may function without batches and some or all of the reproduction can be managed on the farm. In the case of small-scale village production systems, which function in batches, we can also use the specialised layer or broiler production models.

The model is based on the number of layers on the farm: "Average number of layers". This model functions in a steady state, in other words according to the hypothesis that the number of females is constant. This hypothesis means that it is quite simple to calculate the number of animals that should be kept for replacement, given the mortality. In the case of a population that is evolving (increasing or decreasing), we can use a separate spreadsheet to conduct simulations with the tool proposed for changes in hypotheses.

The main features of the parameters and calculations used are explained below. However, the clearly formulated parameters that have no special options are not detailed here.

- "Average number of hens" is, therefore, the average number of females present and "Average number of cocks" is the average number of cocks present. Different ages at culling are proposed for both categories of animals. Mortality for adults is the same.

- The number of eggs per year ("Number of eggs laid/hen/year") should be indicated by the user because it is very variable and, therefore, using a default value is illusory.
- Some of the eggs can be sold or consumed on-farm ("Eggs sold or consumed on-farm, % of eggs laid").
- Entry of animals as planned, such as purchased chicks (males and/or females), layers and cocks.
- Mortality of young animals is indicated as a % of animals and not as a % per year, which would make little sense because the duration of rearing is generally less than 1 year. Therefore, it corresponds to the proportion of animals that do not reach the age of marketing.
- On the basis of this information, and with the hypothesis that numbers are constant (steady state), it is possible to estimate the numbers of chickens sold and kept for reproduction, the number of hens and cocks that are culled, as well as the average number in each category.

- Feed consumption should be indicated per animal and per day. As feeding practices are often different for layers and the other categories, the idea is to indicate the quantity fed to hens ("feed consumption for layers (g/animal/day)") and to the other animals ("feed consumption for growth and cocks (g/animal/day)"). For the latter category, only a global figure is indicated (no distinction between males and females). For these two categories of animals, two types of feed are distinguished (commercial and produced on-farm), with a different cost in the economic calculations. This means that the use of a home-produced resource (e.g. a cereal) and a commercial supplementary feed can be simulated.
- With all these elements, the total quantity of eggs and animals produced (number of head and weight) can be estimated.
- Home-consumption of eggs ("Number of eggs consumed on-farm/year") and animals ("Number of animals consumed on-farm/year") can be used in the economic calculations and the indicators of vulnerability, particularly for determining the energy and protein contributions to the household's food ration.

2.3.5. Specialised pig fattening unit

A specialised pig fattening unit functions with batches of pigs of the same age. It can have several buildings, rooms or stalls per farm with animals of different ages.

The choice has been made to propose different default values as a function of the livestock production system encountered; the references are grouped in a table in the appendix for each spreadsheet according to three types of structure: traditional, semi-intensive and modern. Values are proposed for the average daily weight gain (ADG), feed conversion ration (FCR), dressing percentage (DP), total duration of fattening (Duration), the weaner weight (W. Weaner), and at the end of fattening (W. Final). They are indicative and should be modified in relation to what is known about the zones of intervention.

The main features of the parameters and calculations used are explained below. However, the clearly formulated parameters that have no special options are not detailed here.

- "Number of places in the stalls" is the number of animals theoretically planned for the operation of the fattening unit.
- "Initial number of piglets in the batch (per cycle)" is the quantity of piglets that are in the batch at the start of fattening.
- The weaner and final weights are then requested. The average weights at the time when feeds are changed are optional in the case where a single feed is used.
- "Total duration of a production cycle (days)" is the total duration of fattening, including the rearing period, as well as the time it takes to clean, disinfect the buildings and the depopulated period ; it is expressed in days;
- The mortality of young animals is indicated as a % of animals and not as a % per year, which would make little sense because the duration of rearing is generally less than 1 year. Therefore, it corresponds to the proportion of animals that do not reach the age of marketing. The detail of mortality for the different fattening phases can be specified in the fields "Mortality at 2nd age", "Mortality during growth" and "Mortality at finishing".
- During fattening, entry of animals is planned at the start of the growing and finishing phases. Departures of animals are planned at the end of the post-weaning and growing phase.
- Using this information, it is possible to calculate the number of porkers sold, as well as the number of batches planned for the year in theory. If, for various reasons or particular practices, the number of batches is reduced, this parameter can be modified in the field "Number of production cycles (batches) per year".
- Feed consumption (in kilos of feed per animal and per feeding phase) depends on the feed conversion ratio and growth for the evaluation by default. The user can correct this if direct information is available. Annual feed consumption for all of the batches can then be calculated, with details for each phase of rearing.
- Using all these elements, the total quantity of carcasses (total carcass weight produced – all categories of animals combined) and animals produced (total annual production in numbers) can be estimated.
- Home-consumption of products from the livestock production unit by the family is taken into account with the information "Number of pigs in porker equivalent consumed by the family per

year" and/or "Total quantity of meat consumed by the family per year". It will be integrated in the economic calculations.

2.3.6. Specialised unit for sow breeding and piglet production

A specialised unit for sow breeding and piglet production is a unit that normally functions in batches of sows. In southern countries, livestock production units often fail to respect the batch type system because of difficulties encountered with keeping animals at the same physiological stage and grouping births. Therefore, we will make calculations on an individual basis, without the notion of batches, by monitoring the animals from the moment they arrive on the farm, when they first start breeding until they are culled; piglets are sold either at weaning or after a short growing period.

As with the specialised livestock fattening system, the choice was made to propose default values as a function of the livestock production systems encountered; references are grouped together in a table in the appendix for each spreadsheet according to the three types of structure: traditional, semi-intensive and modern. Values are proposed for an average sized litter at birth (#live piglets born), the number of litters per year and per sow (#litter.year), the age and average weight at weaning (Age et weaning, Weight.weaning), the average age at sale (Age.sale.piglets, Weight.sale), the average weight of sows and boars at culling (Weight.culling.sow, Weight.culling.boar) and the interval between weaning and successful mating. They should be modified by users in relation to what is known about the zones of intervention.

The main features of the parameters and calculations used are explained below. However, the clearly formulated parameters that have no special options are not detailed here.

- Herd composition describes the breeding herd (number of sows and boars); if no boar is recorded, the unused boxes in the spreadsheet appear in grey.
- The breeding parameters describe the different stages of the average cycle of a sow.
- Average mortality can be detailed for adults, as well as for piglets before and after weaning.
- Ration plan for animals is described in the section "Feed parameters" and details the quantities of feed distributed per animal and per day for rearing gilts (young sows before they start breeding), the gestation and lactation period. The annual consumption is then calculated ("TOTAL quantity of feed consumed per herd per year, in kg").
- Age and weight of piglets at weaning and marketing, the weight of adults at culling make it possible to calculate the annual production of the piglet production unit.
- The classic parameters of productivity are estimated: "Number of weaned litters per productive sow and per year"; "Number of piglets weaned per sow and per year"; "Total weight productivity per (kg/year)"; including the weight of piglets and adults sold per year.
- Home-consumption of produce from the livestock production unit by the family is taken into account with the information "Number of piglets consumed on-farm per year by the family" and/or "Quantity of meat consumed on-farm per year by the family". It will be integrated into the economic calculations.

2.3.7. Mixed pig production unit (village system): from sow breeding to fattening porkers

A mixed pig production unit, otherwise described as a Piglet Production-Fattening unit, combines sow breeding, piglet production and fattening *in situ* until porkers are sold. Our calculations are made on an individual basis, without the concept of batches of animals, by monitoring sows from the moment they arrive on the farm, when they first start breeding until they are culled; piglets born on-farm can be sold at several moments during rearing (at weaning, after a short growing period, before the growing phase and the finishing phase), but particularly at the end of fattening. Porkers constitute the main products sold.

As for the other two spreadsheets relating to the pig production units, the choice was made to propose default values as a function of the livestock production systems encountered; references are grouped in a table in the appendix for each spreadsheet according to the three types of structure: traditional, semi-intensive and modern. For sow rearing, values are proposed for the average litter size at farrowing (#live piglets born), the number of litters per year and per sow (#litter.year), the age and average weight at weaning (Age at weaning, Weight.weaning), average age at sale (Age.sale.piglets, Weight.sale), the

average weight for sows and boars at culling (Weight.culling.sow, Weight.culling.boar) and the interval between weaning and the first successful services. For fattening young animals, values are proposed for the average daily weight gain (ADG), the feed conversion ration (FCR), the dressing percentage, the total duration of fattening (Duration of rearing/Duration), the initial weight (Weight.weaner) and at the end of fattening (W.final). They should be modified by the user in relation to what is known about the zone of intervention.

The main features of the parameters and calculations used are explained below. However, the clearly formulated parameters that have no special options are not detailed here.

- The herd composition describes the breeding herd (number of sows and boars); if no boar is recorded, the unused boxes on the spreadsheet appear in grey.
- The reproduction parameters describe the different phases of the average cycle of a sow.
- The average mortality can be detailed for adults, as well as for piglets before and after weaning.
- The ration plan for animals is described in the section “Feed parameters” and details the quantities of feed distributed per animal and per day for rearing young sows (young sows before they start breeding), the gestation and lactation period, as well as the different phases of fattening porkers. Annual consumption is then calculated.
- Most of the young pigs that are fattened were born on-farm; partial sales and additional purchases of animals can be recorded. The structure of the calculations is similar to the spreadsheet designed for the specialised Pig Fattening unit.
- The classic parameters of productivity are estimated: “Number of litters weaned per productive sow and per year”; “Number of piglets weaned per productive sow and per year”; or again “Total weight productivity per (kg/year)” including the weight of piglets and adults sold per year. The total quantities of carcasses and animal products are estimated.
- Home-consumption of products from the livestock production unit by the family is taken into account with the information “Number of piglets consumed on-farm per year by the family” and/or “Number of porker equivalent pigs consumed by the family per year” and/or “Quantity of meat consumed on-farm per year by the family”. This is included in the economic calculations.

2.3.8. Specialised fattening unit (ruminants)

Fattening units have been developed for cattle and sheep. However, they can be used for any ruminant species by adjusting the input values. By choosing one of the two species, cattle or sheep, the default values corresponding to each species are shown.

- The economic evaluation of the fattening unit considers the animals that come in as external animals, even if they could have been produced on-farm or bought-in. Then the input value for animals at the different stages considered (growing stage or fattening stage) is either the price of purchase on the market or the cost of producing the animal until the time it enters the fattening system. These values should be recorded in the spreadsheet “Appraisal”.
- Production phases.
  In the fattening systems, we often separate several phases that may correspond to different feeds: growing stage and finishing or fattening stage. The model proposes using the different phases in association with the demographic parameters (mortality), feed consumption and different types of feed. Nonetheless, the model can also be applied to a livestock unit that has a single phase. Thus, for the units that specialise in finishing animals, it is simply a question of not recording the parameters, such as age, initial weight, mortality, feed consumption for the growing stage. The corresponding boxes appear in grey.
- The ages at the different stages considered (growing stage and fattening stage) are the ages on entry. The age at marketing “Age at end of fattening” is the age of sale.
- Feed consumption is estimated from the number of kg of digestible dry matter per 100 kg of live weight. Default values are proposed but it is preferable to use the data relative to the systems encountered in the country. The plan is to introduce two types of feed (commercial and produced on-farm), which will have different costs in the economic calculations. This means that the use of a resource produced on-farm (e.g. a cereal) and a commercial supplementary feed can be simulated

- Live weights and carcass weights of the animals produced can be indicated. If only a single value is recorded, the other is estimated with an approximate carcass yield of 52%. If both figures are omitted, the default values are used.
- Home-consumption "Number of animals consumed on-farm/year" will be used in the economic calculations.

Approach to be used to calibrate the demographic model in a “steady state”
m3_sm1_a2

In order to model a herd of ruminants over several years, the model first needs to be calibrated in a “steady state”. As an indication, we propose an approach using the case of a Sahelian herd of cattle with 50 animals. Variations can be used depending on the aims of the simulation.

Objective

We presume that a Sahelian herd of cattle with 50 animals is to be represented with the following age groups (*):

Age group	Females	Males
Young	0 - 1 year	0 - 1 year
Young adults	>1 - 4 years	>1 - 4 years
Adults	>4 - 13 years	>4 - 9 years

(*) Exact ages are given (e.g. 1 year = 365 days)

Ultimate culling occurs at 13 years for females and 9 years for males. Reproductive females are those of >4 years of age.

We presume that the herd’s natural parameters are as follows:

- Annual calving rate: 50 %
- Net prolificacy rate: 1 %;
- Annual mortality rate: young (juveniles) 15 %, young adults 8 % and adults 3 %.

We seek to represent a herd, which has the following characteristics in a “steady state”:

- Annual growth rate: 1 % approximately
- Females: 70 % of the herd approximately
- Reproductive females: 39 % of the herd approximately.

We present an example of the process to calibrate the model in order to reach the objective. It is only indicative. Many variations can be used according to the simulation’ aims.

The 7 Stages

1. Determining the duration of the age groups

Classes d'âge			Durée (mois)	Age exact (année) de	à
Femelle	Juvenile		12	0.0	1.0
	Sub-adulte		36	1.0	4.0
	Adulte		108	4.0	13.0
Mâle	Juvenile		12	0.0	1.0
	Sub-adulte		36	1.0	4.0
	Adulte		60	4.0	9.0

2. Determining the duration of the forecast

Projection	
Nb. années	
	20

3. Determining the initial state of the herd

The initial state defines the herd at the start of the period for forecast. You can take any initial state and readjust it in the final stage.

Example.
Determining the number of animals by sex and age group, either directly or by providing the total number of animals and then the % of animals per sex and age group as shown below:

Population

Taille				Taille	Structure	
		Nb. anim.	% anim.		Globale	Intra-sexe
F	J		10%	5.0	10%	14%
	S		20%	10.0	20%	29%
	A		39%	19.5	39%	57%
M	J		10%	5.0	10%	32%
	S		15%	7.5	15%	48%
	A		6%	3.0	6%	19%
Total	F	0.0	69%	34.5	69%	100%
	M	0.0	31%	15.5	31%	100%
	T	0.0	100.00%	50.0	100%	
	Nb. tot. anim		50.0			

4. Determining the herd's natural parameters

- Calving and prolificacy rates constant for the 20-year forecast,
- Natural mortality rate.

Example for the first 4 years

			Année 1	2	3	4
Démographie						
Reproduction						
	Taux de mise bas (/année)		0.50	0.50	0.50	0.50
	Taux de prolificité nette		1.00	1.00	1.00	1.00
	% de femelle à la naissance		50%	50%	50%	50%
Mortalité (%)						
- / classe d'âge si durée < 1 an						
- / année si durée >= 1 an	Femelle	J	15%	15%	15%	15%
		S	8%	8%	8%	8%
		A	3%	3%	3%	3%
	Mâle	J	15%	15%	15%	15%
		S	8%	8%	8%	8%
		A	3%	3%	3%	3%
Exploitation (%)						
- / classe d'âge si durée < 1 an						
- / année si durée >= 1 an	Femelle	J				
		S				
		A				
	Mâle	J				
		S				
		A				

In the summary (synthesis) for “year 20”, the growth rate is then of 2.6 %:

Synthèse année 20

		Structure		Espèces	bovin
F	J	7%		Taille	small
	S	17%		Type	grassland
	A	32%			
M	J	7%			
	S	17%			
	A	20%		Taux	
			Exploitation	Croît	Prod. num.
Total	F	56%	5.5%	2.5%	
	M	44%	8.4%	2.6%	
	T	100%	6.8%	2.6%	9%

In the demographic model, the parameters for the females only determine the growth rate in a “steady state”. Thus, the females are marketed in order to obtain a growth rate of approximately 1 %.

5. Determining the offtake rates of females

We assume the young females (juveniles) are not marketed. After several attempts, the offtake rate is set at 2 % for young adult and adult females:

Démographie			Année 1	2	3	4
Reproduction						
	Taux de mise bas (/année)		0.50	0.50	0.50	0.50
	Taux de prolificité nette		1.00	1.00	1.00	1.00
	% de femelle à la naissance		50%	50%	50%	50%
Mortalité (%)						
- / classe d'âge si durée < 1 an						
- / année si durée >= 1 an	Femelle	J	15%	15%	15%	15%
		S	8%	8%	8%	8%
		A	3%	3%	3%	3%
	Mâle	J	15%	15%	15%	15%
		S	8%	8%	8%	8%
		A	3%	3%	3%	3%
Exploitation (%)						
- / classe d'âge si durée < 1 an						
- / année si durée >= 1 an	Femelle	J	0%	0%	0%	0%
		S	2%	2%	2%	2%
		A	2%	2%	2%	2%
	Mâle	J				
		S				
		A				

In “year 20”, the new growth rate for females now reaches 1.1 %

Synthèse année 20

		Structure		Espèces	bovin
F	J	7%		Taille	small
	S	16%		Type	grassland
	A	31%			
M	J	7%			
	S	17%			
	A	22%		Taux	
			Exploitation	Croît	Prod. num.
Total	F	55%	6.8%	1.1%	
	M	45%	8.7%	1.3%	
	T	100%	7.7%	1.2%	9%

A rate of exactly 1 % could be obtained by fine-tuning the offtake rates of 2 %.

In “year 20”, the growth rate for males (1.3 %) differs from that for females. Therefore, with the current parameters, the model has not converged to a “steady demographic state”. In addition, the sex-age structure does not correspond to the one sought (70 % females and 39 % reproductive females).

We can then market the males to solve these two problems.

6. Determining the offtake rates for males

Young males (juveniles) are not marketed. After several attempts, the offtake rates were set at: young adult males 20 %, adult males 30 %.

Démographie			Année 1	2	3	4
Reproduction						
	Taux de mise bas (/année)		0.50	0.50	0.50	0.50
	Taux de prolificité nette		1.00	1.00	1.00	1.00
	% de femelle à la naissance		50%	50%	50%	50%
Mortalité (%)						
- / classe d'âge si durée < 1 an						
- / année si durée >= 1 an	Femelle	J	15%	15%	15%	15%
		S	8%	8%	8%	8%
		A	3%	3%	3%	3%
	Mâle	J	15%	15%	15%	15%
		S	8%	8%	8%	8%
		A	3%	3%	3%	3%
Exploitation (%)						
- / classe d'âge si durée < 1 an						
- / année si durée >= 1 an	Femelle	J	0%	0%	0%	0%
		S	2%	2%	2%	2%
		A	2%	2%	2%	2%
	Mâle	J	0%	0%	0%	0%
		S	20%	20%	20%	20%
		A	30%	30%	30%	30%

In “year 20”, the total growth rate reaches 1.1 %, with females representing 70 % and reproductive females 39 % of the herd.

Synthèse année 20

		Structure		Espèces	bovin
F	J	9%		Taille	small
	S	21%		Type	grassland
	A	39%			
M	J	9%			
	S	16%			
	A	7%		Taux	
			Exploitation	Croît	Prod. num.
Total	F	69%	6.8%	1.1%	
	M	31%	20.5%	1.1%	
	T	100%	11.1%	1.1%	12%

As previously, the offtake rates can be fine-tuned by 20 and 30 %.

The total numerical productivity rate obtained in a “steady state” is then 12 %, which is typical of an extensively managed Sahelian herd.

With the current parameters, the Results section shows that the growth rate fluctuates before converging to 1.1 % in year 9.

Population		Année 0	1	2	3	4	5	6	7	8	9	10
Taux de croît												
	F		1.0%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
	M		2.0%	1.5%	1.3%	1.2%	1.2%	1.2%	1.2%	1.2%	1.1%	1.1%
	T		1.3%	1.2%	1.2%	1.2%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%

The sex-age structure also fluctuates. However, in this example, it converges more quickly, in year 3.

Structure												
Globale	Femelle	J	10%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%
		S	20%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%
		A	39%	39%	39%	39%	39%	39%	39%	39%	39%	39%	39%
	Mâle	J	10%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%
		S	15%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
		A	6%	6%	6%	7%	7%	7%	7%	7%	7%	7%	7%
	Total	F	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%	69%
		M	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%
		T	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

In a demographic forecasting model, when demographic rates remain constant over time, which is the case in our example, the model starts by fluctuating (transitional state) then converges to a steady state (stable state).

In time, the steady state is characterised by a constant growth rate and a constant sex-age structure (%). These characteristics depend on demographic rates, not on the initial state. For most ruminant herds, the steady state can be observed well before “year 20”.

The duration and magnitude of the transitional state depend on the difference between the structure defined at the start of the herd forecast (initial state) and the structure when reaching the steady state. To eliminate the transitional state, in other words to achieve a forecast that is always

in the steady state, it is simply a case of replacing the initial structure of the herd by the stable structure (which eliminates all fluctuations).

7. Readjusting the initial state of the herd

You replace the initial herd structure (stage 3) by the stable structure observed in year 20 (decimals are used here to avoid problems of rounded numbers).

Population						
Taille				Taille	Structure	
		Nb. anim.	% anim.		Globale	Intra-sexe
F	J		9.0%	4.5	9.0%	13%
	S		20.6%	10.3	20.6%	30%
	A		39.0%	19.5	39.0%	57%
M	J		9.0%	4.5	9.0%	29%
	S		15.7%	7.9	15.7%	50%
	A		6.7%	3.4	6.7%	21%
Total	F	0.0	69%	34.3	69%	100%
	M	0.0	31%	15.7	31%	100%
	T	0.0	100.00%	50.0	100%	
	Nb. tot. anim		50.0			

You obtain the following results:

Population			Année 0	1	2	3	4	5	6	7	8	9	10
Taux de croît													
		F		1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
		M		1.2%	1.2%	1.2%	1.2%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
		T		1.2%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%	1.1%
Structure													
	Globale	Femelle	J	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%
			S	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%	21%
			A	39%	39%	39%	39%	39%	39%	39%	39%	39%	39%	39%
		Mâle	J	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%	9%
			S	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
			A	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%	7%

(The slight fluctuation in growth rate is simply due to problems of rounded numbers).

Activity M3-SM1-A3: LS financial performance

1. Objective

Estimate the financial performances of each livestock farming system in terms of gross margin, production costs, profitability and remuneration for various factors (labour, livestock).

This estimate is based on the production results derived from the activity M3-SM1-A2.

The financial indicators can be used to estimate household vulnerability in terms of money and food (M3-SM1-A4). Some intermediary indicators can be used to evaluate the global value added by the livestock production sector to the national economy (M4), as well as to draw up plans of action for livestock production (M5).

2. Expected outcomes

Indicators to determine the financial profitability of livestock production activities (gross margin, cost price, rates of return). Whereas this analysis provides a large set of indicators, the user should select the most relevant ones depending on the livestock farming systems studied.

Some are summarized in the table "Output_A3" of the tool m3_sm1_a1_TOOL_synthesis.xls and for all the livestock production systems studied:

See: m3_sm1_a3_OUT_perf_financial_EN.jpg

m3_sm1_a3_OUT_perf_financial_EN.jpg [302 kB]

3. Method and tools

This analysis is a continuation of the previous activity and is still conducted at the level of **livestock farming systems (LS)**. In the case of option 1 ("expert method"), as for option 2 ("survey data method"), it is based on the same tools as in M3-SM1-A2: the

economic and financial spreadsheets are inserted just after the spreadsheets that model the *technical* performances of the livestock farming systems.

Each sheet is made up of three parts: 1) the input parameters for setting the quantities and prices of all the inputs and products; 2) the results, which propose a set of output parameters; 3) a summary table of the main results (at the bottom of the sheet).

In the module (M3), we only fill in the "Diagnostic" sheet, which corresponds to the modelling of the actual situation. In module M5, we will use the same files and fill in the sheets "Impact Analysis" and "Investment". We will compare the results with or without intervention ("with" and "without") in the summary sheet.

Tools: see the tools proposed in M3-SM1-A2

Methodological guides:

- Main: m3_sm1_a3_NOT_financial_perf_LS_EN.pdf
- Additional information (with a Burkina Faso case study): m3_sm1_a3_NOTC_details_BFcase_EN.pdf

m3_sm1_a3_NOT_financial_perf_LS_EN.pdf [149 kB]

m3_sm1_a3_NOTC_details_BFcase_EN.pdf [132 kB]

4. Further information

- To conduct an economic analysis of the livestock production systems, refer to the methodological note: m3_sm1_a3_ANN_2_economic_analysis_LS_EN.pdf
- To conduct an analysis of the economic and financial performances of crop systems in order to estimate agricultural income from the following activity (M3-SM1-A4), use the tool: m3_sm1_a3_TOOL_crops.xlsm

An example is provided: m3_sm1_a3_EX_crops.xlsm

- Table of reference indicators (inputs): m3_sm1_a2_to_a3_ANN_default_value.xlsm

m3_sm1_a3_ANN_2_economic_analysis_LS_EN.pdf [13 kB]

m3_sm1_a3_TOOL_crops.xlsm [310 kB]

m3_sm1_a3_EX_crops.xlsm [311 kB]

m3_sm1_a2_to_a3_ANN_default_value.xlsm [325 kB]

m3_sm1_a3_NOT_financial_perf_LS_EN.pdf

ALIVE
PARTNERSHIP FOR LIVESTOCK DEVELOPMENT, POVERTY ALLEVIATION & SUSTAINABLE GROWTH

GUIDE FOR THE INSERTION OF LIVESTOCK PRODUCTION IN THE PRSPs

METHODOLOGICAL NOTE
FINANCIAL ANALYSIS OF THE LIVESTOCK FARMING SYSTEMS
ACTIVITY M_3-SM_1-A_3

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1. OBJECTIVES

The aim of the financial analysis of livestock farming systems as the analysis of their importance in the production system is to provide a set of indicators for financial profitability at the level of the livestock farming systems. It will provide as well calculations for intermediate incomes at a household level. These will be used in the analysis of economic vulnerability (m3_sm1_a4).

The set of tools proposed consists of simplified approaches to the performances of livestock farming systems and production.

The aggregation of these results on a national level will make it possible to determine: the value added derived from the animal production activity at the level of GDP (M4), as well as its contribution in terms of tax revenue; or some indicators of competitiveness, such as domestic resource costs (DRC, M5).

2. BASIC NOTIONS

- Active person: the active people in the household are all those who are old enough to work, regardless of whether or not they have a job or regardless of their real capacity. The age is set in relation to the labour laws in each country. There are formal definitions for the active population, such as “all the people over the age of 15”. The number of active people is generally mentioned in the surveys on the households’ living conditions.

- Rate of activity. The rate of activity in households is the proportion of really active people over the total number of people old enough to work in the household.

- Use of labour (manpower). The analysis of the use of labour for the different systems (livestock and crops) should consider the main calendars and practices used in the production systems identified (transhumance, lending animals, etc.). In the case of agro-pastoral systems, this for instance could limit the number of active people available for agricultural field work (during the cropping season).

- Livestock manure: the term “manure” is often used to refer to the animal droppings used for fertilising the fields, regardless of whether or not they are actually in the form of manure. The term “manure” should be used for the mixture of litter and animal droppings. When droppings are not mixed with plant-made litter, we prefer using other terms like animal droppings mixed with soil, slurry or manure effluent. In the tools the term “organic matter” will be used.

3. DESCRIPTION

3.1. Principle of the spreadsheet design

The overall approach for determining the financial performances of livestock farming systems is based on the principles for estimating income (for the *financial* analysis strictly). The tool can also be used to conduct an *economic* analysis of the livestock production systems which therefore complements the analysis of performances for the livestock farming systems in the framework of the activity M3-SM1-A3. Moreover, it can also be used to analyse the competitiveness of the system when it is considered on a larger scale (regional or national level) with the calculation of the Domestic Resource Cost in M4-SM2-A2. Lastly, it can be used as an alternative for carrying out an impact analysis of an intervention by taking into account the *non-financial* costs and advantages. The *economic* analysis of the livestock farming systems is proposed in the section “*Going further*”.

The first objective in the design of the spreadsheets is to facilitate a rapid analysis of each production system. For a more detailed analysis of production systems, it is important to adjust the spreadsheets. Besides, although the indicators proposed may have the advantage of being familiar to everyone, they may not fully reflect the financial advantages or drawbacks of a given system. Therefore, it is essential to adjust the spreadsheets by adding other indicators when needed.

Each Excel workbook relating to the financial analysis of a livestock farming system includes four worksheets:
- “**Diagnostic** ” sheet, which corresponds to the sheet for the analysis of the production system in the present situation, i.e. the so-called baseline year without change.
- “**Impact analysis**” sheet, which corresponds to the sheet for the simulation where a socio-economic or financial change can be introduced. The parameters can be identical to those in the “Diagnostic ” sheet in the case where we want to simulate the impact of a change in zootechnical performances.
- “**Synthesis**” sheet, which provides key indicators with reference to the baseline situation “without change” (from the “Diagnostic” sheet), and in the situation with change (from the “Impact

analysis" sheet). For the ruminant systems (EcoRum), the results are given for the first year, which is considered as the baseline year and for an average year for the dynamic ruminant models. There is also a summary of the set of coefficients used in the activity M4-SM1-A1 in order to calculate the value added in the livestock sector and its contribution to the GDP; and in the activities M4-SM1-A3 and M4-SM1-A4 for the comparative evaluation of the indicators of vulnerability, poverty or food insecurity. The indicators of financial performance are also included. They can be used to estimate the average incomes derived from livestock production in the survey approach to household vulnerability - option 2 - (M3-SM1-A4).
- "**Investment**" sheet, which will be used in module 5 to test the plans of action with external funding.

Without and With. The two "Diagnostic " and "Impact analysis" sheets are identical. Here we only present the overall structure of the sheet that we call "Diagnostic " and which corresponds to the situation without change. The principle for filling in and using the sheet is exactly the same as for the "Impact analysis" sheet.

In this module (M3), we only fill in the "Diagnostic " sheet, which corresponds to the modelling of the actual situation. In module 5, we will use the same files. We will fill in the sheets: "with" to simulate a technical change; and "Impact analysis" to simulate an economic change; as well as the "Investment" sheet to provide information on the type of investment made and to evaluate its profitability. In the "Synthesis" sheet, we will compare the data "with" (with change) and "without" (without change).

In order to facilitate filling in the "Impact analysis" sheet, you can import the parameters that have already been filled in for "Diagnostic " and in this way modify/complete the relevant cells. In order to do this, click on the button "Import from analysis".

Two types of analyses are proposed: 1. A financial analysis, which makes it possible to determine the contribution made by livestock production to total income and 2. An economic analysis that is optional and presented in the document m3_sm1_a3_ANN_2_economic_analysis_LS_EN.pdf

At the start of the Diagnostic sheet, specify clearly the type of analysis as "financial" and leave the last two columns (in blue): % tradeable goods and economic unit cost that will only be used in the case of an "economic" analysis.

3.2. Principle of modelling for livestock farming systems

The approach is based on identifying and quantifying all the factors of production (production costs and general expenses), the loan for working capital and the products derived from the livestock farming system. The latter is based on one species and one herd management type, which depends on the desired livestock products. The file (m3_sm1_a3_NOTC_details_BFcase_EN.pdf) provides elements or examples that may help with quantifying and valuing the inputs and products.

The data required to calculate the financial results can come from a bibliographic review that we complement with a limited number of field surveys or interviews with producers in order to validate or update certain data. This approach to modelling is obviously simplified. In the case of option 2 (access to household databases), some parameters can be aggregated using the file m3_sm1_a4_TOOL_household.xls, sheet "Typo_LS".

In order to verify the validity of the technical data used, the user can compare his data with the reference tables obtained from the literature m3_sm1_a2_to_a3_ANN_default_value.xls

Reminder: it you want to represent all the farms for a given livestock farming system, remember to take into account the average parameters for farms with and without use of each input.

The “Diagnostic” sheet in the Excel workbook relating to each main livestock farming system provides an analytical grid for conducting a financial and economic appraisal of a livestock farming system. It comprises three main sections: 1) an initial “Model” section, where the user has to enter all the parameters required for the analysis, 2) a “Results” section, which shows all the results for 20 years for ruminants and for 1 year for the short-cycle systems (poultry, pig and fattening), and 3) a final “Synthesis ” section, which shows the main results for the year of reference (and also for the average year out of 20 for the ruminant systems). This will help to compile the final tables of results.

On principle, for all the sheets, the **yellow boxes** are the calculated boxes. The **grey boxes** are the indicators. If the word FALSE appears, it indicates an anomaly in the data. The **white boxes** need to be filled in.

The “Model” section in the “Diagnostic” sheet is composed of three sub sections: I) Production costs and general expenses, II) Products, III) Household economics. The sub sections I) and II) concern the financial analysis of the dominant livestock production system. They should be the focus in the framework of this activity. The last sub section concerns the household, its composition, the other livestock production activities, as well as the other sources of income. This sub section is the subject of the activity M3-SM1-A4 in the case of option 1 only.

3.3. The input parameters: Estimating the production costs and the products from offtake for the dominant livestock farming system

The objective is to quantify and value all the expenses and products for the dominant livestock farming system.

3.3.1. Estimating the production costs and general expenses

Determining the cost of feeds: The cost of feeds is very often one of the major costs in livestock farming systems. There are two ways of estimating the cost of feed: 1) either from empirical data on feed rations used per category of animals (species, breed, sex, age, etc.); 2) or from “theoretical” or “recommended” dry matter requirements for 100 kg of live weight.

In the DynMod model, the model’s technical results (“Projection” sheet) give a total annual digestible dry matter requirement for the herd. In the “Analysis” sheet, the cost of forage can be determined using the percentage of requirements covered by the feed bought on the market and the cost of the feed on the market. The “Diagnostic” sheet makes it possible to take into account a supplement (provision of concentrates) for different groups of animals (age and sex). **These provisions cannot exceed 20% of the ration.**

In poultry, pig and fattening models, the technical sheets are used for the evaluation of the quantities of feed consumed (be they of industrial origin or other). The quantities of feed are directly recorded in the “Diagnostic” sheet

Quantifying and valuing other inputs:

- For the costs linked to forage crops in the ruminant systems: indicate the quantities and unit price of the inputs used (seeds, fertilisers, treatments) and any use of salaried labour (in number of days and daily rate for external labour).

- In the systems with a short cycle (poultry, pig and fattening models), the production cost of forage crops produced on the farm can be estimated from the workbook proposed to evaluate the net income derived from the crop system. In this case, create a new workbook that only includes forage crops.
- For “Vaccines”: estimate an average annual cost per head (with the exception of the piglet production and fattening system where a lump sum per year can be presumed).

- For “Veterinary costs and medicines”: estimate an average annual cost for the whole of the livestock farming system.
- For the external labour allocated to a livestock farming system: 1) for the “permanent employees”, indicate the number of months and the monthly wage; 2) for the “seasonal employees”, indicate the number of days and the daily wage; 3) for the “herders”, the calculation is conducted using the number of “herders – month” and the monthly wage (which includes the cost of payment in kind).
- The “transport costs” and the “maintenance costs of assets” have been grouped together in the category “other supplies and small equipment” for the ruminant systems: use a lump sum per year. For the other systems, the transport costs should be included in the category “other”.
- For “taxes and levies” on animal products: use a lump sum per year.
- For energy and water charges: use a lump sum per month.
- For poultry, pig and fattening systems, the costs linked to investment in animals are indicated. These are considered as variable costs, in the sense that they are regular and incurred each year. In the fattening systems, where animals come from another production unit on the same farm, this cost indicates the initial production cost of the animals until they reach the fattening stage.

Estimating the costs of investment and credit:
In order to take into account the financing constraints that face producers, there is the added possibility of including the financial cost of a short-term loan needed for insuring cash flow or for working capital requirements. Thus, this constraint can be properly taken into account for evaluating vulnerability. Three parameters should be included: (i) the percentage of all the production costs and general expenses financed by the loan; (ii) the annual interest rate for the loan (this rate should theoretically be a real interest rate, excluding inflation, because we are working with constant prices); and (iii) the duration of the loan.
Thus, two incomes are calculated: before financing (excluding the cost of the short-term loan for working capital requirements) and after financing (including the cost of the short-term loan for the working capital requirements).

3.3.2. Products from livestock farming and their valuation

Section II of the “Diagnostic” and “Impact analysis” sheets include three sections:

Estimation of the animal products and their sale price – Most of the products are estimated from the demographic and/or technical models proposed for each system. For the poultry, pig and fattening systems, the user should estimate the average production of animal droppings (referred to as organic matter) per animal and per year. For the ruminant systems, **the user should use the DynMod demographic model by using the economic prices for the animals’ different age groups**. The other prices of animal products correspond to the farm gate prices.

Allocation of intermediate costs depending on the main livestock products – In the livestock farming systems with at least two main products, as for some ruminant systems, this involves estimating the share of costs allocated to each product (meat/milk/energy). If the main product is meat, we put 100% for meat and 0% for milk in the category “% intermediate costs” for the parameters “III. Products”.

Valuing products – this section makes it possible to break down production between the different potential uses for animal products: home-consumption, direct sales (& barter), sales to an intermediary, not valued/losses. Then at a macro-economic level it will help to distinguish the direct GDP from the indirect GDP, the monetary GDP from the non-monetary GDP (once the results have been aggregated). See section II (basic notions) in the methodological note for M4-SM1-A1 for the calculation of GDP.

With this tool, the calculation for the income derived from livestock production includes home-consumption and all sales (including non-commercial sales), in other words the commercial and non-commercial exchanges.

Regarding the products devoted to final consumption, i.e. meat, milk and eggs: the products should be broken down into “home-consumption”, “direct sales” and “sales in the value chain”. All these uses are taken into account in the income for the dominant livestock system.

For wool, hides and skins: they should be broken down between “home-consumption” and “sales in the value chain” once the column “not valued” is filled in (hides and skins).

For the livestock products that correspond to any intermediate product used for agriculture (transfer of organic matter, energy): allocate their use between “on-farm” and “on the other farms” (or for direct sale). The calculation of income only takes into account the use “on other farms”. In addition, for organic matter, estimate the share that will not be valued directly.

3.4. The output results: presentation of the financial indicators

This section provides a set of indicators that allow for a preliminary interpretation of the financial performances of the livestock farming system studied.

Financial indicators of the livestock production activity: These indicators give a preliminary estimation of the income generated per unit of capital (labour, animal). They are based on the monetary profit that includes all of the costs and receipts, as well as the non-monetary ones (agricultural by-products used in animal feeds, home-consumption, manure production, etc.):

- “Net income from livestock production” (also known as gross margin): this is the product generated by the livestock farming system (sale+home-consumption+gift) minus the production costs and general expenses. Some of the production costs and the products from family-based livestock production systems do not have a monetary value. Thus, in extensive systems, the crop residues consumed by animals constitute an important part of the production costs, nonetheless. Even though there is a market for crop residues in rural areas, they are not generally bought but produced on-farm. Similarly, some products are widely consumed at the farm level: home-consumption of milk, use of animal manure in crop fields, etc. Thus, the calculation of the monetary gross margin includes all the costs and receipts, as well as the non-monetary ones (home-produced agricultural by-products, capital, land, home-consumption, manure production, etc.). In addition, two types of income are calculated: before financing (excluding the cost of the short-term loan for working capital requirements) and after financing (including the cost of the short-term loan for working capital requirements).
- “Margin per unit & per product”: The sum of the production costs in relation to the number of animals present or the production (litre, kg of carcass or egg), which makes it possible to determine the *production cost* for the producer. This production cost can be compared to the average sale price of products on the market in order to determine the producer’s “*gross profit per unit*”. The ratio of gross profit to production cost provides an indicator of the “*rate of return*” for the livestock farming system considered. This data will be used in the value chain analysis.
- “Net income per active family member”: the profit generated by an active person working full-time in the livestock farming system considered.
- “Net income per breeding female”: the profit generated per breeding female in the herd. The analysis of the gross margin and other financial results in relation to the number of breeding females makes it possible to draw comparisons between several livestock farming systems of the same species.
- “Net income per animal or place”: the profit generated per head (animal) in the herd or per place. It includes all the costs and receipts, as well as the non-monetary ones (home-produced agricultural by-products, capital, land, home-consumption, manure production,

etc.). This indicator adds to the analysis conducted per breeding female. In fact, for several reasons, the different livestock production systems are not all practiced with the same number of animals. Thus, it is very rare for a farm with only a few heads of cattle to practice large-scale transhumance. Cattle owners who have a sedentary system generally only own a few heads, etc. Given the tremendous variation in the numbers observed in the field, the notion of size of a herd type may seem rigid or simplistic. However, it is completed by (i) the analysis of the margins generated per breeding female; (ii) the calculation of the number of heads required to reach the poverty threshold and; (iii) the notion of the maximum and minimum number of heads for a given livestock farming system, which is taken into account in the analysis of the production systems.

- "The gross margin/herd value ratio", gives an indication of the profitability of the capital tied up (fixed assets). This analysis is only theoretical. In fact, for most of the livestock farming systems, the possibility of an investor investing in the acquisition of a herd, with the characteristics of a "working" herd in terms of age distribution, is virtually unheard of. Nonetheless, this very simple ratio provides a good qualitative indication for comparing the income generated as a function of the capital tied up in the case of different livestock farming systems.
- The "Structure of products": provides a distribution of the financial profits per type of product in relation to the total product. This indicator sometimes attributes importance to products derived from a livestock farming system that may otherwise be under estimated or not estimated at all and which may orient policy choices (M5).
- "Production costs and general expenses per breeding female/place/animal"
- "Feeding costs per breeding female/place/animal"
- "Structure of production costs and general expenses": this indicator helps to identify the production factors that represent the highest cost to producers. Decision-makers can use it to target their development action for each system (M5).

Intermediate results for module 4 - The "Synthesis'" sheet within the workbook presents:
- % of intermediate costs for the different products: indicators used in the calculation for added value (MA-SM1-A1). This concerns the share of production costs and general expenses (excluding labour costs) in relation to the product (valuated at the financial or economic price depending on the type of analysis).
- Tax revenue and cost of tradeable goods: these indicators could be used in the analysis of competitiveness for the livestock production sector (M4-SM2) or for any prospective analyse (M5).

The comparative evaluation of the livestock production systems. It is useful to compare the financial performances of the different livestock farming systems, or even to compare the systems with other economic activities (crop systems or monthly wages in the private or public sector).

3.5. Going further

Economic analysis

In some cases, an economic analysis, if complete, could be used to more efficiently compare livestock farming systems. See the methodological note for further details: m3_sm1_a3_ANN_2_economic_analysis_LS_EN.doc

Evaluation of the crop systems

In anticipation of the household analysis and to help estimate the agricultural incomes, a tool could be used to conduct the economic and financial analysis of crop systems:
m3_sm1_a3_TOOL_crops.xls

Activity M3-SM1-A4: Household poverty and vulnerability (HHD)

1. Objective

- Highlight the situations and pockets of poverty among the households with a main or secondary animal production activity (HHD), households identified in M3-SM1-A1 and whose dominant livestock farming system was analysed in the activities M3-SM1-A2 and A3.
- For each type of household, identify the factors of financial vulnerability and food security that affect their living conditions.
- For each type of household, identify the factors of vulnerability in terms of social capital, access to resources, access to social services, access to technical services, access to the main value chains and, lastly, their vulnerability with regards to climatic or economic crises.

2. Expected outcomes

Quantitative and qualitative indicators that can be used for a global analysis of household vulnerability. The main ones will be summarized in the table "Output_A4" of the tool m3_sm1_a1_TOOL_synthesis.xlsm for all the household (HHD) categories studied:
m3_sm1_a4_OUT_1_vulnerability_EN.jpg

This table will be used to construct the indices of vulnerability and poverty at the national level (M4-SM1-A4).

As an example, the file attached proposes another mode for summarizing the results from the analysis of vulnerability in Mauritania:
m3_sm1_a4_OUT_2_vulnerabilite_mauritanie_FR.xls

m3_sm1_a4_OUT_1_vulnerability_EN.jpg [272 kB]

m3_sm1_a4_OUT_2_vulnerabilite_Mauritanie_FR.xls [144 kB]

3. Method and tools

3.1. Quantitative analysis

The main quantitative indicators relating to monetary and food vulnerability come from the financial analysis conducted in the activity M3-SM1-A3. Several threshold indicators are proposed, for example, the number of breeding females or the total herd, which allows a household to meet its minimum requirements. A nutritional approach is proposed based on the calorie (energy) and protein requirements of adults and children in the household and the contributions linked to home-consumption. Lastly, more qualitative indicators can be envisaged to complete the analysis.

Before conducting the analysis of vulnerability *per se*, two preliminary stages are necessary:

- A change of scale for the analysis: from the livestock farming system (LS) to the household (HHD) where several species of animals may co-exist.
- The reconstitution of the global income of households taking into account the other sources of income (agricultural and off-farm) in order to evaluate the weight of livestock production in the households' global economy.

The methodology and the tools vary depending on whether or not you have access to detailed household survey data (i.e. Option 2 or Option 1, respectively).

Option 1 ("expert method")

As a continuation of M3-SM1-A2 and A3, the analysis consists of deriving average indicators of vulnerability for household groups classified according to their dominant livestock production and on the basis of tools proposed in M3-SM1-A2. The lack of household survey data means that it is not possible to analyze the disparity of income and situations within each of the groups. A sensitivity analysis of other sources of income can be conducted in order to determine this variability.

Tools:

- Analysis: sheets "Diagnostic" and "Impact analysis" of the tool M3-SM1-A2 .
- Summary of results for all the HHD: m3_sm1_a1_TOOL_synthesis.xls (accessible in M3-SM1-A1 previously select Option1 in "About")

Methodological guide: m3_sm1_a4_NOT_vulnerability_option1_EN.pdf

Option 2 ("survey data method")

In the case of option 2, the incomes and indicators of financial and nutritional vulnerability are estimated individually, in other words for each household within the three main production systems: LG, MR and MI. The results are then aggregated according to different typologies (with specific criteria) within these systems:

- HHI: characterized by the level of *income* (poor, average, rich) and the main household *activity* (livestock producer, farmer, part-time or mixed farmer)

- HHD: characterized by the dominant system according to *species* and *size* of the household's dominant herd (*relative* dominance)
- HHS: characterized by the dominant system according to *species* of the household's dominant herd and contribution to *income* (*absolute* dominance)

In this way, the heterogeneity of income can be determined within each household category and the calculation of indicators of poverty (incidence, depth, contribution) and inequality will make it possible to determine the link between livestock and poverty more accurately at the national scale (M4-SM1-A4).

Tools:

- Analysis for (LG, MR, MI): m3_sm1_a4_TOOL_household.xlsm
- Summary of results for all the HHDs: m3_sm1_a1_TOOL_synthesis.xls (accessible in M3-SM1-A1 previously select Option2 in "About")

Methodological guide: m3_sm1_a4_NOT_vulnerability_option2_EN.pdf

Example: m3_sm1_a4_EX_2_household_MR.xls

3.2 Qualitative analysis

This stage consists of completing the quantitative analysis using more qualitative and varied indicators.

Tool: m3_sm1_a4_TOOL_vulnerabilityQUAL.xls

Methodological guide: m3_sm1_a4_NOTC_vulnerability_nonQindicators_EN.pdf

m3_sm1_a4_NOTC_vulnerability_nonQindicators_EN.pdf [215 kB]

m3_sm1_a4_NOT_vulnerability_option1_EN.pdf [206 kB]

m3_sm1_a4_NOT_vulnerability_option2_EN.pdf [145 kB]

m3_sm1_a4_EX_2_household_MR.xlsm (Zip) [5 MB]

4. Further information

Going further: qualitative analysis and modeling of crises

It is also possible to determine vulnerability in the case of climatic or economic crises (see example below).

Example : modeling the impact of a drought
m3_sm1_a4_EX_3doc_impact_drought_EN.pdf

with the associated excel file: m3_sm1_a4_EX_3excel_impact_drought_EN.xlsm

Additional information

Human Development Report, UNDP, 2010

To go further and develop geographical representation of households' poverty at a national scale, the World Bank proposes a Software for poverty mapping

m3_sm1_a4_EX_3doc_impact_drought_EN.pdf [52 kB]

m3_sm1_a4_EX_3excel_impact_drought_EN.xlsm [2 MB]

m3_sm1_a4_NOT_vulnerability_option1_EN.pdf

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GUIDE FOR THE INCLUSION OF LIVESTOCK PRODUCTION IN THE PRSPs

METHODOLOGICAL NOTE
HOUSEHOLD POVERTY AND VULNERABILITY: OPTION 1
ACTIVITY M_3-SM_1-A_4

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1. OBJECTIVES

The activity "Household poverty and vulnerability" seeks to highlight the situations and pockets of poverty among the stakeholders directly involved in animal production within the different livestock farming systems that are identified in the activity M3-SM1-A1 and analysed in M3-SM1-A2 and A3. For this purpose, the scale needs to be changed to that of the household where several animal species co-exist.

While the analysis of poverty is largely based on the actual situation, the analysis of vulnerability makes it possible to take account of the actual situation, as well as the risks involved, by focusing on the main factors that can influence the production systems' future situation. This sub-module aims to provide a set of indicators to determine financial vulnerability, vulnerability in terms of food security, as well as the jobs provided by livestock production.

The overall vulnerability of production systems is determined in relation to an analytical grid, which also includes vulnerability in relation to social capital, access to resources, access to social services, access to technical services, access to the main value chains and, lastly, vulnerability in

relation to climatic and economic crises. For these additional indicators, refer to the supplementary methodological note: m3_sm1_a4_NOTC_vulnerability_nonQindicators_EN.pdf

In short, the aim is to identify the stakeholders who are in a precarious position within the different production systems (LG, MR, MI).

2. BASIC NOTIONS

- Monetary poverty threshold: Level of income below which a household is considered poor. An individual is considered poor when his standard of living is below the poverty threshold.

- Monetary poverty: Monetary poverty occurs when resources are insufficient for an adequate standard of living. It generally leads to difficulties relating to food, clothing and housing.

- Human poverty: According to the UNDP, human poverty indicates "the absence of basic human capacities: illiteracy, malnutrition, reduced life expectancy, poor maternal health, avoidable diseases" [UNDP 2000a: 19].

- Poverty of living standards: Also known as poverty of existence, the poverty of living standards occurs when it is impossible to satisfy the requirements that make it possible to lead a decent life in a given society. It results from malnutrition, lack of education, insanitary housing, etc.

- Standard of living: The standard of living is equal to the available household income divided by the number of consumption units (cu). Therefore, the standard of living is the same for all the individuals in the same household.

- Consumption units: The consumption units are generally calculated according to the OECD-scale of equivalence. This attributes 1 cu to the first adult in the household, 0.5 cu to the other people of 14 years and over and 0.3 cu to children below 14 years. See: http://www.insee.fr/fr/nom_def_met/definitions/html/unite-consommation.htm

- Absolute poverty threshold: The absolute poverty threshold is set on the basis of the normative conventions agreed at a given time in the country or in a given community. The threshold is generally fixed as a function of a basket of food and non-food items required for daily survival. The basket of food items can be set to satisfy a given normative energy requirement (which is 2 400 calories per day for poverty and 1 800 for extreme poverty). The basket of non-food items includes clothing, transport, hygiene, water and energy. One very well known alternative method was provided by the World Bank and is based on a normative threshold of 1 dollar (in 1990) per person per day.

The UNDP report *Defeating human poverty* (2000): "*a person lives in extreme poverty if they do not have the necessary income to meet their basic food requirements – generally defined on the basis of minimum calorific requirements […]. A person lives in general poverty if they do not have sufficient income to meet their basic food and non-food requirements – such as clothing, energy and housing*".

- Relative poverty threshold: The relative poverty threshold is set in relation to the distribution of the standards of living for the entire population, with the median as the reference. In Europe, Eurostat fixes the relative poverty threshold at 60% of the median European standard of living.

- Median income: The median income is the income that separates the population in two, in other words, half the population has a higher income and half has a lower income.

- Food security: The definition of the concept of "food security" has gradually become more precise and now includes access for all individuals at all times to sufficient food in order to lead a healthy and active life with respect for food preferences (FAO, 1983). There are now four aspects to food security: production, physical access to the good, economic access (price, purchasing power, etc.) and diversity of food choices.

- Dominant livestock production system: In rural areas, most households have mixed herds made up of several species of animals. The dominant livestock production system is the one that generates the highest share of income from livestock production.

3. DESCRIPTION

In the case of **option 1**, the analysis of the vulnerability of households with a livestock production activity can largely be deduced from the technico-economic analysis of the livestock farming systems and the production systems conducted in the activities M3-SM1-A2 and A3. It can be carried out using the **sheets "Diagnostic" and "Impact Analysis**" in the same tools **m3_sm1_a2_TOOL_[species].xls** (e.g. m3_sm1_a2_TOOL_chicken_village.xlsm). Check beforehand that option 1 was activated in the sheet "**About**".

In the case of option 2, the analysis of the vulnerability of households with a livestock production activity is conducted using the tool m3_sm1_a4_TOOL_household.xls. Refer to the methodological note m3_sm1_a4_NOT_vulnerability_option2_EN.pdf. However, for the households with a **specialised** livestock production activity, the analysis of vulnerability is conducted using the tools **m3_sm1_a2_TOOL_[species].xls.** Therefore, this methodological note is relevant to them.

Part III of the model section is organised in relation to and specifically dedicated to household parameters. The main ones can be imported directly from the file "**m3_sm1_a1_TOOL_synthesisxlsm**" (previously select option1 in "About"), sheet "**data_A4_opt1**" in the case of option 1. In the case of option 2, these parameters should be recorded on the sheet directly. The results are generated below in part III (in pale red).

The main results of the analysis of vulnerability activity (M3-SM1-A4) are recorded in the file **"m3_sm1_a1_TOOL_synthesis.xlsm", sheet "output_A4_opt1"**. Click on the "Import" button to transfer results.

Before proceeding to the actual analysis of vulnerability, two preliminary stages should be accomplished: 1) a change of scale: from the livestock farming system to the household. 2) the other activities/sources of income should be taken into account in order to estimate the weight of livestock production in the global household economy.

3.1. Change of scale and new typology (HHD)

You are now working with the households that are classified according to the dominant livestock production system (coded **HDD**). The typology proposed on the left of the sheet "**data_a1_opt1**" of the file "**m3_sm1_a1_TOOL_synthesis**" is very close to that of the livestock farming systems. However, be careful because you now have to evaluate the representativeness of the households that own dominant herds and no longer numbers of animals. Complete this part by identifying:

- The number of households for which the given livestock farming system is the dominant system. This information is not *a priori* easy to find out. A rough estimate can be made using the databases of household surveys and the numbers of animals owned: 1) Estimate the total herd capital for each household by aggregating the species as a function of the average price per head. 2) Calculate the percentage of the animal capital for each species identified, and identify then the dominant species for each household. 3) Aggregate the information per household type (HHD typology).

- Then for each HHD record the average number of heads of the species that are not the dominant species.
- Then check that the numbers of animals re-allocated between the households in this way (columns AU-AW) are consistent with the numbers of animals in the typology "livestock farming systems (LS)" (Table [A7-F15]).

3.2. Reconstituting the global household income

To determine the weight of livestock production in the family economy, it is essential to evaluate the other sources of household income by starting with all the livestock farming systems.

3.2.1. Other incomes from livestock production

In fact, rural households often own mixed herds. Here, develop the typology according to the dominant livestock production.

Here, import/enter per species: the number of animals owned, the average net annual income generated per head, the number of heads and the animal products (milk, eggs) used for home-consumption.

Hypotheses adopted in the framework of this model:

- The average income was generated during the analysis of the financial performances of the livestock farming systems (M3-SM1-A3). By default, we propose importing the average income for the three sub-systems (small, medium, large) of the livestock farming systems. This income can be adjusted as a function of herd size in the sheet "data_A4_opt1" of the file m3_sm1_a1_TOOL_synthesis.xlsm or directly in the tool m3_sm1_a2_TOOL_[species].xls.
- The specialised intensive systems (cattle and sheep fattening, modern poultry, piglet production and fattening, semi-urban dairy), are not considered to have any other income from another livestock production.

3.2.2. Other sources of income

The other sources of income are simply estimated in terms of:

- Agricultural incomes. On the basis of data from the agricultural survey, rough estimates can be made by taking the average areas cultivated for each household type multiplied by the average yields and the average prices for the principal products in the main production systems (LG, MR, MI) to which they belong. For a more detailed approach, the user can refer to the tool m3_sm1_a3_TOOL_crops.xls, in the appendix of the activity M3-SM1-A3.
- Non-agricultural incomes. All the other sources of household income (services, crafts, salaried jobs, transfers received, etc.) should be taken into account.

With an iterative method, once the model's results have been completed, it is important to check that the average incomes for the households studied are consistent with those presented in the national statistics of the country.

3.3. Indicators of financial vulnerability

3.3.1. Estimating the differences (gaps) in relation to the poverty threshold per household

A household's financial vulnerability is generally estimated by comparing the income from the household's agricultural and non-agricultural activities with the income at the poverty threshold. Given the limits inherent to any **modelling** work, the objectives are to:

(i) Estimate the scale of the contribution made by livestock production to the **total income** of households and to determine the variability/diversity of this contribution

within the same group of households;

(ii) Show the levels of poverty based on the differences (negative, as well as positive) between the household income and the poverty threshold.

The rate of coverage of the household's poverty threshold by income derived from livestock production (called "Net income from animal production/Household poverty threshold" in the sheet) is calculated according to the following elements:

- Input parameters:
  - The poverty threshold per capita estimated and updated to the year of study; determining the poverty threshold is based on the evaluation of the minimum expenditure to ensure an acceptable standard of living. Therefore, it is a question of determining the total cost of the essential resources that an "adult" consumes on average in a year. This **poverty threshold per capita** will be recorded in section "III. Other parameters" in the sheet "diagnostic".
  - The number of people in the household.
- Estimated/calculated parameters:
  - The incomes from livestock farming are composed of the products from livestock production (sale+gifts+home-consumption) from which we deduct production costs, general expenditure and the loan for working capital;
  - The household poverty threshold is the poverty threshold per person multiplied by the number of people in the household.
- Results parameters:
  - The share of income from livestock production in covering the household's poverty threshold gives a preliminary measure of the importance of livestock in poverty reduction. However, this indicator gives no indication of the household's real poverty, which depends on all the household's resources, nor does it reveal whether livestock production does better or less well than another productive activity allocated the same resources endowment at start.

Estimation of the other indicators provided:

- To complete the analysis of poverty, we have to estimate the contribution made by all the activities to cover the household's poverty threshold. This indicator is calculated as a % of the share of the net incomes derived from all the activities (livestock farming+agriculture+non-agricultural) over the household poverty threshold (referred to as "Net total incomes/household poverty threshold").

- Livestock contribution to household's income is determined using the share of income from the livestock production activity of the dominant system over the total income (referred to as "Net income from animal production/Total net income"), as well as all the overall income from generated the livestock production by all the species owned.

It is important to remember that in the case of option 1, we cannot analyse the income disparity within each of the production systems because of the lack of household survey data. Instead, we can only show an average situation. The disparity can only be determined from the average herd size. However, the fact that the household's financial vulnerability will depend on the level of other sources of income (agricultural, off-farm) is important. In addition, a sensitivity analysis could be conducted by varying the other sources of income in order to determine the variability of total household income in each of the production systems.

3.3.2. Other indicators of financial vulnerability

It is difficult to discuss the conditions for developing the livestock production using only the indicators of financial vulnerability, which are based on the income from livestock farming.

Different indicators can be used to determine such conditions in order to reach the poverty threshold.

The minimum threshold for restocking a family herd in relation to household needs/use (referred to as "Number of animals to reach the poverty threshold (per person)").
This indicator is essential for understanding the processes of impoverishment or, on the contrary, capitalisation. Then, the financial vulnerability of households is determined by evaluating the minimum number of animals below which the family herd is in danger of entering a cycle of de-capitalisation (destocking) in order to meet vital expenses. This indicator is the ratio between the poverty threshold per individual and the average income per animal or breeding female in the herd. In the case of extensive livestock production systems, the minimum threshold is evaluated per breeding female, the herd's basic unit. In pig or poultry production units, it is usually evaluated per number of places, which reflects the producer's level of activity.

3.4. Vulnerability in relation to food security

Given the definition of food security and, particularly, its four aspects: production, physical access to the good, economic access (price, purchasing power, etc.), and the diversity of food choices, we propose looking at two approaches here: (i) an approach in terms of food self-sufficiency, which ensures at least three aspects of food security, namely production, physical access and economic access and (ii) a monetary approach, such as the rate of coverage of cereal requirements, which ensures financial access and food preferences, though not physical access.

3.4.1. Estimating the household's food and nutritional requirements.

While the coverage of *nutritional* requirements makes reference to basic nutrients for ensuring biological functions, covering *food* requirements also makes reference to the food habits of the households concerned.
The requirements calculated in the Excel files are estimated in relation to:

1) Nutritional requirements: for simplicity, three nutritional elements are considered: the household's calories (energy), proteins and lipids requirements. The requirements are estimated on the basis of the daily requirements for adults and children.
2) Food requirements: for simplicity, this criterion is based on the family cereal requirements.

3.4.2. The livestock production activity's contribution to the household's nutritional self-sufficiency.

This indicator is calculated in the sheets "diagnostics" of the Excel files M3-SM1-A2:

- Input parameters: on the basis of bibliographical data or existing survey data 1) estimate the share of animal products kept for home-consumption in the production system considered; 2) modify the calorie, protein and lipid contents of the animal products if necessary. Reference data is provided in the appendix: m3_sm1_a2_to_a3_ANN _default_value.xls.
- Estimated/calculated parameters: 1) the household's annual calorie, protein and lipid requirements based on the daily requirements per individual and the household structure.
- Results parameters: the coverage of the household's calorie, protein and lipid requirements by home-consumption of the different animal products (referred to as "Coverage of household's nutritional requirements by animal production"). This indicator can be used to measure the real contribution that animal production makes to meet the household's nutritional requirements.

3.4.3. The livestock production activity's contribution to the household's cereal-based food security.

Different indicators are calculated in the Excel files:

- Input parameters: 1) estimate the household's annual cereal requirements based on the household structure and the quantities needed per category of person (child, adult) and per year; 2) indicate the average price of cereals per kg (purchasing price on the markets); 3) estimate the amount of cereals used for home-consumption originated from the cropping system (referred to as "total grain production for the household") evaluated in the file M3-SM1-A3: m3_sm1_a3_TOOL_crops.xls;
- Estimated/calculated parameters: 1) household's annual cereal requirements based on the daily requirements per individual and the household structure.
- Results parameters:
    1. Coverage of the household's total cereal requirements based on the income from the livestock production activity (after excluding home-consumption), by taking into account the terms of exchange between livestock products and cereal products (referred to as "Coverage of household's cereal requirements by animal products (%)");
    2. Coverage of the household's total cereal requirements by animal products in number of months (referred to as "Coverage of household's cereal requirements by animal products (in months)");
    3. The minimum number of animals to cover the household's total cereal requirements based on the livestock production activity (referred to as "Number of animals to cover the household's cereal requirements");
    4. The coverage of the household's cereal deficit after deducting the share of cereals produced and used for home-consumption (referred to as "Coverage of household's cereal deficit by animal products (%)");
    5. Financial price of 80 g of animal protein;
    6. Ratio between the financial price of 1 kg of meat/1 kg of cereal.

Attention: None of these indicators take into account the annual price variations, which explain the occurrence of seasonal undernourishment or malnutrition in the household. In fact, during a seasonal drought, the prices of animals can collapse, whereas cereal prices increase. In addition, we do not take any account of the physical accessibility to cereals in terms of availability and physical access. These indicators are used in the "Synthesis" sheet.

3.4.4. Going further: other quantitative indicators for evaluating food insecurity

There are many indicators to determine financial vulnerability or vulnerability in terms of food security. To go further, here are other indicators or concepts of poverty found in the bibliographic references:

- *Notion of "terms of calorific exchange": number of cereal-based calories that can be acquired with one calorie of livestock product sold (one calorie of meat, milk or other animal produce depending on the livestock farming system considered). This indicator evaluates the conditions of market access for the main agro-pastoral populations.*
- *Number of heads to cover the cereal deficit: for this indicator, it is important to take account of the fact that in a period of cereal deficit, animal prices are low, whereas cereal prices increase.*
- *Reduced soil fertility: particularly in sub-Sahelian zones; it accentuates the precarious steady state or the cereal deficit on farms. Thus, reduced soil fertility can constitute an indicator of food insecurity.*
- *It is important to discuss the notion of food security in relation to the problems experienced by households in the zone or country under study.*

3.5. Livestock production as an activity generating employment

Livestock production generates numerous jobs and, therefore, helps generate resources for many unqualified or landless stakeholders. By identifying the stakeholders involved in each production system and their volume of activity, we can determine the total volume of activity generated by the livestock farming systems in number of man-months per year and per livestock farming system. Thus, in the “Synthesis” sheets in the tools M3-SM1-A2/A3 you will find the family and salaried employment generated by the livestock production. This data is then summarised for all the households in the sheet “output_A4” of the file m3_sm1_a1_TOOL_synthesis.xls and aggregated in M4 so that the indirect contribution made by livestock production to the national economy can be evaluated with the tool m4_sm1_a2_TOOL_indirect.xls.

m3_sm1_a4_NOT_vulnerability_option2_EN.pdf

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METHODOLOGICAL NOTE
HOUSEHOLD POVERTY AND VULNERABILITY: OPTION 2 (EXCLUDING SPECIALISED SYSTEMS)
ACTIVITY M_3-SM_1-A_4

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1. OBJECTIVES

The activity "Household poverty and vulnerability" seeks to highlight the situations and pockets of poverty among the stakeholders directly involved in animal production within the different livestock farming systems that are identified in the activity M3-SM1-A1 and analysed in M3-SM1-A2 and A3. For this purpose, the scale needs to be changed to that of the household where several animal species co-exist.

While the analysis of poverty is largely based on the actual situation, the analysis of vulnerability makes it possible to take account of the actual situation, as well as the risks involved, by focusing on the main factors that can influence the production systems' future situation. This sub-module aims to provide a set of indicators in order to determine financial vulnerability, vulnerability in terms of food security, as well as the jobs provided by livestock production.

The overall vulnerability of farming systems is determined in relation to an analytical grid, which also includes vulnerability in relation to social capital, access to resources, access to social

services, access to technical services, access to the main marketing sectors and, lastly, vulnerability in relation to climatic and economic crises. For these additional indicators, refer to the supplementary methodological note:
m3_sm1_a4_NOTC_vulnerability_nonQindicators_EN.pdf

In short, the aim is to identify the stakeholders who are in a precarious position within the different production systems (LG, MR, MI).

Attention: This methodological note concerns the analysis of vulnerability of the households from the main production systems: LG, MR and MI (including village (backyard) pig and poultry systems). Refer to the methodological note relating to option 1 for the specialised systems (semi-urban dairy, fattening, intensive pig, intensive poultry).

2. BASIC NOTIONS

Refer to the methodological note in the case of option 1:
m3_sm1_a4_NOT_vulnerability_option1_EN.pdf

3. DESCRIPTION

In the case of **option 2,** the analysis of the vulnerability of households having a livestock production activity is conducted using the tools m3_sm1_a4_TOOL_household_[LG/MR/MI].xls**,** sheets "Param_A3" to "Poverty&GINI". These files are created during the process.

For households with specialised livestock production, the analysis of vulnerability is conducted using the tools m3_sm1_a2_TOOL_[Species].xls, in section III, from the sheets "Diagnostic" and "Impact Analysis". Refer to the methodological noteC:\Documents and Settings\sahut\Bureau\fait\m3_sm1_a4_NOT_vulnerabilite_option1_FR.doc for these systems: m3_sm1_a4_NOT_vulnerability_option1_EN.pdf

The main results of this activity (M3-SM1-A4) will be recorded in the file **"**m3_sm1_a1_TOOL_synthesis.xlsm**", sheet "output_A4"**. Click on the "Import" button to transfer the results from the three "Household" tools and the "specialized_LS" tools.

Before conducting the analysis of vulnerability, two preliminary stages are necessary: 1) Reconstitute the households' individual incomes on the basis of results from M3-SM1-A3 and 2) Establish the typology of households.

3.1. Reconstituting household incomes and the home-consumption of animal produce (sheet "Param_A3")

The analysis of the role of livestock production in the financial and nutritional vulnerability of households follows on from the results obtained during the analysis of the technical and financial performances of the livestock production systems M3-SM1-A2 and A3. Some key results should be integrated in the household model in order to determine the main indicators of vulnerability. They will be imported directly from the file m3_sm1_a1_TOOL_synthesis.xls (in grey on the sheet). Other parameters should be recorded here (white boxes).

3.1.1. Household incomes and financial vulnerability

Before conducting any financial analysis on the household level (section 3.3 below), it is advisable to start by reconstituting the household income for each main system (LG, MR, MI). In the case of option 2, the incomes are estimated individually, in other words for each household, which is observed in the sheet "Option_2a/b".

Hypotheses retained for the model:

The individual incomes are reconstituted using the following methods:

- Income from livestock production: sum of the income per species estimated from the number of heads of livestock owned by the household i multiplied by the average income generated per head in the livestock production system (LS), average income estimated in M3-SM1-A3.
- Agricultural incomes:
    - Option 2a: the agricultural incomes from the existing databases will be imported directly in the sheet "Option_2a". If they need to be calculated, the method of estimation used in option 2b could be used with existing data and the result imported directly to "Option_2a".
    - Option 2b: the agricultural incomes are estimated along the same model as that for incomes from livestock production. The households' individual assets (number of hectares cultivated) should be multiplied by the average income for the given crop system.
- Off-farm incomes: income from services, craft or salaried activities or transfers received (income from migration). Estimated as a function of the data recorded in "Option_2a" or "Option_2b".

These methods of calculating household income can be summarised as follows:

Option 2a: $R_i = (\sum_{i,LS} Nb_{i,LS} * \overline{Rliv_{LS}}) + Rag_i + Roff_i$

Option 2b: $R_i = (\sum_{i,LS} Nb_{i,LS} * \overline{Rliv_{LS}}) + (\sum_{i,CS} Ha_{i,CS} * \overline{Rcrop_{CS}}) + Roff_i$

Where: R_i = total income for the household i

$Nb_{i,LS}$ = number of animals in the system LS owned by the household i

$\overline{Rliv_{LS}}$ = average income generated by one head of livestock in the livestock system LS (estimated in M3-SM1-A3)

$Ha_{i,CS}$ = area of land owned by the household i and cultivated with the crop system CS

$\overline{Rcrop_{CS}}$ = average income generated by 1 hectare for the crop system CS

Rag_i = agricultural income for the household i

$Roff_i$ = off-farm income for the household i

Before doing these calculations, the user should first enter and import the key parameters from the model in "Param_A3".

Parameter to enter: the absolute monetary poverty threshold (per capita)

Determining the poverty threshold is based on the evaluation of the minimum expenditure to ensure an acceptable standard of living. Therefore, it is a question of determining the total cost of all the essential resources that an "adult" consumes on average in a year.

It can be deduced by updating the threshold officially adopted on a national level, by taking account of inflation. The **poverty threshold per capita** should be recorded in box H9 of the sheet "Param_A3". In the calculations, this notion will be transposed at the level of each household as a function of their structure.

Parameters to import:

- The net financial income and the treasury generated per animal for each financial system (columns E and F for the baseline year (without intervention) and U, V (with intervention). Source: sheet “output_A3” of the file synthesis.
- Case of option 2a: the average incomes from crops per hectare. This can be used to estimate the agricultural income on the basis of the areas specified for cereal crops, other subsistence crops, cash crops, market gardening, etc. Source: sheet “data_A4_crop” of the file synthesis.

NB. The household incomes are automatically calculated in the sheet “database_without” for the baseline year and in “database_with” in the case of an intervention (the average incomes from the livestock production system after intervention are taken into account). The user does not have to do anything in these files.

3.1.2. Reconstituting household home-consumption of livestock produce

Before going on to the analysis of household nutritional vulnerability (section 3.4 below), it is advisable to start by reconstituting how much animal produce households use for home-consumption. In the case of option 2, home-consumption is estimated for the households individually, in other words, for each household observed in sheet “Option_2a/b”.

Parameters to enter: nutritional contribution from animal produce

The calorific and protein contribution from livestock produce (meat, milk, eggs) for each animal species is proposed by default. These values can be modified as a function of the reality of the livestock farming systems studied. At the bottom of the table, you will also find the daily nutritional requirements for an adult, as well as for a child in relation to an adult (adult equivalent).

Parameters to import:

The average level of production (meat, milk, eggs) per animal for each livestock farming system (columns H and I for the baseline year (without intervention) and X, Y with intervention). Source: sheet “output_A2” of the file synthesis.

- The percentage of animal produce used by the household for home-consumption: the values estimated previously in the sheet “data_A3” of the file synthesis should be recorded here. These parameters are the same without (columns R, S) or with intervention (columns AI, AJ). However, they can be modified if necessary.

Calculated parameters

On the basis of the animal products produced annually and the nutritional value of the products, the average calorie and protein contributions provided by one animal per year are calculated for a given livestock production system (columns K and L). Once the nutritional requirements of an adult have been taken into account, we can then estimate an animal’s capacity to cover the annual requirements of an adult (columns N and O). These indicators will then be used to calculate the household’s nutritional vulnerability: V_food”.

NB. Households’ individual home-consumption is calculated automatically in the sheet “database_without” for the baseline year and in “database_with” in the case of an intervention (as a function of the change in the level of production per livestock system resulting from an intervention). The user does not have to do anything in these files.

3.2. Typology of HHD and HHI households (four beige sheets)

Once the household income has been reconstituted, it can then be classified in terms of the contribution made by each species to the household income, or in terms of the relative contribution made by the livestock production activity to the household economy.

3.2.1. Household typology "sources of income" (HHI)

A preliminary typology for households, which is proposed in the sheet "typo_HHI", consists of crossing the household's level of income (three levels: poor, medium, rich) with the relative contribution from sources of income (livestock production, agriculture, off-farm, mixed).

Determining the income categories: the households are classified by default, according to income terciles (33.3% of households with the lowest incomes, 33.3% of households with intermediary incomes and 33.3% of households with the highest incomes). Nonetheless, you can modify these categories by choosing a different percentage of households represented per category.

Determining the categories of activity: the households are then classified according to their main activity, which is determined in the model as follows:

Livestock producer: if the income from livestock production constitutes over 50% of total income.
Farmer: if the income from agriculture represents over 50% of total income.
Multiple activities : if the off-farm income represents over 50% of total income.
Mixed: if none of the activities are dominant.

On the basis of this typology, the households will then be characterised according to their assets and structure.

3.2.2. Household typology "dominant livestock production" (HHD and HHS)

In the sheet "typo_HHD", the households are categorised according to the species of animal reared and, in particular, the dominant species. Two modes of "dominance" can be envisaged:

Relative dominance (**HHD**): here, by dominant species, we mean the species that contributes the most to the household income derived from livestock production. Thus, the households are classified according to the dominant species and the dominant species' herd size. This typology will be chosen by default for the rest of the analysis in M3 and M4. In other words, it provides the basis from which an intervention can be envisaged (in relation to the dominant species). However, it is important to remember that in some cases, the numbers of animals of one species can largely be apportioned between households for which this species is not a dominant one, rather than between households for which it is dominant (often the case for village chickens).

Absolute dominance (**HHS**): here, by dominant species, we mean the species that contributes more than 50% to the household income from livestock production. The households are thus classified per household with:

- A single species (income from livestock production derived from a single species of animal)
- A dominant species (income derived from livestock production for which over 50% comes from one particular species)
- A mixed herd (income derived from livestock production that comes from several species, none of which are dominant).

3.2.3. Characterisation of the households (sheet "Assets_HH")

The analysis of poverty in terms of owning assets helps identify the households that are structurally vulnerable. The sheet "Assets_HH" shows the main assets and the assets in terms of heads of livestock for the households studied according to the different typologies (HHI and HHD/S), for the households with low incomes, medium incomes and high incomes. It makes it

possible to determine how the herd structure varies, in particular, as a function of the income groups.

3.2.4. Crossing typologies (sheet "typo_HHD&I")

The sheet "typo_HHD&I" crosses the two typologies: HHD and HHI, as well as HHS and HHI. Thus, the tables and diagrams can help you identify which households, with which dominant livestock production systems, are the poorest or have incomes that depend mainly on livestock production.

3.3. Indicators of financial vulnerability (sheet "V_financial")

This stage aims to identify if and how livestock production helps secure monetary resources and capacities.

The financial vulnerability of a household is generally estimated by comparing the total household income (agricultural and non-agricultural activities) to the poverty threshold. This generic indicator of household poverty is available in the sheet "poverty&GINI" (see section 3.6).

To estimate livestock production's contribution to poverty alleviation, three indicators are provided in the sheet "V_financial":

- Livestock production's contribution to total household income. This indicator is essential for determining whether the household is poor as a producer (livestock production is the main activity) or whether livestock production is a secondary activity and thus a means of diversifying activities. This reduces the risks inherent with a single production system and reduces dependence on the seasonal cycle of agricultural harvests.
- The difference (negative or positive) between household income from livestock production and the poverty threshold. This indicator should only be analysed simultaneously with the indicators of the household's poverty.
- Livestock production's contribution to the household' cash flow. In rural economies, where subsistence farming is the main activity, livestock production represents the main (indeed the only) source of monetary income. This indicator can be used to determine how the provision of cash works for households.

3.4. Vulnerability in relation to nutritional security (sheet "V_food")

This stage aims to identify how the home-consumption of animal products by households with a livestock production activity contributes to meeting the nutritional requirements of members of the household.

The notion of nutritional requirements makes reference to the basic nutrients to ensure biological functions. For simplicity, the contributions from two nutritional elements are considered: the household calorie and protein requirements. Requirements are estimated on the basis of the daily requirements for adults and children.

The contributions are estimated on the basis of the animal produce used for home-consumption (meat, milk, eggs) and the nutritional value of these products (in the sheet "Param_A3").

The estimated coverage as a percentage of household requirements is derived for the different household categories HHI and HHD, as well as in terms of the animal produce that comes from the dominant livestock production system or from the household's entire animal production.

3.4.2. Going further: other quantitative indicators for evaluating food insecurity

See the methodological note m3_sm1_a4_NOT_vulnerability_option1_EN.pdf on the livestock production activity's contribution to household cereal security (section 3.4.3.) and other indicators (section 3.4.4).

3.5. Livestock production as an employment generating activity (sheet "V_work")

The livestock production activity creates a wide range of jobs and, thus, helps generate resources for numerous unqualified or landless stakeholders. By identifying the stakeholders involved in each production system and their volume of activity, we can determine the total volume of activity generated per livestock production system in number of man-months per year and per livestock production system.

In the sheet "V_work" of the "household" file, the volume of family and salaried activity generated by the households that own livestock is estimated in man-months per year. This indicator is aggregated by household types.

3.6. Indicators of poverty and inequality (sheet "Poverty&GINI")

The last sheet proposes several key indicators of poverty and inequality that can be used to draft a full report, on a national level (M4-SM1-A4), of the link between the livestock production activity and poverty on a country level.

3.6.1. Indicators of poverty: incidence and depth

The left side of the table derives three indicators of poverty for the different household categories (HHI, HHD, HHS):

- Incidence of poverty: percentage of households living below the poverty line.
- Depth of poverty: average difference between the incomes of poor households and the poverty threshold.
- Relative contribution: calculates the percentage of poor people from each household category for each typology given as a function of the incidence of poverty and the representativity of household categories.

These indicators are essential for targeting the households that are to benefit from future interventions. Further selection is likely in order to target either the household categories with the highest incidence of poverty or those with the greatest number of poor people.

3.6.2. Indicator of inequality: GINI coefficient

The right side of the sheet is dedicated to indicators of inequality in order to identify the impact of an intervention on income inequality for all the households from the same main production system (LG, MR, MI).
The GINI coefficient is an indicator that is frequently used to characterise the income distribution within a given population. It is calculated using the Lorenz curve (the cumulative share of income as a function of the cumulative share of the population). The GINI coefficient is between 0 (which corresponds to perfect equality, the previous curve is on the right) and 1 (which corresponds to maximum inequality).

m3_sm1_a4_NOTC_vulnerability_nonQindicators_EN.pdf

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METHODOLOGICAL NOTE: POVERTY AND VULNERABILITY OF HOUSEHOLDS ACTIVITY M_3-SM_1-A_4 -

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1. OBJECTIVES

The activity "Poverty and vulnerability of households" seeks to highlight situations and pockets of poverty among the stakeholders directly involved in animal production within the different production systems identified in the activity M3-SM1-A1 and analysed in M3-SM1-A2 and A3.

While at the first stage tools were proposed to quantify the levels of vulnerability of households in terms of financial and food security, the second stage involves completing the analysis using indicators that are more qualitative and varied. This stage is a prelude to the analysis of stakeholder constraints in M3-SM3.

2. BASIC NOTIONS

- Social capital: social capital constitutes all the social relations and networks, standards and values that lead to social cohesion, cooperation and achievement of common objectives and interests (Charmes, 1998). Today, social capital is largely measured and analysed via private transfers and their contribution to household incomes. The idea is to estimate a stock of rights and capitalised obligations at a given time with regard to other people in order to measure the social interaction within the framework of an altruistic economic policy (Ballet and Mahieu, 2001). The measure of social transfers is generally analysed via the total sum of transfers made and received (social surface) and the importance of net transfers paid (depth). Given the existence of a high correlation between the two indicators and the level of incomes and assets, social capital is indeed a factor of growth inasmuch as it mobilises widespread networks of dependents, providing cheap or free labour, which involves debt in both cases.

3. DESCRIPTION

There are many other factors of vulnerability, which make it possible to integrate the risks involved linked to the present and future situation of production systems. These factors of vulnerability are a constraint for households. Taking them into account means that improvements can be envisaged that are specific to different household groups. This is proposed in the sub-module **M3-SM3** with the tool **Extrapolate**. In addition, to prepare the working groups proposed during this phase, the factors below could be envisaged. This analysis can then be discussed with the stakeholders during the working groups.

Here, the analysis of vulnerability is simultaneously based on quantitative and qualitative indicators relating to production conditions.

In addition, the approach proposes examining the level of vulnerability of stakeholders associated with livestock farming activities at the production stage (e.g. shepherds). It is conducted on the basis of collective interviews with these stakeholders.

3.1. Other indicators of vulnerability

3.1.1. Factors of vulnerability in relation to social capital

Social capital is an essential and critical link for poverty alleviation and sustainable economic development strategies. Social capital is, therefore, defined as the capacity to use social networks. This notion of social capital is particularly important in the African context where social ties are both a factor of security (mutual aid in difficult situations, reduction of risks with the implementation of diverse strategies on a group level), but equally a factor for optimising production systems via the organisation of synergies.

However, it can also be a factor of domination, dependence and fragility or indeed a factor of exclusion or marginalisation. In fact, social interactions are complex processes with negative effects (inhibition of private initiatives, little incentive to increase gains because of social pressure, reduced responsibility, dependency, indeed domination), as well as positive effects (the family provides social protection, which is not guaranteed by the national economy).

Therefore, the objective is to draw up a synopsis of the role of livestock production in the construction of networks of relations or social capital. Integration in social networks or, in economic terms, building social capital, makes it possible to mobilise resources (capital, information, labour), benefit from solidarity in times of crisis, generate confidence in commercial transactions. The extension of social networks to new geographic spaces and to social communities that are different from the original ones is particularly important as a means of

mobilisation. However, integration in social networks does not simply have an economic object. It can be an end in itself ("He who is poor is not he who has nothing, it is he who has nobody").

Four elements can be taken into account in the analysis:

The networks for lending and redistributing livestock.

Donating or lending a cow or any other animal for "production" is a classic practice in most pastoral societies. There is a difference between donating and lending, which is determined by the reciprocity of the relationship. Donating is a formal mechanism for helping a poor person, someone who has lost all or part of their herd to the point where they can no longer live from it. Lending is above all an element that is part of a strategy of precaution in which livestock is distributed between different agents on the basis of a contract, which is usually verbal. However, it can also be interpreted as a mechanism of solidarity within the pastoral community, suggesting a certain reciprocity if the need arises: each animal lent is likely to return to its original herd (the same one or a different one) to help reconstitute the herd that suffered losses.

The transfer of animals via donation or lending can take very different forms, which vary from one ethnic group to another. In most cases, the transfers involve cows or other animals of reproductive age, which confirms that these mechanisms have a role to play in terms of security. However, the transfers can also be temporary and just involve products (new born animals and/or products such as milk).

> *Here, let us look at the well-known example of the Wodâabe Fulani ethnic group (Niger) where these transfers are well described. Thus, the "habbanae" cow (the associated "contract" is called the "habbanaaji") is lent temporarily to a friend or relative until it has calved three times. The offspring becomes the property of the borrower. The "fewnaange" cow is lent to a friend who has just lost an animal. Lending to a relative for an unspecified duration is called "soggarae". When a cow is lent to a family that has been temporarily deprived of milk, the term "diilae" cow is used. The transfer of a reproductive male to satisfy the reproductive needs of a herd with no male can also occur. In this case, the borrower is usually expected to return the animal to its owner along with a heifer after a certain period (Thébaud, 1988). These transfers differ fundamentally from situations in which herders guard "jokereeji" cows, in other words animals belonging to strangers (traders or civil servants outside the community). Milk is actually a form of payment for these herdsmen.*

Lending animals to a group of relatives or members of a clan helps form a "social solidarity network" (Gallais, 1989). Lending and donating are elements that make it possible to develop alliances and maintain ties with relatives and friends. They particularly help domestic units remain viable when they become temporarily unviable because of high stock mortality rates (drought, epizootic disease) or because of involuntary or forced destocking. They are also a means with which a livestock producer, who has exceeded his labour capacity, can encourage the circulation of animals in surplus by distributing the stock in a large geographical space. Ultimately, it is not the possession of wealth in terms of livestock that is prestigious within this social network, it is the distribution of stock (Levi-Strauss, 1967). Behind the "numerical" advantage of having a large number of animals lies the interest of having a large number of friends and relations (Waller, 1999). The redistribution of livestock generates a network of people "under obligation". This type of social construction is inconceivable with monetary wealth. Money cannot be the vehicle of identity and social relations among pastoral peoples, nor can it be part of redistribution mechanisms in any way.

Nevertheless, the strategy for redeploying livestock capital has not prevented the risks of biological depletion during recent droughts. The response capacity of a system based on solidarity is exceeded with the combination of high livestock mortality rates, the deterioration in pastoral "terms of trade" (rise in cereal prices and fall in livestock prices in times of climatic crisis), the depletion of forage and water resources, the disruption of ecosystems.

The demographic crises affecting herds in the wake of recent droughts, which destabilise the traditional system of mutual help, are manifest in the emergence of an alternative activity (a move towards agriculture, in particular) or exile to urban centres. This makes everyone more individualistic, which is incompatible with the redistribution of wealth. It is obviously easier to redistribute livestock capital than to redistribute land or harvests. In extreme cases of generalised impoverishment, sharing risks leads to the use of redistribution, not as a way of facilitating the reconstruction of the herds of the poorest, but simply as a response to immediate survival. This may involve the exchange of an animal that is donated or lent in return for seeds, or indeed home consumption of the animal, which rules out any possibility of reciprocity (Anderson, 1999). Systems of livestock redistribution that benefit the poorest people help resolve the problem of "short-term poverty". However, they are unable to resolve the problem of "structural poverty". Consequently, solidarity mechanisms are not sufficient to help pastoralists overcome collective marginalisation.

Indicators can be tested, such as:

- The percentage of animals lent **by** others to a herd or the percentage of animals lent **to** others.
- The type of lending contract.
- The number of beneficiaries or proposers.

The modification of transhumance "routes" also calls into question the privileged links established with landlords in the dry season. Establishing this type of link in new zones is far from easy as shown by the numerous very severe conflicts that occurred on recent grazing sites or new transhumance routes.

It is becoming increasingly difficult for **transhumant animals to return to the village** in densely inhabitated zones. Thus, situations in which the majority of the herd does not actually return to the farmstead site are on the increase.

> *In Burkina Faso, the families that practice livestock production with large-scale transhumance can thus be organised around three focal points. One part of the family, including the head of the household, stays in the original village or hamlet, which is now located in a densely populated zone. One or more sons leave with the majority of the herd, including all the transhumant livestock, to settle in a less densely populated site, generally located further south. A third part of the family (second wife of the son responsible for the herd, for example) may settle at the site of the dry season transhumance, possibly in Togo or Benin, for example. The owner of the animals possibly joins the herd on some occasions like sales. This socio-spatial family organisation means that each party gains greater autonomy, which may sometimes involve a loss in social capital.*

Loss of traditional know-how linked to the loosening of social links that ensured the transmission of know-how.

3.1. 2. Factors of vulnerability in relation to access to technical services other than animal health services (support-advice, training, research, access to producer's organisations)

Observations:

1. There are few technical services, both in the field of agriculture and that of livestock production, in the Sahelian zone or in arid and semi-arid zones where livestock production is predominant. The spatial distribution of agents from the agricultural and livestock services seldom reflects the demographic importance of livestock in the regions.
2. Emphasis on intensive livestock production in most governmental development projects, be it for milk production or fattening livestock, seems to be detrimental to traditional livestock

production, which still represents the majority of livestock farming systems in most sub-Saharan countries in Africa. The existence of non-governmental development projects is undeniably an advantage, although it is not always able to compensate for this lack in the long-term.
3. Supervision for extensive livestock production systems with species that have a short cycle is still virtually non-existent, although there is considerable potential for technical improvement. In addition, the technical topics dealt with are often limited.

Some quantitative and qualitative indicators for measuring the vulnerability of livestock farming systems in relation to access to technical services:

1. A cross analysis of the geographic distribution of agricultural services (in numbers of personnel) compared with the distribution of livestock (in numbers) gives a preliminary picture of disadvantaged zones from the point of view of access to services. One can also use accessibility to services indices.

2. The relationship of total budgets (governmental and non-governmental projects) allocated to different livestock farming systems compared to the livestock numbers involved in each system gives an idea of the inequalities of means allocated to services by farming system.

3. An examination of the technical topics dealt with in the different development projects gives an idea of the gaps in or the inadequacy regarding some livestock farming systems.

cf. **institutional diagnosis** in the sub-module: **M2-SM3**

3.1.3. Factors of vulnerability in relation to animal health risks and access to veterinary inputs.

The factors of vulnerability in relation to health risks are very similar to the factors of risk that are found with livestock production services in the general sense, namely, the problem of their presence in the remote zones where livestock production is dominant (linked to the problem of infrastructures, means or personnel) and sometimes more attention is given to intensive systems.

There is also a factor of vulnerability of an institutional and organisational nature, which affects the efficacy and efficiency of veterinary services in the broad sense. This factor is closely linked to problems of regulation between the public and private sector, which often lead to competition having a negative impact in difficult zones. Lastly, vulnerability is also linked to the quality of veterinary inputs, with the fraudulent manufacture of numerous medicines with no or low controls of their distribution.

Possible indicators:

1. Distance from the animal health centre, coverage of an infrastructure or a personnel with threshold distances, veterinary density / TLU or VLU Veterinary Livestock Unit, population per veterinary staff (or specialist) ratio..
2. Volume of purchase of veterinary medicines/Household/heads.
3. Presence or absence of a professional organisation facilitating accessing veterinary drugs.
4. Participation to a system for collective prevention.

cf. sub-module **Health** in **M4-SM2-A2**

Some specificity inherent to the systems:

1. Vulnerability in pastoral or agro-pastoral systems with large-scale transhumance:

Agro-pastoralists are often faced with physical difficulties of access to appropriate veterinary care, particularly during periods of transhumance. Veterinarians and technicians are often far away and not necessarily known by the producer when the latter is on transhumance. In addition, it is not always easy to ensure that veterinarians will travel or else they are unable to do so (zones that are cut off during the rainy season). This situation means that there is considerable self-medication and products of doubtful origin (counterfeiting) are used. Medicines available at local markets are often expensive and unreliable, although they do have the advantage of being directly available. In some countries (like in Benin) the establishment of pharmacies run by livestock producers is an appropriate way of facilitating access to treatment for the livestock producers practicing transhumance. CBAHW's (community-based animal health workers) has also paved the way of better integrating farmers to the veterinary health care system. Practical training for some basic treatments, such as treating for parasites or certain simple injections, can also help reduce some risks of diseases in these zones. In some countries, the structuring of livestock producer organisations around improved access to veterinary drugs (for example, the **National Federation of Central African Livestock Producers** – FNEC) has helped facilitate access to the main veterinary medicines via the establishment of a body for group purchase and distribution in the most remote regions.

2. Vulnerability in agriculture-livestock production systems with cattle draught:
The use of animal traction means that more land can be cultivated. If there is access to draught power, the areas cultivated per active family member increase by about a third. Large farms (10-15 ha), particularly in agricultural zones, often have several pairs of draught animals (2-3). However, the practice of grading up trypano-tolerant breeds (taurines or Bos *taurus*) with Sahel breeds (Peuls zebus or Bos *indicus*) is likely to cause serious problems in the long term if effective, rational and complementary control measures are not implemented on a large scale.

3. Vulnerability in short cycle village systems
The private sector (private veterinarians, livestock production auxiliaries) shows little interest in short cycle livestock production units, with the exception of village veterinary auxiliaries trained within the framework of development projects. Given that these systems are found in large pockets of poverty, there should be greater focus on short cycle livestock production, particularly in terms of suitable prophylactic programmes (cf. the analysis of livestock production systems).

4. Vulnerability inherent to poultry production systems:
Poultry production is inherently a vulnerable activity. In the absence of a suitable prophylaxis, it is very sensitive to epizootics (Newcastle disease..) , which can decimate an entire flock. In addition, it is sensitive to economic crises, as shown by the impact of the current crisis in Côte d'Ivoire. Unlike livestock production with a longer cycle, it is difficult to keep poultry in the hope of selling after situations of crisis.

3.1.4. Factors of vulnerability in relation to credit and debt

The factors of vulnerability in relation to credit and debt considerably affect nomadic or transhumant livestock producers, who have little land, the status of which is sometimes ambiguous. Yet, in numerous credit systems in African countries, guarantees are generally based on land capital. Thus, few livestock producers in Sahelian zones have access to bank credit. This problem of access to credit is found among crop-livestock mixed producers and agro-pastoralists, who launch into agricultural activities on small areas of land with an ambiguous status.

In addition, in Africa, the most widespread forms of credit in rural areas involve the purchase of agricultural inputs. They generally ignore the livestock sector, with the exception of intensive or industrial farms or part-time livestock producers who have another activity to guarantee the sums borrowed. Traditional micro-credit systems do exist (tontine), however they are not always for agricultural purposes.

Thus, many livestock producers save what they have earned from their activity in the form of animals. If the need arises, they sell some animals. In mixed crop-livestock production systems, while livestock may not guarantee a bank loan, they entirely fulfil their role as a live savings plan. The sale of part of a herd provides the finances for paying school fees, building a house or reinvesting in other agricultural or aquaculture activities, for example, as in Uganda. The loss of livestock is, therefore, a factor that considerably weakens society. Restocking programmes are based on this rationale of live savings as a means of security for production systems. Nevertheless, the sustainability of this type of development action depends on the mode and rhythm of repayment. Studies have shown that repayment in kind (produce from livestock production) was preferable to cash repayment.

Indicators:

1. Debt rate.
2. Offtake rate compared to debt rate: a high offtake rate for a zero or low debt rate can indicate a weakness in terms of means of access to formal or informal credit to cover production costs or urgent expenditure.
3. Participation to micro-credit structures (tontine, etc.).

3.1.5. Factors of vulnerability in relation to access to local, regional and international markets

This notion simultaneously covers aspects linked to: (i) difficulties involved in selling products; (ii) difficulties involved in producing products that satisfy a market demand; (iii) the fact that it is impossible to obtain profitable prices for their production.

Vulnerability in relation to economic and political crises. Livestock fattening systems, particularly cattle fattening, which is largely practiced by traders, often targets export markets and is, therefore, dependent on the external situation. Nonetheless, the relatively short duration of fattening activities means that risks are limited, the number of animals fattened can be adapted to market conditions relatively quickly, the accumulation of animals then occurs at the level of producers, who sell animals for fattening.

Vulnerability in relation to health crises

In value chains that target export products (live cattle, fishery products), an animal health crisis can totally undermine the export market circuits. Thus, networks to supply sheep from the Horn of Africa to the Arab peninsula for “Eid” muslim celebration were considerably weakened by the epizootic disease Rift Valley Fever, that led to an embargo on exports from the affected countries (Ethiopia and Somalia, in particular).

Indicators:

1. The notion of caloric exchange rate between livestock and cereals to evaluate conditions of market access for Sahelian agro-pastoral populations. It often shows a significant difference between the “terms of trade” in the Sahelian environment and the “terms of trade” in the rest of the country.

*For example, in Burkina Faso, in the framework of **IEPC**, the caloric exchange rate was estimated at around 5 on average in a Sahelian environment, whereas it had been estimated at between 10 and 15 for the whole country for the 1994-1995 period, with an upward trend. Producers with few cattle have to deal with even lower rates. In fact, they are often forced to sell their animals to buy cereals in periods when the exchange ratio between animals and cereals is particularly unfavourable.*

2. Presence of a major epizootic disease likely to lead to an embargo on animal products (cf. sub-module **Health M4-SM2-A2)**.
3. Absence or weakness of a veterinary control mechanism for export (quarantine, vaccination, health checks, accreditation) (cf. sub-module **Health M4-SM2-A2)**.

3.1.6. Factors of vulnerability in relation to access to water and natural resources

Observation:

1. The most important constraints currently faced by agro-pastoralists are linked to the drastic reduction in grazing land (classified forests and newly cultivated land), possibilities of travel (cattle trails not defined or respected) and the possibilities of access to strategic sites (water points, grazing areas, vaccination crush pens).

2. Access to some zones that traditionally welcomed numerous herds on transhumance is becoming more and more difficult. This is particularly the case for the arable banks of certain large water courses and ponds, which become inaccessible for much of the year because of the development of dry season crops, which limits access to grazing on flood plains at the falling stage, including the traditional “bourgou” pastures

3. In addition, a number of recent phenomena tend to multiply the hindrances to large-scale transhumance:

- The control of the presence of livestock in protected areas, particularly the natural park zones, is becoming increasingly severe, often with extremely tough penalties.
- The reluctance of some countries, which traditionally welcomed foreign animals during transhumance and are now closing borders, in the context of tougher health regulation and in order to satisfy the OIE international standards.
- Socio-political tensions between neighbouring countries or civil war in some countries.
- Theft of livestock and banditry are a major constraint, particularly in border zones.
- Agro-pastoralists based in the Sahelian zone are suffering because agricultural land is rapidly expanding to the detriment of the best grazing land.

4. In most countries, use of agricultural by-products and agro-industrial by-products is becoming increasingly difficult because of the high demand, stimulated by the major development in livestock fattening activities, as well as the diminishing grazing resources, which leads to a high rise in prices as the dry season advances. The resulting feed deficiencies often cause females to stop lactating prematurely, induce poor growth among the young animals and interrupt the females’ oestrous cycles. Females come back on heat with the growth of grass during rainy season, which generally leads to a peak in births during periods that are unfavourable for newborn animals.

5. The development of livestock production activities within systems that were originally based on agriculture increases pressure on grazing resources and the competition with agro-pastoral systems. In time, there is no guarantee that grazing zones close to villages will be maintained for village herds in zones of considerable agricultural expansion. In the absence of a rational approach to managing space (e.g. zoning maps), the crop-livestock mixed producers with access to animal traction are extending the areas that they cultivate and thus generating competition between their own activities. This trend was barely noticed by producers while their animals were lent to agro-pastoralists, although it is now becoming more apparent.

6. Urban planning and habitat programmes are not very favourable to continued urban livestock production and could encourage its relocation to peri-urban areas or even further. In addition, the over-exploitation of peri-urban grazing is a threat to the profitability of these production systems, which remain dependent on the use of some natural resources despite a significant degree of intensification. In these peri-urban environments, the sustainability of livestock farming systems is actually very dependent on the producers’ capacity to manage feed constraints. This capacity is a function of the possibility that producers have to: develop peri-urban cropping systems capable of producing forage or suitable mixed crops at prices that are sufficiently low to maintain the profitability of the livestock farming systems; or improve processing techniques and conditions for

transporting natural forage cut on the grazing land. However, harvesting forage in distant regions could heighten the phenomena of competition with other livestock farming systems, which play an essential role in alleviating poverty among rural households.

Indicators:

1. Comparison of the grazing density (number of animals/available grazing area) in relation to its resilience (grazing capacity: maximum number of animals/unit of grazing land) as a function of biomass production: this indicator reveals that the grazing resource is depleted to satisfy the needs of a given system. cf. sub-module **Potential of natural resources M4-SM2-A1**.

2. Number of land conflicts: this indicator reveals the vulnerability of stakeholders in relation to land access and, therefore, constitutes an indicator of pressure on land.

3. Capacity to manage feed costs. Feed costs per unit of production give an idea of the control of access to natural resources, as well as market dependence.

3.1.7. Factors of vulnerability in relation to access to basic social services

Observation:

1. Generally, households in the Sahelian zone and, more generally, households that practice a system of transhumance suffer from little access to education and health care. This is particularly due to the poor network of social, health and educational infrastructure in these zones; a factor to which can be added low monetary incomes and cultural constraints (education).

2. There has been no impact analysis of AIDS and opportunistic human diseases on the level of capitalisation in animals by the poorest households. Nonetheless, it is likely that this type of production system is particularly affected by animal sales or ritual offerings linked to these diseases.

Indicators:
1. Mapping of the spatial distribution of human health infrastructures (with numbers of staff) and of the population to be covered in the zone, see also the indicators presented for access to veterinary care (section 3.1.3 above)
2. Programmes or trainings to raise awareness about certain diseases or conditions of hygiene: budget per zone.

3.1.8. Factors of vulnerability in relation to climatic hazards

Observation:

Agro-pastoralists are particularly vulnerable to periods of prolonged drought, inasmuch as they depend on livestock production activities and restocking a herd is a slow process. The family herd can be greatly reduced after a period of severe drought. Below a minimum threshold of actual stock, agro-pastoralists are constrained to destock productive animals regularly (heifers, young cows) in order to pay for running costs. Thus, the offtake rate exceeds the gross herd growth rate. The herd diminishes in size with the transfer of ownership of animals, which benefits well-off farmers (mixed production systems that are in a situation of integrating/accumulating), civil servants or traders.
The periods of prolonged drought often induce population displacement, particularly livestock producers towards agricultural zones. This displacement creates tensions in the host zones, which can spark local conflicts.

Indicators:
The long-term viability threshold. This threshold considers that in a period of crisis, a household should be able to withstand the loss of at least a third of its stock, for example. This notion is obviously closely linked to the production system and the local context. It is very difficult to establish a set of generic data for the whole country.

3.1.9. Other factors of vulnerability

Lastly, another factor of vulnerability is linked to poor stakeholder participation in the livestock production sector when it comes to developing diagnosis, solutions, decisions for action, intervention, policies that concern them directly. Over and above the diagnosis, ways of improving participation must be identified. For example, more systematic procedures could be used to consult stakeholders in the development of projects and policies, with support from professional organisations or training courses.

We can use quantitative indicators of participation, considered in terms of the percentage of projects developed or decisions made concerning the sector after consultation with the stakeholders. Nevertheless a dialogue with these stakeholders will be more pertinent for addressing this issue.

3.2. Indirect stakeholders involved at the level of production systems

Livestock production calls on service providers whose income and living conditions depend on the animal production activities (shepherd, permanent employee, shearer, etc.). Poverty reduction programmes often ignore many of these stakeholders. This module aims to identify the stakeholders and provide the key points for analysis and discussion for a socio-economic analysis of these “service providers” in order to focus on their living conditions, vulnerability and levels of poverty.

3.2.1. Identification of indirect stakeholders

On the production level, livestock farming activities often involve a number of stakeholders who either supply goods or services needed for livestock production or are directly involved in technical herd management. The stakeholders involved in processing or sale of products are not included here (they are taken into account in the analysis of value chains).

These stakeholders can be divided into two groups:

- The service providers: artificial insemination or health auxiliaries (paravets), private veterinarians, livestock feed retailers, shearers, etc.
- The stakeholders involved in managing the herd: shepherds, full-time or part-time employees, women, children, etc.

Therefore, all the stakeholders and their involvement in the production system under study need to be clearly identified.

3.2.2. Livestock production as a job creation activity

Livestock production activities generate a wide range of jobs and, therefore, generate resources for many unqualified or landless stakeholders. If the stakeholders involved in each production system and the scale of their activity are identified, the total volume of activity generated by the livestock system in numbers of man-months per year and per type of livestock farming system can be estimated. This indicator has already been dealt with in part 3.4 of the methodological notes, option 1 and option 2.

3.2.3. Taking it further: identification of factors of stakeholder vulnerability on the basis of brief interviews.

1. For each type of stakeholder, their activity needs to be characterised and the incomes generated by the activity need to be estimated. This can be achieved with a brief interview of the different stakeholders in different zones.

The main indicators required are the following:

- *Type of activity.*
- *Period of activity (number of months per year).*
- *Volume of activity (for example, the number of services rendered by private veterinarians or auxiliaries, the number of animals guarded by shepherds, the volume of forage or agro-industrial feeds sold by traders).*
- *Annual incomes calculated on the basis of costs linked to the service (costs of intermediate goods, costs of products exchanged, transport costs, etc.) and income (sale price, service/prescription fees). For shepherds, income should take into account monetary and non-monetary income (in kind: the amount of milk collected, the number of animals that he is given, etc.).*
- *Estimated income should be compared to the poverty threshold to determine the financial vulnerability of these stakeholders.*
- *Identify the other factors of vulnerability linked to the seasonal nature of the activity, the conditions for carrying out the activity, the forms of dependence that it generates, etc.*

Cross-reference: an example of vulnerability specific to agro-pastoralists who look after animals that have been lent to them.

Dependence in relation to the owners of animals, which can hinder mobility. Often owners do not like seeing their animals go too far from their homestead. Thus, the system of lending forces agro-pastoralists or herdsmen to limit the movements of their own animals and settle close to the owner, which generally means in dense agricultural zones. This limits their access to both cropland and feed resources for their own animals.

Strong competition between agricultural and livestock production activities regarding labour (workforce). Agro-pastoralists, who look after animals that have been lent, seek to develop their own agricultural production in order to limit the cereal deficit, which would force them to sell animals. Nonetheless, their agricultural production is threatened by the severe labour competition between agricultural and livestock production activities. This competition is exacerbated by the fact that the agro-pastoralists generally settle in dense agricultural zones, where animal guarding requires particular vigilance and, therefore, involves more labour than in other regions.

Insecure land tenure. In addition to the difficulties associated with access to forage resources, there are major difficulties with access to agricultural land and security of tenure. Agro-pastoralists that look after animals that have been lent are not generally able to give animals as a way of securing land tenure. In particularly dense regions, the phenomena of insecure land tenure can force families to travel repeatedly in order to find herds to guard, as well as land where they can settle permanently. The land situation for these producers is even more precarious because landlord farmers covet well-fertilised fields around their home.

2. It is also important to analyse the vulnerability within the household. Many women and children are involved in the livestock production activity, be it guarding for the children or trough feeding or animal milking for the women. These activities can be profitable for these stakeholders. In some countries and some zones, women have been able to add value to surplus milk, either by direct sale of fresh milk or the sale of processed milk products. However, this activity can generate forms of vulnerability: the need for guarding livestock forces some households to take their children out of school.

m3_sm1_a4_EX_3doc_impact_drought_EN.pdf

M3-SM1-A4

Example of a simulation of change: Impact analysis of drought on a farm scale

1. Aims

External shocks have always been a factor involved in the impoverishment of livestock producers. Socio-political crises, droughts, health and economic crises regularly hit the sector and affect households directly.

The aim of this sub-module is to provide the means for evaluating an external change on the evolution of animal production and the degree of vulnerability of households concerned by the livestock production activity.

2. Global description of the approach

In this example, we simulate the impact of a drought on the demography of a herd of cattle in a Sahelian environment.

We conduct a 20-year forecast, by presuming that the drought occurs in year 3. The demographic parameters are presumed to be constant for the whole period of the forecast (representing an average situation with a growth rate of between 3 and 4%) except in the drought year.

We presume that a rapid transversal review was conducted after the shock in order to estimate the effect of the drought on the demographic rates. This survey has shown: an increase in the natural mortality of animals, an increase in the use of old animals (destocking), particularly males (reaching 25%), and a reduction in the calving rate due to numerous abortions.

3. Activities and stages

3.1. Evaluation of the impact of an external change on animal production: example of a drought

Stage 1: Simulation of a shock – Sheet "Projection model (with)"

1. We anticipated a 40% drop in sale prices in the drought year, due to high animal destocking rates (these prices were presumed constant in non-drought years).

2. We presume that there is a high increase in mortality, reaching 45% for young animals of less than 1 year, 13% for heifers and young bulls and 21% for adults.

3. The exploitation rates increase for the males, reaching 10% for young animals, 30% for heifers and young bulls and 50% for the males.

4. In addition, milk production drops by 170 litres to 150 per lactation.

Stage 2: Interpretation of changes: reading the results.

1. Between the beginning and the end of year 3, the size of the herd decreases by 32% for the females, 39.9% for the males and 34.5% in total (mean annual growth rate of 0.80, 0.58 and 0.73).

2. The exploitation rate (number of animals used/initial number) is 27.5%.

3. Total production dropped to -5.9 in year 3, whereas it was around 7.4 animals in previous years (for 50 animals at the start of year 1).

3.2. Evaluation of the impact of external change on economic profitability

Stage 1: Simulation of the financial and economic shock in the sheet "Impact analysis"

1. We presume that the biomass production per hectare on grazing land diminishes in the drought scenario. As a result, the livestock producer has to purchase feed for his cattle in order to cover the deficit. We presume that the livestock producer has to buy 10% of his requirements on the market.

2. The other parameters remain identical to the situation without drought.

Stage 2: Reading and interpreting the results in the sheet "Synthesis"

1. In order to analyse the impact of drought, a number of parameters are chosen to allow for a quick reading of the effects in budgetary terms and in terms of the degree of vulnerability of the livestock production system in question. Some parameters are reviewed in the sheet "Synthesis".

2. A rapid example is given: the analysis of the impact of a drought requiring more complex hypotheses as a function of the phenomena observed. Thus, for each impact analysis, the user will be able to draw up their own summary sheet, which will use the basic results from the "Diagnostic" and "Impact analysis" sheets. They can also create their own indicators.

3. Given that the input prices, particularly for food, were not adjusted for the other years of the scenario, our analysis is limited to the effects in the year or years of drought in question.

4. To start with, we observe a high increase in operational costs incurred in year 3, which is partly linked to the need to compensate for the grazing deficit by purchasing animal feeds on the market. Consequently, as a result of a considerable loss in animal stock due to mortality and reduced market prices for animals, the livestock producer records a drastic drop in income. Thus, in the absence of external support, the livestock producer is forced to borrow in order to cover food costs or to further reduce his herd size. This triggers a process involving either external intervention (special drought credit, grant for foodstuffs, etc.) or a radical adjustment of herd size.

5. The variation in the unit margin per Kg of meat (carcass weight) gives a revealing estimation of the drop in the profitability of the activity in a period of drought.

6. In terms of vulnerability, it is easy to observe that the livestock production activity no longer satisfies the household's minimum requirements, which are set at the poverty threshold. While the livestock production activity more than covers the household's needs in a normal year, it only satisfies 40% of needs in a period of drought, when 50% of young under 1 year and 10-20% of other age groups are affected.

Sub-module M3-SM2: Analysis of the livestock value chains

You study the economics of the households involved in activities linked to livestock production (module M3) in order to determine the arguments in support of the inclusion of this sector in the poverty reduction strategy paper. You should analyse the livestock value chains (sub-module M3-SM2), where the producers' supply is faced with the consumers' demand and imports. This should provide an overview of the interactions between poverty and livestock production at the different stages of the value chains.

1. Objective

- Characterise the forms of organisation of the value chains.
- Evaluate the economic performances of the marketing networks.
- Specify the added value created across the chains and its distribution between stakeholders (indicator of equity or inequity).
- Estimate the direct and indirect effects of the animal product value chains in terms of generating employment and income.

2. Expected outcomes

1. Characterisation of the different livestock value chains
2. Analysis of the financial performances of the livestock value chains
3. Socio-economic approach to sectors

Activity M3-SM2-A1: Characterisation of the different livestock value chains

You should analyse the livestock value chains (M3-SM2) in the framework of the economic study of households involved in livestock production activities (M3).

The first activity is to identify, represent and characterise the chains in order to obtain an overview of the organisation of livestock sector, from production, to imports for consumption and exports.

1. Objective

Identify:

- the value chains linked to livestock production;
- the stakeholders involved at the different stages of each chain;
- the quantities exchanged;
- the sites of transaction;
- the extent of product processing.

2. Expected outcomes

You should obtain a representation of the main processing and marketing networks for the animal products which are studied

- in activity 2 (M3-SM2-A2) for the analysis of financial performances;
- in activity 3 (M3-SM2-A3) for the socio-economic analysis of the direct and indirect effects in terms of employment and income generation.

Example of the representation of the butter and milk industry in Addis Ababa:

- m3_sm2_a1_OUT_Butter.pdf

Example of the representation of some international meat industries:

- m3-sm2-a1-OUT_Meat_EN.pdf

m3_sm2_a1_OUT_butter.pdf [26 kB]

m3_sm2_a1_OUT_Meat_EN.pdf [244 kB]

3. Method and tools

In order to link products, stakeholders and flows, there are four stages:

- Identifying the stakeholders;
- Identifying the functions: types of transactions, place, types of operations (production, processing, marketing, transport, etc.)
  - m3_sm2_a1_TOOL_1_identify_chains.xlsm
- Quantifying the flows of products
  - m3_sm2_a1_to_a2_TOOL_2_analyze_chain.xlsm
  - m3_sm2_a1_TOOL_3_import_export.xls
- Representing the organisation of the sector and the analysis of its competitiveness, excluding price
  - m3_sm2_a1_TOOL_4_Market_Infrastructures.xlsx
  - m3_sm2_a1_TOOL_5_competitiveness.xlsx

Methodological guides:

- m3_sm2_a1_NOT_caracterisation_chain_EN.pdf
- m3_sm2_a1_NOTC_competitiveness_market_EN.pdf

Appendices: illustration of the stages of the analysis

- m3_sm2_a1_EX_1_functional_matrix_EN.xls
- m3_sm2_a1_EX_2_ovine_chain_bf_EN.pdf
- m3-sm2-a1_ANN_1_Chain_mapping_symbols_EN.pdf
- m3_sm2_a1toa2_ANN_2_guide_survey_EN.pdf
- m3-sm2-a1_ANN_3_ConversionFactorsMilk_EN.pdf

m3_sm2_a1_NOT_caracterisation_chain_EN.pdf [142 kB]

m3_sm2_a1_NOTC_competitiveness_market_EN.pdf [92 kB]

m3_sm2_a1_EX_1_functional_matrix_EN.xls [112 kB]

m3_sm2_a1_EX_2_ovine_chain_bf_EN.pdf [108 kB]

m3_sm2_a1_ANN_1_Chain_mapping_symbols_EN.pdf [15 kB]

m3_sm2_a1toa2_ANN_2_guide_survey_EN.pdf [101 kB]

m3_sm2_a1_ANN_3_ConversionFactorsMilk_EN.pdf [7 kB]

4. Further information

Glossary of terminology relating to the value chains

- m3_sm2_a1_ANN_4_Glossary_ValueChain_EN.pdf

Regional and international databases

- West African Agricultural Market Information System Network WAMIS NET, Price statistics from the official West African Market Price Agencies ECOWAS (in French and English)Cattle Bulls
  - Cattle, Beef
  - Cattle, cows
  - Goats
  - Sheep
  - Chickens
- Web site for the South African Red Meat Abattoir Association (in English)
  - Legislation and codes of good practice
  - Definitions of prices collected
- The Eastern and Southern African Dairy Association directory of agents in the dairy sector (per country in English)
- SADC guide to regional statistics on livestock production and animal health in the SADC region. Chapter on the development of livestock production, section 3 Infrastructures Link Wiki LIMS : (in English)
- World Customs Organisation 2010 *Database of merchandise for the harmonised system HS* WCO, complete customs nomenclature for international trade (multi-lingual)

Studies and documents

- Study documents on the organisation of small farmers and their inclusion in the value chains / literature and studies on producer organisations and linking to value chains IIED: Regoverning markets (in English)
- Capacity building to give small farmers better market access *(* multi-lingual*)*
- Making markets work better for the poor (in English)

Other resources

- ValueLinks Manual , The Methodology of Value Chain Promotion, First Edition GTZ (in English)
- Contract Farming Resource Centre (multi-lingual)
- Inclusive Value Chains Resource Centre (multi-lingual)
- Geographic indications
  - m3_sm2_a1_ANN_5_GeographicIndications_EN.pdf

m3_sm2_a1_ANN_4_Glossary_ValueChain_EN.pdf [40 kB]

m3_sm2_a1_ANN_5_GeographicIndications_EN.pdf [3 MB]

m3_sm2_a1toa2_ANN_2_guide_survey_EN.pdf

M3-SM2-A2

Guidelines for surveying agents in a chain

1. Objectives and general approach

Field surveys should help provide some of the information that is lacking from other sources. They can have multiple roles and may vary as a function of the missing data that needs to be collected. Therefore, they can involve all or some aspects of functional analysis, financial analysis, organisational analysis, socio-economic analysis; in the case of the present *vade mecum*, they cover all aspects mentioned in the methodological note so that the tools proposed can be used.

Here, we propose a "memo reminder" list of the different aspects to survey so that questionnaires can be adapted to each situation. There are a large number of questions, which can tire those being surveyed. Therefore, it is often advisable to eliminate questions for which the examination of available documentation has already provided sufficient information to satisfy our objectives. Generally, grouping together value chains or indeed eliminating some, depending on their degree of importance and the means at our disposal, should also be considered.

We presume that the recommended ascending approach is used. Therefore, the questionnaires that should be prepared concern the different categories of productive agents in the sectors. These questionnaires will be drafted after the rapid evaluation of the function of the sector mentioned in methodological note.

A frequent question is how many agents should be surveyed, what size should the sample be? It obviously depends on the desired accuracy and the objective: if we want to establish a mathematical flow model, for example, greater precision is required than for a simple functional analysis. In Africa and in traditional sectors, we often have to deal with numerous agents of different size and technical expertise in each category. Their economic performance and vulnerability are often very variable. A typology for each category of agent and an estimate of the share of the flow handled by each type are sometimes required for correct sampling and for reasonable extrapolation to the scale of the whole sector. This is another function of the preliminary survey recommended.

The interviews can be individual if our objectives involve statistical analysis. However, participative approaches, with small groups of agents are often very interesting for some aspects, such as analysing the organisational constraints, for example, or determining the share of tradable goods in some expenses for the economic analysis.

2. Rapid preliminary survey

As mentioned, a rapid preliminary survey of the main terminal markets is often required.

The objective should then clearly be to ensure that the products and the related chains are defined first:

- Distinction between different qualities corresponding to i) clients, ii) prices, iii) characteristics of the different markets or iv) the stakeholders in the different value chains;
- Distinction related to the different competitors, such as for red meat that is fresh, refrigerated and frozen or "certified" poultry of a certain quality versus industrial poultry;
- Distinction as a function of the operators (productive agents) who work them.

The second objective usually involves briefly describing the different groups of productive agents in the sectors:

- Origin of products
- Nature of products
- Preliminary buyers and suppliers
- Links between them (family, ethnic group, region/country, etc.)
- Potential typology of the different categories of agents with the share of flows between them.

The third objective usually involves characterising and comparing the markets for one product in order to facilitate more detailed surveys:

- Relative importance (including seasonal)
- Areas of supply
- Areas of sale
- Problems and strengths (infrastructure, accessibility, other related chain or facility, etc.).

Lastly, it is often advisable to carry out a preliminary institutional and organisational characterisation at this level:

- Authorities/institution for market regulation;
- Control methods;
- Regulation charges and how they are levied (national, regional, communal, formal or informal "taxes", etc.; police checks, veterinary or customs' controls, etc.);
- Property and rules governing use of infrastructure;
- Professional or inter-professional organisations of agents that are productive (butchers, etc.) or non-productive (transporters, etc.).

3. More in-depth surveys of productive agents

➢ Characterisation of the agents' scope

The agents' perimeter is the first thing to determine. This concerns simultaneously the product(s), as well as the agents' scale and complexity:

- Nature of products coming in and going out;
- Type of processing/transport involved;
- Methods of work (small-scale, traditional, modern, formal, informal, etc.);
- Professional environment (nature/affinity of the agents across the spectrum, ethnic group, open market, origin of funding for the activities, etc.);
- Importance of the structure/volume of business (classification of professionals at the same stage in the chain? Notions of technical thresholds, such us owning a truck, etc.);
- Other activities/importance of the activity in the chain for the business/agent;

- Productive supply agents and clients (areas of supply and sale, markets frequented, etc.);
- Continuity/seasonality of the activity and/or the specialisation;
- Identification of other agents (non-productive) linked to the agent (transporters, forage suppliers, veterinarians, etc.).

- **Characterisation of the flows**

For this aspect, it is essential to have a satisfactory characterisation of the products coming in and going out (for example, a slaughterer can sell carcases on one side, at the same time as pieces of meat, skins, the fifth quarter, the legs and head, etc.). It is also important to characterise the units properly so they can be adjusted in financial terms (for example, the weight of meat retailers' "little piles", the amount of milk in a "gourd", the dressing percentage of the different categories of animals, the definition of a "head", etc.). Lastly, each product should be dealt with individually (successively).

Once these operations have been accomplished for all the categories and types of agent being surveyed, the questions can be put together solely on the flows from the supplier(s) directly preceding and the one(s) directly following. The combination will then be used to construct the functional diagram for the whole. Special attention should be given to the existence of and explanations for variations over time (seasonality of markets, supplies [transhumance], funding, etc.), in order to establish the flows for the whole period. It is also important to consider the flows of by-products at this level (manure, etc.).

Market characterisation is, therefore, a series of questions that fit naturally at this level: volumes on the different markets, reasons/motivation for going to one or other, number of vendors and buyers on these markets, etc. It is also important at this point to characterise the access restrictions to the different markets and the reasons for them (reasons of quality, health, regulations, lack of knowledge, lack of reliable information, risk, monopolies, etc.).

Finally, collecting the purchase and sale prices for products often benefits from being coupled with the identification of flows because we can then talk about well-characterised products and units. In addition, price fluctuations are often closely linked to variations in volume.

In this case, it is always important on every level of the chain to carefully estimate the share of market sales, auto-consumption (including gifts) and often direct or local sale. If prices vary as a function of markets for the same product, we can consider the products going out or coming in as different for the financial analysis.

When collecting product prices, the other point that needs to be properly characterised is the different forms of payment, including non-monetary: for example, cash or credit payment (duration of credit, does the credit operate both ways, impact on the terms of the negotiation, postponing of risk, etc.). As examples of non-monetary payment, exchange (livestock for cereals, for which the value needs to be estimated, or livestock for work), as well as links, for example, with rights to pasture or water and freedom/ease of access to markets, indeed cultural and family links (weddings, chiefdoms, etc.).

Lastly, the survey should also focus on the variations in stocks of products at the agent level during the period.

- **Characterisation of expenses**

This is often the trickiest part with traditional practitioners because of poor memory, the frequent lack of accounts and the complexity of agents who tend to ignore certain expenses. It is often useful to go through the processes of processing/transport so that they can be identified properly. For example, an animal or group of animals arrives: who transported them, who fed, watered, guarded them during transportation, who checked them. On arrival, who unloads them, who checks, how are they fed, watered, guarded, restrained, treated if sick, etc. This data should then be converted in relation to the units used: expenses per head, per ton of carcase, per litre, etc.

The expenses that need to be characterised financially concern all the inputs (products, services and supplies, transport and moving around, various management costs). However, other expenses should also be included: work, taxes, insurance, financial costs, depreciation.

The survey on the labour factor naturally leads to questions about the nature (lack of security) of employment (salaried, temporary, informal, family, etc.), remuneration and the number of people concerned. As for the other factors, a distinction should also be made between fixed and variable costs so that the data collected can be projected for all the agents at the stage considered and, therefore, for the sector. The distinction between fixed costs, variable costs and thresholds is often indispensable if we want to study the sensitivity of some categories of agents to shocks. (*For example, for a trader transporter the insurance for his truck is a fixed cost, whereas its fuel consumption is variable. However, if he wants to increase his activities significantly, he could be forced into buying an additional truck).*

The survey of taxes is a good opportunity to identify the control and tax bodies, as well as all the informal contributions. This data will make it possible to qualify data collection at the institutional level.

Lastly, the characterisation of expenses should also provide the opportunity to distinguish or estimate the shares of tradables and non-tradables required for the economic analysis.

4. Surveys of the institutions

This part of the survey is essential for the organisational analysis. For each institution, it is important to first characterise its objective or objectives: professional organisation for grouping exchanges and negotiating prices; veterinary services for controlling animal and public health, market authority for ensuring the maintenance of the infrastructure, etc.

Then, the regulatory references that they have access to should be characterised: customs and import and export regulations, as well as international agreements, protected or free trade zones; veterinary services and national, local, as well as international health regulations (OIE), etc.

The following step is then to consider in the field, as in theory, both the material and human means available to these institutions and to compare them to the objectives and the market flows. It is then often useful to consider the possibility of monitoring markets longitudinally.

Then, the tools used by the control bodies should be clearly identified: health certificates, market taxes, export taxes, etc. The flows identified can then be compared with the receipts declared and crosschecked with the statements made by the productive agents surveyed.

m3_sm2_a1_NOT_caracterisation_chain_EN.pdf

ALIVE
PARTNERSHIP FOR LIVESTOCK DEVELOPMENT, POVERTY ALLEVIATION & SUSTAINABLE GROWTH

GUIDE
FOR THE INCLUSION OF LIVESTOCK PRODUCTION IN PRSPs

METHODOLOGICAL NOTE – CHARACTERISATION OF THE ANIMAL SECTORS ACTIVITY M_3-SM_2-A_1

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The technical and economic activities central to the sectors constitute the link between production and consumption. The products from livestock production become the raw materials, intermediate products, then consumable products for the end markets. The live animals traded at markets – cattle for breeding, poultry and small ruminants purchased alive as animal products by consumers – also constitute part of the sectors.
Value is developed within the chains. The value chains generate direct or indirect employment or income. They consume national or imported inputs and services.

1. OBJECTIVE

Describe and characterise succinctly and functionally the main national marketing chains of food products of animal origin.

2. BASIC NOTIONS

A full glossary is available in the section "*For further information*"
m3_sm2_a1_ANN_4_Glossary_ValueChain_EN.pdf.

Value Chain: set of interlinked activities, which lead to the development of a product that is made available to the end consumer.
A livestock value chain involves a product (e.g. cheddar type cheese), a group of products (e.g. processed dairy products) or foodstuffs or a *commodity* (e.g. red meat from the beef industry), the production of which (supply) is closely linked to market use (demand). A value chain consists of several stages, each of which corresponds to a technical processing operation or an economic or commercial operation, in order to supply the product to the consumer markets.

Upstream chain segments: they concern the inputs and services required for animal production. If they are directly linked to a livestock value chain (for example, agro-industrial by-products or plant products destined exclusively for animal feed, such as maize silage or soybean), the inputs and services should be included in the financial analysis of the chain.

Otherwise, they are dealt with separately. For example, if crop by-products (rice or wheat bran, etc.) destined for animal feed are used and marketed in the same conditions as the main product (grain), they are part of these grain-related chains. Similarly, the veterinary inputs (medicines, vaccines), that are imported or manufactured by national operators, follow a different logic to that of produce from livestock production.

Downstream chain segments: these concern the successive uses of the primary and raw produce from livestock production, which after processing and marketing will supply the consumer markets. These are the chains studied in this module.

Functions and stages in a value chain: these can be technical or commercial (economic).
For example, to develop a "meat" product, the following *technical* functions are necessary: the production of parent animals (breeding cattle or parents and grandparents for poultry), the production of young stock (day-old chicks or young 8-days old calves), rearing young animals (until they are ready for fattening, such as a weaner calf or a young bull), transport (*change of place*), storage (*change in time*), sorting and grouping (*change in categories*, establishment of new batches, replenishment), fattening (to produce a finished animal ready for slaughter), processing (slaughter, cutting up, cooking).
For trade, the most important *commercial* functions are: *collection*, *trade* as a wholesaler or retailer activity and, lastly, consumption. These functions correspond to stages, which are carried out by agents belonging to distinct socio-professional categories. The extent to which these stages are taken into account (partially or totally) determines the height or *length* of the chain that will be studied.

Agents (of chains): independent economic and functional entities that trade material (produce, funds), or immaterial goods (information, services) within a chain. They can be individuals, collective bodies (producer groups, associations, etc.), public or private businesses.
Productive agents are those that produce value and through which a product will be physically transited, exchanged, subject to processing, before being transferred to other agents for the next stage.
Non-productive agents are, for example, the middlemen involved in negotiations at the live animal markets, the suppliers of inputs or services (credit, information, etc.).
In order to conduct the sectorial analysis, it is important to define the scope of the agent's action and to differentiate between productive and non-productive agents, by using common sense and two criteria: dependence and actual transit of products.
For example:

- The livestock producer, the person who collects the animals on farm, the slaughterer, the butcher, the veterinarian, the consumer are agents. The livestock producer "agent" is analysed in module 3;
- The fattener is considered to be a productive agent. His forage supplier or his veterinarian are also agents (as they are independent of him), however, they are not called "productive agents" because the product (animal) does not physically transit through their hands;
- The traders who sold the animals for fattening or bought the finished animals are "productive agents", because the product (animal) physically transits through their hands;
- The fattener's employees, including family or seasonal labour, are not considered to be agents.

Flow: measurable quantity of produce that enters into and exits out of (input-output model) each "productive agent" entity. We refer to flows of merchandise and products.

Analysis of the value chain (or marketing chain analysis): analysis that consists of characterising the agents, their activities and functions, the relationships and flows between agents, as well as the added value generated at each stage of the chain and the total value. There can be multiple objectives: measure the impact of the activity of some agents, that of the entire sector, its competitiveness, the effects of investments or public policies, etc.

The *financial analysis* focuses on the agents' accounts, the financial profitability of operations and investments.

The *economic analysis* studies the whole of the chain in the context of the national and international economy.

Organisational analysis of the chain: analysis of the relations between the stakeholders and the regulations that they monitor and set: contracts, agreements, rules, etc. The objectives of the analysis can be: to define new regulations or public policies, to decide to invest, to manage a product's quality policy, to control animal health or food safety, etc.

Limits of the chain: stages above and below that limit the length of the chain to be studied. Defining the scope of the value chain is one of the stages in its characterisation.

Vertical integration: cooperation between the different types of agents, in the form of supply contracts (agreements on volumes, quality and prices), or in the form of a transfer of property and through the creation of subsidiaries (pure vertical integration).
Vertical integration is complete when a dominant operator acquires the whole or a large part of the chain above or below his original activity. The more formalised the vertical integration, the more standards, specifications and procedures there are related to the products.

Horizontal integration: formal or informal cooperation at a given level of the chain between agents of the same type, in the form of a group, a union, a cooperative, a network.

Contracts, agreements: written or oral agreements between agents. They generally relate to quantities, prices, expected quality.
They can also include financial modalities for exchanges, terms of payment, compensation; for example, stipulating a system of advanced payments, deferred payment, credit or the conditions for the barter of merchandise, or services, such as rights of land use or access to pasture. They can specify the conditions for transporting products to a given location, delivery dates, methods of control, such as in the quality driven value chains. They can anticipate modalities for resolving conflicts, via a known authority (village chief), or a tribunal.
The contracts are based on relations of trust, for example when a collector "reserves" an animal.

Market: physical or virtual site where buyers and sellers "get together" to exchange merchandise.
Physical markets are real places (spot markets), where buyers and sellers meet regularly.
Virtual markets are sites with no material location where the sellers' supplies are faced with the buyers' demands, where terms of trade are agreed (price, volume). Transactions are conducted via telex, telephone or e-mail (markets for raw materials).
If buyers and sellers are numerous, the market is qualified as competitive. If there are many buyers and 1. only one seller, we refer to a monopoly; 2. there are a few sellers, we refer to an oligopoly. If there is a single buyer for several sellers, we refer to a monopsony.

HS or harmonised system: universal nomenclature based on a hierarchical coding system, used by the WCO (World Customs Organisation) to define categories of products traded on the international markets. It includes products from livestock production (live animals, produce of animal origin by species and major category and agricultural and veterinary inputs).

Incoterms (**In**ternational **co**mmercial **terms):** nomenclature used in international transactions. Incoterms determine the reciprocal obligations for the buyer and seller in an international contract of sale and propose several categories for the price (value) of the transaction (CIF, FOB).

3. DESCRIPTION

The present methodological note focuses on the value chains for foodstuffs derived from livestock. It envisages four stages, which look at the products, agents, flows and organisation.

Therefore, in order to understand the level of organisation of the sector, there will be a functional description of each. This links animals or products, stakeholders (and their economic functions), material flows between stakeholders and market infrastructures and immaterial flows of information (prices, volumes).

3.1. Choice of products and identification of the main value chains and sub-chains

In order to determine whether it is necessary to analyse certain products separately in sub-chains, you should ask: 1. What are the main products and the main segments of the market for consumption? 2. Do different productive agents supply these products? 3. At what level of the sector do the products become different?

For the activities that come upstream, such as the inputs provision and the supply of grandparent or parent animals (breeding farms), you can simply identify their main characteristics at this stage. A more detailed analysis could be conducted in order to obtain a strategic vision of this segment.

3.1.1. Identifying the products to be studied

What are the main foodstuffs (produced in the country, imported or destined for export) of animal origin found on the rural and urban consumer markets?
The studies of the domestic market will provide you with information, particularly the market shares. The segmentation of the actual demand will be dealt with (in module m4_sm2_a2 from a prospective angle), as well as the import-export value chains (in module m4_sm2_a3 on competitiveness).

In order to define the chains for study, you should start with the products marketed and work your way up to the raw material or basic product (*commodity*) (meat, milk, wool). This ascending approach will help you identify the pertinence of studying certain sub-chains separately: for example, quality driven sub-chains (organic farming, fair trade, designations of origin), long chains associated with industrial production or short chains associated with traditional producers, international export chains.

The following appendix provides a detailed analysis of the geographic indications of agricultural produce, which is one example of a quality driven chain.
m3_sm2_a1_ANN_5_GeographicIndications_EN.pdf

The live animal value chains will be analysed separately, in the case of breeding animals sold on a market that is separate from that of food products, or when live animals are sold to consumers on a final market, which is common in Africa (small ruminants, poultry), or for live animals destined for export.

For example, small ruminants, sheep and goats can be sold live to consumers at physical markets and, of course, to abattoirs to be processed into meat destined for consumers who are supplied by the retailer's network and large-scale distributors (hypermarkets & supermarkets).

Lastly, you should study:

- Imports – foodstuffs ready for consumption, raw materials for the national chains (milk powder);
- Exports of animals, crude products (hides, skins, etc.) or finished products (conditioned meat). It is cautious to define specific sub-chains for the products exported.

3.1.2. Analysing the functioning of value chains

You should determine the outline – the limits, the boundaries – of the chains, their *height* (variable depending on the number of stages involved in product development), their *width* (variable depending on the diversity of the sub-systems of livestock farming included in the analysis).

We propose a standard height whose upper limit is that of primary production (livestock producers and livestock production systems identified in the sub-module M3-SM1) and whose lower limit is set by the national markets of final consumption (urban or rural consumption) and by export (define the agents involved on national territory).
Thus, a Burkinabe retailer who exports animals from Burkina Faso to the Côte d'Ivoire is part of the Burkinabe cattle sector, even if he lives in Abidjan. This also applies to his operations in Côte d'Ivoire. However, the wholesalers, slaughterers and butchers in Abidjan are not considered part of it.

3.1.3. Filling in the table for the selection of sectors

Once several marketing chains of animal products or live animals have been identified and analysed according to the protocol proposed, you should fill in the table for each chain:
Tool: m3_sm2_a1_TOOL_1_identify_chains.xlsm.

By clicking on the button “Generate files”, you will create as many files as chains. These files will then be used to: i) set the flows of exchange in the chains and its sub-chains (section 3.3.3 below) and ii) the financial analysis of the chains in the following activity M3-SM2-A2.

For meat, the main chains are defined according to animal species.
The sub-chains are then defined according to their destination or mode of function:

- Sub-chain for live animals export
- Sub-chain for conditioned meat
- Sub-chain for industrial slaughtering and processing
- Sub-chain for traditional slaughtering and butchering
- Sub-chain for national live animal sales (spot markets)
- Etc.

For milk, only one large chain is considered. Nonetheless, it is possible to create sub-chains per species or according to criteria, such as the type of product, quality level, type of processing – traditional or industrial, etc.).
For example:

- Sub-chain for liquid cow’s milk (raw or pasteurised),
- Sub-chain for cheese made from cow’s milk,
- Sub-chain for industrial dairy produce excluding cheese (creams, yoghurts, etc.),
- Sub-chain for milk powder exports,
- Etc.

3.2. Identifying the agents, describing their functions

Which agents are involved in the chain? What is their function, is it technical or commercial or both?

3.2.1. Identification of agents in the sector

You should *identify the operators* (agents) involved in each function. It is important to note that agents may or may not depend on known market infrastructures (see inventory in the following section). The link established between the agents’ activities and the infrastructures will help target the collection of statistics, given that infrastructures are generally registered.

In order to achieve this, you should follow the product(s) of a chain throughout its (their) production by identifying the type of exchange and processing carried out by the agents. You should refer to the functions described in the glossary in the previous section (cf. stages and functions in the sector).

If you have access to an existing typology of *the agents* in the main categories identified, you could study the degree of diversification of their activities. For example, a wholesaler can be involved in several sectors (red beef meat, sheep meat and poultry meat), or several stages in the same sector.

3.2.2. Description of the functions of the agents in the value chain

You should combine the current evaluation with the information collected at markets and from regulatory bodies. You should *cross* the agents’ generic or specific *technical functions* to develop the product (for example, for meat: production of parent animals, of young animals, rearing of young animals, transport, stocking, sorting and grouping, fattening, processing), with *their commercial functions* (collection, wholesaler trade, retailer trade), in order to establish a typology for the agents.
You should distinguish new branches of a chain (from a node on the graph) when the following stage is the responsibility of agents that are noticeably different or when products are marketed on separate markets.

An approach that considers sub-chains (within a larger chain) facilitates the way agents are considered. You should clearly describe the chain of technical development for a product; you should identify (and name) the types of product that result from processing at each stage (input-output) and for each agent.
At the end of the process, you can construct a "***functional matrix***" of the sector.
See: m3_sm2_a1_EX_1_functional_matrix_EN.xls

3.2.3. Graphic representation of the chain

You should represent the value chain or sub-chains in the form of a series of organisational diagrams with exchange flows (not quantified at this stage), like that used in the example given for the sheep sectors in Burkina Faso (m3_sm2_a1_EX_2_ovine_chain_bf_EN.pdf). You should integrate the graphs for the sub-chains in the final graph for the whole sector in order to reconstruct the overall logic.
In addition, by identifying the stages where relationships are created with other sub-chains or chains, you can link up with other diagrams.

The graphic representations are not standardised. The sector can be represented as a horizontal or vertical path. In a vertical representation, the end market (consumption) can be put at the top of the diagram if demand determines the development of products, or at the bottom, if the producers in their diversity supply various products to a segmented market. Above all, the representation should be logical and be consistent with the perception of experts, without a value judgement.

You could use a semiology (graphic symbols) like that proposed in this guide. See:
m3_sm2_a1_ANN_1_Chain_mapping_symbols_EN.pdf

At the end of this stage, you will have graphs for the sub-chains or value chain, which represent the links between agents, but with no quantification of flows.

3.3. Quantifying the flows and finalising the chain graph

3.3.1. Quantifying the internal flows

In order to complete the first version of the graph, you should collect *the information on the flows and the stakeholders* that have not been taken into account in the previous section.

You should collect the statistical information to quantify the physical flows of the product(s) exchanged between agents, including imports and exports of raw materials and finished products, in terms of volume (and value if you have the information). You should record these statistics on the graph, as well as the information on the agents involved. This should provide an overall vision of the sector.

Knowledge of the value chain and the statistics available suffice to achieve this task. However, a rapid evaluation in the field involving key people, such as agents responsible for stocking, or wholesaler distributors, may be required. For some animal products, statistics may be lacking. You may have to conduct complementary surveys. The type of survey will depend on how accurate you want the results to be and on the means available: from a few interviews with experts to surveys based on sampling. A survey methodology is proposed in the appendix: m3_sm2_a1toa2_ANN_2_guide_survey_EN.pdf

3.3.2. Import/export appraisal

To establish the appraisal of import export flows, you should use the following tool:

Tool: m3_sm2_a1_TOOL_3_import_export.xls

You should use the categories suggested, by adding together the quantities based on available data (for example, customs origin), established according to the detailed categories of the HS international coding system. The information obtained will be used in module M4-SM2-A3, which studies the competitiveness of the sector and the chains.

3.3.4. Ensuring the consistency of flows and allocation in the sub-sectors

1. The tool

The objective of this stage is twofold: i) ensure the consistency of sources of information relative to the volumes exchanged in the sectors (official statistics and data generated during the phase M3-SM1-A2 on the productive potential of the livestock production systems), ii) allocate volumes in the sub-sectors. You should work with the tools (one per chain) generated during phase 3.1.3 based on the tool m3_sm2_a1_TOOL_1_identify_chains.xlsm. Each value chain is represented by a code at the end of the file name. Only consider the tab "Marketing chain" in this section. You should then go on to the financial analysis of this chain (the following tabs) in the next activity A2.

Tool: m3_sm2_a1_to_a2_TOOL_2_analyze_chain.xlsm

2. The units

You should be careful about the units used to quantify flows. It is common for official statistics for meat to be expressed in carcass equivalent weight (CEW). As the nature of products exchanged changes from the raw material or animal to the end product (meat cuts), the unit can change. If the degree of technological processing is high, you should express the volumes in *native* units (animals, carcasses, kg of meat, etc.) and then convert the flows in carcass equivalent weight (CEW) for meat, or in litres of liquid milk equivalent *(LME*) for dairy products. For the more traditional sectors, you should use simple physical measures for units, such as the number of heads, which you then convert into CEW depending on the standard factors of conversion. File m3_sm2_a1_ANN_3_ConversionFactorsMilk_EN.pdf will help you convert the volumes of dairy products in liquid milk equivalent (on the basis of the dairy yield, which is the simplest way).

3. Ensuring the consistency of total volumes exchanged in the sector

For each product sector identified, you should determine the total quantity marketed, by referring to the official statistics, agro-industrial statistics, market monitoring and observatories. You should "record" them in section I.1 of the Excel spreadsheet that corresponds to the sector studied (Example for the beef industry: m3_sm2_a1_to_a2_TOOL_2_analyze_chain_AB.xlsm).

You must then visualise the *total productive potential* of the diverse farming systems of livestock production that contribute to this sector, as described in section 1.2 of the sheet. This information will be imported from the summary sheet that summarises the overall technical performances of the livestock production systems from module M3-SM1-A1.

You should then evaluate the *share* of *production* (%) actually *marketed* via intermediaries and which enters the value chain (section I.2 of the Excel spreadsheet). For the sake of coherence, you could also identify the share (%) of theoretical production, which does not enter the chain and is represented by home consumption, donations and direct sales from producers to local consumers. This data will then be imported from the summary sheet in module M3-SM1-A1 (tab Data_A3).

The two preceding stages can be used to deduce the theoretical *quantity* of products available for the chain.

These results should then be compared with the official statistics. If there is a major discrepancy between the two quantities, you could try adjusting the difference by modifying certain parameters. The share of flows represented by certain informal sub-chains could also be questioned. Once the trade-off has been finalised, you will be asked to indicate the most *realistic* volume of total production in section 1.3 of the sheet. This will then be used for the rest of the analysis.

4. Allocating volumes in the sub-sectors

Lastly, in section II, you should indicate the respective shares (as a %) of production marketed for the sub-chains defined previously. Then you should complete the functional graphs for the chains and sub-chains with the flows quantified in volumes, as shown in the examples in the appendix. The following example illustrates the butter value chain in Ethiopia: m3_sm2_a1_OUT_Butter.pdf. The other examples

concern the graphs and national statistics for some meat chains (poultry and beef): m3_sm2_a1_OUT_Meat.pdf. This type of organisational diagram is an essential base for the financial analysis (A2) and the economic analysis, as well as for the analysis of social aspects and income distribution (A3).

3.4. Organisation and competitiveness of the chains

3.4.1 Analysis of the organisation of the chains

The analysis of the organisation of a sector aims to characterise the relationships and the terms of trade between agents. This stage makes reference to notions of vertical integration and horizontal integration.

You should distinguish between the market transactions where prices and volumes are not predetermined from the agreements and contracts where they are. The form and scope of relationships depends on the governance of the sectors and, therefore, on the role of the private sector, commodity associations and farmer's organisations and the public sector.

Using the graph of the chain drawn up previously, you should record the information on the characteristics of the vertical relationships established (market relationship, supply contract, producers integrated vertically with a slaughter firm, etc.). The market transactions can be symbolised by dotted lines (----); the agreements (contracts and conventions that specify prices and volumes, supply of services), with a line in bold (____).

You should also analyse the alliances between stakeholders from the same group (for example, producers that are members of cooperatives or slaughterers that are part of associations), therefore showing horizontal relationships. These can be represented with different colours.

The study of the vertical and horizontal relationships is useful for analysing the current policies (modules 4 and 5) before proposing new ones and constructing a plan for improvement of the sector (*chain upgrading*). This sheds light on the potential dominance of some agents, such as positions of monopoly. It also reveals some hidden mechanisms of social networks and mutual aid groups. It leads to the identification of forms of organisation that help reduce pockets of vulnerability and poverty, by suggesting how to improve the power of negotiation of some agents and redistribute added value in the sector.

For example, in some chains, the agreements made before the exchanges include credit systems or promise of sale. Thanks to these systems, stakeholders can face up to unexpected financial needs. How can this security be compensated for if the organisation is changed?

If a policy to modernise the chains is implemented, how can the social functions of traditional organisation be taken into account and what compensation should be provided for the agents affected?

In a social perspective and in view of reducing poverty, the qualitative organisational analysis is as important as the financial or economic analysis. This analysis will be used for the socio-economic analysis of the value chains (M3-SM2-A3), as well as for the study of competitiveness (M4-SM2-A2).

3.4.2. Inventory of infrastructures

You should inventory the infrastructures used to develop products, do the marketing, export and import them. You should link them to the agents and their functions.

You should identify the infrastructures that provide the most solid basis for regional development, for example: the markets for live animals, the establishments for processing milk, eggs and egg products, hides and skins, meats; the centres for stocking animals, raw or processed products (milk collection and storage); customs posts and border inspection.

To inventory the economic activities linked to the infrastructures, you can refer to the nomenclature of the activities, such as nomenclature ISIC Rev.4.

You can either draw up a list of the infrastructures or map them using a geographic information system (GIS). You can, for example, visualise the territorial coverage and its possible inequalities. In this case, you will be representing the *spatial functioning* of the chains on a map (distinct from a functional graph of

the chains), by identifying the areas of production or supply, the zones of consumption. This simplified cartographic approach is optional but very useful.

You can use the tool (LIMS) inspired by the harmonised procedures set up in the SADC's (Southern African Development Community), chapter on the development of livestock production (section 3 Infrastructures). This tool makes it possible to combine the inventory of small infrastructures in the value chains (statistics combined for the zone), and that of the large infrastructures in the chains (detailed statistics per zone). It also means that statistics can be collected for the activity in a year of reference in view of reconstituting the flows in the sector.

Tool: m3_sm2_a1_TOOL_4_Market_Infrastructures.xlsx

3.4.3. Analysis of the competitiveness of the chains

Once the chain has been characterised, you should look at its competitiveness, which is not limited to financial profitability (for the operators) or to economic efficiency (for the community). Before dealing with these aspects in the activity M3-SM2-A2, you should identify consumer preferences via market studies (or conclusions from existing studies) and you should identify the factors of competitiveness for the chains excluding price factor.
See the methodological note "Aspects of competitiveness of the chains":
m3_sm2_a1_NOTC_competitiveness_market_EN.pdf
You should summarise the information collected in a summary table:
m3_sm2_a1_TOOL_5_competitiveness.xlsx.

m3_sm2_a1_NOTC_competitiveness_market_EN.pdf

ADDITIONAL METHODOLOGICAL NOTE – COMPETITIVENESS OF THE SECTORS "EXCLUDING PRICE"

ACTIVITY M_3-SM_2-A_1

This additional methodological note can be used to develop the stages leading up to an evaluation of the competitiveness of the value chains, excluding price factor. First of all it involves identifying consumer preferences (via market studies), and then determining the factors, that they are sensitive to in their choice of consumption of animal produce, excluding the price of products.

I. Identifying consumer preferences

Agricultural chains and, particularly, livestock chains are generally considered to be "consumer" led chains, in other words they are led by the end consumer. The issue here is to anticipate and control the consumers' needs by defining suitable products and forms of marketing. Market studies can be used to anticipate demand and understand the market.

> Market studies: a market study corresponds to the use of results from business "marketing" research. The main results help us understand the characteristics of the products expected, the market volumes likely, the prices on the different target markets, the market seasonality (important dates, for example religious celebrations), as well as the forms of distribution and communication that seem adequate for promoting the products. The zootechnical approach, which is the basis of animal production, rather involves a technical approach to production practices that should be implemented in order to satisfy the demand identified in these market studies.

It can include:

- *documentary* studies sponsored by large distributors, the industry, joint-trade organisations or even the state.
- *qualitative* studies where one seeks to understand the consumers' perceptions and psychology in terms of attitudes to products, with a view to determining the reasons that lead to preference for one product rather than another. Information from these surveys is obtained from individual interviews.
- *quantitative* studies that provide results based on representative surveys of a sample (sampling) and, therefore, use statistical methods. Here results can be extrapolated from the sample to the whole of the population studied. Among the variables involved in a survey, the most common are *environmental* (socio-economic, demographic, institutional, socio-cultural); the *market* variables (structure, supply, panels, demand, sales, perspectives), the *clientele* variables (motivation, attitudes, behaviour, profile and structure), the *product* variables (brand, name, concept, characteristics, performance, quality, presentation, packaging, market position, image); the *price* variables (production cost, sale price, price elasticity, study of competition); the variables of product *distribution* (choice, control, study of geographical implantation, trading area); the *communication* variables (medium, areas of advertising, choice and monitoring of advertising); the variables relating to the *sales force* (perception and control). This type of information can be sought in specialised journals or from diverse sources (sponsors' studies, marketing schools, research centres or universities, academic associations, for example agro-economic ones), or in papers presented at international conferences that concern the world market for *agricultural commodities* (for example, the International Meat Symposium).

II. Factors of competitiveness of product sub-chains, "excluding price"

The competitive advantages of a *value chain*, both nationally and internationally, are not limited to its *financial* profitability (for the agents) or to its economic efficiency (for the community). Other factors come into play, some of which are detailed in this appendix.

2.1. Organoleptic quality: The consumer's perception of products is important, in a word the "quality" of products from their point of view. The reputation of products for consumers (which

may or may not be justified), and their suitability, in terms of satisfying the diverse demands for different categories of consumers, can be used to differentiate the supply. This constitutes an advantage that is independent of production cost. Differentiation is established on the basis of criteria that are cultural, gustatory (organoleptic), or technological (by virtue of methods of preparation and cooking and culinary use).

For example:

- Some consumers prefer local meat (called "hot" in West Africa) compared to deep frozen imported meat; or again traditional "bush" poultry is preferred to industrial poultry.
- Some phenotypic types of animal have a very strong image, such as the "big white Sahel sheep", which is consumed at the Tabaski Muslim festival (Eid ul-Adha) in West Africa, or the Somali type black-headed sheep exported from East Africa (Somalia, Ethiopia) to the Arabian Peninsula during the pilgrimage to Mecca.

2.2. Certification: The product's or producer's reputation can be shared by consumers even though it may be informal. It can also be enhanced by being *formalised legally* in different forms (labels, geographic indications, distributor brands or collective brands). These indicate their "unique" character in the large centres of urban consumption. Therefore, it is important to check whether devices like this exist in the national legislation. This formalisation is initially a way of improving the identification and recognition of a product by the consumer. In addition, it helps producers of certain traditional specialities protect the name of their products, thus avoiding confusion with imitations.

For example:

- The domain of geographic indications (for example, the protected designations of origin, PDO, in Europe) is one illustration:
  m3_sm2_a1_ANN_5_GeographicIndications_EN.pdf
- A certain amount of "know-how" and, therefore, the reputation of some agents, who may or may not be protected by exclusivity (brands), can also have advantages on the market. For example, there are "good " and "less good" barbequers or milk suppliers who are particularly appreciated.

2.3 Health quality: Health quality or safety, perceived or certified by official services, is also a determining factor for consumer choice and can, thus, constitute a competitive advantage. The export market is particularly sensitive via the application of standards for labelling and traceability (*codex alimentarius* and OIE standards).

For example:

- Some consumer surveys show that a number of consumers have a preference for products distributed by supermarkets, which they consider, rightly or wrongly, to be safer.
- In the event of a health crisis on national territory, it is not uncommon to see changes in consumer behaviour. They tend to turn to products with a strong brand image that come from "known producers' or to imported products or, in extreme cases, they abandon this type of product altogether if there are no guarantees.

2.4 Geographical and organisational factors can also induce comparative and competitive advantages. For example, this is the case when different productive agents join together in joint-trade organisations or associations (of producers, slaughterers, etc.). It is again the case of the sectorial and geographic concentration of one or several stages of the value chain that make it possible to reduce overall production costs significantly and can attract new national or international investors. Semi-urban livestock production is also developing within this framework. Here competitiveness is often linked to a balance between the economy permitted by the proximity of the consumer market and the cost of some production factors, such as feed that is from rural areas or imported. The cartographic summary of market infrastructures provides one approach for modelling this.

2.5 Other factors: The structure of markets, business strategies (particularly processors and distributors) and their capacity to "govern" the sector, the value chain.

For example:

- Acquiring a dominant position (monopoly, oligopoly, monopsony, oligopsony, etc.), in relation to a rare infrastructure (dairy, tannery, abattoir, etc.), can weigh against other agents and, thus, give a competitive advantage.

- In Africa, there is an increasing amount of urban trade of animal products via supermarkets. This situation provides the opportunity to sell large volumes of standardised produce, reducing transaction costs via central purchasing bodies, and gradually leads to a form of horizontal integration of the distribution sector (grouped at the same level of the sector). The negotiation power that comes with the purchase of large volumes also means that they can influence the producer prices.

- The distributors or processors who have to secure their supplies (in volume, quality and price), in order to guarantee their profit threshold and supply their outlets, also practice a form of vertical integration by establishing privileged relationships with agents above or below via supply contracts (*contract farming*) or contracts of sale.

Some of these factors have been identified in module m3-sm2-a1 and you can summarize them in the table m3_sm2_a1_TOOL_5_competiveness_EN.xlsx

Activity M3-SM2-A2: Analysis of the financial performances of the livestock value chains

You should analyse the livestock value chains (M3-SM2) in the framework of the economic study of households involved in livestock production activities (M3). The second activity consists of evaluating the financial performances of the value chains identified in M3-SM2-A1 and to estimate their contribution to the national economy in terms of added value.

1. Objective

For each sector:

- estimate the profitability for the agent;
- estimate the added value i.e. the agent contribution to the national economy.

Using the diagram of the organisation of the sector (M3-SM2-A1) and the quantified flows, you should aggregate the results for the sub-chains and value chains. Then you will be able to estimate the global added value for the livestock production sector generated at the marketing stage.

You should obtain information on the activity as a whole and on that of the agents, particularly the producers: is the activity profitable? Is pricing and the distribution of added value between the categories of agents fair enough? Which categories of agents are the most, the least fragile?

2. Expected outcomes

The expected result is the distribution of the added value across the value chain.

- m3_sm2_a2_OUT_simplified_account.jpg

m3_sm2_a2_OUT_simplified_account.jpg [141 kB]

3. Method and tools

By putting together the stages of product processing, from initial production to consumption, and by linking the productive agents, you will obtain the total added value for the value chain.

Simplified approach to the analysis of the value chain

- m3_sm2_a1_to_a2_TOOL_2_Analyse Chain.xls

Methodological note

- m3_sm2_a2_NOT_analysis_Chain_EN.pdf

Appendix

- m3_sm2_a1toa2_ANN_2_guide_survey_EN.pdf

m3_sm2_a2_NOT_analysis_chain_EN.pdf [64 kB]

m3_sm2_a1toa2_ANN_2_guide_survey_EN.pdf [101 kB]

4. Further information

- m3_sm2_a2_ANN_further_information_EN.pdf

If you have access to detailed information on the agents in the sector, you can conduct a more in-depth analysis of the financial performance of the chains using the following tool (accompanied by its methodological note):

- m3_sm2_a2_TOOL_detailed_chain.xlsm
- m3_sm2_a2_NOTC_detailed_approach_chain_EN.pdf

m3_sm2_a2_ANN_further_information_EN.pdf [66 kB]

m3_sm2_a2_TOOL_detailed_chain.xlsm [350 kB]

m3_sm2_a2_NOTC_detailed_approach_chain_EN.pdf [148 kB]

m3_sm2_a2_NOT_analysis_chain_EN.pdf

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GUIDE FOR THE INCLUSION OF LIVESTOCK PRODUCTION IN PRSPS

METHODOLOGICAL NOTE
FINANCIAL ANALYSIS OF THE LIVESTOCK VALUE CHAINS
ACTIVITY M_3-SM_2-A_2

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   - 3.3. TAKING IT FURTHER: A DETAILED ANALYSIS OF AGENTS IN THE VALUE CHAIN 2

1. OBJECTIVES

The aim of the financial analysis is to determine the profitability of the activity of each agent in the sub-chains and its contribution to the national economy (added value generated).
Using the diagram of the organisation of the chain (M3-SM2-A1) and quantified flows, you can aggregate the added value generated per category of agent for each sub-chain.

The simplified approach proposed will help you link production generated by the different livestock production systems with the quantities exchanged within the different value chains.
This will give you information on the activity as a whole and on the agents' activity: is the activity profitable? Is pricing fair (distribution of added value between the categories of agents)? Which categories of agents are the most – the least – fragile? etc.

2. BASIC NOTIONS

The turnover of an agent or a farm = total amount of sales.

Production statement: shows the costs and products of an agent, the balance of which is the gross operating income.

Intermediate goods: all the goods and services consumed by an agent for his activity: raw materials (e.g. animals, etc.), inputs and merchandise (e.g. forage, etc.), maintenance work and services (e.g. vaccination, etc.), transport and travel, various management costs. The following are not taken into account: the costs of personnel (wages & salaried labour, family employment), financial costs, insurance, various taxes and contributions.

Market price: price of a transaction observed on the market.

Added value: AV = production – intermediate goods used to process the product (goods and services: work, inputs, forage, transport, etc.). The added value is calculated at each stage or for each agent. It is the wealth generated by an agent, his contribution to the national economy.

Value chain: set of successive processing operations for a product, from initial production to consumption, which determines the total added value for the chain. The value chain can be local, national or international.

3. DESCRIPTION

3.1. Principles of the approach

The financial analysis is based on market prices, in other words the prices set for transactions.

The market price is difficult to determine for several reasons. Animal products are often consumed at festivals, ceremonies, etc., prices and volumes fluctuate during the year. Therefore, it is important to establish an average, or an amount weighted as a function of the changes in prices and volumes.

The origin and the quality of products can also have an impact on prices and costs. The latter are combined for each sub-chain in the form of weighted averages. A more detailed analysis of markets of quality products may prove necessary, with additional longitudinal monitoring if required.

The analysis will focus on the "representative" productive agents or the sum of productive agents. In traditional sectors in Africa, the size of agents in the same category can vary. For example, moving livestock "on the hoof" or in a truck does not cost the same, even if it is organised by the same agent; statistical weighting is necessary. Considerable rigour is required for determining the data used. It is also important to ensure that you choose the units of work (kg live weight, kg carcass weight, average number of heads, etc.), before the field surveys.

3.2. Simplified approach to a value chain

If there is no detailed information on the accounts of the agents in the sector, you should conduct a rapid and simplified analysis of the financial performances of each value chain of animal products.

In the previous activity (M3-SM2-A1), you quantified the volumes produced by each chain and sub-chain. You recorded the data in as many files as there are chains: m3_sm2_a1_to_a2_TOOL_2_analyse_chain.xls.
You should now estimate the margins created for each agent for each segment of the chain (sheet "sub-chain" in Excel). For each agent, you should mention the sale price and estimate the intermediate goods per unit of product. You should obtain the distribution of the unitary value, of costs and the margin per agent.

You should obtain global results for each sub-chain: costs (per unit of product or for the whole of the chain), added value (sum of margins), share of marketing costs and processing costs within the total costs of the chain.

These results will then be aggregated in the first sheet "marketing chain" section III summary. They will be used to calculate the livestock production sectors' contribution to the national economy (GDP calculation) in activity M4-SM1-A1.

3.3. Taking it further: a detailed analysis of agents in the value chain

If you have access to detailed information on the accounts of the main agents or the representative agents in the sub-chains, an in depth analysis can be conducted, the results of which can provide valuable information on the activity overall and on that of the different productive agents in particular. In addition you will be able to determine whether any subsidies are required and sufficient, if the distribution of taxes is adequate, etc.

First, you should establish the production statement for each category of agent in the chain. Then you should establish the operating statements by taking into account the costs of personnel, taxes and contributions for production. Any operating subsidies should also be included.

The instrument m3_sm2_a2_TOOL_detailed_chain.xlsm and the methodological note m3_sm2_a2_NOTC_detailed_approach_chain_EN.pdf, which provide details of the method, are proposed under the entry “Taking it further”.

m3_sm2_a2_NOTC_detailed_approach_chain_EN.pdf

GUIDE FOR THE INCLUSION OF LIVESTOCK PRODUCTION IN PRSPs

FOR FURTHER INFORMATION – DETAILED ANALYSIS OF THE FINANCIAL PERFORMANCES OF THE LIVESTOCK VALUE CHAINS ACTIVITY M_3-SM_2-A_2

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1. OBJECTIVES 1
2. BASIC NOTIONS 1
3. DESCRIPTION 2
3.1. ESTABLISHING A PRODUCTION STATEMENT 2
3.2. ESTABLISHING AN OPERATING STATEMENT 3

1. OBJECTIVES

1. If you have precise data on the agents in the chain, a more in-depth analysis can be conducted in order to obtain results that can provide precious information on the activity as a whole and on that of different productive agents in particular: is the activity profitable? Can it guarantee the renewal of investments? Does it allow for access to certain sources of finance (banks)? Is profitability sufficient in comparison to other types of investment or in relation to risks? Are possible subsidies necessary and sufficient? Is the distribution of taxes adequate? etc.

2. You then work on the sub-chain level. For each category of productive agent, in other words, for each stage of the sub-chain, you should establish a **production statement**. This includes all the products and expenses for the specific activity in the chain. Any operating subsidies that the agent has received should be added to the production statement. Then the resources generated by the activity and their employment can be broken down into an **operating statement**, which explains how added value is distributed.

2. BASIC NOTIONS

- Fixed costs: costs that are independent of the volumes handled (for example, licence, etc.).

- Variable costs: costs that are directly linked to the volumes handled (for example, purchase of animals, forage, etc.).

- Turnover: of an agent or a farm = all the sales.

- Production statement: statement of costs and products of an agent, which indicates the gross operating income.

- Operating statement and its balance, gross operating surplus, is equal to the value added minus the employees' remuneration, other production taxes and plus operating subsidies.

- Intermediate goods (consumption): all the goods and services consumed by the agent's activity.

- Tradable goods: goods and services that can be imported or exported.

- Market price: prices actually observed for transactions.

- Reference price: prices representative of the economic value of the good or service (also known as economic prices or shadow prices).

- Gross operating income: value of production minus the operating costs (intermediate goods, work, financial costs, insurance, taxes and contributions).

- Net operating income: gross operating income minus the value of depreciation.

- Threshold: level of volumes handled at which a significant and sudden change occurs in terms of costs or sales.

- Added value: = [Production – intermediate consumption]. At a given stage of the chain i.e. for each productive agent, one finds the inputs required for processing (goods and services: work, forage, transport, market tax, etc.) on one hand, and a product value differential before and after processing or transport, on the other hand. The inputs are called production factors and the **value added** by the productive agent corresponds to the value differential produced by the productive agent minus the value of production factors consumed for processing at the considered stage. Therefore, the value added by a productive agent corresponds to the additional wealth that his activity has generated for the national economy. Therefore, it is different from the sale price that he obtained for the processed product.

3. DESCRIPTION

3.1. Establishing a production statement

1. A **production statement** should be established for each category of productive agent in the sub-chain. This includes all the products and costs of the specific activity in the chain. During surveys, particular attention should be given to the complexity of the productive agent surveyed so that the share of the activity at each stage of the chain is revealed and to ensure that only the related costs and products are accounted for.

2. For simplicity, we do not take account of the variation in stocks between the start and the end of the period considered. We consider a complete period in which the intermediate purchases correspond to requirements and are not stocked.

3. The costs are then grouped together into:
   - Intermediate goods (consumption), which includes all the goods and services acquired for the activity: raw material (e.g. animals, etc.), inputs and merchandise (e.g. forage, etc.), maintenance work and services (e.g. vaccination, etc.), transport and travel, various management costs (e.g. bank charges, etc.).
   - Work: salaried employment (wages) with costs but also seasonal or family labour. A convenient way to estimate the value of family labour is to use its opportunity cost, in other words, its value if it were used in the best alternative situation or the maximum income that it could generate if it were used outside the business.
   - Financial costs: necessary to mobilise the capital required for an activity (for example, bank interest, but also increases in prices linked to purchases on credit, etc.).
   - Insurance (if any).
   - Various taxes and contributions.

4. The agent's sales are established in parallel: this obviously includes finished products at his level, although it can also include special merchandise (Agro-Industrial By-Products, etc.), waste (manure, etc.), by-products (skins for the slaughterer, etc.). We will also attribute a sale value to working activities that the agent does for himself in the framework of his activity in the sector (particularly home consumption and gifts). Overall these sales constitute the agent's **turnover**.

5. The **total product** (or value) is the sum of products sold (including the by-products from the system) plus the products given or consumed on-farm.

6. The **gross added value** that the agent generates for the national economy, in other words the gross contribution to the domestic economy, is equal to the total product, from which we deduct intermediate goods (consumption), including services (such as transport, management costs, provision of services, etc.).

7. The **gross operating income** will then be deduced as the difference between sales and operating costs. It can also be calculated as the sum of gross added value and subsidies, from which we deduct labour costs, financial costs, insurance, taxes and contributions.

8. When the agent has incurred physical investments for his activity (enclosure, truck, dairy plant and equipments, etc.), we also have to take wear and tear into account via depreciation, even if this transfer is not part of the flows. The **net operating income**, which corresponds to the result of the operation, is equal to the gross operating income minus depreciation, whereas the **net added value** will be equal to the gross added value minus depreciation.

3.2. Establishing an operating statement

1. The production statement, with the addition of any operating subsidies that the agent may have received, can then be used to break down the resources generated by the activity and their allocation into an **operating statement**. The operating costs and sales for each productive agent should, therefore, be established for each category of agent on the basis of their accounting system or on the basis of the survey.
See M3_SM2_A1: m3_sm2_a1toa2_ANN_2_guide_survey_EN.doc

2. Working with these results, the tool proposed can be used to calculate the statements for each of the different agents and to deduce the distribution of costs and the margins between them.
See: m3_sm2_a2_TOOL_detailed_chain.xlsm

3. Combining the statements for the different successive productive agents in the sub-chain means that the added value for the whole of the sub-chain and the pricing of end products can be calculated (sheet “sub-chain”). With this consolidation, the value of sales of a product studied in the sub-chain at a given stage n will be equal to its purchase value for the stage n+1 and these figures will cancel each other out. The purchase price, on-farm (farm gate), can be deduced from the module M3-SM1-A3. The consolidated added value for each sub-chain will then be equal to the value of final sales for the latter minus the purchase from the producer and minus all the intermediate goods (consumption) bought from outside the chain. By combining the results for each sub-chain, we obtain the global value added for the chain.

4. By juxtaposing two spreadsheets (one for “before” and one for “after”), we could theoretically simulate the effect of a shock on the volumes handled (disaster or improvement in primary production). Nonetheless, great caution is necessary because it is essential to distinguish between fixed and variable costs and to take into account the effects of thresholds. Similarly, this type of aggregate analysis often involves “average” agents and does not take into account the sensitivity or possible vulnerability of some specific agents. This requires specific analyses, which follow a typology of categories of productive agents considered.

Activity M3-SM2-A3: Socio-economic approach to sectors

1. Objective

The level, nature and remuneration of direct and indirect employment are particularly important for comparing different sectors or technical and organisational options.

The objective is to provide the keys to examine the multiplicity of jobs generated across the sectors, to estimate the financial vulnerability of the agents involved, but also their vulnerability in relation to the socio-economic environment and the organisation of the sectors.

2. Expected outcomes

- Expected results: m3_sm2_a3_OUT_vulnerability_sector_EN.xls

m3_sm2_a3_OUT_vulnerability_sector_EN.xls [24 kB]

3. Method and tools

3.1. To start with, there should be an assessment of the level, nature and remuneration of the direct and indirect employment for each sector or sub-sector identified in M3-SM2-A1 and analysed in M3-SM2-A2 . The approach also proposes questioning the social safety nets (credit, public support), the nature of the agreements that link these agents to the sector and the impact of the sector's organisation on these activities.

3.2. Methodological guide: m3_sm2_a3_NOT_vulnerability_chain_EN.pdf

m3_sm2_a3_NOT_vulnerability_chain_EN.pdf [53 kB]

4. Further information

Case study of the impact of a health crisis on the small ruminant export sector in Ethiopia: m3_sm2_a3_EX_ILRI_WB.pdf

m3_sm2_a3_EX_ILRI_WB.pdf [666 kB]

m3_sm2_a3_NOT_vulnerability_chain_EN.pdf

GUIDE
FOR THE INCLUSION OF LIVESTOCK PRODUCTION IN PRSPs

METHODOLOGICAL NOTE: SOCIO-ECONOMIC APPROACH TO SECTORS
ACTIVITY M_3-SM_2-A_3

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1. OBJECTIVES 1
2. DESCRIPTION 1

1. OBJECTIVES

Data on the number, nature and remuneration of direct employment are key for comparing chains, technical options and organisational options.
The example presented shows the different stages of the sheep marketing chain in Burkina Faso (m3_sm2_a3_OUT_vulnerability_chain_EN.xls), which directly generates some 6 000 poorly paid jobs.

This activity also proposes a number of other key factors that should be taken into account for the analysis of vulnerability within marketing chains in order to answer the following questions: what do these sectorial activities contribute to the income of the households involved? What effect would a crisis (epidemic, drought, etc.) have on family incomes? If a policy was implemented to encourage vertical integration and the establishment of direct contracts between producers and large traders, who are financially more “efficient”, what compensation should be envisaged for these agents?

2. DESCRIPTION

1. Assess the number, nature and remuneration of direct employment for each value chain and sub-chain identified in M3-SM2-A1 and analysed in M3-SM2-A2.

2. Describe the social mechanisms before any change in policies.
In the example given (m3_sm2_a3_OUT_vulnerability_chain_EN.xls), a credit system or promise of sale in tandem means that stakeholders can face up to unexpected financial needs. How can this security mechanism be replaced if the organisation is modified? This system makes stakeholders vulnerable to external market shocks that affect downstream chain segments. How can they be protected?

3. Identify the nature of agreements, which determine the terms of exchanges and can distort the market.
In the example given, the general payments on credit and the difficulty of making an effective claim if problems arise mean that transactions are based more on relationships of trust than on price and free competition, thus distorting the stakeholders’ power to negotiate.

4. Anticipate the impact of a crisis (epidemic, drought, etc.) on family incomes. A climatic shock or a animal health-related crisis automatically has repercussions on stakeholders in the sector.
An impact analysis of Rift Valley fever on the small ruminant marketing chain in Ethiopia (m3_sm2_a3_EX_ILRI_WB.pdf) shows how these effects can be grasped.

5. Classify the stakeholders in the chains in terms of their vulnerability to the system, by crossing the functional matrix (M3-SM2-A1_Annexe 1) with the organisational matrix (M3-SM2-A1_Annexe 4).

Complete the table with their financial vulnerability, by using the report of expenditure (job, salary paid or expenses) from the main agents in the sector (M3-SM2-A2).

6. Draw up a summary based on the model in sheet: m3_sm2_a3_OUT_vulnerability_chain_EN.xls.

Sub-module M3-SM3: Identifying Policy and vulnerability

You study the economics of households involved in activities linked to livestock production and products commercialization (module M3) in order to determine the arguments in support of the inclusion of this sector in the poverty reduction strategy paper. You will now assess the perceived impact of OPLI on the various groups of actors involved in the livestock sector (sub-module SM3). This should provide preliminary results and help you identify a set of possible interventions to be included in the action plan (module M5).

1. Objective

The objective of this sub-module is to identify in a participative way the direct and indirect impact of the organizations, policies, legislation and institutions (OPLI) on different agents which livelihoods depends on livestock activities.

Before end and to reach this objective, this sub-module proposes a first results synthesis using the main findings of the livestock systems, households and value chains diagnostics realized in M3-SM1 and M3-SM2.

2. Expected outcomes

The expected result is a summary presenting - for each group of actors (i) the priority objectives and constraints that are limiting them (ii) the strenghts (S) and weaknesses (W) of the current organizations, policies, legislation and institutions which have impact on livestock activities and the opportunities (O) and threat (T) of international and national policies that are affecting indirectly the livestock sector.

Activity M3-SM3-A1: Identification of constraints and priorities of agents

1. Objective

The objective of this activity is to identify for each livestock products value chain the main households groups involved in the production of these products.

2. Expected outcomes

The expected outcome is a series of tables linking the livestock products value chains with the livestock productions of the households (HHD):
m3_sm3_a1_OUT_hh&sector_BF.jpg

This will come in support of the material proposed in M5-SM1-A1 to help identify the priority sectors and target groups (M5-SM1-A2). These cross-tables may help as well to conduct the analysis of the livestock sector opportunities (M4-SM2), in particular the health section.

m3_sm3_a1_OUT_HH&sector_BF.jpg [125 kB]

3. Method and tools

The proposed tool is: m3_sm3_a1_TOOL_HH&sector.xls

1. Import parameters needed for the analysis from the livestock system ("Import" button in Param_LS) and the households groups ("Import" button in Param_HHD). Complete if necessary missing parameters.
2. Analyze results derived automatically in the following sheets (one per animal product chain) regarding how each HHD as a group provides to the production, self-consumption and marketing of each animal products.

From there, you can group several household classes (HHD) in order to reduce the total number of types and facilitate further analysis.

Activity M3-SM3-A2: Identify the roles of OPLI

1. Objective

- Identify the main objectives and constraints faced by households involved in livestock activities and particularly of those that are vulnerable.
- Conduct a participatory assessment of the organizations, policies, legislations and institutions (OPLI), their effects on reducing the household's constraints and helping them reach their production and marketing objectives.

2. Expected outcomes

For each livestock product chains, the main groups of households involved in the production and marketing of the products will be identified as well as their constraints and production objectives: m3_sm3_a2_OUT_opli_dairysector_Uganda.jpg

m3_sm3_a2_OUT_opli_dairysector_Unganda.jpg [122 kB]

3. Method and tools

You will follow the EXTRAPOLATE approach developed by the Pro-Poor Livestock Policy Initiative (PPLPI) of FAO.

Tool: EXTRAPOLATE version 1.0 (version 2.0 ongoing)
Methodological guide: online version 1.1 (version 2.0 ongoing)

This activity will be undertaken in links with the construction of the action plan (M5). You may organize two working sessions with the livestock sector stakeholders (identified in M2):

- A first one at this stage: setting the constraints and objectives and a general assessment of OPLI. This session may help identifying possible interventions.
- A second one after the economic and environmental impacts of identified interventions have been assessed (M5-SM3-A3 /A4 /A5). The extrapolate tool may help then in the bargaining process of selecting final interventions.

4. Further information

Pasteur, Kath, 2001. Tools for sustainable livelihood: policy analysis. IDS [Online] http://www.livelihoods.org/info/tools/pas-PA01.rtf

Pica-Ciamarra, 2005. Livestock Policies for poverty alleviation: Theory and practical evidence from Africa, Asia and Latin America. PPLPI Working paper No.27.

Shankland, A. 2000. Analysing policy for sustainable livelihoods. IDS Research Report 49. http://www.ids.ac.uk/ids/bookshop/rr/Rr49.pdf

Thorne,P., P. Thornton, and T. Robinson, 2005. A Discussion-Decision Support Tool for Assessing Impacts of Policy Changes on the Poor. Extrapolate version 1.0. PPLPI [Online] http://www.fao.org/AG/AGAInfo/projects/en/pplpi/docarc/extrapolate1.0_en.pdf

Livelihoods connect (IDS)http://www.livelihoods.org

Livelihoods options (ODI)http://www.odi.org.uk/livelihoodoptions/

M4

Macro level

Module M4: Macro level

You will strengthen the argument for including livestock production in the poverty reduction strategy paper (PRSP). You have identified the stakeholders who are in the best position to prepare the strategy and the action plan (module M2), and the role of livestock production in the economy of households (module M3).

You should now conduct a macro-economic analysis in order to specify the role that this sector plays in the national economy and its potential evolution in the next 15 years (module M4).

1. Objective

- Evaluate the contribution made by the livestock sector to the national economy: creation of wealth (GDP); indirect effects on other sectors; contribution to food security, the reduction of poverty and inequalities.
- Evaluate the sector's potential for growth as a function of: The estimated supply and demand in 15 years' time,
- The sector's competitiveness,
- The resources for feeding the animals,
- The health constraints,
- The available genetic resources.
- Describe the importance attributed to the livestock sector in the national development strategy: review and analysis of the sectorial policies for livestock production and projects, legal and regulatory framework.

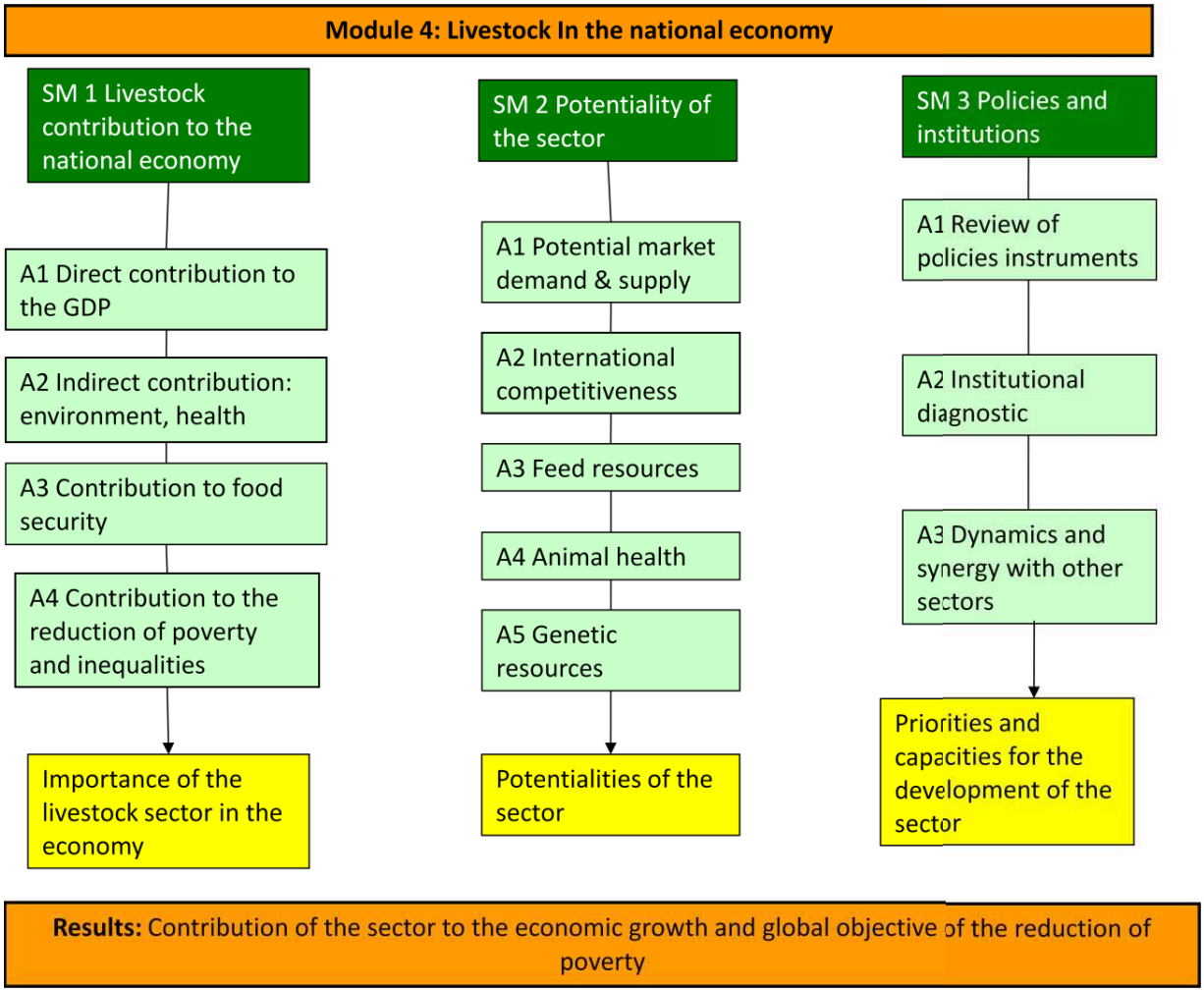
2. Expected outcomes

Provide the arguments so that the poverty reduction policies take livestock production into account (M2).

Develop the strategy and action plan to strengthen the role of livestock production in the national economy (M5).

Establish the baseline year and the indicators for the monitoring and evaluation of the national strategy (M6).

M4_full_text_EN.pdf [599 kB]



Sub-module M4-SM1: Livestock's contribution to GDP

You will evaluate the weight of livestock production in the national economy and its development potential (module M4), in order to provide the arguments for the poverty reduction strategy paper (PRSP).

You will now examine the role that this sector plays in the creation of wealth, in the populations' food security, and in the reduction of poverty and inequalities. This study complements the micro-economic analysis of households and the meso-economic analysis of the animal sectors.

1. Objective

Specify the livestock sector's contribution to the creation of wealth (GDP), food security, and the reduction of poverty and inequalities, by using:

- Data with figures and,
- Qualitative data from scientific research that characterise the sector.

2. Expected outcomes

- Contribute to the analysis in view of developing the poverty alleviation strategy and policies (module M5).
- Define the indicators for the monitoring and impact of these strategies and policies (module M6).

Activity M4-SM1-A1: Direct contribution to GDP

To determine the roles and importance of livestock system in the national economy and the development, you first need to evaluate the direct contribution made by livestock system to the gross domestic product (GDP).

1. Objective

- Estimate the contribution made by the livestock sector to the national GDP by taking into account the added values generated at the production level and all along the value chain, calculated in module M3.
- Estimate the contribution made by the livestock system to the national economy over the next 15 years.
- Assess the impact of external shocks that affect the livestock system on the national economy and then assess the national economy's dependence on this sector.

2. Expected outcomes

- A summary table indicating the contribution that each activity in the livestock system sector makes to the national economy.

Example. Calculation of the added value of the livestock system and its contribution to GDP: m4_sm1_a1_OUT_1_GDP_EN.xls

- A simulation of the effects of change, induced by the action plan (module M5), on the contribution of the livestock system to the national economy.

Example. Contribution of the livestock system to the GDP in the next 15 years, with and without change: m4_sm1_a1_OUT_2_GDP_EN.xls

m4_sm1_a1_OUT_1_GDP.jpg [200 kB]

m4_sm1_a1_OUT_2_GDP.jpg [147 kB]

3. Method and tools

Direct contribution to GDP

- Combine the production per product and the intermediate supplies used to develop each product that comes from livestock production activities.

These results were obtained in the activities 2 and 3 (M3-SM1), for the producers; and in activity 2 (M3-SM2) for the agents in the animal sectors.

Evaluation in 15 years

- Develop hypotheses for herd growth rate and the scenarios relating to zootechnical and economic performances, in synergy with the activity M4-SM2-A2 (estimation of the potential supply).

Tool: Contribution of the livestock system to GDP: m4_sm1_a1_TOOL_GDP.xls

Methodological guide: m4_sm1_a1_NOT_GDP_EN.pdf

m4_sm1_a1_NOT_GDP_EN.pdf [297 kB]

4. Further information

The National Accounts Section of the United Nations Statistics Division delivered the last update of The *System of National Accounts* (2008 SNA)

m4_sm1_a1_NOT_GDP_EN.pdf

ALIVE
PARTNERSHIP FOR LIVESTOCK DEVELOPMENT, POVERTY ALLEVIATION & SUSTAINABLE GROWTH

GUIDE
FOR THE INSERTION OF LIVESTOCK PRODUCTION IN THE PRSPs

METHODOLOGICAL NOTE
CONTRIBUTION OF THE LIVESTOCK SECTOR TO THE GDP
ACTIVITY M_4-SM_1-A_1

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1. OBJECTIVES

The aim of this activity is to evaluate the importance of the livestock sector in the national economy. To achieve this, we propose evaluating the livestock sector's share in the national GDP.

The estimate of the livestock sector's share to the national wealth makes it possible to evaluate the importance that the development of this sector should have in terms of the global strategy of development or investment.

This activity also aims to evaluate the importance of the livestock sector in the national economy over the next 15 years. The objective is to be able to simulate a policy change and/or a technical change in the framework of an action plan (module 5).

2. BASIC NOTIONS

- Added value: Value of production* (100% - % intermediate consumption).
- GDP. The GDP is equal to the sum of the added values (VA) of the resident economic agents, calculated using the market prices, to which we add the share of added value recovered by the state

(tax on added value and other customs duties). Thus, the GDP is a measure of the value of all the goods and services produced on a given country's territory over a given period (1 year in general).

The GDP calculation for livestock production can only be done in the global framework of the national accounts. The GDP calculation for livestock production only makes sense if it is developed at the same time as the GDP for the other sectors, within a unified framework. The GDP calculation of the different sectors is generally conducted on the basis of a global model for the national economy (a matrix of social accounting, for example). Nonetheless, the calculation of the added value for the livestock sector can highlight some under-estimations of the contribution of the livestock sector in the national economy and how to correct them.

- Monetary GDP/non-monetary GDP: by definition, the GDP calculation only accounts for monetary exchanges. The non-monetary exchanges (home-consumption, barter, etc.) are not taking into account. However, in countries where farmers are largely self-sufficient, production for home-consumption can represent a considerable share of national production. In addition, some national accounts take these exchanges into account by distinguishing them clearly from the "traditional" commercial or monetary values.

  In addition, there are numerous initiatives for developing alternative indicators to the GDP for a better understanding of the non-monetary economy in terms of the country's wealth, particularly the social and environmental aspects: the Genuine Progress Indicator (GPI) or the Index of Sustainable Welfare (ISEW) are examples.

- Direct GDP/indirect GDP: the indirect GDP relates to the effects of a sector (livestock production) on other sectors in the economy (agriculture, industry, services, etc.), in other words the upstream and downstream effects of this activity.

3. DESCRIPTION

3.1. Approach to determine the livestock sector's contribution to the national GDP

3.1.1. Choice of method

Theoretically, there are three methods for calculating the GDP of a country or a sector: from production, expenditure or revenue. For practical reasons, we generally apply the method using production. According to this technique, the stakeholders' added value (VA) is calculated on the basis of the production accounts (results) provided by business or administrative bodies.

In order to estimate the importance of the livestock sector in national economies, we propose limiting ourselves to the wealth generated by the main agents in the livestock sectors, namely the producers and agents in the downstream sectors processors, traders, etc.). For simplicity, we do not take into account the added value added that is created upstream (suppliers of inputs or raw material, etc.).

Here, the question is to aggregate the data from the production systems at a national level and the data from the sectors to obtain an overview of the livestock sector in the national economy.

To calculate the added value linked to the production activity, it is difficult to work from the gross results of the estimate of added value at the scale of the livestock production systems, given that the relative importance of these systems varies enormously in the different countries. We propose using the total numbers of heads. However, the estimation of the parameters of technical and economic performances (such as the offtake rates calculated for the total number, milk production/breeding female, the share of intermediate consumption for a unit of product, etc.), come from the analyses of the livestock production systems (M3-SM1-A2).

3.1.2. Direct/indirect GDP – monetary/non-monetary GDP

In this guide, the following rule is used to evaluate the contribution made by the different products from livestock production to the national economy:

	Meat & milk Wool and skins Organic Matter (fuel) Energy (transport) (Final consumer goods or intermediate goods in livestock-related industries)	Organic Matter (manure) Energy (traction) (Intermediate goods for agriculture and industries other than livestock)
Exchanges Cash	Direct/monetary	Direct/monetary
In kind*	Direct/non-monetary	Indirect
Home-consumption/use on-farm	Direct/non-monetary	Indirect

*Milk versus cereals /manure contracts (manure versus crop residues)

The direct monetary (or commercial) GDP consists of all the monetary transactions for animal products, including:

- goods for final consumption.
- or intermediate goods destined for another sector of the economy in the downstream sectors (transport, conditioning/packaging, storage, etc.). The livestock production activities also generate other activities linked to the supply of intermediate goods in the upstream sectors (veterinary products, animal feeds, etc.). However, for reasons of methodological choice, they are not taken into account here.
- We also take into account the processing and sale of products from livestock production by specialists, such as curdled milk, butter, cheese, dried meat, smoked meat, refined honey, etc. These activities, often organised by women, are ignored in the surveys on economic activities because they are often mixed with the ordinary livestock production activity or straightforward trade.

The direct non-monetary (or non-commercial) GDP consists of:

- The non-commercial exchanges (barter) of final consumer goods. For example, the exchanges of milk for cereals can still be common practice in some parts of the world. These exchanges are evaluated at the market price for animal products.
- Home-consumption of final consumer products from livestock production (valued at market price). We also take into account organic matter used as a fuel (this is a final consumer good, whereas manure is an intermediate good for agriculture), as well as animal draught, which is used to transport members of the household (and not draught used as work power).

The indirect GDP: At this stage, we only take into account the effects of livestock production on agriculture in terms of organic matter and draught (as intermediate products). The other indirect effects of livestock production (jobs, tourism, etc.) are dealt with in the activity “Indirect GDP” in M4-SM1-A2. Therefore, the following are estimated:

- The effects induced as a result of the use on-farm (“home-consumption”) of organic matter as manure to fertilise the fields and animal traction used as work power (horticulture thanks to the water pumped by animal draught).
- The non-commercial exchanges of animal traction and manure are difficult to classify (they could be classified in non-commercial GDP). Let use take the hypothesis that these exchanges consist mainly of manure contracts (exchanges of crop residues for fertilising fields). Taking them into account cancels them out for the livestock sector (product-input), although it does still represent a potential benefit for the agricultural sector (indirect effect).

All these monetary and non-monetary resources from the livestock sector have been evaluated or estimated at the scale of livestock production systems (LS) in module 3. Here, they should be aggregated and compared in relation to the agricultural GDP or total GDP at a national scale.

3.2. Estimating livestock production's contribution to the GDP

The estimation of the added value to the livestock sector and its contribution to the national GDP (agricultural GDP or total GDP), is conducted in the Excel file: m4_sm1_a1_TOOL_GDP.xls

This tool is composed of 11 sheets:

- Sheet 1 summarises the national numbers of animals in the year of the analysis, as well as for the next 15-year for the projection.
- Sheets 2 and 9 summarise the technical and economic parameters of the livestock production systems that will be used to calculate the added value for the year of the analysis ("2.production"), as well as for next 15 years after an intervention ("9.prod_horizon (With)"). The technical parameters for the forecast without interventions are the same as for the baseline year (only the numbers of animals change).
- Sheets 3 to 5 are used to calculate the added value at the production ("3.VA production"), and marketing stages ("4. VA sector") and at a national level ("5. PIB").
- These sheets (except "4.VA sector") are adapted to the 15-year forecast after intervention (With) in sheets 10 and 11.

The yellow sheets (6 to 8) can be used to estimate the supply-demand appraisal for animal products and food security for a 15-year forecast and will be processed in M4-SM1-A3 and M4-SM2-A1.

3.2.1. Estimating the numbers per species (sheet "1.cheptel")

Information about the numbers of domestic livestock is the basis of all the calculations to estimate livestock production's share in the national economy. When the real numbers are not really known (recent survey) some estimates can be used.

These numbers, as well as their respective weights for each livestock production system, have already been estimated in M3-SM1-A1 in the tool "summary". They can be imported directly by clicking on the "import option 1" or "import option 2" button depending on the method chosen.

The technical performances are recorded in the white boxes in terms of increase in numbers for the next 15 years (Columns E, F and G). Each of the growth rates mentioned is the rate that prevails for the next 5 years. This rate can be calculated using the sheet "Projection" in the file for evaluating the technical and economic performances for ruminants. For poultry, pig and fattening production systems, hypotheses need to be established taking into account the past growth and future estimates. A method for calculating the growth rates is proposed in the sub-module M4-SM2-A2 in the methodological note.

In columns H, I and J, we can set hypotheses of change for the rates of growth as a function of the scenarios of herd evolution linked to external changes. This data will be used to simulate the effects/impacts of the action plan proposed in module 5.

Thus, in columns K to N, we find the numbers estimated every 5 years for a 15-year forecast starting with the year of study. In columns Q to T, we find the estimated numbers every 5 years for a 15-year forecast starting with the year of study with change.

3.2.2. Reminder of the parameters of production and valuing for animal products (sheet "2.production")

The second step consists of establishing the different parameters required for calculating the added values at the production stage. For simplicity, in sheet "2.production" of the file, we have limited ourselves

to the main products, such as meat, raw milk, eggs, organic matter (animal droppings), hides and skins, wool and energy linked to animal traction.

These parameters, which are generally calculated in module M3-SM1-A2 and A3 can be imported directly from the tool "summary" by clicking on the "import option 1" or "import option 2" button depending on the method chosen. Some parameters can be modified afterwards according to requirements.

The zootechnical parameters can be used to estimate the quantities produced for each product and each species within the production systems that have been identified. As a reminder, to estimate:
The slaughtered offtake share for all the systems identified, we set:

- The offtake rate calculated for the total number: [E slaughtered (n) / (E (n) + birth)] from module M3-SM1-A2 for the main species with E slaughtered: the number of slaughtered animals and E: the total number of heads. Estimates are required for some species, such as donkeys (asinines), horses and game (wild animals).

Milk production for ruminant species, we set:

- Rate of breeding females in the system
- Rate of parturition
- Milk production per breeding female and per year (in litre/year).

Egg production, we set:

- Average egg production per head and per year.

The production of animal droppings for the different species, we set:

- Production of animal droppings in kg/head and per year.

The production of hides and skins for the different species, we set:

- Production in kg of hides and skins per animal only for the animals that producers use for this purpose.

The production of wool for the different species, we set:

- Production in kg of wool per animal only for the animals that producers use for this purpose.

The quantity of energy supplied by draught animals (cattle, horses, camels and asinines), we set:

- Number of hours of draught power used per species and per year and per crop system. The number of hours was evaluated at the level of crop system ("Number of hours per draught animal" in the file: m3_sm1_a3_tool_systeme_de_culture) or otherwise it can be found in the file "summary".

The calculation for intermediate goods is essential to calculate the added value for the sector. It can be imported directly with the other parameters from the tool "summary". For energy, we use the hourly maintenance cost of draught animals (see "hourly cost per draught animal" in the file: m3_sm1_a3_TOOL_crop).

The % of intermediate goods per species is calculated directly in the sheet "5.GDP" as a weighted average that depends on the weight of the livestock production systems for each species.

The prices of animals and products are the average prices that have been estimated for each livestock production system. These prices are imported in sheet "2.production" in local currency per unit of product. They are the average prices recorded on the markets over the year. It is difficult to attribute a price to energy. The hourly cost of rental can be used to value work power.

3.2.3. Calculation of production per species or per product (sheet "3.VA_production")

Using the parameters entered in sheet "2.production" for each product from the livestock production systems (LS), the third sheet automatically calculates:

- Total production
- The added value generated, broken down into commercial VA, non-commercial VA and indirect VA.

3.2.4. Estimating the added value for the marketing sector (sheet "4.VA_value chain")

In the sheet “marketing chain” of the files: m3_sm2_a1_to_a2_TOOL_2_analyse_chain[CODE].xlsm, the turnover, purchase price of animals bought from the producers and the intermediate goods were evaluated per unit for each sub-sector.

They just need to be imported by clicking on the “Import” button. The added value for each sub-sector is calculated automatically in the penultimate column.

3.2.5. Estimating the livestock sector’s contribution to GDP (sheet “5.GDP”)

This GDP sheet summarises the results of the two previous sheets. It presents the added value (in millions of the monetary unit considered) for the different products of livestock production at: the production stage (section 1.), then at the marketing sector stage (section 2.), as well as in section 5. per main production system (LG, MR, MI, other village systems, specialised systems).

It indicates the breakdown of commercial VA, non-commercial VA and indirect VA in columns. The calculation for GDP does not take into account the direct VA (commercial and non-commercial). The indirect VA from manure and animal traction will be used in the activity M4-SM1-A2.

In section 6 of the table, a comparison with data for the national GDP is proposed, even though it should be analyzed with caution, given that the methods of estimation are probably not synchronised with the other sectors of the economy. In the boxes J72 and J73, we refer to livestock production GDP and national GDP (or agricultural GDP), evaluated in the year of study. Thus, the share of livestock production in the national GDP is calculated automatically. The boxes L72 and L73 show the GDP calculated here and the national GDP, which is adjusted for the new value of GDP for livestock production. By comparing this result with official data, livestock production’s importance in the national economy can be reconsidered.

3.2.6. Estimating the livestock sector’s contribution to the GDP in the next 15 years (sheets 9, 10 and 11)

It can be useful to evaluate the effects of policies or improvement programmes (such as the action plan proposed in module 5) on livestock production’s share in the national economy.

Modify the zootechnical performance parameters (such as the offtake rate, the average weight of animals, milk production, egg production), rates of intermediate consumption or price policies for products in the sheet “9.prod_horizon (With)”. The numbers mentioned are the numbers calculated after 15 years (+ 15 years) as a function of the rates of growth proposed in the situation with change in sheet “1.cheptel”. The technical parameters for the forecast without interventions are the same as in the year of analysis (considered directly in sheet “11.PIB_horizon”).

To ensure that the hypotheses remain realistic, it is useful to go back to the sheets relating to the different livestock production systems in order to test the hypotheses linked to an improvement in the production systems; or to refer to the sheets relating to the financial evaluation of the sectors in order to test the hypotheses for an improvement in the added value in the sectors (M3-SM1-A2 and A3). The indicators of zootechnical or economic performances can then be recalculated.

You can then import the new technical and economic parameters directly by clicking on the “Import” button.

3.3. Other indicators

The estimates for the livestock sector’s share in agricultural GDP or total GDP are always difficult and approximate because many livestock production activities are not declared, including product processing and numerous related activities. Therefore, the estimates should be analyzed with caution. In addition, the comparison with official statistics is difficult given that the official statistics often tend to under-estimate this sector.

We can also refer to other indicators, such as the share of products from the livestock sector in total consumption (See M4-SM1-A3 and M4-SM2-A1). The budget-consumption surveys or the household living standards surveys can be used to calculate the total consumption of the country in monetary value and in quantity using nomenclature, which can be detailed. Apart from the actual value, which indicates the importance of these products on the domestic market, the study of these data, combined with a sound knowledge of the function of the agents in the sectors, can be used to evaluate the number and turnover of these operators. For example, if we know that the consumption of dried meat in the country is X tonnes for a total value Y MU (Monetary Unit) and if we also know that the sector is almost exclusively made up of tradesmen of a relatively homogenous size and that a tradesman produces Z tonnes of dried meat per year on average (based on the sectorial surveys), we can estimate that the dried meat consumed is generated by X/Z tradesmen, with an annual turnover of YZ/X MU.

For the other contributions made by the livestock sector to the national economy (jobs, tourism, environment, etc.), continue with activity M4-SM1-A2.

Activity M4-SM1-A2: Indirect contribution to the GDP

In order to complete the analysis of the contribution of the livestock sector to GDP and specify their roles in the national economy and population development, you will then evaluate the livestock sector's indirect contribution to the national economy.

1. Objective

- Examine the indirect economic contributions of the livestock sector, as well as the social and environmental functions of the sector at the national level.
- Discuss the impact of global changes (climate, political, commercial) on these contributions.

2. Expected outcomes

The indirect advantages that economies benefit from have been classified into three categories:

- Impacts on the other economic sectors (agriculture, tourism)

We are interested in the expected results for animal traction or animal droppings on agricultural yields. It is important to note that the direct effects of these two products from the livestock sector have already been taken into account in the analysis of direct effects in terms of income generation (M4-SM1-A1).

- Social and cultural contributions

Here, the main question is to calculate the number of direct (including family) and indirect jobs generated by the livestock production activity at the production stage and in the processing and marketing sectors.

- Contribution in terms of environmental services and disservices

While quantitative indicators are not easily accessible, identification of key environmental services will be made

3. Method and tools

This activity comprises two steps:

1. Estimate the indirect contributions of the livestock sector in economic, social and environmental terms.
    - **Tool** : m4_sm1_a2_TOOL_indirect.xls
    - **Methodological note** m4_sm1_a2_NOT_indirect_EN.pdf
    - **Appendix**, Pastoralism's indirect contribution: m4_sm1_a2_ANN_indirect_EN.pdf

2. Determine several factors of variation in the livestock production sector's contribution to the national economy.
    - **Methodological note** : m4_sm1_a2_NOTC_global_change_EN.pdf

m4_sm1_a2_NOT_indirect_EN.pdf [187 kB]

m4_sm1_a2_ANN_indirect_EN.pdf [130 kB]

m4_sm1_a2_NOTC_global_change_EN.pdf [86 kB]

4. Further information

Livestock production and tourism
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Nagle, Garrett (1999) *Tourism, Leisure and Recreation*

Pastoralism's indirect contribution
WISP (2006a) *Global Review of the Economics of Pastoralism* , IUCN.

The effects method
In French: La méthode des effets , schéma logique et guide d'utilisation (M.Chervel)
In English: The effects method and economic cost-benefit analysis (B. Franck)
Data Sources: matrices of social accountancy: SAM – IFPRI
Example: indirect effects of the poultry sector in La Réunion (in French): m4_sm1_a2_EX_effets_FR.pdf

m4_sm1_a2_EX_effets_FR.pdf [553 kB]

m4_sm1_a2_NOT_indirect_EN.pdf

ALIVE
PARTNERSHIP FOR LIVESTOCK DEVELOPMENT, POVERTY ALLEVIATION & SUSTAINABLE GROWTH

GUIDE
FOR THE INCLUSION OF LIVESTOCK PRODUCTION IN THE PRSPS

METHODOLOGICAL NOTE
THE LIVESTOCK SECTOR'S INDIRECT CONTRIBUTION TO THE NATIONAL ECONOMY
ACTIVITY M_4-SM_1-A_2

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1. OBJECTIVES

GDP does not take into account the estimated value of public and private assets and liabilities (heritage), nor the positive or negative externalities that affect this value and, therefore, which contribute to a gain or loss of means. For example, the GDP does not calculate environmental and social values. In extensive livestock production systems, for example, livestock production fulfils important social functions (particularly in terms of redistribution, management of social risks, etc.), as well as in terms of labour. The GDP does not take account employment or labour creation. Therefore, the objective of this activity is to examine the indirect values of the livestock sector for the national economy.

2. BASIC NOTIONS

3. DESCRIPTION

3.1. Contribution to the other sectors of the economy

The question is to examine the indirect values of the livestock sector in terms of:

3.1.1. Agriculture

The evaluation of the livestock sector's indirect contribution to agricultural production is a challenge. However, symbiotic and mutually beneficial relations generally exist between livestock producers and crop producers and this has a value. Again, this win-win situation should be evaluated in an indirect way because often there is no exchange of money. The key inputs that pastoralism provides to agriculture are:

Manure/fertilisers

Small farms use manure to fertilise their fields and gardens, often within systems that combine grazing and post-harvest soil fertilisation. The indicators that can be developed include:

- The calculation of the amount of manure required to increase yields, and therefore, the estimate of the economic contribution that these contracts bring to agricultural production.
- The estimate of the price of alternative fertilisers on the market. This indicator has already been calculated for evaluating the GDP (M4-SM1-A1) and can be directly recorded in the tool m4_sm1_a2_TOOL_indirect.xls.

Draught

Animals provide draught power for transport and ploughing. The importance of draught depends on soil type.

The indicators that can be developed include:

- The relative increases that result from use of draught, both for food production and yields;
- The estimate of the price of alternative traction on the market, e.g. tractors. This indicator has already been taken into account in the evaluation of the direct effects on the livestock sector in terms of generating wealth (M4-SM1-A1).

3.1.2. Tourism

Tourism is the most developed industry in the world. According to the World Tourism Organisation's estimates, it represents 10% of world GDP[1]. Tourism is on the increase in less advanced countries (LDP). It can be a motor for economic development when it is managed by local and national economies (Reid *et al*, 2006). Unfortunately, it is often seized by international markets, which considerably limits its economic impact for the final destination. However, it remains one of the few viable economic development strategies[2] for many disadvantaged rural zones and LDPs. This explains why the development of tourism was included in the Poverty Reduction Strategic Papers (PRSPs) for some countries, even though development stakeholders and institutions generally ignore it as a viable mechanism for economic development.

Traditional cultures create an atmosphere, a history and an authenticity in places, which attract interest from all over the world, be it the Maasai of Kenya and Tanzania or the Bedouin of North Africa. Their cultures turn safari destinations into places that are far more than a mere collection of animals. They influence the way that the destinations are perceived and the holidaymakers' experience. This is why tour operators in the North and their subsidiaries in East Africa regularly use pastoral imagery to sell their products, even if the latter are not directly based on culture or do not involve or benefit those whose

[1] Goodwin, H (2004)
[2] Goodwin, H (2004)

image is used. In fact, this is not merely limited to industries that sell the image of destinations. In recent years, other industries, such as car manufacturers and mobile phone distributers have used similar imagery for their brand strategy[3].

See appendix: m4_sm1_a2_ANN_indirect_EN.pdf for a list of indicators that will help to evaluate how the tourist industry values the cultural services provided by pastoralism.

3.1.3. Going further: Evaluating the livestock sector's contribution to the sectors upstream using the effects method

A sector (or a production and marketing sector) is a system that is anchored in the national economy. It causes induced effects upstream of its own activities because of its demand for intermediate goods. In turn, these induced effects lead to income distribution, in terms of work and capital. However, they also impose imports in foreign currency. Therefore, the sector's impact on the national economy is not limited to its own added value; it should also take into account what are induced by its activities.

Usually, we distinguish the direct effects of a sector that can be deduced from the consolidated operating account, by using the market price in general. The direct effects are made up of all the income distributed (either income from work, financial costs, taxes and other contributions linked to products and to the activity plus, of course, the income or operating profit), plus the taxes linked to the direct imports made by the agents in the sector minus the subsidies received by these agents. For the external exchanges, we will consider the appraisal of gains and costs in foreign currency by comparing the share of exported products and the CIF cost of imports of intermediate goods. The income distributed directly by the sector includes its added value, as well as the subsidies received.

In order to estimate the sector's indirect effects, the same approach is applied to all those who provide supplies to the productive agents in the sector. It should include all the suppliers' activities that are induced by the sector. Thus, we can go up as many links of the production chains as required.

The sum of the sector's direct and indirect effects is called the induced effects. Obviously on the basis of these induced effects, the different policies can be compared in terms of contribution to the national economy, both for distributed incomes and for external exchanges.

There are several methods for applying this type of analysis. We can either go up the production chains, as mentioned above, or start working from the national statistics and accounts, or combine the two for greater precision. When the country already has a social accounts matrix, the effects method can be applied. Resources are available for this in the part "the effects method" in the section "for further information".

3.2. The livestock sector's social and cultural contribution

The livestock sector's social contribution can be evaluated essentially using the direct and indirect employment generated by the activity. The cultural contribution has partly been taken into account above for the evaluation of the interactions between livestock production and tourism. Other aspects can also be taken into account (livestock's cultural contribution to religious festivals, such as Eid al-Adha/Eid ul-Fitr/Tabaski). Lastly, other impacts on the resilience of the family economy are considered.

3.2.1. Jobs

The livestock production activity generates numerous jobs, mostly for family members that are barely taken into account by the national accounts. However, indirect jobs are also generated with the use of paid labour. It is important to associate this indicator directly with that for GDP because it provides a complementary perspective.

[3] Hesse & MacGregor

The jobs linked to livestock production were estimated at the production stage for the analysis of household vulnerability (M3-SM1-A4) and recorded in the table m3_sm1_a1_TOOL_synthesis, as well as at the level of the marketing sectors (M3-SM2-A3). In the first case, they can be directly imported in the table m4_sm2_a2_TOOL_indirect.xls by clicking on the import button. Employment data for the sectors can be entered in the sheet “Q_indirect”.

3.2.2. Other indicators

Other indicators of the social function of livestock production can be taken into consideration. Some have already been taken into account in the analysis of household vulnerability in M3-SM1-A4.

Monetary buffer/capital reserve: Investment in animals reared in pastoral production systems provides farmers with an important safety net, which reduces their vulnerability and risk.

Accumulating social capital and conflicts: the exchanges between livestock producers and between livestock producers and other social groups (farmers) can lead to conflicts (field damage, etc.). It can also help reduce conflict and promote cooperative relations and exchanges.

3.3. Livestock production and environmental services

Here we consider the environmental services and disservices generated by the interactions between livestock production and the ecosystems where livestock production is located. The LEAD toolbox will facilitate this evaluation.

3.3.1. Support and regulatory services

The environmental services provided by livestock production largely concern pastoral ecosystems where mobile livestock production develops areas of land that would otherwise be classified as *marginal zones*. The recognised effects of this mobility are:

- Reducing the quantity of dead matter that accumulates on the surface of the soil, which improves the regeneration of grasses;
- Opening up grazing land, which thus harbours fewer pests;
- Stimulating plant growth, particularly grasses;
- Providing manure, which fertilises pastures;
- Breaking the soil crust, thanks to hooves/trampling, which improves water infiltration in the soil;
- Contributing to seed dispersion, thus maintaining pasture diversity;
- Improving the germination of seeds, which pass through animals’ intestines;
- Preventing bushes invading pasture, when it is well managed;
- Improving the nutrient cycle in the ecosystem overall;
- Cleaning dead grass from pasture, which reduces the risk of fire;
- Not to mention carbon sequestration!

3.3.2. Biodiversity

The positive effects of pastoral production on grazing land are also important for maintaining biodiversity and ecological resilience.

- Grazing encourages the regeneration of some trees, grasses and bushes. Most ecosystems in arid areas depend on grazing ecologically. A reduction in the mobility of herdsmen or their exclusion could lead to a significant drop in biological diversity and reduce the health and stability of the ecosystem.

- The traditional breeds developed over centuries of selective breeding are more drought-resistant and can cover much greater distances to find grazing. These traits are important, given the context of climate change and uncertainty.

3.3.3. Disservices

The negative aspects and losses should also be presented in the case of overgrazing in extensive systems, as well as water and soil pollution caused by intensive systems and industries that process animal products (tanneries, etc.).

m4_sm1_a2_NOTC_global_change_EN.pdf

SUPPLEMENTARY METHODOLOGICAL NOTE
IMPACT OF GLOBAL CHANGES
ON THE LIVESTOCK SECTOR'S CONTRIBUTION TO THE NATIONAL ECONOMY
ACTIVITY M_4-SM_1-A_2

The aim of this activity is, therefore, to examine the impacts of global changes (climate, political, trade), which influence the livestock production sector's contribution to the national economy. The factors of variation in livestock production's contribution to the national economy will be identified using a literary review and on the basis of past experience. Three types of factor will be considered.

Climatic and environmental factors

These factors include all the risks linked to droughts and to the availability of pastoral resources and agricultural by-products, which lead to associated risks, such as health crises and epizootic diseases or changes in strategy, particularly strategies relative to livestock mobility. In the case of disasters like this, the GDP only indirectly accounts for the destruction of assets (loss in live capital (animals), infrastructures, etc.), by considering the value of the impact on production (therefore, less than the share of assets). However, GDP takes into account the reconstruction that follows the disaster and which is financed by national or international aid.

Climate change alters our environment throughout the world and our capacity to adapt to this change is crucial for our survival. We forecast that in less advanced countries the costs of climate change will be the highest (Reid *et al.* 2007). In these countries, the poorest inhabitants and those living on marginal land will be the worst hit. These groups will have to adapt to new types of risk and to fewer opportunities. The herdsmen's subsistence strategies constitute an important source of knowledge of adaptation (see document in the appendix on pastoralism's contribution).

It is difficult to quantify resilience and it has not been attempted. It cannot be directly quantified. However, an estimate of its scale or its importance can be calculated indirectly. The indicators can be developed by using a combination of observations and surveys, including:

- Collecting estimations from commercial farms of change in investment, yield and margin as a function of changes in rainfall or temperature per livestock unit;
- Observing changes caused by periods of drought: in the prices for all of the local goods and proteins and in the composition of the diet of a sample of households.

The political and identity factors

Risks linked to the local conflicts for access to resources, and linked to regional conflicts, wars, rebellions, political changes for access to basic services (education, health, credit, etc.), and migration strategies.

The economic importance of livestock production in the national economies should be discussed in relation to the country's social, political and cultural context. Is livestock production considered as a regional "feature"? Or on the contrary is livestock production an activity that is spread throughout the territory? What role do products from livestock production have in food culture, particularly in urban

areas? Does livestock production depend on distinct socio-political identities? Does livestock production have a positive or negative image in urban culture?

The factors linked to markets and trade policies

Here, it is a question of evaluating the risks of variation in the value of production, which are linked to access to trade outlets (infrastructures, processing industries, trade, etc.) or to variations in national or international prices. These factors are likely to evolve rapidly in response to environmental or political shocks or in response to political measures (trade agreements, new tariff policies, protection measures, health embargoes, etc.).

Knowledge of the environmental, health, political and economic issues is essential for understanding the sensitivity and variation of the indicators calculated to estimate livestock production's share in the economy. These issues also help to explain the differences that may exist between livestock production's share in GDP and the share of public resources allocated to livestock production policies.

Activity M4-SM1-A3: Livestock sector's contribution to food security

1. Objective

The objective of this activity is to estimate the importance of animal products in the population's food security and to identify the means with which the sector could contribute further.

2. Expected outcomes

The expected results are indicators of the importance of animal products, particularly of national origin, in the food availability and the national food security. The assessment of the supply and demand (developed on the basis of the activities M4-SM1-A1 and M4-SM2-A1) can be used to evaluate the percentage of nutritional needs covered by animal products: m4_sm1_a3_OUT_food_security.xls

This activity will also provide an appraisal of the importance of animal products for food security in terms of accessibility, nutritional contribution, health risks, as well as their social and cultural importance and functions.

m4_sm1_a3_OUT_food_security.jpg [388 kB]

3. Method and tools

The activity is based on the five fundamental elements that constitute the consensual definition of food security, which is not limited to the quantitative appropriateness between food supply and demand. This definition:

- Integrates but goes beyond the simple notion of food **availability**
- Emphasises economic **access** in space and time
- The **nutritional dimension** is not limited to the energy provided
- Integrates **food safety**
- Takes into account of **food preferences**, which are not limited to taste, but also linked to the social and cultural roles of food and food practices.

This activity is based on:

- The available statistical data on national food availability and results from nutritional surveys
- a comprehensive knowledge of the function of the sector obtained in module 3 and from literary reviews or consultations with experts or multi-agent workshops.

Tool: sheet **"SD_balance"** of tool m3_sm1_a1_TOOL_GDP.xls

Methodological guide: m4_sm1_a3_NOT_food_security_EN.pdf

m4_sm1_a3_NOT_food_security_EN.pdf [153 kB]

4. Further information

Alive Drought Toolkit: m4_sm1_a3_ANN_Alive_drought_Toolkit.zip

m4_sm1_a3_ANN_Alive_drought_Toolkit.zip [2 MB]

m4_sm1_a3_NOT_food_security_EN.pdf

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GUIDE FOR THE INCLUSION OF LIVESTOCK PRODUCTION IN PRSPs

METHODOLOGICAL NOTE
LIVESTOCK PRODUCTION'S CONTRIBUTION TO FOOD SECURITY

ACTIVITY M_4-SM_1-A_3

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1. OBJECTIVES

The objective of this note is to present the methods for estimating the contribution of products from livestock production to food security.

2. BASIC NOTIONS

- Definition of food security:

The term "food security" should not be confused with food safety, which is much more restrictive.

"*Physical and economic access for all human beings, at all times, to sufficient, healthy and nutritional food, which allows them to satisfy their energy requirements and food preferences so that they can lead a healthy and active life (*World Food Conference*, 1996).*

3. DESCRIPTION

This definition:

- Integrates but goes beyond the simple notion of food **availability**
- Emphasises economic **access** in space and time
- The **nutritional dimension** is not limited to the energy provided
- Integrates **food safety**
- Takes account of **food preferences**, which are not limited to taste, but also linked to the social and cultural roles of food and food practices.

It leads to the identification of five stages in the analysis.

3.1. The share of available animal products

The objective of this activity is to estimate the importance of animal products, particularly national animal products, in food availability, trace its evolution, analyse the trends and compare with similar data from other countries.

Two indicators can be established:
- The share of animal products in food availability
- The share of animal products produced in the country in food availability.

The FAOSTAT database (http://faostat.fao.org/) and “food assessments”, in particular, provide basic data, which makes it easy to carry out calculations.

Some advice:

- Depending on the country, different types of animal products can be identified or grouped together.
- Ideally, 3-year averages should be calculated so that seasonal variations in availability are taken into account.
- The share of availability can be calculated in terms of energy provided (calories) and protein provided.
- Results are assessed in terms of absolute value for the most recent period. The analysis of evolution over the past 10 or 20 years indicates the evolutionary trends.

3.2. Estimating accessibility of animal products

The objective of this stage is to collect the data and the elements concerning the accessibility of animal products in space and time, particularly for the most vulnerable populations.

Three indicators can be established:

- Price of 80 g of protein depending on its origin (plant, different animal products). This indicator helps to identify the animal product that provides the cheapest protein and indicates the comparative prices of animal and plant proteins. A similar indicator, which is often used, is the ratio between the prices of 1 Kg of meat/1 Kg of cereals. These indicators have been calculated for the different production systems in relation to the average prices for cereals (sheet “Summary” in the files on activity M3-SM1-A2).

- Relationship between the average highest and lowest seasonal prices over the past 5 or 10 years. This indicator shows the temporal accessibility of animal products.

- The share of expenditure on animal products in relation to total food expenditure for the poorest and the richest groups of the population.

Data from Market Information Systems, price reports conducted by state services (Ministry for Trade, Ministry for Agriculture, services responsible for food security, etc.) are often available in each country and can be used for price calculations.

Data from the Budget-Consumption Surveys or the Household Surveys on Living Conditions conducted by the national statistical institutes can be used to calculate the share of expenditure. The list of these surveys for African countries is provided by the World Bank database on the website: http://www4.worldbank.org/afr/poverty/databank/survnav/default.cfm

3.3. Estimating the importance of animal products in terms of nutritional contribution

The objective of this stage is to specify the importance of animal products in terms of nutritional contribution for the population. A preliminary estimation was conducted at the first stage using data on food availability at a national scale. At this stage, data from the nutritional surveys is used. It is often more precise and provides information on the disparities within a country.

Two indicators can be established:

- The share of animal products in the provision of calories and proteins for different categories of the population (for example depending on regions, depending on the rural or urban environment, age or sex).

- The share of the population that does not have sufficient animal proteins.

The share of animal products in terms of calorific and protein contribution is calculated for each production system (PS) studied in the sub-module M3-SM1. A summary table can use this indicator for each PS in order to identify the most vulnerable PS from the point of view of food.

On the basis of estimates of the livestock production sector's contribution to the national economy (M4-SM1-A1) and estimates of the demand for animal products (M4-SM2-A1), the Excel file 'm4_sm1_a1_TOOL_GDP.xls' automatically calculates the share of animal products, which are imported or of national origin, in terms of its contribution to the population's nutritional requirements (calories, protein, lipids):
- for the present situation (year of study)
- for a 15-year projection, which takes into account the increase in demand although no allowance is made for possible import or export restrictions.

The share of animal products of national origin is also estimated in terms of its contribution to the population's nutritional requirements (calories, proteins, lipids):
- for a 15-year projection with no change in terms of technical or economic productivity
- for a 15-year projection with the introduction of a change in technical or economic productivity.

These results are shown in sheet '8. SD balance' of the Excel file 'm4_sm1_a1_TOOL_GDP.xls'. They help to identify the role that livestock production activities have in providing nutritional requirements at a national level. They also indicate the animal production activities that contribute the most to meeting calorific and protein requirements.

These results can be discussed with national nutritional services or specialists, who are able to interpret the nutritional data, which is always problematic, in terms of the country's specificities and given the methods of evaluation used.

An in-depth interview with nutritional specialists will also help specify the strategic importance of animal products for different categories of the population.

3.4. Estimating the health risks of animal products

The objective of this activity is to gather and process information, indeed data on sanitary quality and risks linked to consumption for each product of livestock production.

Two elements should be distinguished:
- The nature and seriousness of the risks depending on the product, the consumption way and the quantities consumed.
- The population's perception of risks.

From the point of view of the political management of health risks, it is now generally recognised that evaluating these risks simply on the basis of an analysis of probability and seriousness is inadequate. The population's perception of these risks should be taken into account. The population's perception of risks is often based on much more diverse criteria and, therefore, differs from that of the experts, who only conduct an "objective" analysis. The population can minimise or accept risks considered to be important by specialists or, on the contrary, fear risks even if their probability of occurrence is very low. Risk management policies should integrate these different perceptions, particularly for adapting their communication and intervention strategies.

No database exists that is specific to these questions. In addition, the scientific literature available on the health quality of foods and on the perception of risks linked to the consumption of animal products in the country or similar regions should be collected.

It would be useful to consult food science specialists in order to identify the objective risks (university laboratories for food quality analyses, food technology institutions, or quality control services). In order to identify the population's perception of risks, we will conduct a bibliographic search in the fields of sociology and psycho-sociology.

If information is lacking, a round table could be organised bringing together consumer representatives (consumer groups) and product quality specialists so that a substantial basis could be established quickly to debate this issue.

3.5. Estimating the social and cultural importance of animal products

The objective of this activity is to collect information and points on the social and cultural roles of animal products. From now on, the definition of food security includes the question of preferences and acknowledges the fact that food has multiple functions and is not simply limited to satisfying the body's physiological requirements.

The expected result is to collect the points, which demonstrate the roles that animal products have in social life (ceremonies, sacrifices, protection, festive preparations, etc.) and in terms of the identity of populations.

The scientific literature in the field of sociology and anthropology can be used to identify these points.

Activity M4-SM1-A4: Livestock's contribution to the reduction of poverty and inequalities

In order to specify the role that livestock production plays and will play in the national economy and in development, you will evaluate this sector's contribution to the reduction of poverty and inequalities.

Poverty alleviation and the reduction of inequalities do not necessarily go hand in hand. An activity can help reduce poverty for some people or social groups and increase inequalities between individuals or social groups. The method proposed will make it possible to analyse the link between livestock production, poverty and inequality on a macro-economic level.

1. Objective

- Analyse the potential of livestock production to alleviate poverty.
- Evaluate livestock production's contribution to the reduction of inequalities.
- Identify the mechanisms that allow this sector to play an increasing role in poverty alleviation and the reduction of inequalities.

2. Expected outcomes

Poverty alleviation

- Data on the employment and the monetary resources generated by livestock production and related activities (see M4-SM1-A2).
- Capacity of livestock systems to secure producers' incomes facing risks.
- Percentage of households below the poverty threshold according to the production systems.
- Stakeholder participation in public decisions (see M3-SM1-A4).

Reduction of inequalities

- Data on income inequalities.
- Data on inequalities of access to factors of production.

m4_sm1_a4_OUT_poverty&inequality.jpg [177 kB]

3. Method and tools

Poverty alleviation

1. Identify and evaluate the monetary resources generated by livestock production and the indicators of poverty.
2. Evaluate the relational and cognitive resources.
3. Evaluate the role of livestock production in securing producers' resources.
4. Evaluate the capacity of stakeholders to take part in decisions that concern them.

Reduction of inequalities

1. Calculate the decile dispersion ratios (option 1) and the GINI coefficients (option 2).
2. Compare the population ratios per main systems (LG, MR, MI).
3. Calculate the indicators of inequality in access to resources.

Tool: m4_sm1_a4_TOOL_poverty_inequality.xlsm
(Choose option 1 or option 2 while opening the file (About))

Methodological guide: m4_sm1_a4_NOT_poverty_inequality_EN.pdf


m4_sm1_a4_NOT_poverty_inequality_EN.pdf [191 kB]

m4_sm1_a4_NOT_poverty_inequality_EN.pdf

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METHODOLOGICAL NOTE
LIVESTOCK'S CONTRIBUTION TO POVERTY ALLEVIATION AND THE REDUCTION OF INEQUALITIES
ACTIVITY M_4-SM_1-A_4

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1. OBJECTIVES

Poverty alleviation and the reduction of inequalities do not necessarily go hand in hand. It is possible for an activity to help reduce poverty for some people or social groups at the same time as increasing inequalities between individuals or social groups. Therefore, the reduction of inequalities is an issue in its own right. The objective of this note is to explain and justify the methodology proposed for analysing the link between livestock production, poverty and inequality on a macro-economic level.

2. BASIC NOTIONS

- Definition of poverty

Poverty is not only defined as an insufficient level of income, but as a process that limits the capacity to escape poverty. Now, particularly with A. Sen's contributions, it includes: the lack of opportunities and potential to maintain good health, be educated, and have access to resources and a social life, the "capacities to do and be" ("capabilities").

- The link between growth, poverty and inequalities

Kuznets was one of the first to theorise on the link between growth and inequalities: the level of inequality evolves depending on the stage of growth. According to this theory, inequality in a society tends to increase during the first phases of growth, then it stabilises, and finally it declines when the society is developed. Numerous recent studies adjust this analytical framework considerably, by underlining the negative impact of inequalities on growth (c.f. the World Bank's 2006 world development report "Equity and development"). This is why it is important to deal with growth and the reduction of inequalities simultaneously, instead of considering redistribution as a later phase of growth.

- GINI coefficient

The GINI coefficient is an indicator that is often used to characterise income distribution within a given population. It is calculated using the Lorenz curve, which represents the cumulative share of income as a function of the cumulative share of the population. The GINI coefficient lies between 0 (which corresponds to perfect equality, the preceding curve is on the right) and 1 (which corresponds to maximum inequality, where one person owns everything).

- Decile dispersion ratio

This ratio measures the difference between the average income of the richest decile of a given population and the average income of the poorest decile. The ration can be calculated for other fractions of the population, such as quintiles (20%).

3. DESCRIPTION

The analysis of poverty and inequality at a national level is based on the results of the analysis of household vulnerability, which was conducted in activity M3-SM1-A4. In addition, the tools and indicators proposed vary according to whether you are working with option1 (without survey data) or option 2 (with survey data). In the sheet "About" in the Excel tool (m4_sm1_a4_TOOL_poverty_inequality) **select Option1 or Option2.**

3.1. Identify livestock production's contribution to poverty alleviation

Using the definition of poverty, the analysis of the livestock production sector's contribution to poverty alleviation can be deduced from the previous activities:
The generation of direct and indirect monetary income (conducted in M4-SM1-A1)
The relational and cognitive resources (conducted in M3-SM1-A4)
Securing resources and "capabilities" (conducted in M3-SM1-A4)
The increase in participation in decision making ("empowerment") (conducted in M3-SM1-A4 and M3-SM3-A1)

The analysis of the indicators over time is very instructive and should be conducted if the availability of data in time series allows. This will enrich the analysis by making it possible to update potential changes over time in the relation between livestock production, poverty and inequalities.

The Excel tool proposed (m4_sm1_a4_TOOL_poverty_inequality) also makes it possible to calculate the % of the livestock farms below the poverty threshold.

Option 1: working with representative farms for a given system, all households are above (below) the poverty threshold, if the income from the system is above (below) the poverty threshold. This calculation is conducted for the net income from livestock production activities, as well as for total net income after funding. These indicators are available in the sheets "Synthesis" of M3-SM1-A1 and can be directly imported by clicking on the "Import Option1" button.

Option 2: A detailed analysis of the indicators of poverty is available in the sheet "poverty&GINI" of the "households" files in M3-SM1-A4. Here, we propose aggregating the main results. Click on "Import Option2" to import the indicators of the incidence and depth of poverty for each system. The tool then calculates the number of poor households according to the main systems. In the last lines of the green summary boxes, it is possible to calculate the rate of poverty for the households classified according to livestock production's share of income.

3.2. Identify livestock production's contribution to the reduction of inequalities

The development of the livestock production activity affects inequalities by generating induced effects (the development of an individual's livestock production activity has a positive effect on his neighbours and the local population) or eviction (degradation of the neighbours' situation). This analysis concerns the macro-economic level above all and the indicators proposed in the activity M3-SM1-A4 should be used.

The analysis of livestock production's contribution to the reduction of inequalities can also be deduced from the calculations of income and, therefore, in a differentiated way according to option 1 or option 2.

3.2.1. Calculation of the indicators of inequality with Option 1

In order to simplify the calculation and for reasons of data availability in the case of option 1, we will use the ratio between the average incomes of the poorest household and the incomes of the richest households.

On the basis of the incomes imported previously (net incomes for animal production and for all the household activities after funding), it is possible to evaluate the ratio between the net income of the richest households in relation to the net income of the poorest households. This is carried out for the ratio of net income from livestock production activities and the total net income at the bottom of the sheet (green box).

However, households do not have the same weight in the population. We could also try to determine an estimate in deciles by doing several calculations alongside the tool.

Going further: the decile dispersion ratio

The decile dispersion ratio is the ratio between the average incomes of the richest decile of a given population over the average incomes of the poorest decile.

Operational methods:

- The initial information required for this calculation is the income that corresponds to each individual in the population considered.
- Incomes are ranked in decreasing order in the spreadsheet.
- This classification makes it easy to identify the first decile (10% of the population with the highest incomes) and the last decile (10% of the population with the lowest incomes), which constitute the two sub-samples.
- The spreadsheet then calculates the mean income for each of the two sub-samples.
- Then we just need to divide the average obtained for the first decile by the average obtained for the last.

The inequality that prevails within a population is greater the higher the ratio. A ratio of 2 to 3 indicates a situation that is relatively equal. A ratio above 5 indicates an unequal to very unequal distribution of income.

3.2.2. Calculation of the indicators of inequality with Option 2

An in-depth analysis of the indicators of inequality is available in the sheet "poverty&GINI" of the "households" files in M3-SM1-A4, with the calculation of the GINI coefficient. Here, it is directly recorded in the green summary boxes at the bottom of the tables for the three main systems: LG, MR and MI. Unfortunately, this coefficient cannot be aggregated as such on a national level. In addition, for the other systems (village and intensive) and for the national level, the calculations of ratio between the poorest and richest households' income is proposed as a supplement.

3.2.3. Comparison of the ratios according to the population considered

The comparison of the ratios or the GINI coefficients according to the population considered reveals whether the inequalities are greater depending on the main systems.

- If we have access to data on income for the same population at different periods, we can determine how the inequalities evolve over time. If we have the same data for several populations, we can see whether the inequalities tend to disappear or to increase.
- This analysis is particularly useful for evaluating the impact of a livestock production policy or a particular project implemented in a given region (M5).
    - Thus it is possible to determine if, after the implementation of policies (whether they are targeted at livestock production or not), the inequalities tend to disappear within the main systems.
    - In the case of projects that have been beneficial to some producers but did not concern others, and if we have access to the data on income before the project was implemented and also several years later, we will be able to observe an increase in the average income, but simultaneously an increase in the inequalities.

3.2.4. Going further: inequality in the access to factors of production

Inequalities are not just related to income. Another major source of inequalities is the access to factors of production used in the livestock production activity (land, pasture, water, credit or veterinary services):

- The analysis of conditions of access to land presupposes that information is available on land tenure, as well as the nature of land ownership: individual property rights, common rights, traditional rights, etc.
    - If data on land tenure exists, it is possible to calculate diverse indicators that can be used to determine the level of inequality in terms of land access.
        - To achieve this, the different producers should be ranked in decreasing order according to the land to which they have access.
        - Then, using a spreadsheet, you should calculate the areas of land cumulated by the two largest landowners, by the three largest and so on until the end of the list.
        - Thus, we can identify the following three indicators:
            - The percentage of the population of producers that owns 20% of the land
            - The percentage of the population of producers that owns 50% of the land
            - The percentage of the population of producers that owns 80% of the land
    - If this type of data already exists from previous studies, it can be used as a reference.

- The analysis of conditions of access to other factors of production is generally conducted in a more qualitative way. We use binary terms for access or no access, in an attempt to characterise populations roughly according to whether or not they have access to pasture, water, credit and veterinary services.
    - The most obvious indicator is the percentage of the population with access to a given factor. The conditions of access to pasture and water often result from social agreements. In the case of credit and veterinary services, lack of access can be due to the fact that the service is not available in the geographic zone or because it is too expensive. In all cases, we will measure the percentage of the population of producers that actually use these services.
    - The social characterisation of populations is a qualitative approach. It aims to compare the two sub-populations, the one with access to services and the one without, in order to reveal the socio-economic criteria that determine access to factors of production, if indeed there are any.

These indicators have been determined in activity M3-SM1-A4. We can use the summary table proposed in M3-SM1-A4.

Sub-module M4-SM2: The livestock production sector's potential

1. Objective

The objective is to determine the sectors with the greatest potential for growth and whose growth could be maintained.

Using the potential demand estimated for animal products in the livestock production sector over 15 years and their competitiveness, the growth potential for the supply of animal products can be compared to the availability of food resources for the animals, health constraints and genetic potential. The results of these analyses will be used to support the case for the development of the livestock production sector on a national level.

2. Expected outcomes

- An appraisal of the supply and demand of animal products on the market to estimate the export potential or, on the contrary, the import requirements
- Indicators of competitiveness to determine the international market opportunities
- An appraisal of supply and demand in food resources to support the livestock production sector
- An appraisal of the constraints linked to animal health
- An appraisal of animals' genetic resources

3. Activities

1. Evaluation of the potential demand and supply
2. International competitiveness of the livestock production sectors
3. Potential and food resources
4. Potential and animal health
5. Potential and genetic resources.

Activity M4-SM2-A1: Potential market demand and supply

1. Objective

The objective is to estimate the potential demand for animal products and the balance between market supply and potential demand for animal products taken globally in 15 years' time.

Therefore, this involves identifying the sectors with the most potential in terms of growth and whose growth should be supported. These estimates will be used to identify the strategic sub-sectors with the aim of reducing poverty in module M5.

2. Expected outcomes

The expected result is an assessment of the potential supply compared to the potential demand at a national level. The difference can be used to identify the most promising sectors in terms of export or the sectors with a deficit, where growing demand is likely to deepen the deficit of the balance of trade.
These results can also be interpreted in terms of nutritional deficit or surplus for the population.
Thus, the main results can be represented in the form of a table:
m4_sm2_a1_OUT_supply_demand.jpg

m4_sm2_a1_OUT_supply_demand.jpg [257 kB]

3. Method and tools

This activity requires estimating the supply and the potential demand:

- Demand is estimated using available data from national household surveys, from which we infer the parameters of elasticity, of demographic growth (urban – rural), prices/inflation seasonality. A methodology with a regional approach is proposed.
- The actual and potential supply is estimated using demographic models for each type of farming system (FS) for ruminants (M3-SM1-A2) and the hypotheses for

growth for the other FS. A methodology for a regional approach is proposed based on the same principal presented in M4-SM1-A1.

Tools: the calculation of the potential supply is based on the same hypotheses developed for estimating the national production in the activity M4-SM1-A1. Thus, the tool proposed in this activity (M4-SM1-A1) integrates the sheets required for assessing the supply and potential demand at a national level.

Methodological guide: m4_sm2_a1_NOT_sypply_demand_EN.pdf

m4_sm2_a1_NOT_sypply_demand_EN.pdf [179 kB]

4. Further information

Examples for estimating growth rates: m4_sm2_a1_NOT_sypply_demand_EN.pdf

m4_sm2_a1_EX_hypo_growth_EN.pdf [37 kB]

m4_sm2_a1_NOT_sypply_demand_EN.pdf

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METHODOLOGICAL NOTE: ESTIMATE OF POTENTIAL MARKET DEMAND AND SUPPLY ACTIVITY M_4-SM_2-A_1

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1. OBJECTIVES

The objective is to estimate the potential demand for animal products and the balance between market supply and potential demand for animal products taken globally in 15 years' time.

Therefore, this involves identifying the sub-sectors with the greatest potential in terms of growth and whose growth should be supported.

This approach can also be used to identify deficient sub-sectors, which could exacerbate the deficit of the national balance of trade if they do not develop as a function of demand.

2. BASIC NOTIONS

- Elasticity of demand: The elasticity of demand is an economic concept for measuring the sensitivity of demand to variations in price (price elasticity) or income (income elasticity). Income elasticity is defined as the relationship between the percentage of variation in demand for a good and the percentage of variation in income. It measures the impact that a change in consumer income has on the demand for a particular good.

As not all goods have the same income elasticity, an increase in income changes the structure of consumption. There are three different categories of goods:

- Negative income elasticity: consumer demand for these goods diminishes when income increases. These goods are of poor quality and consumers prefer substituting them with new goods when their income allows them to do so.
- Income elasticity between 0 and 1: consumer demand for these goods increases when income increases in a proportion of less than or equal to 1. These goods are also known as essential goods.
- Income elasticity greater than 1: consumer demand for these goods increases faster than income.

3. DESCRIPTION

To determine the balance between potential market supply and demand in 15 years' time, we propose starting with the tool designed to estimate the contribution that the livestock production sector makes to the national economy (m4_sm1_a1_tool_GDP). This needs to be completed with the estimate for demand using the following sheets '5.population', '6.demande', 7.bilan OD'. Using the same principle, the white cells need to be filled in and the yellow cells are calculated.

3.1. Estimating the numbers and the potential supply in 15 years' time

The method used to estimate the supply in animal products for a given time horizon (year of study + 15 years) is based on the estimate of the actual supply calculated for the different livestock production systems studied in the sub-module M3-SM1 and given their importance at national level. The estimate of the potential supply in 15 years' time is based on hypotheses concerning the rate of growth in numbers (net population growth rate), which have been derived from the demographic model only for ruminants or which estimates were taken from existing trends observed for the poultry and for pig production systems.

3.1.1. Estimating the evolution in the national herd

1. Current supply – which corresponds to the supply for the chosen year of reference – is determined on the basis of the total number of animals per species and the relative importance of each livestock farming system identified in module 3 (in numbers within the total population) (see M3-SM1-A1). The relative importance was estimated after discussions with key resource people who had a thorough knowledge of the distribution of livestock farming systems (LS) per zone and at a national level. If a relatively comprehensive database exists for the country, the percentage of each system was estimated on the basis of key-indicators for each system in activity M3-SM1-A1. This data was used to complete sheet '1. cheptel'.

2. The scenario concerning the growth in numbers for 5-year periods can be developed using the demographic model for ruminants or estimated using a function of past trends. With a number n_t at the start of the period and a number n_{t+x} at the end of the period, with a duration of x (in number of years), the annual population growth rate in numbers (TauxCroissance in formula) during the period is calculated as follows:

$$TauxCroiss\ ance_t = \left(\frac{n_{t+x}}{n_t} \right)^{\frac{1}{x}} - 1$$

3. To calculate the number of animals after X years, given that the number at the start of the period is Eff_t, the number (Eff_{t+x}) at the end of X years is calculated as follows:

$$Eff_{t+x} = Eff_t * (1 + TauxCroissance_t)^x$$

4. Thus, the forecast for numbers in 15 year's time was estimated on the basis of the hypotheses of evolution for the different livestock production systems by considering three consecutive 5-year periods. Hypotheses had to be developed in order to estimate the net growth for the non-ruminant species. For example, let us refer to the hypotheses developed in the case of Burkina Faso: m4_sm2_a1_EX_hypo_growth_EN.doc.

3.1.2. Estimating the potential supply

1. Total production of meat, milk and eggs for consumption generated from the forecast of animal numbers was estimated on the basis of the current production parameters (situation *without* change) and then by applying the improved parameters (situation *with* change). In terms of the numbers estimated, the parameters in the situation *with* change concern the annual growth rates of numbers for each type of farming system. Thus, the number is estimated by taking account of these changes in growth rates.

2. Three parameters are required in order to forecast the potential supply of meat in the future (at the time horizon):

- The net offtake rate for the herd: that is the proportion of animals sold, used for self-consumption or given away over the total number of animals present (numbers at the start of the year plus intake i.e. new arrivals during the period).
- The average weight of animals (this concerns the animals marketed).
- Dressing percentage: this is the animal's carcass weight over its live weight (dressed). Carcass weight is the weight of the carcass before chilling, with kidneys, kidney fat, tail, hump, etc. The live weight (dressed) is the weight of the animal after its intestinal tract and bladder have been removed. The standards for dressing percentage are closely linked to the animals' condition and depend on age and sex.

3. All these parameters have been calculated in the technical sheets in the models relative to the livestock farming systems (M3-SM1-A2) and carried over to sheet '2. production' for the situation without change. The result is a forecast for future meat production in sheet '4 PIB'.

4. Three parameters are required in order to estimate the potential supply of milk in the future:

- The rate of reproductive females in the herd: this parameter is given in the output of results for the demographic model (with and without change).
- The birth rate: this rate is considered as an input parameter in the demographic model for ruminants.
- Milk production (litre) per lactating female and per year: this parameter is considered as an input parameter in the demographic model for ruminants.

5. All these parameters were calculated in the technical sheets for the models relating to the livestock production systems (M3-SM1-A2) and used in sheet '2. production' for the situation without change. The result is the forecast for future milk production in sheet '4 PIB'.

6. The estimate for the future potential supply in eggs was calculated using the number of eggs per zootechnical unit and per year.

7. The summary of results at the bottom of each table shows:

- The total production for each type of animal product consumed: carcass meat, milk and eggs.
- The share of production that comes from so-called "vulnerable" systems. The term vulnerable system refers to extensive ruminant systems, village pig and poultry systems and camel systems. It is important to note that some systems, particularly camel dairy systems, can be quite intensive. This parameter just needs to be recalculated. This indicator is based on a number of assumptions, namely that extensive systems, village pig and poultry systems and, lastly, systems with donkeys have been developed by a majority of vulnerable households.

3.2. Estimating the potential demand for animal products in 15 years' time

1. The estimate for potential demand is based on data from the national household surveys, which can be used to determine the parameters of elasticity (demand-income), demographic growth (urban-rural). To simplify matters, we do not consider the differential food preferences between urban and rural environments (urban/rural consumption factor).

2. The consumption of animal products is largely influenced by four main determining factors, which have an unequal impact:

- Prices: generally, over time, prices of animal products vary little or at least vary slowly because supply and demand are essentially regulated by quantities; in addition, the increasing internationalisation of exchanges and trade agreements (WTO, WAEMU) means that, in future, world prices are likely to be far more determining factors than local prices. Although prices have dropped drastically over the past few decades, this trend should diminish or indeed be reversed. The diverse scenarios forecast for 2020 by Delgado et al (1999) predict that over this period, prices for animal products will only drop by less than 10% in general and by 15% maximum for some hypotheses. In these conditions, the price will not be a determining factor for animal products. However, it is important to take account of the actual change in the international context, which introduces numerous uncertainties in terms of the evolution of prices.

- Incomes: income really does seem to be the determining factor for the consumption of food of animal origin in Africa in general, with elasticities close to 1 across the continent where GDP is below US$ 800 per inhabitant (with the exception of poultry meat and, depending on the country, beef). However, this evolves as a function of economic growth, which can be estimated using the GDP per inhabitant.

- Demographic growth and urbanisation: the forecast for demographic growth and urbanisation remain generally quite high in Africa. Consumption per inhabitant is already so low that it can be considered as an acceptable minimum. If it remains stable, global demand should automatically follow this growth.

3. From now on, to estimate potential demand in the future (at a time horizon), data on the evolution of demographic growth is required:

- An estimate of the population's annual growth rate, which is generally based on existing forecasts (source: UNDP, WAEMU, WB).
- An estimate of the annual urbanisation rate and the proportion of the urban population in the total population. This can be used to distinguish between urban demand and rural demand.
- An estimate of the total population in the country.

Thus sheet '5.population' can be filled in.

4. The estimate of consumption per inhabitant and total consumption is based on the availability of animal products in the year of reference (actual situation). The level of exports and imports is required to estimate the supply available (see: M4-SM3-A3), which is carried over to sheet '6.demande'.

5. To estimate the potential demand, we require:

- The forecast for growth in GDP
- The coefficient of demand-income elasticity

These indicators are generally estimated in the official statistics in the country. Other sources can also be used, such as data from the World Bank, UNDP or WAEMU. These indicators are carried over to sheet '7. bilan OD'.

6. On the basis of the nutritional contents of animal products and individual demand (in Kg/day), it is possible to estimate how much of individuals' nutritional requirements are covered by animal products. This will be used for studying food vulnerability at a national level (M4-SM1-A3).

3.3. The supply/demand balance in 15 years' time.

1. The supply-demand balance is the difference between the future supply and demand:
   - If the balance is positive: the country is potentially an exporter in future.
   - If the balance is negative: the country is potentially an importer in future. This national deficit will have repercussions on the country's balance of trade. It could also have major repercussions on the vulnerability of households in terms of food security because of the problems of delivering products to the different sites of consumption.

2. The results are calculated in sheet '7. bilan OD'. The estimated balance is conducted for a situation without change (by using the actual rates) and for a situation with change. The latter takes into account the changes in the herd growth rates ('1.cheptel') and changes in technical and economic parameters ('9.Horizon (with)').

3. Using the potential demand in kg/inhabitant, it is possible to calculate the content of the diet in terms of basic macro nutrients: calories (energy), protein and lipids. This shows the daily supply of basic nutrients provided by animal products in the food ration. If we presume that the average requirements are 2900 Kcal/day, 61 g/day of protein and 97 g/day of lipids, we can estimate how much of people's nutritional requirements are provided by the consumption of animal products. The average requirements can be changed if necessary. More detailed analyses could also address demand and supply in micro nutrients (minerals, vitamins..)

4. This approach can be extended to other scales, particularly the regional scale. To achieve this, the supply and demand should be estimated on the basis of regional parameters. The indicators should be recalculated using a weighting coefficient. For example, the rate of growth of GDP is the weighted sum of the GDP for each country in the zone considered as a function of its demographic weight. The rates of herd off take are the weighted sum for the off take rates in each country of the zone considered as a function of the demographic importance of the national herd in each country.

Activity M4-SM2-A2: International competitiveness

In order to identify the macro-economic arguments for including livestock production in the poverty reduction strategic paper (PRSP), the sector's potential, particularly in relation to international competitiveness, should be estimated.

1. Objective

The objective is to examine the competitiveness of a sub-sector or of the livestock sector in order to determine the comparative advantages of an investment, as well as to estimate the importance that should be given to the development of the livestock production sector in the framework of a national development strategy.

2. Expected outcomes

Quantitative indicators of competitiveness for the different livestock value chains will be developed. They can then be compared with other sectors of the national economy and the sectors with the greatest economic advantages can be identified.

Other indicators for qualitative aspects are proposed, such as product quality, their food safety, know-how or organisational factors in a chain. These indicators reveal the advantages or disadvantages of each chain in a context of globalisation and trade regulations.

The different factors of competitiveness should be summarised in a table, to complete the first set of competitiveness indicators collected in M3-SM2-A1:
m4_sm2_a2_OUT_competitiveness.jpg

m4_sm2_a2_OUT_competitiveness.jpg [176 kB]

3. Method and tools

This activity proposes different methods for examining the competitiveness of a sub-sector of livestock production, including:

- The method for estimating the Domestic Resource Costs (DRC): m4_sm2_a2_TOOL_DRC.xlsm
- The Balassa coefficient
- Factors of competitiveness apart from price

Methodological guide: m4_sm2_a2_NOT_competitiveness_EN.pdf

Examples:

- Case of the sheep sector in Burkina Faso: m4_sm2_a2_EX_BF_competitiveness_sheep_EN.pdf
- DRC ratio for the live animal sub-sector in Senegal: m4_sm2_a2_EX_DRC_Dakar_liveanimal.xlsm

m4_sm2_a2_NOT_competitiveness_EN.pdf [150 kB]

m4_sm2_a2_EX_BF_competitiveness_sheep_EN.pdf [187 kB]

m4_sm2_a2_EX_DRC_Dakar_liveanimal.xlsm [234 kB]

4. Further information

To go further: the Policy Analysis Matrix

- Tool: m4_sm2_a2_TOOL_PAM.xlsm
- Methodological note: m4_sm2_a2_ANN_1_PAM_EN.pdf
- Monke, E.A. and S.R. Pearson, 1989. The policy analysis matrix for agricultural development
- Example 1: Analysis of the competitiveness and the comparative advantages of cattle fattening in Indonesia (in English): m4_sm2_a2_ANN_2_competitiveness_Indonesian_beef_EN.pdf
- Example 2: Competiveness of smallholders: three case studies (in English): m4_sm2_a2_ANN_3_competitiveness_samllholders_EN.pdf

Other resources

- Analysis of the competitiveness of agricultural sectors in WAEMU countries: m4_sm2_a2_ANN_4_Compet_Uemoa.zip
- Delgado et al. 1999 "L'élevage D'ici 2020. La Prochaine Révolution Alimentaire ." In *Alimentation agriculture et environnement, Documents de synthèse*, 82: IFPRI, FAO, ILRI (multilingual)
- International Trade Centre. 2010 *Market Analysis and Research* International Trade Centre (ITC),
- ACP-EU Trade. 2010 EPA *Negotiations: Where Do We Stand?*
- Agritrade: Agritrade News and Summary Papers on trade issues in the livestock production sector for ACP countries (in French and English):

- Beef meat
- Dairy produce
- Poultry

m4_sm2_a2_TOOL_PAM.xlsm [279 kB]

m4_sm2_a2_ANN_1_PAM_EN.pdf [75 kB]

m4_sm2_a2_ANN_2_competitiveness_Indonesian beef_EN.pdf [444 kB]

m4_sm2_a2_ANN_3_competitiveness_smallholders_EN.pdf [173 kB]

m4_sm2_a2_ANN_4_Compet_Uemoa.zip [2 MB]

m4_sm2_a2_NOT_competitiveness_EN.pdf

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METHODOLOGICAL NOTE
INTERNATIONAL COMPETITIVENESS OF LIVESTOCK VALUE CHAINS
ACTIVITY M_4-SM_2-A_2

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1. OBJECTIVES

This activity proposes several methods for examining the competitiveness of a livestock chain or sub-chains.

The analysis of competitiveness is usually conducted using the reference price or "economic price".

In fact, the analysis using the market price is unsatisfactory because the price does not reflect the true value of goods when there are market distortions. This is particularly the case when there is imperfect competition between markets (linked to situations involving a monopoly or oligopoly or when information from livestock producers is lacking for some markets or in some regions). It is also the case when the state distorts economic processes via taxes, subsidies, rules, etc. In some countries, for example, the state subsidises the use of agro-industrial by-products (AIBP), which means that livestock producers do not pay their true cost. Ultimately this subsidy constitutes a cost for the national economy as a whole.

2. BASIC NOTIONS

- Coefficient of Domestic Resource Costs: = DRC = cost of non-tradeable goods (at reference price) / (value of products – costs of tradeable goods also at reference prices).
- Tradeable goods: goods and services that can be imported or exported.
- Market price: price actually observed for the transactions.
- Reference price: prices representative of the economic value of the good or service (also known as economic prices or shadow prices).

- INCOTERMS: Contraction of "**IN**ternational **CO**mmercial **TERMS**", the incoterms determine the reciprocal obligations binding the seller and the buyer in the framework of an international contract of sale (CIF, FCA, FOB, etc.).

3. DESCRIPTION

3.1. Estimating the domestic resource costs

3.1.1. Determining the reference prices

The economic analysis is conducted, first, by substituting the market prices with the **reference prices** for the goods. By reference prices, still called "economic prices", we mean the prices that represent the true economic value of goods and services.

Then, all the financial transfers that do not correspond to a commercial transaction are eliminated from the calculations; for example, this is the case for taxes and contributions, subsidies, bank interest, insurance, etc.

In order to determine the reference prices, we distinguish between **tradeable** goods and services, in other words goods and services that can be exported or imported, from **non-tradeable** goods and services.

For tradeable goods, we generally consider their **parity** price, in other words the CIF price (cost, insurance and freight) for imports at the border plus the costs of transport to the market and possibly the costs of processing required for marketing the good. The calculation for these costs excludes the financial transfers that are not attached to commercial transactions, like taxes, for example. The parity price for milk, for example, is the CIF price of milk powder at the port plus the costs of unloading and transport to the market, as well as costs of re-processing calculated excluding taxes, domestic subsidy, insurance and bank interest. Inversely, for products to export, we consider the FOB price minus the transport costs to the border and possibly the costs of processing calculated in the same way. Lastly, to represent the real economic value of a good, its value of use should also be considered, in other words, the price that people are willing to pay to obtain it. For example, preference for quality traits can then come into play at this level. If, for example, the preference for bush poultry (traditional production) means that it can sometimes be sold for 20% more than industrial poultry, we would apply added value that corresponds to 20% of the parity price calculated on the basis of imported industrial poultry.

For non-tradeable goods, we deduct the financial transfers that have no commercial compensation. For domestic production factors, such as land, labour, etc. we generally apply their opportunity cost, in other words, the maximum price that they could be attributed outside the sector.

Clearly it is not always easy to determine the share of tradeable and non-tradeable goods or their economic prices. Sometimes certain specific estimates of the share of tradeable goods within a given factor of production need to be examined in more detail. Certain global techniques for a range of goods, for example, such as factors of standard conversion between market price and reference price are also used.

3.1.2. Analysis of the sector's competitiveness

Once the economic prices have been determined, we can then calculate the competitiveness or the economic efficiency of a value chain or part of a chain for the national economy by comparing its economic cost in terms of national internal factors (non-tradeable goods) to the gain in foreign currency earned thanks to this chain or this part of the chain. The gain in foreign currency corresponds to the difference between the product's economic value and the economic value of the tradeable goods consumed to produce it. To do so, we use the Domestic Resource Costs or DRC coefficient.

The DRC = the cost of non-tradeable goods (at reference price) / (value of products – costs of tradeable goods also at reference prices).

- If the DRC is greater than 1, that means that for the national economy the cost of internal factors consumed is more than the added value created, measured in international prices. Therefore, the chain generates a loss of wealth for the national economy, for the society.
- If the DRC is less than 1 on the other hand, the sector's consumption of internal factors is less than the saving in foreign currency that the chain permits; therefore, the chain generates economic added value for the national economy.

The DRC can also be used to compare two different value chains that target the same market in terms of the national economy: the one with the lowest DRC is, therefore, the most "attractive" from the community's point of view.

In order to apply this method, the sector should be divided into segments that are bordered by markets at both ends, which permit entry into or exit from the chain via supplies or external outlets: imports of raw material and exports of finished products. These segments are then put together for a global analysis. In the case of this exercise, the entry into the chain occurs at the producer level and presupposes an analysis based on the average financial performance of livestock production systems conducted in M3-SM1-A3. Here, the data are put together for the segment of the chain studied. In addition, the analysis can only be conducted on the basis of the hypothesis that flows are constant and it usually concerns a single end product. This presupposes that the information on the different agents' costs means that they can be allocated to this product alone. As for the financial analysis, it is often easier to "follow" the product in question between the boundaries that have been set.

The tool proposed (m4_sm2_a2_TOOL_DRC.xlsm) is based on an analytical type table, which breaks down costs. It is possible to design your own analytical framework as suggested in the example provided for Burkina Faso (m4_sm2_a2_EX_BF_competitiveness_sheep_EN.pdf).

3.1.3. Taking it further: the DRC for production systems and the PAM

An economic analysis was proposed as an option during the analysis of the financial performance of livestock production systems (M3-SM1-A3). If you decide to conduct the analysis, the DRC is calculated automatically (shown at the bottom of the results section of the "diagnostic" sheet). It can provide a useful element for analysis if the production systems are analysed on a larger scale than that proposed here (for example, at the level of large types of production systems (LG, MR, MI)).

The Policy Analysis Matrix (PAM), is a method of analysis that shows the effects of policies and their changes on incentives for production or marketing. It distinguishes "the individual effects of policies discussed at the micro and macro level, as well as the dysfunctions and other market distortions" (Monke et al, 1989). This method m4_sm2_a2_ANN_1_PAM_EN.pdf is presented and proposed along with an Excel tool m4_sm2_a2_TOOL_PAM.xlsm if you are interested in taking the analysis further.

3.2. The import and export approach

The assessment of imports and exports is an important element for estimating how dependent a country is on the outside world, as well as for revealing an indicator of specialisation.

The imports that have been assessed (in quantity and in value in foreign currency), give an indication of the degree of dependence of a country on the outside world. Imports can reflect:

- a demand for a type of product that is not satisfied by the national supply
- insufficient domestic production
- a problem of carriage (transport..) of products from the sites of production to the sites of consumption.

The exports assessed (in quantity and in foreign currency), give an indication of the value chain dynamism and of the potential for value adding beyond the national market.

The specialisation of an economy can be measured using the Balassa coefficient (1966). This is the relationship between the balance of trade and the sum of exports and imports.

$$b = \frac{X_i - M_i}{X_i + M_i}$$

b: Balassa coefficient of specialisation, Xi: exports of the product or of the product category i,
Mi: imports of the product or category of product i.

When the country only exports the good in question or the category of goods (i.e. zero imports), the coefficient b is equal to +1. When the country only imports, b is equal to -1. Therefore, the Balassa coefficient of specialisation varies between -1 and +1 ($-1 \leq b \leq 1$). The greater the degree of specialisation for a given product or a category of products is, the closer b is to +1. When b is close to 0, we refer to intra-specialisation (intra-branch specialisation).

For Balassa (1966), the products or categories of products that the economy has specialised in, are those for which the value of the coefficient is greater than 0.33. The coefficients that are less than 0 with a significant value below -0.33, indicate a de-specialisation. When the coefficient is quite close to -1, this indicates that the country tends to be only an importer.

Data for importation and exportation have been recorded on the Excel sheet m3_sm2_a1_TOOL_3_import_export.xlsm in the module on sector characterisation (M3-SM2-A1). The indicator of specialisation can now be calculated at this stage of the analysis using the same sheet simply by adding this parameter.

3.4. Other factors of competitiveness apart from prices

The competitive advantages of a value chain, both on the national and international level, are not limited to its financial profitability (for the operators) or its economic efficiency (for the community). Three main groups of factors can have an important influence on its competitiveness. They have been presented in module M3-SM2-A1. Here, we would like to raise other points that deserve attention. In fact, in the international context, the prospective analyses of the regional or global market and the existence of agreements or special regimes should be taken into account.

Thus, in the event of a revolution in livestock production (Delgado C. 1999), we consider that urbanisation and the increase in income in countries with high demographic growth (emerging) offer conditions for the development of the world meat trade. Therefore, these countries constitute new markets (for example, in China +2.4% growth in beef consumption per year), on the periphery of existing markets (European Union, Japan, etc.). In this context, it is obviously important to examine a country's capacity, its interest in and its competitiveness for exporting to these destinations given that its production cost is lower than that of its competitors or because of its unique qualitative attributes of competitiveness. As far as the European Community is concerned, the particular situation of the trade of beef from ACP countries (*African, Caribbean and Pacific Group of States*) was governed by a preferential system of access negotiated for the European market until the end of 2007 (*Beef protocol of the Cotonou agreement*). This was subject to restrictions and authorised free access of products from few countries on condition that the animal health regulations in force were respected (standards were controlled by the commission's Food and Veterinary Office, FVO). See: étude CTA Agritrade.
Since the end of quotas, the interim economic partnership agreements (EPA) are gradually being set up (cf. étude CTA Agritrade). In addition, there is now increased competition with the different suppliers of red meat in the world, particularly with Latin American countries (MercoSur region).

Once the different dimensions have been identified and sub-chain have been consolidated, the competitiveness of the value chains studied can then be summarised to complete the table: m3_sm1_a2_TOOL_competitiveness_EN.xlsx

Activity M4-SM2-A3: Feed resources potentiality

1. Objective

The objective is to estimate the potential growth in the supply of animal products as a function of the availability and the potential supply of feed resources for animals. Given the current pressure on natural resources, attention is focused on taking into account crop residues and by products from the agro-industry.

2. Expected outcomes

The expected result is a feed balance derived from the comparison of the national herd's demand for and the supply of resources. An estimate of the availability of feed resources means that it is possible to consider an increase in animal production or to manage a deficit of resources in relation to the current herd:

3. Method and tools

This activity proposes simple methods for estimating the potential for growth in the livestock sector based on the availability and the potential supply of fodder and other productive feed resources:

- Estimating demand. Demand for feed resources is estimated from the energy requirements for the different species, the numbers of animals and the main livestock farming systems.
- Estimating supply. The supply is estimated using concise information gathered on the agro-ecological zones, the amount of forage crops and pastures, yields from grazing areas, from residues and agricultural by-products, to which we add agro-industrial by-products supplied in the country.

Tools:

- Estimating the requirements per species: m4_sm2_a3_TOOL_1_feed_needs.xls
- Estimating the resource potential and feed balance: m4_sm2_a3_TOOL_2_feed_resources.xls

Methodological guide:

- m4_sm2_a3_NOT_feeds_EN.pdf

- m4_sm2_a3_NOTC_feeds_needs_EN.pdf

Example:

- Estimating the requirements per species: m4_sm2_a3_EX1_ feeds_needs.xlsm
- Estimating the resource potential and feed balance in Mali: m4_sm2_a3_EX2_ feeds_resources_mali.xlsm
- Estimating the resource potential and feed balance in Burkina Faso: m4_sm2_a3_EX3_feeds_resources_bf.xlsm

m4_sm2_a3_NOT_feeds_EN.pdf [145 kB]

m4_sm2_a3_NOTC_feeds_needs_EN.pdf [149 kB]

m4_sm2_a3_EX_1_feed_needs.xlsm [261 kB]

m4_sm2_a3_EX_2_feed_resources_Mali.xlsm [245 kB]

m4_sm2_a3_EX_3_feed_resources_bf.xlsm [244 kB]

m4_sm2_a3_NOT_feeds_EN.pdf

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METHODOLOGICAL NOTE
FEED RESOURCES
– ACTIVITY M_4-SM_2-A_3

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1. OBJECTIVES

This activity proposes simple methods for estimating the potential for growth in the livestock sector. Here, the objective is to estimate the potential growth in the supply of animal products as a function of the availability and the potential supply of feed resources for animals.

2. BASIC NOTIONS

The basic notion for animal feed is generally that of energy requirements and dry matter consumption.

The notions of agro-climatic zones and of productivity yields of natural grazing lands and croplands.

3. DESCRIPTION

3.1. Estimating demand for feed.

3.1.1. The animals' requirements

1. The animals' requirements for energy, protein, minerals and vitamins correspond to the energy, nitrogen, etc. used by the animals in order to produce. They include:
- The maintenance requirements, which allow the animal to fulfil the physiological functions necessary to maintain its live weight, including the energy requirements for finding feed, which are high for animals that are kept on rangeland and limited for herds that are kept in sheds. Maintenance is an objective for the producer during the dry season in an extensive system.
- The production requirements correspond to the necessary needs relative to forming muscular tissue, adipose tissue, etc. (growth, fattening), milk components, foetal tissue (gestation), eggs, work, etc.

2. The total requirements are the sum of the two. They can be expressed in different units:
- For energy, in digestible organic matter, total digestible nutrients (TDN), metabolisable energy, net energy (net energy for lactation – UFL; net energy for fattening (meat) – UFV);
- For proteins, in digestible crude protein, in digestible proteins, in intestinal digestible proteins for ruminants, in amino acids for non-ruminants;
- In weight or units for minerals and vitamins.

3. The requirements depend on the animal species and the types of production (milk, meat, eggs, etc.). This can be converted into yields expressed by consumption indices (kg of dry matter - kg DM, needed for a unit of production, for example kg of product - DM/kg of live weight produced or per kg of milk, etc). They vary enormously, for example, ranging from 2.4 kg DM for 1 kg of broiler chicken fed a well-balanced ration, to over 50 kg DM per kg weight gain for sheep kept on rangeland at certain periods of the year. Therefore, it is important to know the animals' requirements either in order to assess the feed required or predict the needed rations, or to deduce the livestock production possible given the available feed resources.

3.1.2. Feed requirements for herbivores

1. For ruminants, maintenance requirements differ little between species. They can represent a high proportion of total requirements for relatively unproductive animals in extensive systems. Regarding production requirements, they are low for gestation, average for milk, higher for the production of muscle and bone tissues, very high for animals being fattened.

2. To calculate the demand for feed resources, calculations were based on energy requirements, converted into quantity of dry matter by developing hypotheses for the average energy content of feeds over the year. There are huge variations in the energy content of feeds: young fodder plants (Gramineae at the heading stage, Gramineae regrowth of 3-4 weeks, etc.) are easily digestible and have energy values of between 0.7 and 0.8 UFL. On the other hand, forage from natural grasslands in the dry season and cereal straw have average to low energy contents, often below 0.5 UFL/kg DM. By-products also have very variable energy and nitrogenous contents; some are high in energy and proteins (oil cake, etc.), others are energy rich (molasses, etc.), others are intermediary (cereal bran, spent grain from brewery, etc.). Their nutritional value depends on their origin plant and from the types of process used to extract oil from seeds or to prepare flour. This raises the question of the accessibility of these by-products for many producers. Other concentrated feeds (either with high energy contents and/or high nitrogen contents) can be used like cereals.

3. Examples for the three main ruminant species are reported in the Excel sheets, in the files: m4_sm2_a3_TOOL_1_feed_needs.xlsm for cattle, sheep and goats, respectively. For cattle, two types of production were analysed: an extensive system with rangeland, a dairy production system with cross-bred cows (local indigenous breed x exotic dairy breed). The examples developed included annual diets with energy values of 0.55 and 0.75 UFL/kg DM. They show the importance of the rations' nutritional value for the performance of animals and, consequently, for the quantities of feed required.

Examples of methods to estimate the DM requirements calculated on the basis of the energy requirements: m4_sm2_a3_TOOL_1_feed_needs.xlsm

4. After the calculations for energy, the provision of nitrogen or protein should be calculated on the basis of information on feed contents and as a function of the animals' requirements, which depend on levels of production.

5. For the different livestock production systems, the quantities of DM were calculated for herds of 100 animals with a given herd composition:

Examples of DM requirements calculated on the basis of the energy requirements of a herd of 100 animals: m4_sm2_a3_TOOL_1_feed_needs.xlsm

The main results are for the herds of 100 animals:

SPECIES	Type of production	Performances	Energy and UFL/kg DM	Tons DM/year	Calculation Total Crude Protein required (T/year)
CATTLE	Extensive	Cow calving every 2 years 73 per 100 females	0.55	182	14
	Intensive dairy	Housed dairy cow of 500 kg producing 4 000 kg of milk 78 per 100 females	0.7	275	32
SHEEP	Extensive	Sheep with one lamb per year 74 per 100 females	0.55	41	3.4
GOATS	Extensive	Goats with 1.2 kids per year 72 per 100 females	0.55	37	3.1

6. For the ruminant requirements on a national scale, the quantities of DM necessary for each large system of production and an assessment of demand can be calculated using the numbers of the different species from the FAO's agricultural statistics. For example, for Burkina Faso, the demand is 21428 million tons for all the ruminants managed in extensive systems. For Mali, it is 22726 million tons.

3.1.3. Feed requirements for non-ruminants

1. Non-ruminant requirements are rarely divided into maintenance and production requirements. They are generally combined. They are well known for the main species kept in intensive conditions and fed a balanced diet adapted to the type of production (growth, eggs, sow gestation and lactation). However, they are little known and have not really been studied for poultry and pigs raised in extensive systems and wandering.

2. For non-ruminants in an intensive system, diets are based on cereals and oil cake, with supplements that correspond to requirements, particularly amino acids, minerals and vitamins. It is possible to consider that generally the quantity of a balanced compound feed required is 2.4 kg for producing 1 kg of broiler meat and 2.6 kg for 1 kg of eggs. Cereals make up between 50 and 60 % of these diets. The production of 1 million broilers of 2 kg corresponds to a cereal consumption of between 2 400 and 2 900 tons. Other raw materials should complete the rations. The production cycles are controlled in industrial livestock production systems. However, they are very diverse in extensive livestock production systems given the difficulty of determining the animals' requirements under these management systems, on one hand, and their proportion in terms of national meat and egg production, on the other hand. To determine the demand for feeds, calculations were based on production data from FAO statistics.

3. The following principles were set: for 1 ton of poultry meat produced, it was considered that 1.85 tons of cereals were required on the basis of a ration comprising 55 % cereals and a dressing percentage of

72 %. This means that a cereal “equivalent” can be calculated for all the poultry meat and eggs produced. This corresponds to the demand if all the production was intensive. The method of calculation is reported in the file.

4. For eggs, the same proportion 1.85 T cereals / Ton of eggs was used
(See: m4_sm2_a3_TOOL_1_feed_needs.xlsm).

5. For Burkina Faso, the potential demand for cereals for poultry represents 8.8 % of national maize and sorghum production.

6. This approach using cereals is interesting inasmuch as it shows the proportion of these feeds that could be in competition with food for people. The other raw materials come from processing oil plants (groundnuts, cotton, soybean), some of which are produced in the country and others are imported. The question here is the cost of these food/feeds in relation to other uses and the potential for exporting them.

7. For pigs, the use of cereals and by-products raises the same questions.

3.2. Estimating the feed supply.

3.2.1. Basic principle

1. **Requirements** are covered by energy, nitrogen or proteins, etc. contained in feeds. To determine the feed supply, herbivores need to be differentiated from other domestic species and the main livestock production systems need to be identified (extensive, intensive, etc.). For herbivores in extensive grazing systems, fodder plants provide almost all of their feed requirements. In intensive systems, they make up between 25 and 75 % of the rations. The remainder of the diet is in the form of a supplementary feed, which is made up of different raw materials, most of which are so-called “concentrated”.

2. For other animal species, mainly pigs and poultry, the feed is based on grains, agro-industrial by-products and residues. Grass constitutes a small part of the diet for extensive production systems and is absent from intensive production systems.

3. Feed resources vary greatly in terms of quantity and quality in a single year and from one year to the next. They include:

- fodder plants: 1) natural in dry, sub-humid and humid grassland areas, 2) cultivated with some areas planted with Gramineae or leguminous crops, 3) by-products and residues from cereal and leguminous food crops or from cash crops, largely made of straw, which has a considerable biomass;
- by-products from the small-scale and agro-industrial processing of cereals and oil plants, etc. (bran, molasses, oil cakes, etc.);
- raw materials such as cereals, fishmeal, etc.

4. The large variations in the nutritional value of these feeds and their quantities depend on climatic variations during the year, which can modify the composition of fodder plants, on small-scale and agro-industrial processing techniques used, on the possibilities to access agricultural and grazing land, with all the related land tenure issues and to access by-products, with the questions of organisation and price.

5. In addition, the proportion of the available quantities used varies depending on the animals’ behaviour and the producers’ practices.

3.2.2. Quantitative approach to supply in extensive ruminant systems

For the calculation of feed supply potential, one should use the following tool m4_sm2_a3_TOOL_2_feed_resources.xlsm should be used to complete

1. According to the main livestock production systems, different elements should be considered for the inventory of feed supply.

2. In the extensively managed ruminant production systems:

i. In the predominantly pastoral system, the agro-climatic zone is essential. Dry matter production (DM) in pastoral areas is very variable, depending on the climatic zones and the year; it can range from several kg of DM in arid zones to almost 10 tons in humid zones. It depends on rainfall, rain distribution and the plant species present (predominantly annuals in dry zones, perennials in humid zones).

ii. In a mixed crop - livestock system, the variability in forage resources depends on the production in pastoral areas, as well as plant production, particularly cereals, whose growth and yield depend on the same climatic factors as above. Crop residues and by-products (straw, haulm, etc.) represent a large volume of biomass. They are not entirely used by animals, partly because their quality makes them difficult to digest, and partly because they are utilized for alternative purposes (buried as fertiliser, used for fencing, etc.). The part consumed by animals varies depending on the sites and farmers' practices.

3. The latter livestock production system, with the use of natural resources and agricultural residues, is becoming the dominant one in sub-Saharan Africa. The amount of forage of agricultural origin varies and increases with the length of the rainy season.

4. In both these livestock production systems, while little is provided in the way of minerals at different times of year, the provision of supplements in the form of agro-industrial by-products is developing depending on the cash crops grown in the regions and the existence of processing plants.

5. Some examples of calculations for the supply of feed resources at a country scale are reported in the files: m4_sm2_a3_EX2_feeds_bf.xls, m4_sm2_a3_EX1__feeds_mali.xls, for Burkina Faso and Mali, respectively.

3.2.3. Quantitative approach to the supply in intensive ruminant systems

1. In an intensive management system, animals do not move around on rangeland, though they may go onto some farm plots. The producer grows or buys in the necessary fodder for the different lots of the herd. The use of cultivated fodder crops has not yet really developed in sub-Saharan Africa. For this type of crop, there are several species of Gramineae and Leguminosae, some of which have been selected. Depending on the cropping zone, irrigation may be necessary. For Gramineae, mineral and organic fertiliser applications are essential. Yields can be high, although it is often difficult to reconcile high biomass production and high feed value for Gramineae, which have a rapid growth rate and, as a result, high cellular contents and low nitrogen contents.

2. In intensive systems, a large part of the animals' requirements is covered by a concentrated feed composed of diverse raw materials, with a high energy value of greater than 0.8 UFL/kg and a nitrogen fraction close to 150 g/kg of the feed. Often, the amount of concentrate exceeds 50 % of the total ration for dairy cows. The manufacture of concentrated feeds is problematic in terms of regular access to raw materials (cereals, agro-industrial by-products) and their cost price.

3.2.4. Non-ruminant production

1. As already described, it is difficult to calculate the feed supply for extensive production with non ruminants species. The calculation for potential demand is shown below.

2. With intensive management, raw materials with a high nutritional value are often used, cereals, local or imported agro-industrial by-products (cereal bran, oil cakes, etc.) and supplements and additives. The main points to consider for the development of balanced rations are the availability of diverse ingredients and their prices.

3. Therefore, supply is a function of the availability of cereals and agro-industrial by-products. It can be in competition with food for people.

3.3. The supply/demand balance.

3.3.1. Ruminants

1. The examples developed for Burkina Faso and Mali show two different cases.

2. In the first case, the feed supply is less than the demand. According to the method of calculation proposed, there will be a deficit in DM close to 18% to satisfy demand. Thus, there would be saturation in terms of production for ruminant production systems and, consequently, the need to modify the production systems. Nonetheless, this raises questions on the method used (production of DM, percentage of use) and on the animal numbers reported in the FAO directory.

2. On the other hand, in Mali, the second example, a large amount of biomass is left over, exceeding 18% of demand, which indicates that the herd could be increased. The same questions as for Burkina Faso are raised in relation to methods.

3.3.2. Non-ruminants

1. The example of Burkina Faso shows that poultry and pig production systems could represent a demand of 192 000 tons of cereals, almost 7 % of maize, millet and sorghum production in 2004.

2. For Mali, the demand is lower, with almost 87 000 tons of cereals, which currently represents a small proportion of the cereals produced (4.13 %).

3. A third example was developed for Senegal where current potential demand is close to 110 000 tons of cereals, which represents 13 % of the national production of maize, millet and sorghum. In this case, the development of non-ruminant production would undoubtedly involve importing cereals.

3.3.3. Limits of feed resources

1. The assessment of the feed supply shows calculations for the matter available and consumed by the animals and a calculation for dry matter that animals can “potentially ingest”. It is conducted for the extensive livestock production systems, the predominant management method in many African countries.

2. The limits of the feed supply are both qualitative and quantitative. In terms of quality, it is difficult to classify the limiting factors in a hierarchy. Tropical fodder plants rarely have high nitrogen content. On the other hand, they are always rich in cellulose and, therefore, have an average to low energy value. Their mineral contents are generally poor in phosphorous and some trace elements (copper, zinc). It is important to remember that production is largely dependent on the nutritional values of the feed consumed by animals. The question of the energy and nitrogen contents of feed is, therefore, essential for improving production. As developed in the example of cattle requirements, a herd of 100 dairy cows fed a ration with a high nutritional value will produce 13 times more milk than a transhumant herd, by receiving almost double the DM. However, the quality of the rations distributed to the dairy cows should be higher in energy and nitrogen in order to meet their needs. The feed values of rations with variable proportions of fodder are a major constraint.

3. In terms of quantity, the available biomass can be very variable in systems based on natural resources and crop residues, whose production is largely determined by rainfall. Only the controlled systems in humid zones or in irrigated areas can manage the production of biomass to a certain extent.

4. For non-ruminants, the resource limitations are the availability of cereals and agro-industrial by-products.

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AID FOR THE SPREADSHEETS FOR FEED REQUIREMENTS AND RESOURCES

ACTIVITY M_4-SM_2-A_3

1. EXAMPLE OF A CALCULATION OF THE ENERGY AND DRY MATTER REQUIREMENTS FOR CATTLE IN TWO PRODUCTION SYSTEMS 1

1.1. EXTENSIVE CATTLE SYSTEM 2
1.2. INTENSIVE DAIRY CATTLE SYSTEM 2

2. EXAMPLE OF A CALCULATION OF ENERGY AND DRY MATTER REQUIREMENTS FOR SHEEP AND GOATS IN AN EXTENSIVE SYSTEM 3

2.1. SHEEP 3
2.2. GOATS 4

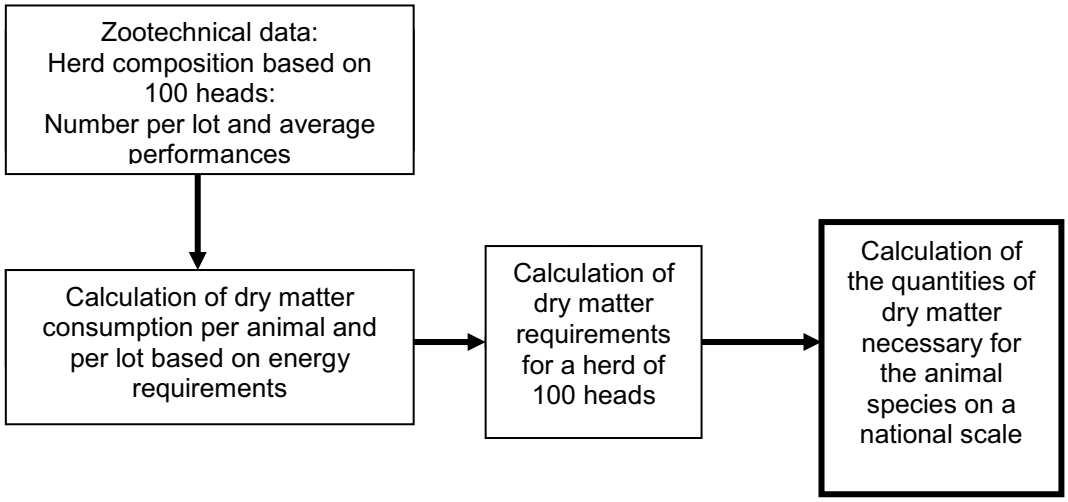
3. CALCULATION OF THE FEED SUPPLY PROVIDED BY FODDER PLANTS AND AGRO-INDUSTRIAL BY-PRODUCTS 4

4. CALCULATION OF FEED REQUIREMENTS (AGRO-INDUSTRIAL BY-PRODUCTS) FOR RUMINANTS 5

1. Example of a calculation of the energy and dry matter requirements for cattle in two production systems

The energy requirements for maintenance, moving around and production are calculated using data from INRA (feeding cattle, sheep and goats, 1978, 1988, 1989) for a lactating cow with a calf (cow sucked by the calf and milked by owner).

The general approach is:



1.1. Extensive cattle system

Stage 1: The herd's zootechnical data

Herd composition is based on a herd of 100 heads. It is made up of six categories or lots: cows of reproductive age (over 4 years), heifers (1-4 years), heifer calves (0-1 year), bulls and oxen (over 4 years), young bulls or bullocks (1-4 years) and bull calves (0-1 year).

Stage 2: Calculation of the requirements per animal for each lot

Calculations were made for a cow of 250 kg calving every 2 years. The requirements (maintenance, milk production, weight loss and gain, gestation) include the cow's production over 2 years and the requirements of the calf up to 1 year old (with consumption of forage only from 4 months). The sum of requirements is converted at the end of the calculation to apply for a period of 1 year.

The requirements of the other animals in the herd are calculated for each category of animal and are also converted into DM. For bull and heifer calves, requirements are calculated for a 9-month period because they only consume milk during the first 3 months.

The energy requirements are converted into dry matter (DM) with an average feed content of 0.55 UFL/kg DM.

Stage 3: Calculation for a herd of 100 heads

The requirements are then calculated for a herd of 100 heads, composed of 72 % of females, of which 42 % are cows of reproductive age, 20 % heifers (1-4 years) and 10 % heifer calves. The requirements of the heifer and bull calves (0-1 year) are included with those for cows, which explains why the calves do not appear in the table.

The DM requirements of the cows in the herd were calculated for an average weight of 250 kg based on the average consumption in g/kg $P^{0.75}$ (metabolic weight) obtained in the calculations for individuals.

The DM requirements with an average dietary content over the year of 0.55 UFL/kg DM are **182 tons** of forage.

Stage 4: Calculation of quantities of dry matter for the national herd

The calculation is based on the numbers in the national herd, for which data is provided either in the results of national surveys or taken from the figures in FaoStat. These calculations are in the spreadsheets m4_sm2_a3_EX2_feeds_bf.xls, m4_sm2_a3_EX1__feeds_mali.xls.

1.2. Intensive dairy cattle system

Stage 1: The herd's zootechnical data

Herd composition is based on a herd of 100 heads. It is made up of 6 categories or lots: cows of reproductive age (over 3 years), heifers (1-3 years), heifer calves (0-1 year), bulls and oxen (over 4 years), young bulls and bullocks (1-4 years) and bull calves (0-1 year).

Stage 2: Calculation of the requirements per animal for each lot

Calculations were made for a cow of 500 kg calving every 14 months and producing 4 000 kg of milk during lactation. The requirements (maintenance, milk production, weight loss and gain, gestation) include the production of the cow alone, given that the calf is removed and reared separately.

The sum of the requirements is reported at the end of the calculation for a period of 1 year.

The requirements of the other animals in the herd are calculated for each category of animal and are converted into DM. It was assumed that calves started eating solid feed from the fourth month.

Energy requirements are converted into dry matter (DM) with an average feed content of 0.7 UFL/kg DM.

Stage 3: Calculation for a herd of 100 heads

The requirements are then calculated for a herd of 100 heads composed of 79 % females, of which 50 % are cows of reproductive age, 9 % heifers for replacement (after culling) and sale (1-2 years) and 20 % heifer calves. It was presumed that the 20 calves born each year were sold at 1 year old.

The herd DM requirements with an average dietary content over the year of 0.7 UFL/kg DM are **275 tons** of feed.

Stage 4: Calculation of the quantities of dry matter for the national herd

The calculation is based on an estimate of the number of intensive dairy cattle in the national herd drawn from various studies conducted around large towns.

2. Example of a calculation of energy and dry matter requirements for sheep and goats in an extensive system

The energy requirements for maintenance, moving around and production are calculated on the basis of data from INRA (feeding cattle, sheep and goats, 1978, 1988, 1989).

2.1. Sheep

Stage 1: The flock's zootechnical data

The flock's composition is based on a flock of 100 heads. It is made up of four lots: ewes of reproductive age (over 1 year), ewe lambs (0-1 year), rams (over 1 year), ram lambs (0-1 year).

Stage 2: Calculation of the requirements per animal for each lot

Calculations were made for a ewe weighing 25 kg that produces one lamb every year. The requirements (maintenance, milk production, weight loss and gain, gestation) are calculated for the year.

The requirements for the other animals in the flock are calculated for each category of animal and are converted into DM.

The energy requirements are converted into DM with an average feed content of 0.55 UFL/kg DM.

Stage 3: Calculation for a flock of 100 heads

The requirements are then calculated for a flock of 100 heads made up of 78 % females, of which 55 % are ewes of reproductive age.

All the lambs are sold at 1 year old.

The DM requirements with an average dietary content over the year of 0.55 UFL/kg DM are **41 tons** of forage.

Stage 4: Calculation of quantities of dry matter for the national flock

The calculation is based on the number in the national flock, which is derived either from national surveys or from figures in FaoStat. These calculations are in the spreadsheets m4_sm2_a3_EX2_feeds_bf.xls, m4_sm2_a3_EX1_ feeds_mali.xls

2.2. Goats

Stage 1: The flock's zootechnical data

The flock's composition is based on a flock of 100 heads. It is made up of four lots: female goats of reproductive age (over 1 year), female kids (0-1 year), male (billy) goats (over 1 year), male kids (0-1 year).

Stage 2: Calculation of the requirements per animal for each lot

Calculations were made for a goat of 25 kg with 1.2 kids each year. Requirements (maintenance, milk production, weight loss and gain, gestation) are calculated for the year.

The requirements of the other animals in the flock are calculated for each category of animal and are converted into DM.

The energy requirements are converted into DM with an average feed content of 0.55 UFL/kg DM.

Stage 3: Calculation for a flock of 100 heads

The requirements are then calculated for a flock of 100 heads composed of 81 % females, of which 58 % are female goats of reproductive age.

All the kids are sold at 1 year old.

The DM requirements with an average dietary content over the year of 0.55 UFL/kg DM are **37 tons** of forage.

Stage 4: Calculation of the quantities of dry matter for the national flock

The calculation is based on the numbers in the national flock, which are derived either from national surveys or from figures in FaoStat. These calculations are in the spreadsheets m4_sm2_a3_EX2_feeds_bf.xls, m4_sm2_a3_EX1_ feeds_mali.xls

3. Calculation of the feed supply provided by fodder plants and agro-industrial by-products

The analysis of the supply in feed resources is based on the calculation of the areas of the different climatic zones, which are classified in terms of rainfall:

1. < 200 mm: Desert zone
2. 200-600 mm: Sahelian zone
3. 600-1200 mm: Sudanian zone
4. > 1200 mm: Guinean zone

An additional category was included for zones of more than 1000 m asl (above sea level).

A map with isohyets is required to determine the areas of these different zones (cf. Agrhymet, FAO, etc.). These calculations can be made using diverse methods, including GIS and digital maps, either using averages or the year if data is available at the start of the dry season.

Several types of resources correspond to these large climatic zone types and in varying proportions:

1. natural pastures;
2. crop residues from agricultural cropped areas;
3. energy and nitrogen supplements for which only the main agro-industrial by-products were taken into account.

The second geographic element is the amount of cultivated land in each zone. This can be obtained from national statistics.

For each zone, two main elements are considered:

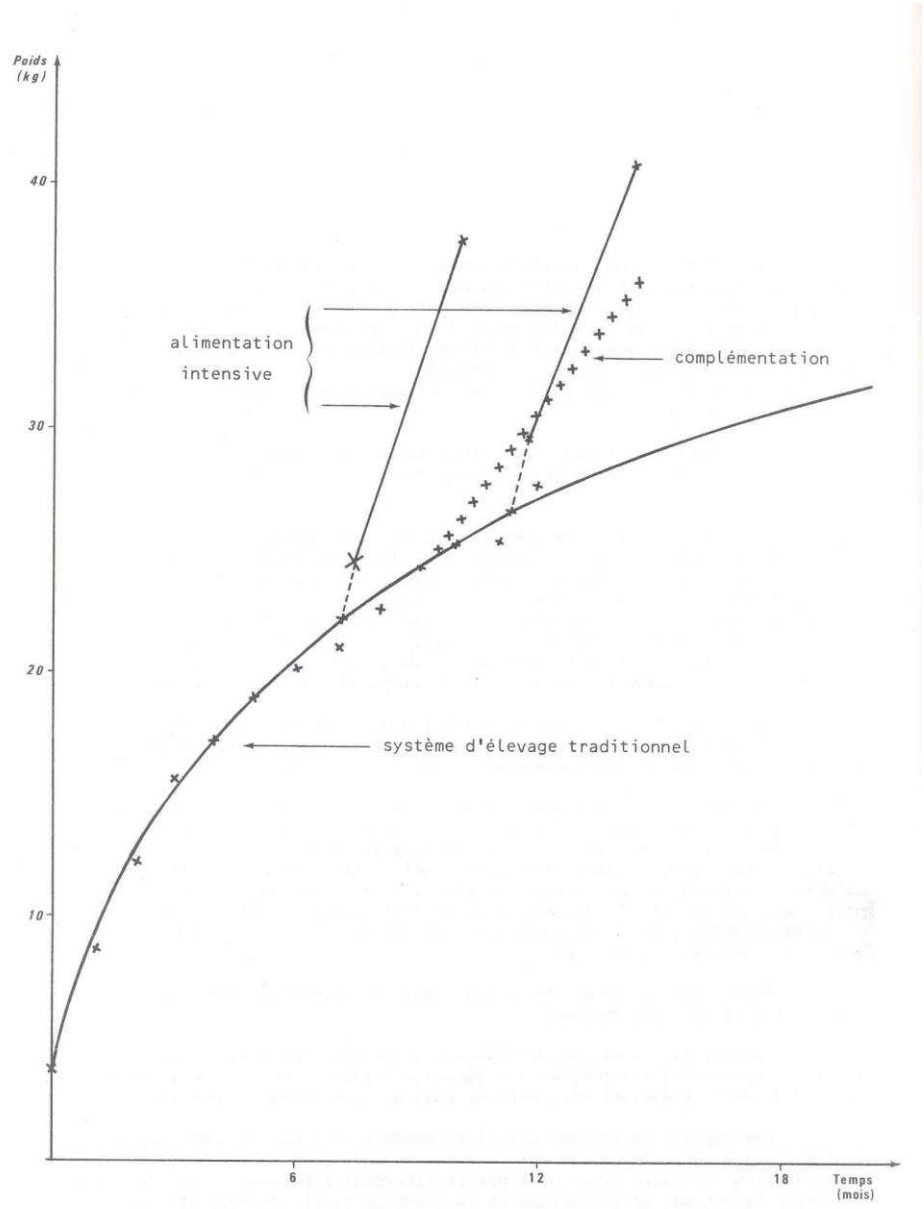
- Rainfall, for which three classes have been identified for the year: *good, normal, low*. For natural pastures, dry matter production will differ according to these classes. This applies to agricultural crops, although in the examples used, only one yield was considered.
- The proportion of forage used by the ruminants. The animals only use part of the available forage, both in the case of natural pastures and agricultural land. The part used is expressed in tons of dry matter (DM) and is referred to as “potentially ingestible” in the calculation table.

An improvement in animal production is only possible if the provision of feed is superior to that provided only by forage of both natural and agricultural origin. The example below illustrates the performances possible depending on the feeding systems used for sheep raised in a Sahelian and Sudano-Sahelian zone. The provision of a concentrate feed of good nutritional value (> 0.8 UFL/kg of DM), which represents between 50-70 % (intensive system) and 25-30 % (semi-intensive system) of the ration means that much higher growth rates can be achieved than those observed in agro-pastoral systems. Rams can reach slaughter weights that are rarely obtained with extensive management.

4. Calculation of feed requirements (agro-industrial by-products) for ruminants

These are estimated on the basis of data collected during various surveys. The calculation at the national scale is not very precise.

The figure below shows the weight performances of sheep in different production systems and the interest of supplementary feeding to improve weight gain.



Example of an improvement scheme in feeding and related performances for Fulani (Peul) sheep in Niger.
Y axis = Weight; X axis = Time (Month); *système d'élevage traditionnel* = traditional farming system; *complementation* = supplementary feeding; *alimentation intensive* = intensive feeding

Activity M4-SM2-A4: Animal health

In order to identify the macro-economic arguments for including livestock production in the poverty reduction strategic paper (PRSP), you should evaluate the sector's potential, particularly that linked to animal health. The conclusions of this activity, combined with those from the feed resources (M4-SM2-A3) and the genetic potential (M4-SM2-A5), will help define the global interventions required (M5).

1. Objective

1. Analyse and highlight the impact of a selection of animal diseases on livestock production in terms of its social and economic functions.
2. Analyse the animal health services that help attenuate the impact of these diseases. This point is directly linked to the activity "Institutional analysis" in module M4-SM3 "Policies and Institutions" of the LSIPT tool.

2. Expected outcomes

You should obtain a representation of the main *health* constraints and their mechanisms of impact, which diminish the potential of the livestock production sector. You should link this to the national context of existing veterinary interventions. This analysis will provide the basis for justifying new forms of intervention in animal health targeted at certain livestock production systems, certain types of household or value chains, which have significant multiplier effects for poverty reduction.

3. Method and tools

The two objectives will be achieved using two complementary approaches. A preliminary simplified method involves a *qualitative* approach. A second more elaborate method could be used and is based on a *quantitative* approach.

Achieving the required analysis involves three steps. The first and third steps are common to both approaches (qualitative and quantitative). The second step is the subject of a quantitative approach (section *for further information*).

Step 1: Select the main diseases recognised as a constraint to the livestock production sector in the country.

- **Tool** : m4_sm2_a4_TOOL_1_Disease_Selection.xlsx
- **Appendix** : The WHO's International Classification of human Diseases (ICD) for selecting zoonotic diseases: m4_sm2_a4_ANN_1_CIM_Zoonoses_EN.pdf

Step 2: Evaluate the impact of these diseases according to three dimensions

1. threat to the assets of poor households
2. threat to the livestock markets and value chains
3. constraint to the intensification of livestock farming systems

- **Tool** : m4_sm2_a4_TOOL_2_Impact_diseases.xlsx
- **Appendix** : Methodology for *scoring* the impact of diseases
  - m4_sm2_a4_ANN_2_Scoring_Procedures_EN.pdf

Step 3: **Analysis of the capacity and activities of the veterinary services** for responding to the challenge of these diseases and analysis of their capacity and activity.

- **Tools :**
  - m4_sm2_a4_TOOL_3_Prog_Health.xlsx
  - m4_sm2_a4_TOOL_3B_Infrastruct_Health_EN.xlsx
- **Methodological guide :**
  - m4_sm2_a4_NOT_Animal_health_EN.pdf
- **Appendix :** Sources of data that could be used
  - m4_sm2_a4_ANN_3_Health_data_sources_EN.pdf

m4_sm2_a4_ANN_1_CIM_Zoonoses_EN.pdf [29 kB]

m4_sm2_a4_ANN_2_Scoring_Procedures_EN.pdf [110 kB]

m4_sm2_a4_NOT_Animal_health_EN.pdf [232 kB]

m4_sm2_a4_ANN_3_Health_data_sources_EN.pdf [96 kB]

4. Further information

Step 2: Quantitative approach for establishing measures of impact per disease based on the three main dimensions selected for evaluating their impact.

Tools:

- m4_sm2_a4_TOOL_4_ImpactQ_Assets_Intensif.xlsx
- m3_sm2_a1_TOOL_4_Market_Infrastructures.xlsx (accessible on the page M3-SM2-A1)

Example of DALYs calculation / 100 000 population (Influenza type lung infections): m4_sm2_a4_EX_DALY_lunginfection_EN.pdf

Methodological guide: m4_sm2_a4_NOTC_ImpactQ_Diseases_EN.pdf
Appendices: Glossary of vocabulary used in health statistics:

- University of Washington Department of Medicine
- Washington State University, College of Veterinary Medicine
- Columbia University

Other resources

Description of diseases OIE

Perry, B.D., Randolph, T.F., McDermott, J.J., Sones, K.R., Thornton, P.K. 2002. Investing in animal health research to alleviate poverty . 148p. Nairobi (Kenya): ILRI.

Association pour l'Étude de l'Épidémiologie des Maladies Animales

m4_sm2_a4_TOOL_4_ImpactQ_Assets_Intensif_EN.xlsx [150 kB]

m4_sm2_a4_EX_DALY_lunginfection_EN.pdf [568 kB]

m4_sm2_a4_NOTC_ImpactQ_Diseases_EN.pdf [171 kB]

m4_sm2_a4_NOT_Animal_health_EN.pdf

ALIVE
PARTNERSHIP FOR LIVESTOCK DEVELOPMENT, POVERTY ALLEVIATION & SUSTAINABLE GROWTH

GUIDE FOR THE INCLUSION OF LIVESTOCK PRODUCTION IN THE PRSPS

METHODOLOGICAL NOTE –- ANIMAL HEALTH
M_4-SM_2-A_4

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1 OBJECTIVES OF THE ACTIVITY

Animal diseases hinder development in the livestock production sector. They expose producers' households to high risk and uncertainty, which limits their chance of escaping from the "poverty trap".

- The primary objective of this activity is to analyse and highlight the impact that animal diseases have on livestock production in terms of its social and economic functions. This description should help give priority to some diseases in the context of poverty reduction.

- The secondary objective of the activity is to analyse some of the characteristics and activities of the animal health system that contribute to mitigating the impact of diseases. This point is directly linked to the activity "Institutional analysis" in module m4_sm3 "Policies and Institutions".

The results of this activity will provide the basis for justifying investments in animal health that are targeted for some livestock production systems and value chains. Lastly, intervening in terms of the limiting factors in animal health implies an examination of *priorities* of action that could be set on the basis of very different criteria. We could compare the impact of diseases according to epidemiological criteria (mortality, morbidity, etc.), or go further with the analyses by comparing the ratios of cost effectiveness or the net benefit of health interventions required, which would give priority to the most effective or efficient interventions.

2 BASIC NOTIONS

- Biological classification of diseases according to the causal agent

From a biological point of view, animal diseases are classified as parasitic, vector-borne, viral, microbial.

- Multi-factorial diseases or "syndromes"

Diseases whose appearance and expression are not directly dependent on a single causal agent but are also controlled by a set of complex factors or risk markers (such as animal housing, hygiene, microbism, food), for example mastitis, diarrhoea in calves, some respiratory diseases and some abortions.

- Classification according to the control method

Diseases can be classified according to the possible methods of *control* and *prevention*, such as vaccination ("*vaccines preventable" diseases*). This is an important aspect in the development of control programmes for concurrent diseases.

- Classification in relation to spread

Diseases can be classified according to their capacity to be transmitted from one animal to another or from an infected herd to a previously uninfected herd (transmittable diseases, contagious diseases), in other words their propensity to propagate across vast territories or in communities.

- OIE's list of internationally notifiable diseases

There is a list of notifiable diseases on the OIE website. The former OIE classifications in a list of A, B or C are no longer used. The list largely includes diseases that affect livestock (and also bee, fish, molluscs etc..). Member countries are subject to regular reports and can obtain an official status in relation to these diseases according to the following classification:

	No information is available for the disease
	Disease never reported
	Disease not reported during the period covered by the report
	Disease suspected but not confirmed
	Presence of infection with no clinical signs
	Presence of infection with clinical signs
	Presence of the infection but limited to certain zones

- Zoonotic diseases: Diseases that are common to man and vertebrate animals (wild and domestic), which are transmitted naturally from man to animals and vice versa. There are many types of zoonotic causal agents: viral, bacterial or fungal agents. It is thought that at least 61% of human pathogens are zoonotic.

- International Classification of human Diseases (ICD): The International Classification of human Diseases is used by the WHO. We can access it to select some *zoonotic* pathologies or food-borne diseases, for which human health services may have some statistics that are published

on national or international websites. For this type of disease, we should actually try and find coherence or complementarity between the statistics produced by the different sources, like the idea of "One Health" (OH).

- Biological effects and the socio-economic impact of diseases:

Diseases have *direct* effects (mortality and morbidity) and *indirect* effects. Each disease acts in a different way on the animal's organism, affecting the organs' systems (digestive, respiratory, reproductive system, etc.) and restricting the animals' specific socio-economic functions (producing and providing services). By limiting animal productivity, these effects are the source of their *direct* economic impact (e.g. milk yield).

Diseases also interfere with the *quality* and *value* of food products of animal origin or services that are consumed on-farm, sold or returned to the natural environment. They alter some functions of livestock production that are very useful to poor households, such as maintaining fertility in the cultivated fields via the application of natural animal fertiliser or the use of animal power for transporting produce to markets, ploughing the land. Given the threatening presence of some diseases (risks) and the absence of major control programmes, livestock producers fail to equip themselves with all the resources and factors of production that would allow them to produce more and better, as well as add value to their production at markets that generate income. These effects constitute the *indirect* economic impact, which can be measured as a function of the social and economic or natural system that is altered: herd and farm, territory and community (village), region and nation (territory) or value chain (productive system). We can mention losses in household incomes, loss in added value and the disorganisation of the livestock value chains, the degradation in GDP during export embargoes, the drop in monetary values (prices) of products on the markets, the closure of some market places during control of epizootic.

- Socio-economic classification of diseases:

The forms of biological classification of the diseases will only be included in the step involving the selection of diseases for analysis. Then we will give priority to the typologies on the basis of the form and scale of their impact. Three main types of impact will be distinguished:

- Diseases that threaten the households' *assets*;
- Diseases that threaten the function of *markets* and *value chains*;
- Diseases that impede the processes of intensification of livestock farming systems (*intensification pathways*);

The effects of most diseases fall into all three categories of impact. However, some have a marked type of impact.
For example:

- *Some zoonotic diseases or food-borne human diseases caused by animal products (Q fever and milk) can affect members of the livestock producers' families who have a salaried activity outside the farm, providing the main source of income. We refer to the impact on the human capital and the financial capital (human & financial assets).*

- Evaluating and measuring the *capacity*, *activity* and *impact* of animal health services

  The effectiveness, availability and accessibility of veterinary and technological services (particularly preventive ones) should be studied in order to select the health interventions that have a real capacity to reduce the global impact of pathologies. The services provided to poor producers actually constitute part of the *social network* (*safety net*) that

protects them. Hence, the services should also be examined in terms of capacity, activity and impact on herd health and the welfare of households to provide a better picture of the context of the health analysis.

- PVS: performance vision strategy, a method for evaluating veterinary services, which the OIE has set as a standard.

3 DESCRIPTION OF THE ACTIVITIES AND EXPECTED RESULTS

In order to evaluate the impact of diseases, you should *bring together* a group of stakeholders, including, not only animal health specialists, but also representatives of producers, associations and the industry. In fact, it would be preferable to launch a forum in order to support steps 1 and 2 of the analysis.

You can use the two successive and complementary approaches. The first method, the approach by default, is *qualitative* (c.f. note: m4_sm2_a4_NOT_Animal_health_EN.pdf).

- The *qualitative* approach is based on the establishment of *scores* set by a panel of experts made up of a representative and sufficiently diverse sample of specialists of livestock production, value chains, veterinary services and human health services and research. Ideally, this involves starting with a group of people who are regularly asked to give their opinion on complex areas of the livestock production sector and health. The scores will contribute to evaluating the impact of diseases that threaten household assets (capital), threaten the functions of markets and value chains, and impede the intensification pathways of livestock production systems.

The second approach is optional "for going further" and is based on *quantitative* measurements (c.f. the other methodological note: m4_sm2_a4_NOTC_ImpactQ_Diseases_EN.pdf

- The *quantitative* approach is supposed to improve the quality of the analysis by validating the hierarchies and knowledge acquired in the qualitative approach. It is based on the examination of health and socio-economic data from surveys. However, health statistics do not necessarily reflect the full impact of diseases, nor of all the health problems suffered by the poorest livestock producers' households. In conclusion, the evaluation should not be based on these statistics alone, as the qualitative approach provides the backbone of the analysis.

Three steps should always be undertaken for the required analysis.

1. *Selection* of a *list of priority diseases submitted for appraisal* (diseases recognised as a threat to households and as a constraint to the value chains), by a group of experts on the subject;
2. Establishment of *scores* for each disease (*qualitative* approach) on the basis of the three main dimensions chosen for evaluating their impact (threat to assets, threat to the markets and value chains, constraint to the intensification of livestock production systems);
3. Analysis of the *veterinary services' capacity* to attenuate the impact of these diseases and to analyse the past and present *preventive health programmes* and *activities*.

The first and third steps are common to both approaches. Only the second step differs in the *quantitative* approach.

3-1 Step 1: Draw up a selective list of diseases for analysis

You should determine which *diseases* should be subject to a detailed analysis in step 2. You should use the following tool: m4_sm2_a4_TOOL_1_Disease_Selection.xlsx

You should *draw up* a preliminary list of diseases to be considered for the country. A list of pathologies has already been drawn up (of OIE origin). This list is a guide. First, you should add to it and delete the pathologies on the list that are not included in this step. In fact the initial list was drawn up on the basis of OIE references. It is not ideal in the context of the African LIVEstock platform (Alive). Some categories of diseases that have an impact on poverty are not properly represented. Therefore, major endemic diseases in the country should be added. For example, this may include some parasitic diseases, zoonotic diseases and multi-factorial diseases (food deficiencies, mastitis, etc.). You can use the lists and Internet reference sites for selecting the diseases to be considered. For the zoonotic diseases, you can use the WHO's International Classification of human Diseases (ICD). This appendix will help you:
m4_sm2_a4_ANN1_CIM_Zoonoses_EN.doc

You should then conduct a global *evaluation* of the characteristics of the diseases listed. Are they present? What sort of threat and costs do they represent? What are the mechanisms of their impact on the value chain? In order to achieve this you should *reply yes* or *no*. For each disease you should reply to the *assertions* presented in the columns (9 columns corresponding to 9 criteria).

You should *group* the diseases (using the Excel sorting tools) as a function of the answers to the basic questions. You should establish an initial group of diseases for which you will have answered yes to all the questions. Then you should establish other sub-groups using the same principle.

Using the groups that have been established, you should *select* a limited number of diseases in order to study the detailed characteristics in step 2. We recommend that you study a maximum of *five* diseases per group, starting with the first group. You should not neglect the diseases that only have one type of impact, if the panel of experts considers it to be critical in terms of poverty.

At this stage you will have *access* to a list of diseases to evaluate in step 2. Later, you will be able to continue using this approach for all the diseases if you so wish.

3-2 Step 2: Establish the *scores* for the impact of the diseases selected on the three dimensions studied

On the basis of the selection of diseases, you should now *launch* a *collective assessment* in order to evaluate the characteristics of their impact. A panel of experts should be put together before moving on to *scoring*.

You should *explore* the three main dimensions of impact for each disease selected in the context of the typologies of the livestock farming systems, households and value chains studied in module 3:

- The capacity of these diseases to threaten the *assets* of poor households, with details (per attribute of impact representing the types of assets);
- The capacity of these diseases to disrupt the *markets* and *value chains*, with details (per attribute of impact);
- The capacity of these diseases to impede the *intensification* of livestock production systems, with details (per attribute of impact).

You have access to the tool: m4_sm2_a4_TOOL_2_Impact_diseases.xlsx

The three tabs propose score grids that study the three dimensions of impact in detail, one by one, with the help of specific attributes for each disease and by household type, type of value chain and type of livestock farming system. Thus:

- The tab for assets (*assets_HHD*) focuses on five categories of assets considered as attributes (financial, human, social, natural, physical or technical capital). For example, we could study the impact of *bovine tuberculosis* on the social capital of households with small herds (sub-class) in a grass-based livestock production system (LG) in which cattle is the dominant species reared by households.
- The tab for markets and value chains (*VC&Markets*) focuses on five attributes of impact (causing the closure of numerous local collection markets; depreciating the value and quality of products; causing the closure of processing units; stopping demand; causing border closures). For example, we could study the impact of *Rift Valley fever* on the sheep markets and mutton *value chain*, but also on other chains that may be affected in terms of collateral. We can start with the list of value chains and sub-chains established in module m3-sm2-a1.
- The tab for intensification (*Intensification_LS*) focuses on five attributes of intensification (genetic, feed, health services and inputs, shelter, production practices and hygiene). For example, we could study the impact of *Lumpy Skin Disease* on semi-urban dairy cow farming systems.

The questionnaire was designed so that impact scores could be established individually (per panel member) or according to a unique group rating method. The first case is the simplest. In this case, the same tool should be used and the results should be consolidated on a single sheet (sum of scores in each cell).

An additional note provides a detailed description of the methodology of *scoring*, which is based on the establishment of *proposals* (sentences describing the impact of diseases) rated according to coded *responses* on a five-level Likert scale.
This appendix will help you: m4_sm2_a4_ANN2_Scoring_Procedures_EN.pdf

For the diseases that have been identified as only concerning one type of impact, you can use a single tab, namely the one for the corresponding impact. For the diseases concerning two or three types of impact, you should use several detailed tabs.

At this stage, you should have *access* to a series of score grids populated. Therefore, you will be able to *organise* and *summarise* the information in an *intermediate report*, by highlighting the diseases that have the greatest overall impacts for the sector or in certain types of household, farming systems or value chains and for each dimension of impact or for each detailed attribute. These results should be interpreted in the light of the results provided in the next step. In fact, a

given disease may not be recognised as having a considerable impact when it is perfectly controlled by the animal health services. However, removing the control could reveal its potential impact (risk).

3-3 Step 3: Analyse the capacity and activities of the veterinary services that seek to reduce the impact of selected diseases

You should *consult* the document that analyses the veterinary services drawn up using the PVS method (Performance of Veterinary Services). You can then deduce the services' strengths and weaknesses.

OIE reference site: PVS (in French) PVS (in English)
Examples of PVS reports that are online and freely accessible with state authorisation.

The four main components of the performance of a health system, such as those proposed by the WHO and applicable to the veterinary health system, are:

- resources and processes (infrastructures and equipment, budget, human resources, information and governance)
- services (availability, quality, accessibility),
- use and access to health services,
- improving the health status of target populations (reducing mortality and morbidity, improving the quality of products).

They have partly been incorporated in the structure of the chapters for the OIE's *PVS tool*. The effectiveness of veterinary services actually depends on four components:

- the presence of the **human, physical and financial resources** required to bring together the means and access to professionals with technical skills and the capacity to supervise;
- **the authority and the technical capacities** to deal with existing or new problems (including protection and control of biological catastrophes) by using scientific principles;
- the existence of **constant interactions with the beneficiaries**, with the aim of obtaining recent information and proposing suitable joint services and programmes;
- the capacity to gain **access to markets** by respecting standards and applying new disciplines, such as harmonising standards, equivalence and zoning.

Lastly, you should *draw up* a list of the *preventive health programmes and interventions* that seek to reduce the direct and indirect impact of diseases in the country, as well as the list of OIE *standards* that have been (or are being) set up in the country (in reference to the zoning and compartments). You can use the following tool to draw up an inventory and describe their characteristics: m4_sm2_a4_TOOL_3_Prog_Health.xlsx

In the first tab, the tool proposes listing the main programmes of preventive control.

- monitoring, screening (diagnosis)
- vaccination (immunisation)
- systematic preventive treatments (anthelmintics)
- insect control, vector control (*dipping tanks*), spraying
- shelter and biosecurity

In the second tab, the OIE standards set up in the country should be specifically noted.

You will note that some *programmes* that are not specifically health-related, which support livestock producers, have beneficial effects on the prevention and control of diseases, such as programmes that provide credit for investing in the biosecurity of livestock production, or programmes that seek to facilitate access to veterinary inputs or the establishment of cooperatives and associations whose function is to improve community health. Strictly speaking, if there is a proven link between these programmes and animal health, they should be included in the inventory. We will also survey the initiatives, such as the campaigns to *promote health* (awareness raising, promotion of breeds that are adapted to the eco-system, in other words resistant to or tolerant to some diseases).

Lastly, you will *draw up* an inventory of the main veterinary *infrastructures* that will help describe some service activities and their type of governance (private - public).

You will have *access* to a *tool* for establishing an inventory of the main infrastructures per zone, which can be used to measure the level of activity for the *prevention* and *control* of diseases. You will complete it, by giving priority to actions that concern the diseases selected in step 1. This table can be used to estimate some of the resources used (and to deduce the coverage of services relative to different regions) and the costs of disease control. These results will be combined with the disease impact analysis in step 2.

- m4_sm2_a4_TOOL_4_Infrastruct_Health.xlsx

The five first tabs in series A describe:

- the tick control infrastructures (with dip tanks or spraying), and their activity
- the infrastructures used for vaccination (corrals, etc.), other collective treatments, insemination in rural areas, and their activity
- the private or public clinics and dispensaries and their activity
- the veterinary laboratories for diagnosis and their activity
- the veterinary laboratories that produce vaccines and therapeutic products and their activity.

Lastly, you should have access to a *specific tab* (series B) to combine the results for the preventive *vaccination campaigns* (mass campaigns or those organised in response to epizootic diseases), which concern the diseases selected.

The notions described in module 3 for the value chain analyses will be useful for the production (manufacture), importation and distribution of strategic veterinary inputs (such as vaccines). In fact, production and distribution of medicines constitutes an *example of a value chain that can be analysed* according to the same principles.

The data on the import and export of veterinary medicines or vaccines could be integrated in the customs statistics with the other data on other inputs and food products of animal origin (module m3).

This part of the diagnosis will also mean that the *costs* of interventions can be examined, in other words: an estimate of the resources mobilised by households, agents in the value chains, the state and sponsors to carry out health-related actions, the cost of which is often shared. You should try writing an intermediate report to *summarise* the conclusions from the financial, economic or

social analyses of the large programmes set up in the country. This information will be useful for defining the interventions when the action plan is developed in M5-SM3.

m4_sm2_a4_NOTC_ImpactQ_Diseases_EN.pdf

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METHODOLOGICAL NOTE –- ANIMAL HEALTH GOING FURTHER: QUANTITATIVE ANALYSIS OF THE IMPACT OF ANIMAL DISEASES

M_4-SM_2-A_4

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1 OBJECTIVES OF THE ACTIVITY

- The main objective of this activity is to analyse and measure the impact of animal diseases on livestock production in terms of its social and economic functions. This description should lead to giving priority to some diseases in the context of poverty reduction.

2 BASIC NOTIONS

- Measure of the diseases and the health situation (health metrics/disease metrics)

Diseases can be measured using epidemiological indicators (rates of prevalence, incidence, mortality), which are calculated in reference to the number of individuals in an animal population or the number of herds (livestock) used to infer the zonal statistics for a given period of time.

- Administrative or technical (by topics) partitioning of a country: these partitions help to establish the zonal health statistics, which are calculated either according to the *technical* partitioning of a country, for example, the health management map that shows human health care districts or veterinary districts; or according to the *administrative* zoning of the country. The

latter involves a hierarchy of the type “nation, region/province, district, etc.”, which is then identical for all kinds of health statistics.

- Collective immunity: protection of the receptive fraction of the animal population, resulting from the immunisation of a large number of individuals through mass vaccination.

Other notions relating to epidemiological statistics are available in paragraph 3.2.2.

3 DESCRIPTION OF THE ACTIVITIES AND EXPECTED RESULTS

If the time and the means allow, you could *develop* a *quantitative* approach in order to support the previous exercise and to corroborate the scores set by a panel of experts. You should refer on one hand to the *epidemiological statistics* and on the other hand to the quantitative indicators of the impact of diseases (which include epizootics) on the functioning of *marketing infrastructures*.

The first and third steps are common to both approaches (qualitative and quantitative).

- 1/ Selection by a group of experts of a *list of priority diseases* to be analysed;
- 3/ Analysis of the *capacity and the activities of the veterinary services* to respond to the challenge of diseases.

Only the second step is included in a specific quantitative approach.

- 2/ Establishment of *measures* of the impact of diseases based on the three main dimensions chosen (threat to assets, threat to markets and value chains, constraint to intensification of the livestock production system).

3-1 Step 1: Draw up a selective list of diseases for analysis

You should use the diseases selected for the qualitative approach.

3-2 Step 2: Establish the measures of impact of the selected diseases on the three main dimensions studied.

3.2.1 Identify and consult the sources of quantitative data

You should *identify* the sources of raw data and databases available and you should *evaluate* their characteristics. The proposed approach is partly based on establishing *epidemiological measures* to illustrate both the impact of diseases on assets and as a constraint to intensification. It is also based on the use of *indicators* of *value chains dysfunction* in order to illustrate the impact on *markets*.

You should *draw up* a list of the most relevant sources of health data to answer the first point. You should consult the accessible databases (starting with the national database) and conduct the necessary queries to extract useful raw data. You should establish the necessary contacts with the private sector in order to answer the second point.

The following appendix will help you with this step.
Sources of epidemiological data that can be used:

- m4_sm2_a4_ANN3_Health_data_sources_EN.pdf

3.2.2 Establish a series of quantitative statistical indices and other measures of impact for the diseases selected

For the dimensions relating to assets and intensification

By starting with the baseline data for a selected disease affecting a sub-population of animals and a given region during a period of reference, you should establish certain *epidemiological indicators*. You should use suitable *rates* and *quotients* (% of herds affected, etc.), rather than *raw* data (number of dead animals or number of epidemics in a zone). It is advisable to use a historical analysis based on at least the last 5 years in order to determine the trends and changes over time. You should calculate the average annual indices for the period. The following indicators should be calculated as a priority:

- Annual rate of animal mortality
- Annual rate of animal morbidity
- Annual rate of herd morbidity (herd as a collective management unit)
- DALY for 100 000 inhabitants

Glossaries and definitions of epidemiology in English

- University of Washington Department of Medicine
- Washington State University, College of Veterinary Medicine
- Columbia University

In order to study the first two types of impact ("assets" and "constraint to intensification"), you should use a *tool* that uses the same structure as that in the qualitative approach (with two tabs). You will no longer measure the impact on the basis of *scores* but using the epidemiological *rates* calculated and the DALYs (when available and for zoonotic diseases).
m4_sm2_a4_TOOL_5_ImpactQ_Assets_Intensif.xlsx

In the *first* tab, you should calculate the rates and the DALYs per zone in reference to the administrative or technical partitions of the country (which conforms with the most widespread use).

In the *second* tab, you should calculate the same rates for the main livestock farming systems (cf. typology), when the baseline databases from producer surveys allow. Given the geographic characteristics of animal production, a rural zone of livestock production often corresponds to a predominant livestock farming system and, therefore, correspondences and extrapolations can be made.

For some of the *zoonotic diseases* inventoried by the ministry for health, we rarely have access to raw data. Therefore, we could use measures already aggregated (the WHO's DALY Disability-Adjusted Life Year calculated per 100 000 inhabitants). The DALY summarises the impact of some zoonotic diseases on the members of rural families that are involved in livestock production, on population that work within livestock value chains or use animal products (consumers). The impact is estimated using the losses due to premature death (YLL number of Years of potential Life Lost compared to a situation with the ideal life expectancy) plus the number of years lived with a disability caused by a disease (YLD, Years Lost due to Disability).

- Aggregation of the impact of animal diseases (aggregated data):

- DALY = YLL +YLD: WHO reference site

Example of the DALY calculation (Influenza type lung infections):

- m4_sm3_a2_EX_DALY_lunginfection_EN.pdf

If you do not find any references for the epidemiological measure of some diseases that have been studied little, despite their considerable impact on poverty (parasitic diseases), you could use replacement variables (*proxy*). For example, you could use the market data for *veterinary medicines consumed* (sales of anthelmintics from private clinics' sales' registers, etc.). However, you should interpret them with care. You could also consult the results from studies on use of veterinary or health services or specific scientific studies of a given pathology.

For the dimension dysfunction of value chains and markets

To study this dimension of impact you should use a tool that is shared with module 3 on value chains and add *indicators* of *value chains and markets dysfunction and disruption*, for example, the durations of functional stoppages established per main market infrastructure.
m3_sm2_a4_TOOL_4_Market_Infrastructures.xlsx

The *tabs* for this tool are designed to add to the detailed aggregated inventories established in module 3 with more or less detailed measures for market closures, temporary interruptions in the economic activity. You can then determine the average level of economic activity that has been hindered by the epizootic disease as a function of the normal volumes of activity identified in the value chain analysis.

As far as the *international market* is concerned, you could re-examine the results that have already been obtained in module 3 in the Import Export tool, though for a 10-year time series (one file per year) covering the periods during which the epizootic diseases occurred.
m3_sm2_a1_TOOL_3_import_export.xlsm

In addition, the analysis of *international negotiations* conducted to recover the status of exporter of animal products will contribute to the understanding of the impact that trade embargoes for these products have on households when the latter are involved in the export value chains (very often for some live ruminants).

Lastly, you will examine the national *price volatility* for certain animal products during the periods when an epizootic disease occurs (taking into account the carry-over effects), which will provide you with information on another form of impact, the loss incurred by the producer in terms of the monetary value of production.

Activity M4-SM2-A5: Genetic resources

In order to identify the macro-economic arguments for including livestock production in the poverty reduction strategic paper (PRSP), you should assess the potential of the sector, particularly the potential of genetic resources.

1. Objective

1. Describe the management and use of animal genetic resources in the country.
2. Identify the local policies for genetic resource management.

2. Expected outcomes

- Inventory and characterisation of the animal genetic resources in the country
- Review of the intervention in the field of genetic conservation and improvement.

3. Method and tools

Description

You should conduct the inventory of the country's animal genetic resources using the national and international data (the FAO's DAD-IS and the ILRI's DAGRIS). You should describe the characteristics of these resources and their level of use in the different production systems (grassland system, mixed rain-fed system, mixed irrigated system, others).

You should then analyse the local policies and intervention methods for **conserving** and **selecting local** breeds, on one hand, and for **importing** and **using improved** genes, on the other hand. This should be linked to the institutional appraisal (activity M4-SM3-A2).

Tool: m4_sm2_a5_TOOL_genetic.xlsm

Methodological guide: m4_sm2_a5_NOT_genetic_EN.doc

m4_sm2_a5_NOT_genetic_EN.pdf [84 kB]

4. Further information

Sources used in the activity's framework:

- Genetic nomenclature and animal breeding terms: m4_sm2_a5_ANN_nomenclature_genetic_EN.pdf
- FAO State of the World's animal genetic resources for food and agriculture: m4_sm2_a5_ANN_State_AGR_FAO_EN.pdf
- All the national reports on the state of animal genetic resources (FAO)
- DAD-IS: Domestic Animal Diversity Information System (FAO)
- DAGRIS: Domestic Animal Genetic Resources Information System (ILRI)

Other sources of information

- ILRI's training material on animal genetic resources (in English)
- Online resources on animal genetic resources (in English)
- Network for teaching in genetics (GENET) (in French)
- AgroParisTech teaching aids on animal genetic improvement (in French)
- Indicators for animal genetic resource management (in English)
- Example of a Brazilian network for the conservation of animal genetic resources (in Portuguese)

m4_sm2_a5_ANN_nomenclature_genetic_EN.pdf [78 kB]

m4_sm2_a5_ANN_State_AGR_FAO_EN.pdf [7 MB]

m4_sm2_a5_NOT_genetic_EN.pdf

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METHODOLOGICAL NOTE
MANAGEMENT OF ANIMAL GENETIC RESOURCE
ACTIVITY M_4-SM_2-A_5

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2 BASIC NOTIONS 2
3 DESCRIPTION OF THE ACTIVITIES AND EXPECTED RESULTS 2
3-1 INVENTORY AND CHARACTERISATION OF GENETIC RESOURCES 2
3-2 POLICY AND ORGANISATION 3

1 OBJECTIVES OF THE ACTIVITY

1. The main objective is to describe the management and use of animal genetic resources in the country.

The genetic potential of animals used by producers is an important component of herd productivity and its adaptation to the constraints of livestock production. As yet, little is known about local (indigenous) breeds. Few have been the subject of zootechnical or genetic studies or genetic improvement plans. Their intrinsic productivity remains low compared to exotic breeds from western countries, which have been intensively selected for more than a century using methods developed by genetic scientists.

In addition, local breeds are threatened by policies aiming at importing exotic genes and crosses. The FAO estimates that 20% of domestic indigenous breeds are threatened with extinction in the world (ftp://ftp.fao.org/docrep/fao/011/a1250f/a1250f.pdf).

Improved breeds have been used in African production systems, although there have been no great improvements to the living conditions of the poorest households. As there is not one assessment of these failures, development managers continue to promote the use of improved genes rather than the rational selection of local breeds.

In this context, it is not easy to find objective information on the evaluation of technico-economic performances of indigenous genotypes that are or could be used by producers.

2. The secondary objective of this activity is to find out about the local policies for genetic resource management, linked to the activity "Institutional assessment" from the module on "Policies and institutions" (M4-SM3).

You should describe the regulations adopted and draw up an inventory of the collective structures set up for managing breeding animals (conservation structures, breeding schemes, crossing schemes, artificial insemination centres), which facilitate producers' access to quality genitors. You should put this description in the context of the health regulations governing the circulation of breeding animals or genetic material (semen, embryos).

2 BASIC NOTIONS

You should refer to the genetic nomenclature for animal breeding (in English):
http://www.agric.wa.gov.au/objtwr/imported_assets/content/aap/sl/bgh/fn073_2003.pdf

3 DESCRIPTION OF THE ACTIVITIES AND EXPECTED RESULTS

3.1 Inventory and characterisation of genetic resources

The first task involves recording the information on the country's genetic resources in the table m4_sm2_a5_TOOL_genetic.xlsx. First of all, you should consult the international database on the Internet:

- DAD-IS: Domestic Animal Diversity Information System hosted by the FAO
- DAGRIS: Domestic Animal Genetic Resources Information System hosted by ILRI

You should then update and complete the information collected using official statistical data (herd survey), with the data obtained from studies, experts and scientific publications on livestock production in the country or with the national report on the state of animal genetic resources (FAO).

The approach should be adjusted and progressive depending on the information available. There are three sections to research.

3.1.1. Characteristics of genetic resources

The section "Characteristic" should be researched in all cases. It provides a first overview of animal genetic resources in the country.
The following should be specified for each local breed:

- numbers;
- risk of extinction (see the FAO "Early warning tool" in the DAD-IS;
- vocation and use for production (meat, milk, manure, work, skins, pelts and other integuments, etc.);
- recognised qualities & traits for meeting the conditions of livestock production in the country (hardiness, capacity to make the most of natural pasture, resistance to diseases, etc.).

The inventory of local genetic resources should be completed with the description of exotic breeds found in the country (either in the form of small groups of pure breeds or imported frozen semen).

3.1.2. Representativity of genetic material

If you have access to data in the local bibliography, you should use the section "Representativity" to allocate the numbers of the genetic types in the main livestock production systems described in M3-SM1-A1, according to Sere and Steinfeld's typology (1996). By specifying the conditions of use, this information adds to that collected in the previous section on the vocation of such genetic material.

3.1.3. Going further: zootechnical and economic parameters

A third section "Parameters" is proposed for a more thorough appraisal. When possible, you should characterise the production potential of the genetic resources in the livestock production systems where these resources are used, according to the classification defined previously. In particular, you should collect information on productivity by number (fertility, prolificacy, mortality), the productivity by weight (average weight of the different categories of animals), or by yield (milk) and the animals' commercial value.

Once weighed against the prevalence of the genetic types in each system (section "Representativity"), you should be able to use these parameters to analyse the performances of the livestock production systems (M3-SM1-A2).

3.2 Policy and organisation

A fourth section "Programmes" is also proposed for inventorying policies on the matter. You should conduct this activity at the same time as the institutional appraisal proposed in M4-SM3-A2.

3.2.1 Conservation and selection of local breeds

You should describe the institutional initiatives that aim to preserve, manage and develop animal genetic resources in the country, for example, the creation of a national commission for genetic improvement that sets out a coherent national policy and regulates genetic flows.

This special chapter is therefore reserved for a summary description of the modes of genetic resource management (conservation programmes for local breeds and even selection). You should also record the crosses using the local genetic material. You should collect information on the sire's breed used and the genetic project planned: terminal cross, , rotational crossing, creation of a new genotype that is intermediate between the parent genotypes, grading up, etc.

The conservation programmes can involve the creation of breeding nucleus on state farms, breeding programmes on producer's farms that keep animals or even a combination of the two with "open nucleus". You should describe exactly how the infrastructures function and their impact on livestock production (diffusion of breeding males and females, semen). You

should underline the contribution that producers make to the programme's orientation (participative approach), done by organising regular meetings, setting up associations, producer's commissions, etc. Particular attention should be given to how these mechanisms are funded and to their financial sustainability.

You should describe the selection process by specifying the objectives and the criteria for animal selection. You should specify how the selection is organised (protocols and stakeholders): identification of animals, performance recording system, paternity control, management of information, etc.). You should record the existence of more sophisticated tools, such as programmes to calculate genetic values (animal model), individual testing centres, progeny testing programmes, etc.

Health guarantees for breeding animals or imported semen and embryos are essential for avoiding the spread of diseases and epizootic diseases, even though they are not part of the genetic questions *per se*. You should describe the procedures for health controls relating to the exchange of animals or genetic material (cf. M3-SM2-A4 on the health aspects).

Lastly, you should assess the national human resources capable of managing these genetic programmes (number of technicians, managers).

3.2.2 Importation and use of improved genes

Crossing experiments often fall through. It may be useful to draw lessons from these failures. If trials of this type have been successful, you should identify the conditions for the success.
For each experiment, you should find out the necessary information for describing the genetic project (type of cross), the methods for importing genes (semen or breeding animals) and how they are kept in the country (closed or open selection nucleus). You should describe the operators responsible for imports (private or public firms) and include a reference to any assessments that may have been conducted (longitudinal monitoring of herds).

Sub-module M4-SM3: Policies and institutions

In order to identify the macro-economic arguments for including livestock production in the poverty reduction strategy papers (PRSPs) and to identify the most relevant interventions, you should analyse the policies and institutions linked to this sector, as well as the interactions with the other sectors.

This sub-module is connected to M3-SM3, where you have linked the stakeholders' constraints with policies and institutions. It provides the basis for the development of an action plan in module M5.

1. Objective

The aim of this sub-module is to conduct an appraisal of the political and institutional environment in the livestock production sector in order to identify possible improvements to reduce poverty.

The depth of your analysis will depend on the intervention planned:

- If you wish to establish foundations for an investment programme, you should base your appraisal on the existing analyses, which will complete the critical points identified by the stakeholders (M3-SM3);
- If your intervention has more scope, combining investments, institutional changes and public policies, the appraisal should be more detailed and complete.

2. Expected outcomes

At the end of this sub-module, you will have:

1. Evaluated the policies linked to livestock production in terms of economic efficiency and social equity: strengths and weaknesses; complementarities and contradictions, indeed conflicts between the objectives and the actions planned;
2. Identified the internal constraints and the dysfunctions of the institutions linked to livestock production, as well as their dynamics and synergies.

3. Activities

Policies
Institutions
Multi-sectorial interactions

Activity M4-SM3-A1: Policies

1. Objective

The objective of this activity is to evaluate the strengths and weaknesses of the political and institutional measures for reducing poverty and improving people's living conditions.

This activity involves the analysis of livestock policies and their associated instruments (portfolio of ongoing projects and programmes, investment projects and legislative measures). It is based on a review of all the documents that identify the main strategic themes (specifying the objectives) and propose concrete action. This review will reveal either the complementarity between the actions/objectives or the redundancy or even the contradictions that may be the cause of "loss" or "poor allocation" of means, or the source of conflicts in the field, etc. In addition, this activity proposes an analysis of the potential conflicts between the different objectives/actions.

While the activities in the sub-module M3-SM3 involved the evaluation of policies from the point of view of the objectives of stakeholders in the sector, this sub-module is established at the national level, which means that the sector can be considered in its entirety. It draws on the conclusions of the sub-module M3-SM3-A2 while taking into consideration the realisation of more global objectives (which cannot be defined at a micro level).

2. Expected outcomes

The first result is a tabulated summary, which includes all the main strategic themes for each policy and the associated instruments. It proposes an analysis of their contribution to the different socio-economic and environmental objectives. It is possible to distinguish between policies and their instruments, which are derived from the global environment (external diagnosis), and those that involve the livestock domain (internal diagnosis).

Lastly, the final result is a review of the strengths and weaknesses of each policy and institution in relation to the different objectives linked to the socio-economic and environmental field.

3. Method and tools

The method consists of two main stages:

- an almost exhaustive review of documents on national or regional strategy, investment projects and a systematic analysis of policy objectives and the associated instruments in terms of complementarity or contradictions.
- an analysis in terms of strengths and weaknesses (SWOT method) of the specific objectives of the livestock policies in four areas of activity:

1. **Economic**: improve the livestock sector's competitiveness, improve market access for small producers, stabilise prices, etc.
2. **Social**: improve producers' well being, particularly the most vulnerable, risk management, etc.
3. **Environmental**: ensure sustainable development in the sector by recognising environmental services, etc.
4. **Health**: improve public health and human nutrition, improve international competitiveness, etc.

m4_sm3_a1_NOT_policies_EN.pdf [133 kB]
m4_sm3_a1_ANN_Swot_Template.pdf [8 kB]

4. Further information

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METHODOLOGICAL NOTE – REVIEW OF POLICIES AND THEIR ASSOCIATED INSTRUMENTS

ACTIVITY M_4-SM_3-A_1

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STAGE 3. COMPLEMENTARY ANALYSIS: PAM ANALYSIS (POLICY ANALYSIS MATRIX) 5

1. OBJECTIVES

Initially, this activity involves analysing livestock production policies and their associated instruments (investment projects and legislative measures). It consists of: i) a review of all the documents which define the main strategic themes (and specify objectives) and propose concrete actions. This review will reveal either the complementarities between the actions/objectives or the redundancy or even contradictions that may be the cause of "loss" or "poor allocation" of means, or the cause of conflicts in the field, etc. and ii) the identification of possible inconsistencies between the different actions presented.

The goal for this activity is to estimate the strengths and weaknesses of the political and institutional measures for reducing poverty and improving people's living conditions.

This activity is set at a national level and it allows considering the sector in its entirety, while the sub-module M3-SM3 involved evaluating policies from the point of view of the objectives of stakeholders in the sector. This activity includes the conclusions of M3-SM3-A2, while taking into account the realisation of more global objectives (which cannot be defined at a micro level).

2. BASIC NOTIONS

- Policies: policy analysis includes two elements: the identification of the policy objectives and the political instruments or measures implemented to achieve the objectives. The distinction between the two elements is necessary because several instruments can sometimes serve the same objective. It is only by distinguishing between the objectives and the instruments that we can determine the relative effectiveness of each instrument. Conversely, a particular instrument can have an impact on several objectives. For example, the increase in milk prices will affect the well-being of producers and consumers, as well as the level of milk production.

- Political objectives**.** These objectives reflect the principal aim (the "ends") in the long term and indicate the performances that the policy is supposed to promote (e.g. increasing beef exports or facilitating access to grazing resources). These objectives are often presented in the form of official statements or national strategic documents. The policy statements are an useful source of information. However, they cannot be considered as proof of practice. Similarly, the absence of documentation for a policy objective cannot automatically be considered as a shortcoming.

- Political instruments or measures. These instruments and measures are actions and methods ("means"), such as laws, regulations, programmes or projects that facilitate the implementation of policies (e.g. import taxes on milk products or grants for artificial insemination services). Some measures can be introduced without any reference to a specific declaration. Conversely, policies can be formulated without being supported by specific measures, which means that the government or the ministries are not entirely committed to a process of policy change.

- Legislation. The set of laws in a country relative to a particular field. Here, it includes formal rules that have direct or indirect impacts on livestock production.

- Organisations. These include governmental structures and sets of individuals grouped in a formal/informal structure to achieve a given objective.

- Institutions. This term has numerous definitions depending on the context. It is generally used in two ways: 1) in a broad all-encompassing sense (organisations, legislation, customary and traditional rules, stakeholder groups, standards and customs), 2) in a more restrictive sense when it is distinguished from legislation and organisations (informal rules, standards and customs).

3. DESCRIPTION

This activity comprises two main stages:

Stage 1: an almost exhaustive review of national or regional strategy documents, investment projects and a systematic analysis of policy objectives and their instruments in terms of complementarities or contradictions.

Stage 2: an analysis in terms of the strengths and weaknesses (SWOT method) of the specific objectives of the livestock production policies in four areas of activity:

1. Economic: improving the competitiveness of the livestock production sector; improving market access for small producers, stabilising prices, etc.
2. Social: improving the well-being of livestock producers, in particular the most vulnerable, risk management, etc.
3. Environmental: ensuring the sustainable development of the sector by recognising environmental services, etc.
4. Health: improving public health and human nutrition, improving international competitiveness, etc.

An analytical grid is proposed: m4_sm3_a1_TOOL_policies.xlsm.

Stage 1: Systematic analysis of policies and their instruments in terms of complementarities or contradictions

Warning: broadly speaking, policy statements are an useful source of information. However, they cannot be considered as proof of a practice. Some measures can be introduced without reference to a specific declaration and the absence of documentation for a policy objective cannot automatically be considered as a shortcoming. In addition, a comparison between these documents and the practice will help identify what is lacking.

1.1. Report and analysis of national strategic documents, which concern livestock production in particular.

The first stage consists of collecting the main documents from the offices of the ministries for agriculture, livestock production, the environment and research institutes, international NGOs and projects and other civil organisations. A number of these documents are essential for the analysis:

National agricultural development plan
General strategies for the development of the rural sector
Development plans for livestock production
PRSP (Policy Reduction Strategy Paper)
NAPCD (National Action Plan to Combat desertification)
National Strategies for Sustainable Development (NSSDs)
Management strategies for animal genetic resources
Any other memorandums, declarations and official statements announced by political decision makers

For each document, a list will be drawn up of the **main strategic themes** that directly or indirectly concern the livestock production sector, as well as of the **main actions planned or underway**.
By main strategic themes, we mean the main themes of the policy.
By actions, we mean the policy instruments set up to implement a specific strategic theme (cf. definition of basic notions above).

In module 5, we propose analysing the national objectives by classifying them according to the four mainstays of the CAADP, which are: (i) extending the zones with sustainable land and water management, (ii) improving rural infrastructure, (iii) improving product supply and (iv) agricultural research.

Then, all the information needs to be transferred to the Excel file, Excel sheet: policies. The list of policies and their main strategic themes is indicative and must be modified/completed according to the information collected.

The information will be summarised in a column (“Summary”) in the section “Actions linked to policies” in the sheet “Policies” (Excel file: m4_sm3_a1_TOOL_policies.xlsm). The following question needs to be answered for each field: “For each strategic theme, are the actions proposed by the different documents coherent?” Beware: it is important to distinguish between the documents that relate to policies, investment projects and lastly, to legislative and regulatory measures. Here, the column “Summary” refers to the policy evaluation.

1.2. Analysis of project portfolio

This stage involves identifying the main actions (recent, underway or planned) and obtaining the documents relating to the programmes and projects that particularly concern livestock production from the offices of the ministries of agriculture, livestock production and the environment, international NGOs and projects and other civil organisations. Consulting the review of the livestock production portfolios, Alive, can help identify the sponsors’ action (link in the section “Further information”). The different sponsors’ country strategies are also interesting documents.

As for the strategic documents (1.1.), list the **main fields** that directly or indirectly concern the livestock production sector, as well as the **main activities** implemented, then transfer them to the Excel file: (m4_sm3_a1_TOOL_policies.xlsm), sheet Excel: ”policies”.

The information will be summarised in the last column (“Synthesis”) in the section “Actions/activities linked to projects and programmes” by answering the questions: “Are the activities for the different projects/programmes coherent for each strategic theme?” Are the beneficiaries well targeted (in terms of region of action, sector of action, etc.)?

1.3. Analysis of the legislative framework

Identify the main laws that are directly or indirectly linked to livestock production and collect the statutory, legal and administrative texts available from the offices of the ministries of agriculture, livestock production and the environment.

i. Texts on the organisation of the ministry responsible for livestock production; on the creation of professional organisations; on the regulations governing livestock.
ii. Texts on environmental management; water; grazing code (rural code).
iii. Texts governing regional and land development.
iv. Texts governing medical questions and questions of public health.
v. Etc.

Fill in table “Policies” in the Excel file (m4_sm3_a1_TOOL_policies.xlsm), specifying how each law applies to the main economic, social, environmental and health fields. Identify the possible shortcomings and contradictions between the laws with regard to the realisation of each objective in the column “Summary”.

1.4. Conclusion: matrix analysis of the objectives of the livestock production policies

For each strategic document with a clear main objective (poverty reduction, environmental management, effectiveness of resource allocation in the sector, etc.), the actions proposed may be contradictory. In other cases, achieving an objective involves realising several complementary actions (the realisation of each one separately leads to limited or invalid results). Therefore, identifying these complementarities/contradictions is essential for developing a coherent policy.

The objective of this stage is to detect the possible **contradictions/incompatibility and complementarities of the objectives** by crossing the strategic themes and actions derived from the strategic documents.

The analysis could use the matrix in the Excel sheet “Policies” in the Excel file to answer the following questions: How are the strategic themes linked together? Are there any conflicting objectives or actions? Which strategies and actions are very complementary? Are there any grey areas concerning certain interactions that call for more in-depth analysis?

Stage 2: Analysis of the strengths and weaknesses, opportunities and threats of each policy and its associated instruments

This stage seeks to summarise the results of the analysis of stage 1 using the SWOT table (strengths, weaknesses, opportunities, constraints) by distinguishing between what stems from the general political environment (external diagnosis) and from the more specific field of livestock production (internal diagnosis) (see document: m4_sm3_a1_ANN_swot_template.pdf).

2.1. Comparison of the policy objectives and the objectives of the target stakeholders

It is interesting to compare the objectives of national policies with the priority objectives of the stakeholders in the sector in order to evaluate their level of coherence.

Go to the summary table for the activity M3-SM3-A2 and check that each priority objective and each constraint is taken into consideration by each of the policies. Highlight those that are not and transfer them to the SWOT table ("SWOT_objectives") in the Excel file (m4_sm3_a1_TOOL_policies.xlsm),.

2.2. Summary table

This involves identifying the main opportunities and constraints that are unavoidable for realising **each of the policies' main strategic themes**. The identification of opportunities and constraints is based on the conclusions of the analyses conducted in stage 1. The results are transferred to the table in the Excel sheet "SWOT_objectives" in the Excel file.

Then, the strengths and weaknesses of the actions undertaken need to be identified for each of the policies' main strategic themes. The results will be transferred to the table in the Excel sheet SWOT_measures" in the Excel file. The following questions will help guide the analysis:

a. Is the measure suitable for developing the livestock production sector given the objectives targeted?
b. Is the measure fair for all the stakeholders?
c. Is the measure applied effectively?
d. What possible trade-offs exist between the economic, social, environmental and health objectives?

In conclusion, an analysis is required about the impact of government intervention on the different networks of the livestock production sector. Therefore, this analysis is an extension of the activity M3-SM2-A2. The matrix method for policy analysis can be used to examine which networks benefit the most from state intervention and whether there are differences in relation to farm size.

This analysis will be conducted or at least validated by a working group made up of various stakeholders, so that the main strengths and weaknesses of the current policies and laws in place can be analysed. The working group will provide proposals for new policy objectives and/or instruments that will be developed in module 5.

Stage 3. Complementary analysis: PAM analysis (Policy Analysis Matrix)

The Policy Analysis Matrix (PAM) is a tool for evaluating the influence of policies on costs and revenues from agricultural or livestock production. It is explained in M4-SM2-A3.

PAM alone cannot isolate causes of inefficiencies. Additional data collection is required on the costs and benefits of each policy taken individually before a decision to change economic policies can be made. The PAM can also be completed with a bibliographic analysis of reports on studies of economic policies in the agricultural and livestock production sector if they are available and up-to-date.

Box 1. Policy areas applicable to the livestock production sector

General economic and social policies
- Fiscal and monetary policies
- Marketing policies and exchange rates
- Employment and labour policies
- Foreign aid and investment
- Population policies
- Primary social services (education, health, medical, housing)

Agricultural, sectorial and rural development policies
- Rural infrastructure and market infrastructure
- Livestock production services
- Sanitary regulations
- Building human capital in the rural sector
- Agronomy/zootechny/veterinary and technological development research
- Agricultural prices
- Stabilising and managing risks
- Direct government intervention
- Subsistence support
- Food security, nutrition

Land policies and property rights
- Marketing policies for products of livestock production
- Land and regional development policies
- Property rights governing other resources (water, forests, grazing, animal genetic resources)

Environmental policies
- Direct state environmental action
- Control measures
- Economic incentives

Policies promoting participation and the democratic process
- Development of local institutions
- Decentralisation and the role of non-governmental stakeholders
- Participation of the population and self-sufficiency

Activity M4-SM3-A2: Institutions

1. Objective

The aim of this activity is to conduct an institutional appraisal of the sector in order to assess how the supply of services meets the demand of stakeholders in the sector. It is particularly based on the main constraints and dysfunctions identified by the stakeholders in the sector in M3-SM3.

2. Expected outcomes

The main result is an evaluation of the balance between the supply of services in the livestock production sector and the demand from the categories of stakeholders in the sector.
These results will lead to some propositions of measures at a national or sub-regional scale.

3. Method and tools

The qualitative approach is the most suitable for an institutional evaluation. Several tools can be used:

- Individual interviews with civil servants, political decision-makers, project coordinators and project staff in the field, leaders of grass roots organisations, NGO personnel, etc.;
- Discussion groups or individual interviews with beneficiaries;
- Workshops with diverse stakeholders;
- A bibliography and analysis of documents

The following **tool** will help you to identify the role of each institution:
m4_sm3_a2_TOOL_institutional_diagnosis.xlsm

Methodological guide
m4_sm3_a2_NOT_institutions_EN.pdf

Appendices

- Survey guide: m4_sm3_a2_ANN_1_survey_services_demand_EN.pdf
- List of stakeholders: m4_sm3_a2_ANN_2_groups_EN.pdf
- Example of institutional appraisal in Burkina Faso (IEPC, Burkina Faso):

- Supply and demand of services: m4_sm3_a2_EX_1_BF_services_supply_demand_EN.pdf
- Analytical grid for structure and function of services: m4_sm3_a2_EX_2_BF_structure_fonctions_EN.pdf
- Summary grid: m4_sm3_a2_EX_3_BF_synthesis_EN.pdf

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m4_sm3_a2_ANN_1_survey_services_demand_EN.pdf [72 kB]

m4_sm3_a2_ANN_2_groups_EN.pdf [120 kB]

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m4_sm3_a2_EX_2_BF_structure_fonctions_EN.pdf [45 kB]

m4_sm3_a2_EX_3_BF_synthesis_EN.pdf [32 kB]

4. Further information

Evaluation of extension services : Neuchâtel Initiative

m4_sm3_a2_NOT_institutions_EN.pdf

ALIVE
PARTNERSHIP FOR LIVESTOCK DEVELOPMENT, POVERTY ALLEVIATION & SUSTAINABLE GROWTH

GUIDE
FOR THE INCLUSION OF LIVESTOCK PRODUCTION IN PRSPs

METHODOLOGICAL NOTE
INSTITUTIONAL AND ORGANISATIONAL APPRAISAL

ACTIVITY M_4-SM_3-A_2

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1. OBJECTIVES

The objective of this activity is to conduct an institutional appraisal of the sector in order to assess how the supply of services meets the demand of the stakeholders in the sector. It is particularly based on the main constraints and dysfunctions identified by the stakeholders in the sector in M3-SM3.

A qualitative approach is the most suitable method for an institutional evaluation. Data collection can be achieved using various instruments:

Individual interviews with civil servants, political decision-makers, project coordinators and project staff in the field, leaders of grass roots organisations, NGO secretaries, etc.
Discussion groups with the beneficiaries
Individual interviews with beneficiaries
Workshops involving different stakeholders
Bibliography and analysis of documents (independent evaluations, audits, etc.)

2. BASIC NOTIONS

- **Organisations:** any organisation, including governmental structures and individuals grouped together within a formal or informal structure to achieve a specific objective.

- **Organisational appraisal:** process of evaluation of the functioning of an organisation, using conceptual or specific models with the aim of helping an organisation in a specific situation.

- **Institutional appraisal:** in this module, we will refer to an institutional appraisal when the analysis focuses particular attention on the capacities and the institutional dynamics between the organisations in a specific sector. The method of evaluation is participative and can, therefore, help develop the partnership between the different stakeholders in the sector.

3. DESCRIPTION

3.1. Identify the demand for services expressed by target stakeholders

You will conduct a bibliographic review of reports, memorandums and documents relating to livestock producers' demand for services. This review will complement the information collected in the activity M3-SM3-A1.
A semi-structured survey can be conducted with livestock producers from different systems of production and with stakeholders in the sector (fatteners, dairymen, etc.) defined in M3.
The following interview guide (m4_sm3_a2_ANN_1_survey_services_demand.doc) can help you, on condition that it is completed and adapted to the reality of the situation in your country.
Example of presentation of results (IEPC Burkina Faso):
m4_sm3_a2_EX_3_BF_synthesis_EN.doc.

3.2. Identify and evaluate the organisations involved in the livestock production sector

3.2.1 Identification of organisations

Three types of organisation are directly involved in the livestock production sector for regulating it, managing it or providing services. They can be involved at different scales: regional, national, provincial, county and community.

i. **The public organisations** responsible for developing policies, educating, supervising and monitoring livestock producers, extension:
   - central organisations – ministry responsible for livestock production and its different departments;
   - decentralised organisations – regional authorities responsibles for livestock production;
   - schools, faculties, research centres, technical authorities.

ii. **Civil organisations and associations**:
   - producer organisations (cooperatives, groups, etc.);
   - organisations of stakeholders in the sector;
   - umbrella organisations – unions, federations.

iii. **The providers of private services**:
   - animal health and veterinary practices;
   - auxiliaries of livestock production;
   - banks and other financial organisations;
   - other stakeholders in the sector – middlemen, wholesalers, transporters, etc.

Apart for the organisations that have a direct impact on the income of the agents involved in livestock production, you need to analyse those that interact with the livestock production sector, such as the ministries of agriculture, the environment, etc.

You should identify the different groups in the context of your country, using activity 1 as the basis (M2-SM3-A1). You should record them in a summary table, like this one: m4_sm3_a2_ANN_2_groups_EN.doc

3.2.1 Evaluating the organisations

You will evaluate **the efficiency** (or inefficiency) of the organisations and institutions. You need to specify the type of impact on the targeted stakeholders. You will identify the interests – humanitarian, commercial, political, social, etc. – that these organisations give to the targets and determine whether the interests can evolve with the process to put together the PRSP.

Then you will evaluate the structure and the **functions** (economic, social, environmental, health) for the three types of organisation defined previously.

i. The public organisations responsible for developing policies, educating, supervising and monitoring livestock producers, extension:

You will go through the following stages:

- brief history of the ministry responsible for livestock production and its current organisation chart;
- brief history of the related structures;
- identification of the missions and functions of each structure and its current expertise;
- analysis of the geographical distribution of the personnel in each structure, in comparison to that of livestock producers, particularly the poorest and most vulnerable; you will underline the imbalances;
- identification of the skills that need to be developed and the proposals for change that come from the institutions themselves.

In order to evaluate the supply of veterinary services, you can refer to the PVS method, explained in the activity M4-SM2-A4.

In order to evaluate the agricultural extension services, you canuld refer to the resources provided by the Neuchâtel initiative.

ii. The civil organisations and associations

You will go through the following stages:

- inventory of the producer organisations, organisations of operators in the sector and umbrella organisations;
- brief history of their training and the legal framework regulating their activities;
- brief description of their structure and organisation;
- weighted analysis (number of members, percentage of the population, etc.), geographical distribution, percentage of the different types of livestock producer;
- identification of the current missions and functions of each structure;
- identification of the skills to be strengthened and the proposals for change that come from the institutions themselves.

iii. The suppliers of private services

You will go through the following stages:

- inventory and geographical distribution of the veterinary practices, the suppliers of veterinary products and the livestock production auxiliaries;
- brief history of the legal framework regulating their activities;
- brief description of the clientele, particularly the role of the targeted stakeholders within this clientele;
- evaluation of the economic viability and the constraints met (for example, competition with state veterinarians);
- identification of the skills to be strengthened and the proposals for change that come from the institutions themselves.

The information will be summarised in a summary table (see the spreadsheet Excel: m4_sm3_a2_TOOL_institutions.xls).

Example of public organisations in Burkina Faso:
m4_sm3_a2_EX_2_BF_structure_fonctions_EN.doc

3.3. Compare the supply and demand for services

A workshop will be organised to discuss the results of the previous stages, to collect additional information, establish a shared appraisal of the main dysfunctions and formulate the proposals for change. It will bring together representatives from each production system and from each organisation, which will:

1. examine the organisations' main internal dysfunctions and weaknesses by type and function (organisational appraisal);
2. conduct an appraisal of supply and demand by category of beneficiaries, based on the contributions from each organisation for each group of beneficiaries (institutional appraisal). The list of target beneficiaries comes from M3-SM3-A1. It is important to note that some stakeholders in the sector (transporters, wholesalers) can be service providers for livestock producers at the same time as being beneficiaries of public or associative services.

Example of an appraisal of supply/demand of services in Burkina Faso:
m4_sm3_a2_EX_1_BF_services_supply_demand_EN.doc

The data will be summarised in a report. The proposals for change will be recorded in the Excel file, Excel spreadsheet: M4-SM3-A2, by distinguishing between the central, regional and local (village or community) interventions. For each intervention, the main beneficiaries will be indicated. This table will be used in the action plan developed in module 5.

Activity M4-SM3-A3: The livestock production sector in the transversal initiatives

1. Objective

A policy can be considered successful when it has achieved the objectives set out in its own sector without compromising the interests and objectives of the other sectors in interaction. The PRSPs must take into account the links between the livestock production sector and the other sectors in order to help identify the policies implemented for poor populations. If this does not occur, conflicts of interests will emerge or policies with unrealistic objectives will be proposed. Although some of these interactions may sometimes be minimal, they can have important consequences. Hence, the results of this activity are crucial for the validity of the whole process. The activity should include consultations with other sectors. If module M4 is completed, it will provide essential data for the team supervising the PRSP on the inter-relations between livestock production and the other sectors in the country being studied. It should underline the most important aspects for the definition of future policies and initiatives in this sector.

2. Expected outcomes

The initiatives concerning livestock production are integrated as part within a wider multi-sectorial framework.

3. Method and tools

Stage 1: Review of main issues and links between the livestock production sector and the other sectors

The basic analyses for this activity started in M2-SM2 and were complemented in the two previous activities of this sub-module. Representatives from the main groups of participants had to be included in the technical team for livestock production, in the partner committee's larger group or should have been identified in the organisations of the sector.

- **Workshop with multiple stakeholders** : the best way to obtain the information required for this stage is probably to organise a workshop, whose objective is to review and extend the work generated during M2-SM2 and M4-SM3-A1 and A2.

This involves asking representatives from the main groups of participants to summarise their organisation's outlook (as well as their own if possible) regarding the issues at stake and the links that they may have with the livestock production sector. Work could also be conducted in sub-groups to determine where the participants agree and disagree and to classify the different issues at stake and the links in order of importance. This work will then be presented and the results used for other activities (especially in module M5 for drawing up an action plan), and stage 2 below, in particular.

Stage 2: Identifying the PRSP's capacity to take into account transversal questions that exist between the livestock production sector and the other sectors and the potential to develop this capacity

Special attention should be given to the inter-sectorial issues at stake in order to ensure that the other sectors are not hit by the recommendations made during the process that focuses of livestock production.

- **Review of documentation** : This should include the analysis of the existing PRSP (on the basis of what was conducted in M1-SM2), with special attention to the references made to the transversal questions that affect livestock production and their likely impact on the development initiatives for poor populations. An effective way to represent them is to use matrices and diagrams that highlight the links between the sectors and stakeholders (in particular Venn/Chapati type diagrams). These can then be compared to the results from stage 1 above in order to identify the areas where the PRSP should examine the inter-sectorial issues more closely.