RESEARCH PROGRAM ON Livestock

More meat, milk and eggs by and for the poor

Working Paper

Adapt the LSITP tool on existing databases and discuss different scenarios of technologies or management improvement at the farm and household level using three livestock systems' areas in Egypt as a case study

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Acknowledgment

This working paper has been developed within the frame of the CRP Livestock program to test the LSIPT tool. The final goal was to simulate different scenarios of technologies or management improvement at the farm and household level by using three agroecological systems in Egypt as a case study of North Africa. This working paper is also a first step in the way to organize data, conduct reflexion on the multifunctional role of the livestock, and provide an overall approach to the impacts of technology or management improvement on economic growth and poverty reduction in Egypt by using the LSIPT.

The data materials had been previously collected in three research projects conducted between 2011 and 2016 in three agro-ecological zones: 1) the pastoral and agro-pastoral systems in the Northwest coastal zone (ELVULMED project funded by the French national research agency, ANR), 2) the small mixed crop-livestock systems in the new reclaimed lands in the western part of the Nile Delta (the CLIMED project funded by ANR within the ARIMNET program 2011), and, finally, 3) the very small crop-livestock systems in the old lands of the Nile Valley (SIADEEP project funded by Danone Ecosystem Funds).

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This working paper allowed us to develop a didactic approach of the toolkit, presented in the CRP Livestock workshop organized in Dakar (December 2018) within the Cluster 1 entitled ***'Policies, foresight and systems analysis' to improve livestock systems modeling tools and datasets to better-informed priority setting, investments and policymakers***." It could constitute the basis for a prospective study regarding territorial livestock development in Egypt by coupling the LSIPT toolkit with a dynamic spatiotemporal tool such as GEOC. It will also serve to develop more on price policies by developing new approaches regarding interannual price variability and prevision within the CGIAR livestock Program.

1. Introduction

Over the last two decades, different studies have highlighted the importance of livestock activities for a sustainable agricultural development either in terms of poverty reduction (Asley et al., 1999; FAO, 2009; Livestock Data Innovation Project in Africa. 2013) or in terms of resilience at the farm or local level (Herrero et al., 2010; Alary et al., 2014, 2016a). Around 70% of the 1.4 billion extreme poor population with a consumption of less than US$1.25 per person per day, depend on livestock for their livelihoods (FAO, 2009). By comparing rural livelihoods in four African countries (Uganda, Kenya, Tanzania, and Malawi), Ellis and Freeman (2004) showed that livestock ownerships with on-farm diversification and non-farm employment is one element that favors virtuous spirals of accumulation. This activity is also a key component of production systems over vast areas characterized by water scarcity and erratic rainfall (Séré et Stenfield, 1996). In mixed crop-livestock systems, livestock offers many opportunities to sustainably increase production by raising productivity thanks to manure, draft power, and to increase resource use efficiency both at the household and regional levels (Herrero et al., 2010). Livestock is also one of the only livelihood options for landless or very small-scale farmers (Upton, 2004; Alary et al., 2016a), and for women, who represent 70% of the world's poor (DFID, 2000). Moreover, the livestock sector is currently undergoing rapid growth, which is likely to continue due to population growth, urbanization, and, most importantly, increasing income in developing countries (Thornton et al., 2010).

In spite of livestock's potential to contribute to economic growth and poverty reduction, investments by national governments and international agencies were historically limited. This low investment in the livestock sector is partially attributed to a lack of capacity, critical data, and tools for sector monitoring and investment planning at a national level. A Partnership for Livestock Development, Poverty Alleviation and Sustainable Growth in Africa ("ALive") established in 2004 to address these issues. Within this frame, the Livestock Sector Investment and Policy Toolkit (LSIPT) was developed by the French Agricultural Research Centre for International Development (CIRAD) and World Bank staff, with inputs from FAO, ILRI, and IIED, to support national authorities in improving their livestock sector policies and help livestock planners in improving the quality of livestock investment projects. LSIPT provides methods and tools for the analysis of critical processes to decision-making and policy design, such as the diversity of livestock production systems, their links to households and their vulnerability, the different value chains, and the contribution of livestock to poverty alleviation and national GDP. The LSIPT also allows simulating investment scenarios or technical changes that can help decision-makers in choosing the most appropriate investments and policy options.

Since 2012, parts of the toolkit have been used by ILRI to assist in the preparation of Livestock Master Plans (LMP) in Ethiopia (with the assistance of CIRAD and the financial support of the Bill and Melinda Gates Foundation (BMGF)), and also Tanzania (BMGF), Rwanda, (with support of FAO), Uzbekistan (World Bank), and most recently in Bihar, India (BMGF). Moreover, having identified significant demand from its member countries, FAO, through its Animal Production and Health Division (AGA) and Investment Center (TCIA), recently enhanced its capacity to deploy the toolkit. Besides, ILRI's existing LMP and modeling team seek to use upgraded tools in new LMPs currently being requested by several countries, in addition to applying them to sub-national studies of interest.

Recently, within the CRP Livestock Program, the Livestock Livelihoods and Agri-Food Systems Flagship (LLAFS) proposes to work specifically on the impacts of technologies and strategies developed at the country level, on the welfare of the resource-poor. This program addresses, among others, the rural livelihoods, nutrition, gender inequality and livestock agri-food system performance.

This program highlights the lack of models and data available to understand and project future system changes. Based on the frame of theory of change, the LLAFS is composed of four clusters corresponding of 4 priorities: (i) cluster 1: 'Policies, foresight and systems analysis' to improve livestock systems modeling tools and datasets to better-informed priority setting, investments and policymakers; (ii) cluster 2 'Gender and social equity' for assessing progress on gender strategic change; (iii) cluster 3 'Food and nutrition security through Livestock' to improved nutrition and cost-effective nutrition-sensitive intervention and (iv) cluster 4 'Integrated technologies, practices and institutions for improved livestock systems' with ex-ante and ex-post impact assessment of technologies, practices and institutional arrangements to enhance resilience. Among the potential modeling tools to better informed the relative impacts of alternative technology investments, this program proposed to explore the Livestock Sector Policy Investment Tool (LSIPT), already used for livestock master Plans such as in Ethiopia (Desta et al., 2014; Shapiro et al., 2015).

In this working paper, we proposed to test the toolkit in a North African country, Egypt, to assess different scenarios of technologies and management improvements at the farm and household level. Working on data collecting in previous research projects in three agro-ecological zones (rainfed, new reclaimed land and irrigated zones), the aggregation allowed to assess the 'scaling out/up process' of alternative technologies developed by different research projects in Egypt. The implementation of the toolkit in Egypt allowed seeing how the research communities can use this toolkit for ex-ante or ex-post impact assessment. The third and final objective was to highlight the present limitations or opportunities of the different tools for future improvements of the LSIPT toolkit.

2. Rapid overview of the LSIPT Toolkit

2.1. The entire LSIPT framework

The LSIPT Toolkit consists of six modules (Fig. 2.1). Each module is composed of sub-modules, activities, and steps. Each activity contains a set of specific tools (like excel spreadsheets models including demographic projection model, technical-economic performance' assessment, cost-benefit analysis, competitiveness analysis, organizations, policies, legislations and institutions (OPLI) analysis) and mode of data collection (based on expert knowledge, literature review, and survey questionnaires). Finally, the majority of the data are connected at the different scales of analysis from the livestock system and household to the nation (Dutilly et al., 2019).

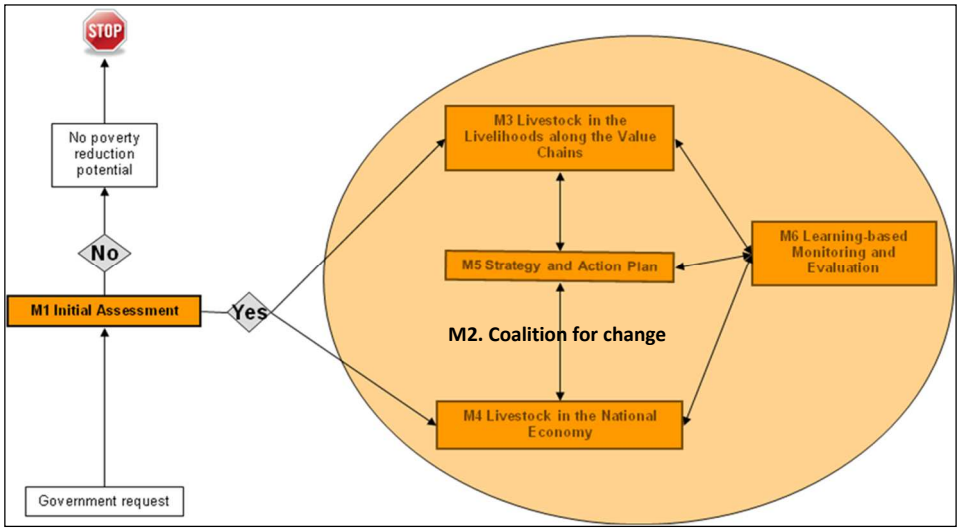


Figure 2.1: Content of the LSIPT

The first module, M1-Initial assessment, proposes an initial understanding of the importance of the livestock sector and the links between livestock and poverty. The objective of this module is to conduct a rapid assessment of the potential advantages offered by the livestock sector in supporting the poor population of the country. This initial assessment constitutes a basic diagnostic for determining if or no more complete analysis of the livestock sector is necessary to support the national strategies in achieving their objective in terms of alleviating poverty or economic growth. This assessment is mainly based on the existing national database. If this is confirmed, Module 1 leads directly to the next modules (Figure 2.1).

The second module, M2-Coalition of change, has been conceived to support the constitution of a national team, as a committee of experts, with various disciplines and institutions, that will have in charge of realizing the diagnosis of the livestock sector (Modules 3 and 4). Besides, this module provides guidelines to establish a coalition of partners that will support the process and validate results. This coalition will also be responsible for managing and promoting the necessary policy and institutional changes to guarantee the integration of the livestock sector in the policy planning of

different institutional bodies of decision making. This module is critical to the development of an effective strategy and action plan (Module 5).

The modules 3 and 4, respectively, at the farm, household, value chain and national level, constitute the diagnostic section of the LSIPT and as such, the core assessment of the livestock contribution to the economic growth and poverty reduction (Fig. 2.2). Module 3 - Livestock in the farm household and value chain levels - aims at identifying where and to whom livestock is a livelihood priority. It provides a detailed analysis of productivity and financial returns of livestock systems, poverty indicators and income structure of households and a contribution of various livestock systems to value chains. Module 4, Livestock in the national economy, estimates the importance given to livestock sector development as part of the national development strategy. Firstly, it consists of aggregating at the national level all information generated from the livestock systems and animal commodity chains, and, of calculating the GDP and other aggregate indicators. Secondly, poverty and equity indicators will be generated from the results at the household level.

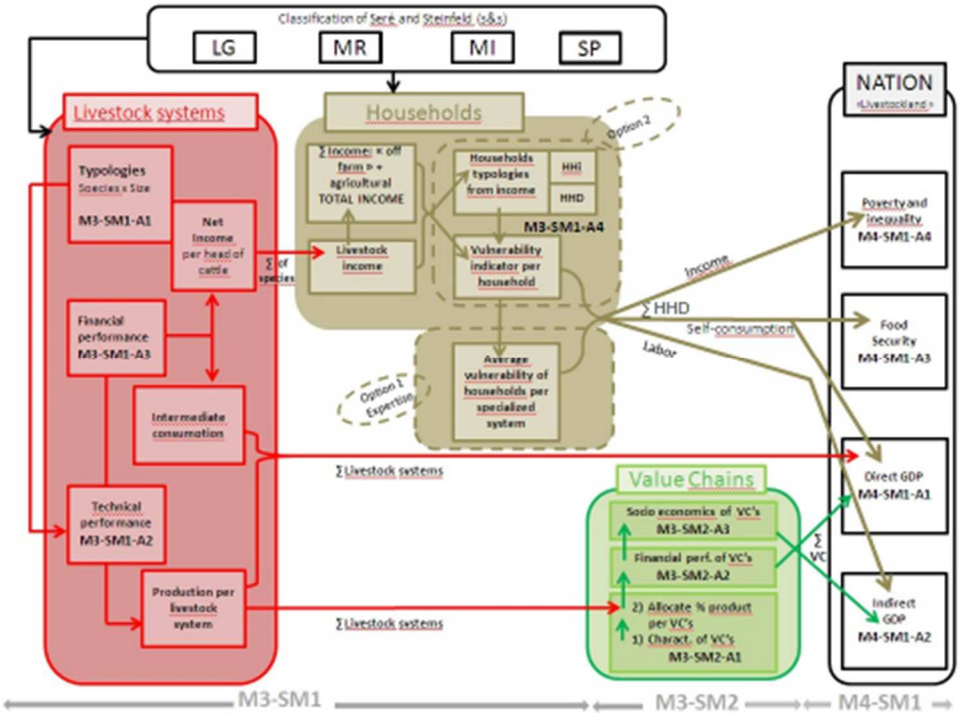


Figure 2.2. Mapping of modules 3 (M3) and 4 (M4) and their articulation

With around 33 Excel tools (section M3 and M4) proposed, the tools to analyze livestock systems (LS), the household economy and vulnerability (HH) and value chain performance (VC) in M3 and GDP and poverty in M4 constitute the core of the LSIPT, and, they are interlinked between each other. These modules constitute the reference to (i) Provide the arguments so that the poverty reduction policies take livestock production into account (M2), (ii) Develop the strategy and action plan to strengthen the role of livestock production in the national economy (M5), and (iii) Establish the baseline year and the indicators for the monitoring and evaluation of the national strategy (M6).

Module 5, Strategies and action plan, helps to develop a strategic livestock sector development plans and detailed investment proposals. This module uses the results of the diagnosis realized in modules 3

and 4 to elaborate on a strategy and action plan that are susceptible to be incorporated in various strategy and investment programs (such as integrated rural development programs, pro-poor investment programs, etc.). This module builds on the prospective tools proposed in modules 3 and 4 and, then, can track positive or negative changes at each level: farm or household level, the marketing chain, and the national level.

Finally, the module 6, Learning-based monitoring and evaluation, proposes an up-to-date information system on the impact of the inclusion of the livestock sector in an action plan on equitable wealth creation and sustainable economic growth. It allows choosing key indicators to monitor the process of implementation of the action plan. It is an essential component to support the long-term development of the livestock sector and build the monitoring capacity within this sector.

The six modules are interconnected by links of (i) cause and effect (Module 1), (ii) links of aggregation (between Modules 3 and 4), (iii) links of input-output tools (modules 3, 4 and 5), (iv) command links and networking (Module 2 with the other modules), and (v) link of control (Module 6 with Modules 3, 4 and 5). In order to use the best of the toolkit analytical potential, it is important to consider the analytical process as a perpetual back and forth movement between modules, sub-modules and activities. For instance, some results from one tool can show some incoherence once aggregated with other indicators in the next step at the macro level. It is also important to conduct a permanent comparison with existing statistical figures to adapt or validate each step of the analysis.

2.2. Diagnostic framework based on the herd and household diversity

2.2.1. Two mainstreams to assess livestock contribution to the economy

The originality of this toolkit is to assess national indicators of economic growth and poverty from, respectively, the diversity of Livestock dominant Systems (LS) and HouseHold Dominant Systems (HHD) (Figure 2.3). The two units of analysis are complementary and necessary to conduct a full diagnostic. From the herd/flock diversity, we can quantify the economic contribution of the sector to the national economy through the animal products they supply. The household perspective is essential to assess its role in providing financial resources to sustain livelihoods.

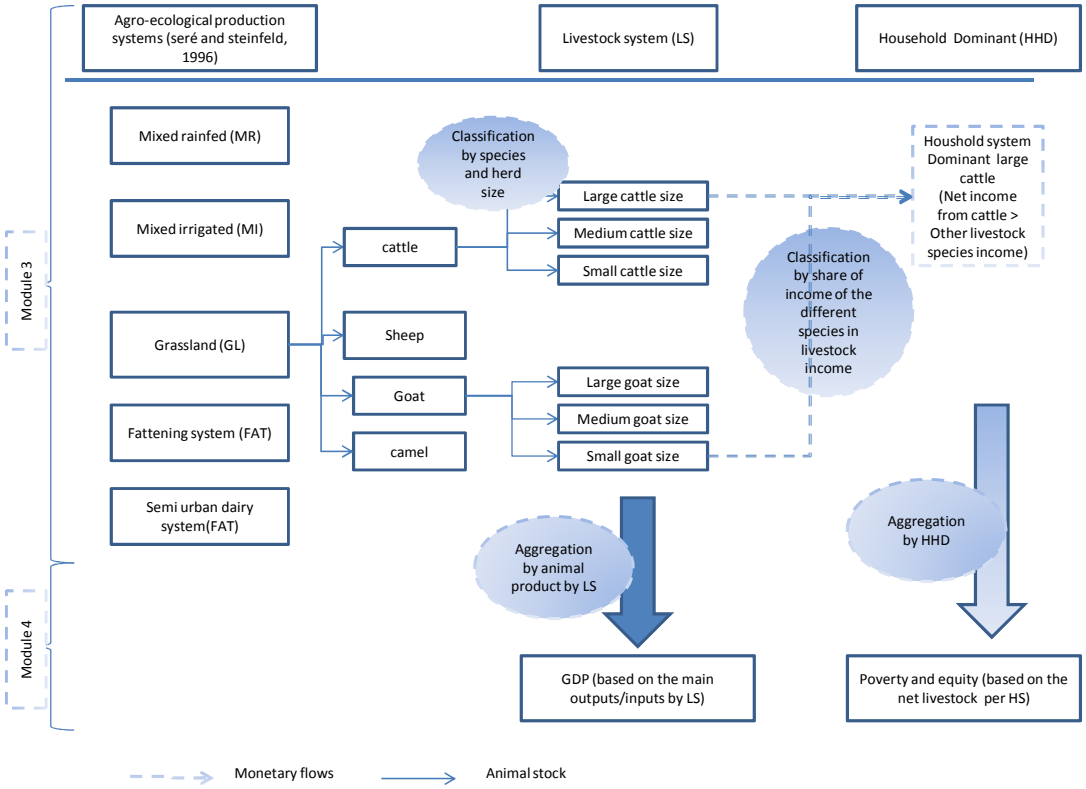


Figure 2.3. The two mainstreams (LS and HH) of the LSIPT (Dutilly et al., 2019)

Knowing that up-date household surveys are not always available, the toolkit provides two approaches, named Option 1 and Option 2. Option 1, also called 'without survey data', is built around representative farm types (farm typology based on the dominant livestock system in the farm), where the model's parameters and the results are average indicators for a given type. Option 2, called "With survey data", is based on the complementarities between modeling performances of certain types of livestock farming systems (LS) and the analysis of household survey data with individual observations. This option allows us to approach the order of magnitude of the contribution of livestock farming to households' agricultural income and determine the degree of variation and the degree of diversity of the contribution for a given farm type. Then quantitative and qualitative approaches to the levels of poverty are proposed based mainly on the deviation from the national poverty line and the coverage of households' dietary needs.

2.2.2. From the livestock production system to the GDP

The diagnostic starts by establishing a typology representing the diversity of dominant livestock systems (LS) in the country. First, the main agro-ecological areas and livestock production systems are identified using the Seré and Steinfeld (1996) classification (named 'S&S' systems later on in the paper). Within each agro-ecological zone, LSs are defined according to the dominant animal species and the herd size. We assume that the herd size is critical in the differentiation of technical parameters, such as off-take and mortality.

Using the appropriate tool[1] in regards to the animal species and production systems under study, we can assess the technical performance of each livestock systems in terms of production of meat, milk, eggs and products derived from the animal activities. The main derived animal products are animal draught, organic matter, production of hides, skins and wool. For ruminant systems, an integrated tool, EcoRum, is proposed to simulate the bio-economic performances of livestock based on the demographic model drawn from the software DynMod (a Microsoft Excel © simulation tool for the livestock demography of tropical domestic ruminants; CIRAD, ILRI). For the other species (mainly poultry, pig, and fattened ruminants), ECORUM couple a static model of the herd system with the financial, economic, and scenario components.

Moving at the level of animal product chains, we can assess the total quantity of products marketed through the chain by adding all production from the livestock systems once home consumption, direct sales and barters have been taken out. After having characterized different sub-chains for each animal product and the flows of products going through the main agents for each sub-chain, a financial analysis allows estimating the total wealth creation generated through each of these chains.

At the national level, the total added-value generated by the livestock sector is then computed both at the production stage by aggregating the added value created through each product by each livestock system and at the transformation and marketing stage by adding the added value created by each commodity chain. So, the livestock total added value (*AV*) comes from the total production (*Q*) of all animal products (*A*= meat, milk, egg, hides and skin, manure, traction) generated by each livestock systems (*S*), the average price of each product (*p*) and the percentage of intermediate costs *(%CI*):

$$Total\ AV = \sum_{S,A} Q_{A,S} * p_{A,S} * (1 - \%CI_{A,S})$$

Then, using estimates on the relative share of products that are self-consumed, bartered, or sold, it is generated several aggregate indicators of GDP, such as:

- The **direct monetary** GDP, which consists of all the monetary transactions for animal products, including goods for final consumption (meat, milk, eggs, ..) or intermediate goods destined for other sectors of the economy in the downstream sectors (traction, manure) on the same farm.
- The **direct non-monetary** GDP, which consists of the home-consumption of animal products (valued at market price) and 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.

[1] Each tool has been developed around three components: i) a herd model to assess the technical performance 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), ii) an other spreadsheet allowing calculating financial and economic performance indicators, iii) these tools can also be used to compare two scenarios, for example, scenarios 'with' and 'without' a project or a chock like drought, etc. Therefore, these tools are used for the two mainstream levels of analysis as well as in M5.

- The **indirect GDP,** which consists of the contribution of livestock production to agriculture in terms of transfer of manure and draught power, as intermediate products.

Finally, in addition to the GDP generated at the production stage, the tool compiles the added values generated along the downstream value chain, by aggregating the margins from the various sub-chains.

2.2.3. From the livestock holding households to the social dimension of livestock

Within each S&S system (LG, MR, MI, except specialized), we can conduct a household analysis. As most households possess mixed herds (several animal species), the total livestock income is calculated using the observed number of animals for each animal species from raw data of the household survey (if option2 selected) and multiplying it with the net income per animal generated at the LS level. The total income of each household is computed using the newly generated livestock income and adding the observed crop and off-farm income. In a given S&S system, households are categorized according to the dominant livestock system (HHD) (i.e., the animal species that contributes the highest share of income in the livestock income). Finally, several indicators of vulnerability (HHI) (share of livestock in total income, employment generation, nutrients coming from home consumption of animal products, poverty incidence, and inequality (GINI)) are then automatically generated for each category in the household tool.

At the national level, all these indicators generated at the S&S system allow deriving the poverty incidence within the rural population holding livestock and, given their level of representativeness, identifying which group of households encompasses the highest number of poor.

In sum, the toolkit proposes an original framework to estimate macro-indicators from a detailed household and farming system approach. However, the question is to know if the results from this approach are fundamentally different for the national account approach and the implications of this approach in policy orientations.

3. Methodology for LSIPT Egypt

3.1. Materials & methods

As the toolkit proposes three agro-ecological zones, we have affected our three sets of data corresponding to three contrasting socio-agro-ecological zones in Egypt to the three pre-defined 'S&S' zones (table 3.1 & Fig. 3.1). The farm household data result from a farm household survey based on a semi-structured questionnaire including quantitative data on 1) family size, composition and employment, 2) land access and crop system, 3) livestock system and performances, and 4) off-farm activities. These farm household surveys are the results of different research projects or research and development projects within a partnership with the Animal production Research Institution (APRI) in Egypt.

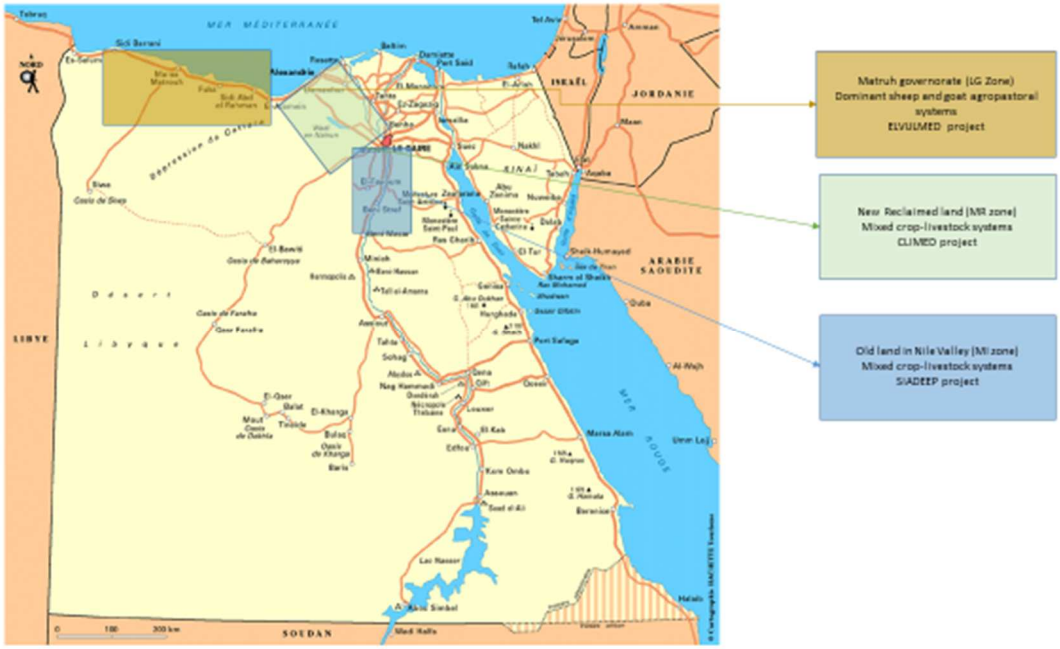


Figure 3.1. The three agro-ecological zones in Egypt (Google earth)

Table 3.1: Source of data from farm household surveys in Egypt used in m3_sm1-a4_TOOL_Household for each zone

S&S zones	Representative zone in Egypt	Research Project	Zones of intervention	Data	Description of data in
Grazing land (LG)	Matruh Governorate	ElVulmed 'Role of livestock activities in the process of adaptation and reducing the vulnerability of Mediterranean societies facing global changes' (project funded by ANR[2], 2011-2016)	Sidi Barani, Neguila, Marsa Mathrouh, Ras el Hekma	94 Family farm surveys conducted in 2011-2012	Alary et al., 2014; 2016 Bonnet et al., 2014
Mixed Rainfed zone (MR)	New Reclaimed land	CLIMED project 'The future of Mediterranean Livestock Farming Systems: Opportunity and efficiency of Crop–Livestock Integration' (Project ARIMNET2010, funded by ANR, 2012-2016)	Three villages in each district: Nahda, Bangar, Hamam, Bustan, Tiba	175 family farm surveys conducted in 2013-14	Alary et al., 2018
Mixed Irrigated zone	Beni Suef in the Nile Valley	SIADEEP project on Socio-economic Impact of the of Danone-Egypt Ecosystem (DEEP) project (Funded by Danone Ecosystem Fund)	Three villages in Beni Suef governorate	72 family farm surveys conducted in 2014	Alary et al., 2016 (Atlas)

For each zone, we had conducted a Multiple factorial analysis (MFA) followed by a clustering analysis (using the method Ward) to represent the diversity of farm household systems (see Alary et al., 2016a for LG zone, Alary et al., 2016b for MR and MI zones; see Annex A). As frequently observed, the physical assets as the herd and land size constitute important discriminant factors for analyzing the diversity of farm households in each zone. For the LSIPT implementation in Egypt, we chose a production system prototype (Sub-System) according to the farm herd size based on the datasets of each location (Table 3.2). In table 3.2, the label of the subsystem refers to an individual (farm survey no.) of the dataset of each zone. This individual is a representative farm of the subsystem, called prototype or farm pilot. The average number of heads results from the herd repartition in three classes according to the dataset of farm households in each zone. The 'No. herds at the national level' is calculated according to the weight of each subsystem at the national level according to herd size (based on national statistics synthesized in Aboulnaga et al., 2016). The 'relative importance of the livestock system (LS) at the national level' gives an estimation of the repartition of the animal population in each subsystem.

[2] ANR French National Research Agency

Table 3.2. List of ruminant sub-systems represented in the LSIPT model for Egypt (m3_sm1-a1)

		Sub-system	Average no. of heads	No. herds/flocks at the national level	Relative importance of LS (% of heads)
Cattle					
Grass land system (LG)	B1LG	W18	1.8	59 639	1.1%
	B2LG				
	B3LG				
Mixed rain-fed system (MR)	B1MR	NRLSmall_225	2.4	66 232	1.6%
	B2MR	NRLMedium_413	4.9	70 748	3.5%
	B3MR	NRLLarge_218	17.2	88 811	15.5%
Mixed irrigated system (MI)	B1MI	Bssmall_1114	1.9	260 600	5.0%
	B2MI	BSMedium_1419	3.4	581 339	20.0%
	B3MI	BSLarge_1308	8.7	601 385	53.0%
Fattening system (OF)	B1OF				
	B2OF				
Peri-urban dairy systems (OM)	B1OM				
	B2OM				
				1 728 754	**99.79%**
Sheep					
Grass land system (LG)	O1LG	W46	22.1	1 663	0.7%
	O2LG	W83	61.0	1 448	1.6%
	O3LG	W19	188.7	1 663	5.8%
Mixed rain-fed system (MR)	O1MR	Tiba 221	1.0	3 572	0.1%
	O2MR	Bustan-130	3.8	12 758	0.9%
	O3MR	Hamam-308	44.5	8 676	7.2%
Mixed irrigated system (MI)	O1MI	BS1112	2.1	410 341	16.0%
	O2MI	BS1106	6.7	547 121	68.0%
	O3MI				
Fattening system (OF)	O1OF				
	O2OF				
				987 243	**100.24%**
Goats					
Grass land system (LG)	G1LG	W25	6.8	4 538	0.7%
	G2LG	W52	15.1	5 722	2.0%
	G3LG	W55	46.7	5 722	6.1%
Mixed rain-fed system (MR)	G1MR	Tiba 207	1.0	14 130	0.3%
	G2MR	Bustan 115	2.4	33 912	1.9%
	G3MR	Hamam 312	6.8	42 390	6.6%
Mixed irrigated system (MI)	G1MI	BS1120	1.0	111 433	2.5%
	G2MI	BS1407	2.4	445 733	24.4%
	G3MI	BS1105	7.3	334 300	55.6%
				997881	**99.99%**
Camels					
Grass land system (LG)	C1LG	W62	1.5	2 322	2.5%
	C2LG	W55	7.8	2 903	16.5%
	C3LG	W88	38.2	2 903	80.9%

The technical parameters using in the ECORUM models for each animal species and dominant livestock system resulted from a mixture of literature review and raw data from the farm surveys (Table 3.3). The prototype of each subsystem is used to calibrate the DYNMOD model (Excel sheet 'production (without)' in ECORUM based on the simulation tool for the livestock demography of tropical domestic ruminants; CIRAD, ILRI) and the technical and economic parameters related to the farm system (Excel Sheet 'Diagnostic' in ECORUM).

Table 3.3. Variables and their estimations used for characterizing each livestock system (LS)

Variables	Estimation of the variables	Sources and comments
Structural data		
Herd composition	Declarative data from pilot farms	
Mortality rate (< 1 year)	Literature	Tabana, 2000; Faye, 1997; Aboulnaga et al, 2016
Parturition/prolificacy rate	Literature	Tabana, 2000; Faye, 1997; Aboulnaga et al, 2016
Offtake rate	Calculated to keep the same number of dairy animals over 20 years et according to the average age of marketing (pilot farms)	
Daily needs for upkeep	2.5% for live weight of animals	
Animal live price	Regional prices by age category	
Cultivated land area	Declarative data from pilot farms	
Feed and fodder production		
Area for animal feeding	Declarative data from pilot farms	Structural data from pilot farm to assure coherence in the production system
Workforce cost	Declarative data from pilot farms	
Fertilizer cost	Declarative data from pilot farms	
Rental land cost	Declarative data from pilot farms	
Veterinary cost	Declarative data from pilot farms	
Feed and fodder purchased		
Concentrate price	Declarative data from pilot farms	
Quantity concentrate per head	Declarative data from pilot farms	
Fodder	Declarative data from pilot farms	
Dairy activities		
Milk production	Declarative data from pilot farms	
Milk price	Declarative data from pilot farms	

3.2. Scenario and impact assessment

The LSIPT tool allows estimating the technical and financial performances of the LS systems (subsystem) (m3_sm1_a1 and m3_sm1_a2) and indicators of vulnerability related to household income. It also allows approaching the contribution of livestock in household food security by tercile of poverty and the overall poverty incidence parameters at the agroecological level (m3_sm1_a4). Moreover, this module M3 helps to establish the reference situation at the farm and agroecological levels and provides the technical and socio-economic indicators on which will rely the macro-economic diagnostic related to the contribution of livestock sector at the national level in terms of economic growth (through the GDP) and poverty alleviation (through the depth and incidence of poverty) (module 4).

Based on this reference, we can simulate a technological or management improvement for each subsystem (scenario) to assess the impact indicators of these changes in terms of productivity, livelihoods, income, food security, and equity. The proposed scenario results from global expertise or advanced technologies developed and proposed in research projects conducted in the three zones.

For the bovine systems in the mixed rainfed (MR) and Mixed irrigated zone (MI), one of the main obstacles was the feed cost and feed market dependence of farms that affected the economic profitability of milk activity in link with the milk selling price at the farm level. Based on field researches (SIADEEP project), we proposed an increase of milk prices that was supposed to boost both the volume and quality of milk production. To ensure that milk price increase boost the volume and quality, we hypothesized that the totality of the cash benefit from the increase of milk price is invested in feed concentrates with high protein content (around 18%) with an average price of 3 EGP/kg (fixed in 2014). Referring to Tabana's study (2000), we estimated milk production according to the increase of concentrate distributed following the equation (1): $y = -2E\text{-}10x^4 + 2E\text{-}06x^3 - 0.0073x^2 + 12.661x - 5239$ (see the curb in Fig 3.2).

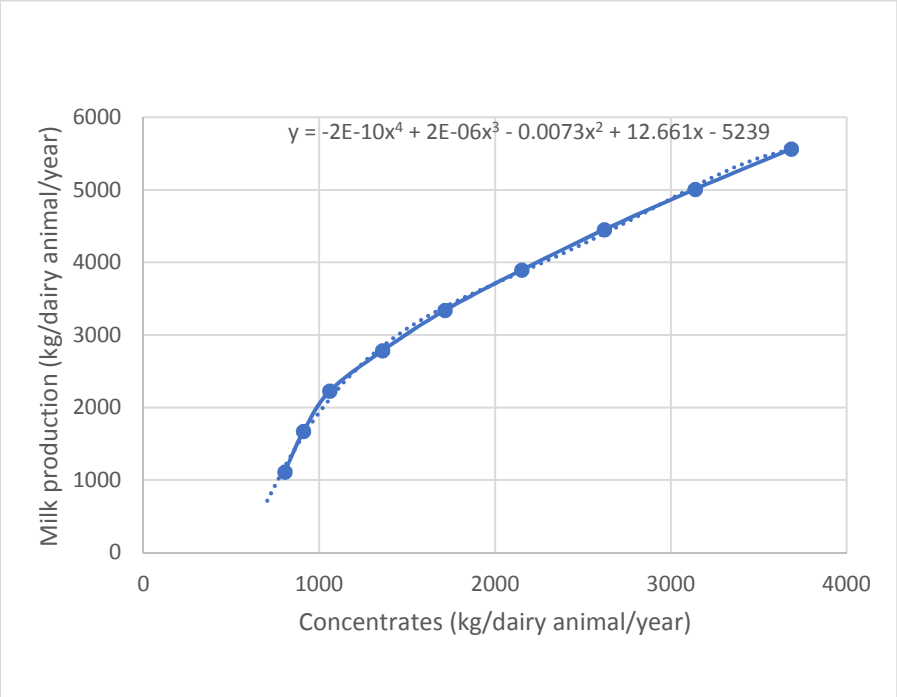


Figure 3.2. Milk yield production according to the supplementation in concentrates (derived from Tabana, 2000)

The table 3.4 gives the changes of technical parameters of the dairy herd due to the use of high-protein content concentrates.

Table 3.4. Technical parameters of each LS in the reference situation (without change) (T0) and the scenario (with change) (T1)

	B1MI	B2MI	B3MI	B1MR	B2MR	B3MR
Milk price increase (egp/l)	0.4	0.4	0.4	0.4	0.4	0.4
Lactating period (days)	250	210	230	210	180	240
Milk yield (T0) (l/head/day)	5.8	6.6	9.3	4	11	12
Profit increase in year 1 (T1) (Egp/head/year)	580	554	856	336	792	1152
Daily increase of concentrate (T1) (kg/ head/ day)	0.53	0.51	0.78	0.31	0.72	1.05
Concentrate (T0) (kg/head/day)	2.67	2.38	3.21	2	2.2	3
Concentrate (T1) (kg/head/day)	3.20	2.89	3.99	2.31	2.92	4.05
Total feed (T1) (kg/head/year)	1168	1054	1457	842	1067	1479
Total milk production (T1) (/head/year)	2405	2089	2996	1339	2130	3032
Milk yield (T1) (l/head/day)	9.6	9.9	13.0	6.4	11.8	12.6
Av. feed price (T1) (Egp/kg)	2.12	2.3	2.46	1.87	2.26	3.15

Regarding the sheep and goat systems in the three zones, research has mainly focused on the selection of resistant local breeds to feed shortage during drought events in the agro-pastoral zone (LG) or to disease and hot temperatures in the mixed rainfed and irrigated zone (MR and MI). The degree of resistance can be approached by a reduction of mortality birth rate and an increase in fertility rate and a reduction of mortality rate for the young animals (< 6 months). Hence, we suppose a reduction of mortality of 10% for lamb (passing from 17% to 15.3%), with an increase of 8% of the parturition rate in rangeland zone (LG) (passing from 0.89 to 0.96). In the irrigated zone, we suppose an increase of 5% of the parturition rate for does, increasing from 0.8 to 0.85.

4. Results

4.1. Impact assessment at the livestock production system level (LS)

The impact assessment at the farm production system (LS) results directly from the results of ECORUM tool. This tool couples the demographic animal population according to natural rates of reproduction and mortality and the off-take rates for each animal categories (age classes) of each dominant livestock system and its technical and economic management (such as feed management with market dependence, animal costs related to veterinary, water use, tax, pastureland management, labor, etc.).

The table 4.1a and 4.1b provide the impacts of the change on the productive and economic performances per animal or animal products. Here, the results focused on the dominant livestock systems where technology improvements have been proposed, given the research priorities defined in part 3.2.

Tables 4.1(a) and (b) show that the increase of milk price of about 0.4 EGP/liter reinvested in supplementation of higher-quality feed (18% protein content) could have high benefits for the very small dairy systems. The main beneficiaries are the small mixed farmers in the New reclaimed lands (B1MR) and the large dairy farms in old irrigated lands (M3MI), with a multiplier rate of net income per animal by 3.4 and 6.0, respectively. More importantly, we observe an increase of 1.7 of the net income per animal for the very small dairy farms in the Nile valley (B1MI), which represent the majority of farm systems in the old irrigated land (representing at least 40% of holders in Egypt). The profit of the dairy activity (calculated as the ratio between the net income/product) is multiplied by around 2. Consequently, the cost price per liter registers a decrease by around 20 to 36% due to milk production increase per animal.

Regarding the sheep system in rangeland (LG), we can observe an increase of net income per animal by around 1.1 for small sheep flock (O1LG) up to 1.4 for the medium and large flock (O2LG and O3LG), with an increase of the profit between 1.08 and 1.38. In irrigated lands (MI), the increase of parturition rate by 5% induces an improvement of 11% of the net income per animal and 27% the net income by active members involved in this activity.

Table 4.1a. Change of productive performance per animal and animal products without and with technological changes (Extracted from the m3_sm1-a1_Synthesis, Output_A2)

Activity M3-SM1-A2: Indicators of production of livestock systems (ALL LS): results from tools m3_sm1_a2_TOOL* [LS]*[CODE].xls / projection

				Situation without change (T0)					Situation with change (T1)				
				Total production of the herd		Other indicators of technical performance			Total production of the herd		Other indicators of technical performance		
		Sub-category	Average no. of heads	Meat (kg)	Milk (l) or egg (no.)	Offtake rate	Average weight of animals used	Milk productivity per breeding female	Meat (kg)	Milk (l) or egg (no.)	Offtake rate	Average weight of animals used	Milk productivity per female
Cattle													
Grass land system (LG)	B1LG	W18	2	47	710	36.0%	243	935	47.20	710	36%	243	935
	B2LG												
	B3LG												
Mixed rain-fed system (MR)	B1MR	NRLSmall_225	2	112	1709	44.0%	181	748	112.20	2632	44%	181	1156
	B2MR	NRLMedium_413	5	304	8354	36.0%	244	1762	303.50	8952	36%	244	1889
	B3MR	NRLLarge_218	17	964	38601	32.0%	257	2563	964.20	40511	32%	257	2691
Mixed irrigated system (MI)	B1MI	Bssmall_1114	2	93	1944	45.0%	224	1291	92.50	2811	45%	224	1874
	B2MI	BSMedium_1419	3	189	3742	44.0%	227	1234	188.80	5519	44%	227	1827
	B3MI	BSLarge_1308	9	400	15770	45.0%	176	1904	399.60	21686	45%	176	2627
Sheep													
Grass land system (LG)	O1LG	W46	22	216		47.0%	37		303.30		47%	37	
	O2LG	W83	61	570		45.0%	37		806.60		46%	37	
	O3LG	W19	189	1170		30.0%	35		1583.00		31%	35	
Mixed rain-fed system (MR)	O1MR	Tiba 221	1	12		46.0%	37		11.80		46%	37	
	O2MR	Bustan-130	4	54		47.0%	39		54.00		47%	39	
	O3MR	Hamam-308	45	269		46.0%	39		268.50		46%	39	
Mixed irrigated system (MI)	O1MI	BS1112	2	19		47.0%	37		18.70		47%	37	
	O2MI	BS1106	7	78		46.0%	37		78.40		46%	37	
	O3MI												
Fattening system (OF)	O1OF												
	O2OF	09-janv	120										
Goats													
Grass land system (LG)	G1LG	W25	7	49	818	39.0%	27	134	48.90	818	39%	27	134
	G2LG	W52	15	35	643	39.0%	27	86	34.80	643	39%	27	86
	G3LG	W55	47	202	2442	52.0%	24	115	201.80	2442	52%	24	115
Mixed rain-fed system (MR)	G1MR	Tiba 207	1	7	152	40.0%	28	180	6.70	152	40%	28	180
	G2MR	Bustan 115	2	25	263	39.0%	27	86	24.70	263	39%	27	86
	G3MR	Hamam 312	7	87	947	37.0%	27	86	86.80	947	37%	27	86
Mixed irrigated system (MI)	G1MI	BS1120	1	7	73	38.0%	28	86	7.90	86	38%	28	92
	G2MI	BS1407	2	15	181	50.0%	24	108	15.10	181	50%	24	108
	G3MI	BS1105	7	22	231	45.0%	27	108	21.50	231	45%	27	108
Camels													
Grass land system (LG)	C1LG	W55	2	122	61	27.0%	222	31	121.60	61	27%	222	31
	C2LG	W88	8	267	89	20.0%	266	21	266.80	89	20%	266	21
	C3LG	W88	38										

Table 4.1b. Change of profitability per animal and animal products without and with technological changes (Extract from the m3_sm1-a1_Synthesis, Output A4)

Activity M3-SM1-A3: Indicators of financial performance of livestock farming systems (ALL LS): results from tools m3_sm1_a2_TOOL*[LS]*[CODE].xlsm / diagnosis parts I and II

In currency: EGP

				Situation without change (T0)						Situation with change (T1)					
				Income indicators (per animal)		Other indicators		Production cost		Income indicators (per animal)		Other indicators		Production cost	
		Sub-system	Average no. of heads	Net income (financial)	Cash flow	Net income per active family member	Profit margin (net income/product)	/kg meat	/liter	Net income (financial)	Cash flow	Net income per active family member	Profit margin (net income/product)	/kg meat	/liter
Cattle															
Grass land system (LG)	B1LG	W18	2	233	-1115	705	9%	38.10	2.59	233	-1115	705	9%	38.10	2.59
	B2LG														
	B3LG														
Mixed rain-fed system (MR)	B1MR	NRLSmall_225	2	366	-102	1 460	15%	52.12	1.51	1250	357	4966	37%	51.21	0.97
	B2MR	NRLMedium_413	5	553	103	5 228	16%	49.41	1.46	591	8	5575	15%	57.46	1.59
	B3MR	NRLLarge_218	17	1 172	957	18 895	17%	70.43	3.04	1388	1157	22351	18%	76.96	3.17
Mixed irrigated system (MI)	B1MI	Bssmall_1114	2	1 322	281	1 549	38%	22.05	1.71	2361	643	2779	49%	25.65	1.38
	B2MI	BSMedium_1419	3	997	256	1 684	25%	10.39	3.50	2185	978	3715	40%	11.57	2.64
	B3MI	BSLarge_1308	9	276	253	1 832	5%	44.25	3.87	1654	1640	11388	24%	49.04	3.11
Fattening system (OF)	B1OF														
	B2OF														
Peri-urban dairy system (OM)	B1OM														
	B2OM														
Sheep															
Grass land system (LG)	O1LG	W46	22	230	202	12 457	51%	27.36		264	214	18985	55%	26.31	
	O2LG	W83	61	85	66	676	20%	45.01		123	86	1299	26%	43.26	
	O3LG	W19	189	50	12	5 995	19%	42.93		75	22	11312	26%	41.34	
Mixed rain-fed system (MR)	O1MR	Tiba 221	1	135	129	1 005	28%	45.54		135	129	1005	28%	45.54	
	O2MR	Bustan-130	4	63	74	1 980	13%	49.03		63	74	1980	13%	49.03	
	O3MR	Hamam-308	45	190	187	5 978	39%	35.21		190	187	5978	39%	35.21	
Mixed irrigated system (MI)	O1MI	BS1112	2	197	74	4 610	51%	23.72		197	74	4610	51%	23.72	
	O2MI	BS1106	7	187	164	9 219	48%	25.39		187	164	9219	48%	25.39	
	O3MI														
Fattening system (OF)	O1OF														
	O2OF	09-janv	120												
Goats															
Grass land system (LG)	G1LG	W25	7	126	-118	6 258	28%	45.89	1.19	126	-118	6258	28%	45.89	1.19
	G2LG	W52	15	151	33	1 848	47%	35.07	1.28	151	33	1848	47%	35.07	1.28
	G3LG	W55	47	137	-8	4 787	35%	21.61	1.81	137	-8	4787	35%	21.61	1.81
Mixed rain-fed system (MR)	G1MR	Tiba 207	1	333	-90	2 287	79%	17.63	0.00	333	-90	2287	79%	17.63	0.00
	G2MR	Bustan 115	2	170	-119	4 248	59%	23.90	0.00	170	-119	4248	59%	23.90	0.00
	G3MR	Hamam 312	7	183	59	3 220	64%	10.85	0.96	183	59	3220	64%	10.85	0.96
Mixed irrigated system (MI)	G1MI	BS1120	1	136	-150	1 842	48%	30.73	0.00	151	-146	2338	51%	29.71	0.00
	G2MI	BS1407	2	293	-74	7 653	60%	34.41	0.00	293	-74	7653	60%	34.41	0.00
	G3MI	BS1105	7	250	10	9 496	60%	14.64	1.37	250	10	9496	60%	14.64	1.37
Camels															
Grass land system (LG)	C1LG	W62	1.50	637	430	2 080	37%	28.75	0.00	637	430	2080	37%	28.75	0.00
	C2LG	W55	7.80	1 022	950	8 414	69%	13.00	2.11	1022	950	8414	69%	13.00	2.11
	C3LG	W88	38.20												

4.2. Impact assessment at the household level

Approaching and measuring this technical and economic improvement at the farm household level needs to consider all farm and off-farm activities. Within the LSIPT frame, this analysis is conduced at the household level for each agro-ecological zone.

4.2.1. Impact for households in grazing systems (LG)

For the analysis at the household level, we have differentiated two types of category of households based on:

1) Their specialization or activity profile considering the categories of breeders called also 'livestock producers' (50% of income come from livestock activity), 'cultivator' (50% of income from crop cultivation), 'off-farm' (50% of income from off-farm activities), and 'mixed' (there are no dominant activities).
2) The level of wellbeing according to their total net income. Income terciles are computed based on the total net income attributed to each household. The data (of each household) are ordered according to the value of the total net income. Two cut-point values (the so-called tercile cut-off points) of income are identified, dividing the survey population into three groups equally represented by one-third of individuals each. The first tercile group represents one-third of the population with the lowest income called 'very poor' (an income smaller or equal to the first cut-off value), and the third tercile group (called 'rich') represents the third of population with the highest income (an income greater than the second cut-off value). In-between, there is the second or intermediary tercile called 'poor.'

Tables 4.2a and 4.2b give an overview of the contribution of the dominant livestock system and all livestock activities to the household income. In the 'livestock producer' category, if the total livestock activities contribution reaches around 75 to 97% of the total net household income, they cover only 8% of the poverty line for the 'very poor' category, against almost 85% for the 'rich' category of breeders. The contribution of livestock is the most important for the 'very poor' in the 'mixed' and 'cultivator' categories confirming the role of livestock in reducing poverty in the mixed systems. In the majority of farm systems in grazing lands with sheep (representing 80% of the sample), the activity of sheep provides from 30 to 32% of total household income.

Table 4.2a. Contribution of the livestock activities to household income by category of household (in the situation without change, T0) (rangeland zone, LG)

Without (without change)

			Contribution of livestock production to income (dominant system)			Contribution income livestock production (all livestock farming systems)		
		Number of households	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow
Mixed	Very poor	4	33%	5%	38%	43%	7%	36%
	Poor	2	17%	5%	15%	20%	6%	13%
	Rich	2	16%	10%	15%	19%	12%	14%
Livestock producer	Very poor	14	75%	6%	-17%	97%	8%	17%
	Poor	15	51%	16%	84%	80%	24%	-18%
	Rich	5	53%	24%	-109%	75%	85%	887%
Cultivator	Very poor	7	35%	4%	59%	39%	5%	51%
	Poor	10	22%	7%	26%	30%	10%	29%
	Rich	18	15%	12%	12%	20%	16%	12%
Off-farm activities	Very poor	6	19%	3%	12%	18%	3%	11%
	Poor	4	15%	5%	8%	18%	6%	8%
	Rich	7	14%	12%	10%	17%	14%	10%
Total	Very poor	**31**	**51%**	**5%**	**13%**	**61%**	**6%**	**27%**
	Poor	**31**	**35%**	**11%**	**51%**	**52%**	**16%**	**2%**
	Rich	**32**	**21%**	**14%**	**-8%**	**28%**	**26%**	**153%**
	Total	**94**	**35%**	**10%**	**19%**	**47%**	**16%**	**61%**

Table 4.2b. Contribution of the livestock activities to household income by category of dominant livestock system (in the situation without change, T0) (Rangeland zone, LG)

Without (without change)

			Contribution of livestock production to income (dominant system)			Contribution income livestock production (all livestock farming systems)		
		Number of households	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow
Cattle								
	Small	0						
	Medium	0						
	Large	0						
Sheep								
	Small	30	31%	8%	48%	37%	10%	45%
	Medium	23	30%	9%	28%	42%	13%	30%
	Large	22	32%	11%	-18%	46%	28%	-10%
Goats								
	Small	0						
	Medium	4	91%	2%	-7%	93%	3%	-5%
	Large	6	42%	13%	-66%	73%	23%	542%
Camels								
	Small	0						
	Medium	2	51%	11%	60%	78%	19%	74%
	Large	5	44%	16%	73%	66%	24%	77%
Poultry								
	Small	0						
	Medium	0						
Swine								
	Small	0						
	Medium	0						

Figure 4.1 gives the monetary contribution of the livestock activity to achieve the poverty line for each income tercile within each activity profile. We can observe the important gap between the 'Rich' for the 'livestock producer' category and the other categories. Only large breeders in grazing lands can have a consequent net income and then living standards due to livestock contribution, knowing that the natural conditions do not allow developing other agricultural activities. However, the selection of resistant local breeds would have a major impact on the categories of 'mixed' and 'cultivators' and, to a lesser degree, on the 'very poor' and 'poor' groups of the 'livestock producer.'

Except for the 'rich' in the 'mixed' category, the simulated intervention induces a reduction of the protein contribution of livestock activity in the household diet (fig. 4.2). This effect is mainly due to the changes in the tercile of income of households that affect the average protein coverage for each category.

Figure 4.1. Effect of the different interventions (livestock management improvement) on the contribution of livestock income to achieve the poverty line for each household category in the rangeland zone (LG)

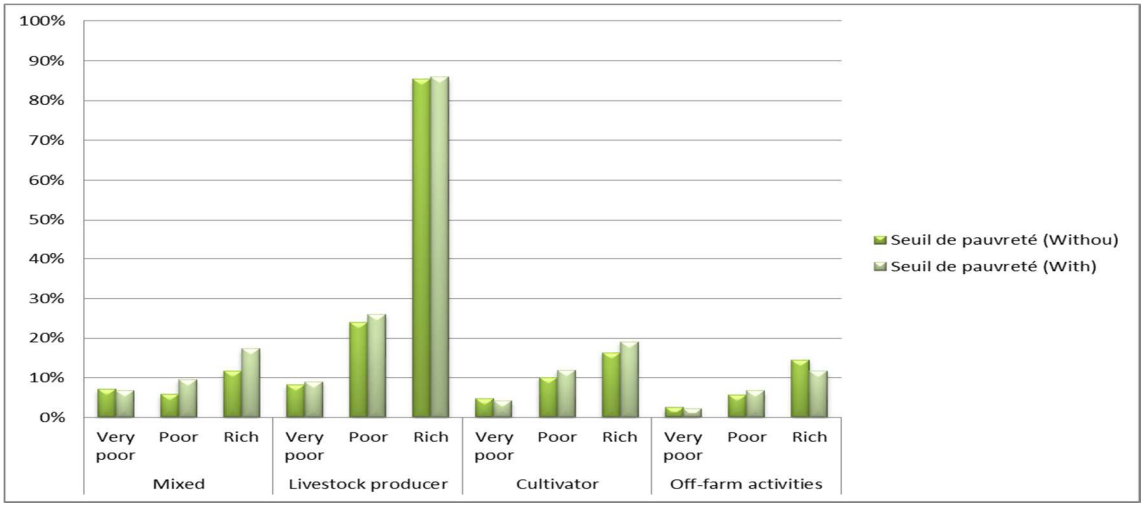
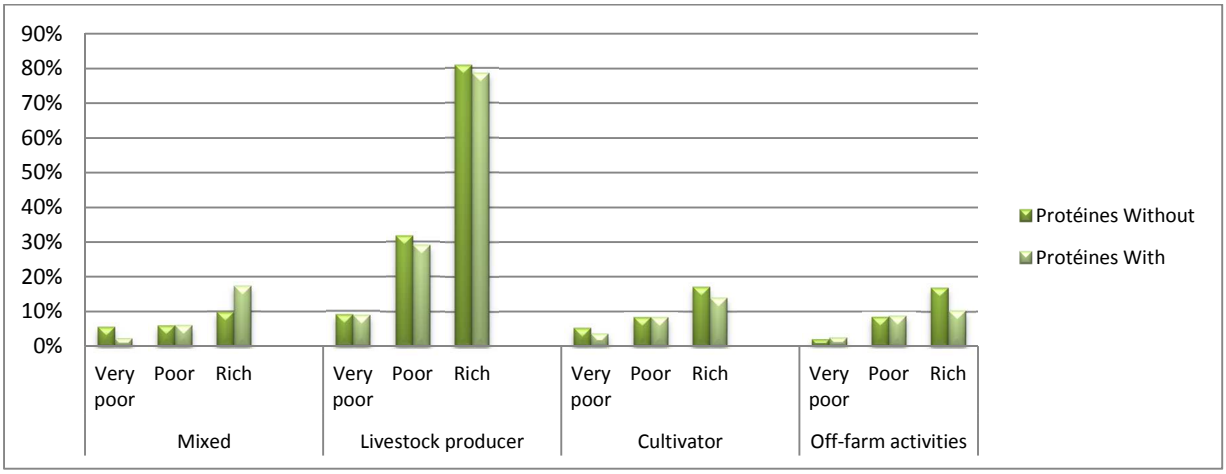


Figure 4.2. Effect of the different interventions (livestock management improvement) on the contribution of on-farm livestock consumption to cover the protein needs for each household category in the rangeland zone (LG)



Two indicators of poverty are produced (see table 4.3): 1) Incidence of poverty: percent of households living below the poverty line; 2) Depth of poverty: the average difference between the incomes of poor households and the poverty thresholds. These indicators confirm the livelihood improvement of households in the 'mixed' and 'cultivator' categories due mainly to the net income increase per animal. However, we can see a different impact of the change. For the "mixed' systems, if we observe a significant reduction of poverty incidence, the intervention affects the depth of poverty lightly. For the category of 'cultivator,' we note the opposite effect with a slight reduction of the poverty incidence but a significant reduction of the depth of poverty.

Table 4.3. Impact of the intervention on the indicators of incidence and depth of poverty in the rangeland zone (LG)

	Without changes			With changes		
	Incidence	Depth	Distribution of the poor	Incidence	Depth	Distribution of the poor
Total	89%	0.60	100%	87%	0.58	100%
Households according to type of activity						
Mixed	100%	0.68	10%	90%	0.67	11%
Livestock producer	97%	0.73	39%	95%	0.77	45%
Cultivator	80%	0.48	33%	77%	0.40	28%
Off-farm activities	88%	0.58	18%	87%	0.52	16%

4.2.2. Impact for households in the newly reclaimed lands (MR)

The farm systems in the newly reclaimed lands (NRLs) are the most specialized agricultural systems, mainly toward crop activities, with 63% of households belonging to the category of 'cultivator.' Around 45% have only cattle or buffaloes. 48% are mixed livestock systems with sheep and goat and 5% with only sheep and goat; this concerns mainly the farm systems at the border of the rainfed zone in the northern coastal zone. Over the 173 surveyed farms, around 19% belong to the category of 'livestock producers,' and the dominant livestock systems based on cattle and buffaloe contribution to 37% up to 84% of the household net income. In the 'mixed' and 'cultivator' categories, the dominant livestock activities represent between 6% and 20% of the total income at the household level and contribute to 4 up to 20% of the poverty line. For the 'very poor' of the 'mixed' category, if all the total livestock income contributes to an average of 8% of the poverty line, the cash flows from livestock activity ensure between 59% of the total liquidity. This result confirms the role of livestock in terms of financing (table 4.4a & b).

Table 4.4a. Contribution of livestock activities to household income by category of household in the mixed rainfed zone (MR) (in the situation without change)

Without (without change)

			Contribution of livestock production to income (dominant system)			Contribution income livestock production (all livestock farming systems)		
		Number of households	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow
Mixed	Very poor	1	16%	4%	57%	31%	8%	59%
	Poor	2	13%	8%	11%	13%	9%	11%
	Rich	2	14%	40%	12%	15%	44%	15%
Livestock producer	Very poor	24	84%	13%	61%	91%	14%	58%
	Poor	7	66%	41%	72%	73%	46%	79%
	Rich	1	67%	92%	63%	67%	92%	63%
Cultivator	Very poor	21	20%	6%	3%	19%	5%	7%
	Poor	41	13%	11%	9%	13%	11%	10%
	Rich	48	6%	20%	5%	6%	25%	7%
Off-farm activities	Very poor	11	16%	5%	6%	17%	6%	7%
	Poor	8	4%	3%	0%	4%	3%	0%
	Rich	7	7%	16%	4%	8%	16%	9%
Total	Very poor	**57**	**47%**	**9%**	**31%**	**49%**	**9%**	**31%**
	Poor	**58**	**19%**	**14%**	**16%**	**19%**	**14%**	**17%**
	Rich	**58**	**8%**	**22%**	**6%**	**7%**	**26%**	**9%**
	Total	**173**	**25%**	**15%**	**18%**	**25%**	**16%**	**19%**

Table 4.4b. Contribution of livestock activities to household income by category of dominant livestock system in the mixed rainfed zone (MR) (in the situation without change)

Without (without change)

			Contribution of livestock production to income (dominant system)			Contribution income livestock production (all livestock farming systems)		
		Number of households	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow
Cattle								
	Small	40	20%	3%	1%	21%	3%	2%
	Medium	43	25%	6%	17%	28%	7%	15%
	Large	56	32%	33%	29%	34%	39%	33%
Sheep								
	Small	0						
	Medium	1	1%	1%	1%	1%	2%	1%
	Large	8	33%	15%	56%	47%	22%	59%
Goats								
	Small	1	2%	1%	-1%	2%	1%	-1%
	Medium	3	1%	1%	-1%	1%	1%	-1%
	Large	7	4%	4%	1%	5%	6%	2%
Camels								
	Small	0						
	Medium	0						
	Large	0						
Poultry								
	Small	0						
	Medium	0						
Swine								
	Small	0						
	Medium	0						

In the mixed rainfed zone (MR), the simulation concerns the improvement of milk production thanks to an increase in milk price and the improvement of the feed supplementation (with the purchase of concentrate at 18% protein content). This change induces an increase in livestock activity's contribution to household net income for all categories, but only for the middle- and upper-income terciles, i.e., the 'poor' and 'rich' groups. This intervention has mainly a beneficial effect on the 'poor' group of the 'mixed' category.

Figure 4.3. Effect of the different interventions (livestock management improvement) on the contribution of livestock income to achieve the poverty line for each household category in the mixed rainfed zone (MR).

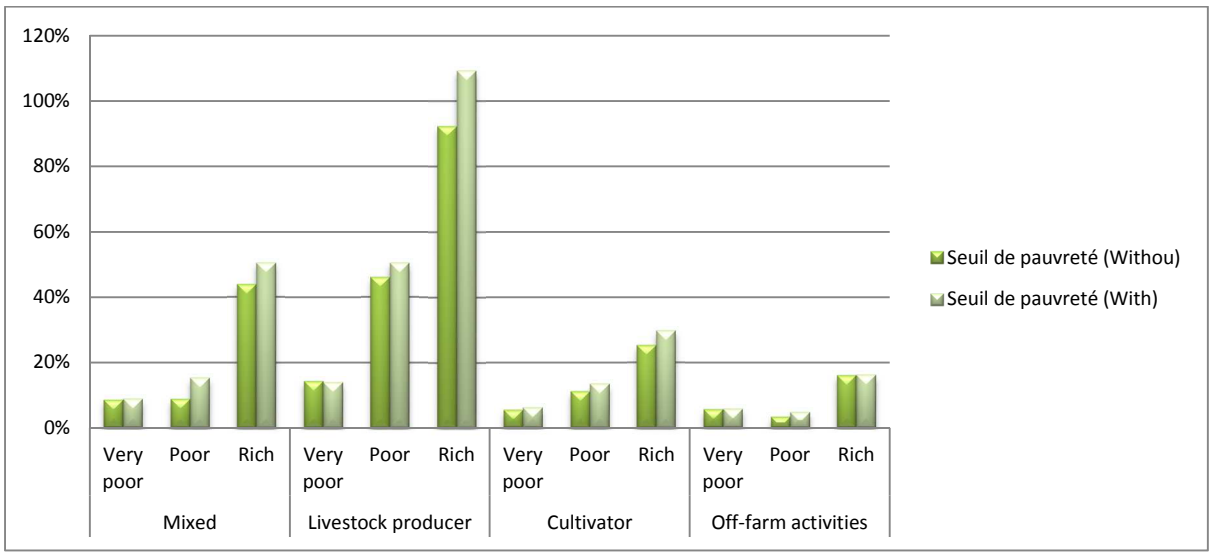


Figure 4.4. Effect of the different interventions (livestock management improvement) on the contribution of on-farm livestock consumption to cover the protein needs for each household category in the mixed rainfed zone (MR)

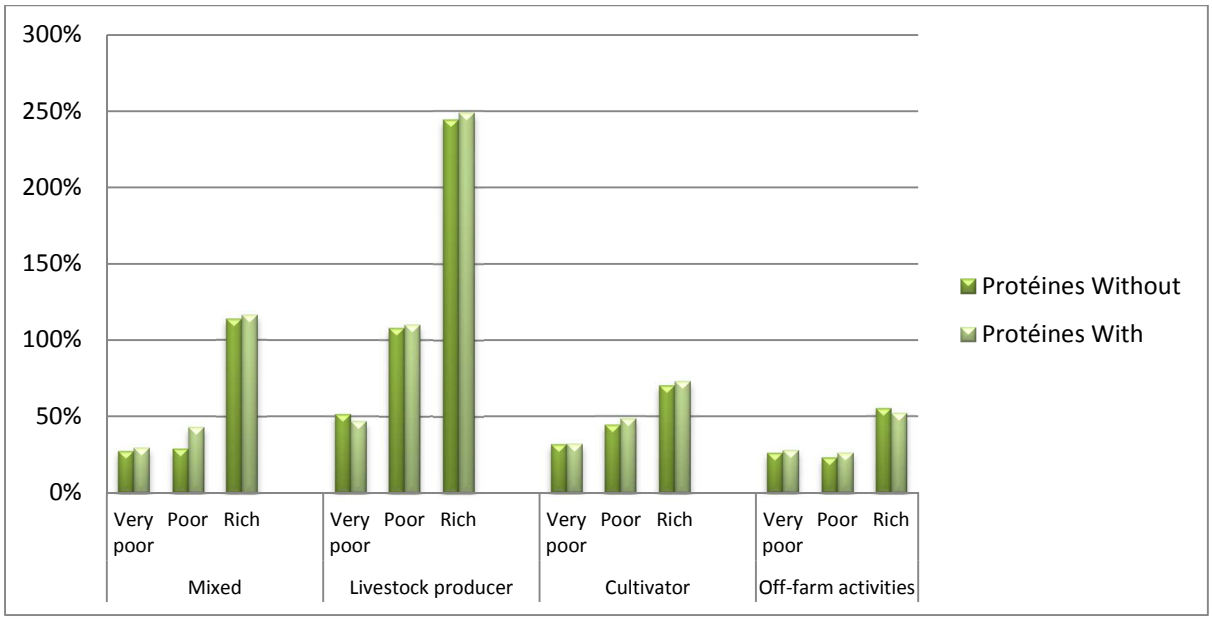


Table 4.5 shows a contrasting effect of the intervention on the poverty indicators between the four categories of the household population with a deterioration of the financial situation of the 'mixed' categories.

Table 4.5. Impact of the intervention on the indicators of incidence and depth of poverty

	Without changes			With changes		
	Incidence	Depth	Distribution of the poor	Incidence	Depth	Distribution of the poor
Total	59%	0.33	99%	57%	0.31	99%
Households according to type of activity						
Mixed	60%	0.23	3%	70%	0.52	7%
Livestock producer	94%	0.70	29%	92%	0.76	35%
Cultivator	45%	0.20	49%	39%	0.16	42%
Off-farm activities	69%	0.38	18%	68%	0.31	15%

4.2.3. Impact for households in old irrigated lands (MI)

In the irrigated zone (MI) corresponding to the Nile valley area, the households are distributed in the three main categories of 'livestock producer' (30% of households), 'cultivator' (with 33%), and the 'Off-farm activities' (with 29%). The remaining 8% are mixed farming systems without a dominant activity. Regarding livestock activities, 43% are specialized systems with cattle and buffaloes, and 50% are multi-species systems with goat and poultry. In the sample, the livestock activities contribute to 69% of the total net income for the 'very poor,' compared to 25% and 19% for the 'poor' and rich' categories. For the 'poor' group in the category of 'livestock producer,' the dominant livestock represent only 19% of the poverty line and 43% of the cash flow, compared, respectively, to 34% et 59% when including all the livestock activities. In this group, cattle and buffalos constitute mainly a capital although goat and poultry a regular flux of cash flow to cover daily household needs.

Table 4.6a. Contribution of livestock activities to household income by category of household (in the situation without change) in the mixed irrigated zone (MI)

Without (without change)

			Contribution of livestock production to income (dominant system)			Contribution income livestock production (all livestock farming systems)		
		Number of households	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow
Mixed	Very poor	0						
	Poor	3	13%	7%	5%	15%	8%	7%
	Rich	3	13%	31%	9%	18%	41%	14%
Livestock producer	Very poor	16	65%	9%	82%	84%	13%	74%
	Poor	5	39%	19%	43%	68%	34%	59%
	Rich	1	50%	57%	50%	60%	69%	53%
Cultivator	Very poor	7	39%	8%	16%	39%	8%	16%
	Poor	7	14%	7%	13%	16%	8%	13%
	Rich	9	15%	20%	12%	20%	26%	16%
Off-farm activities	Very poor	1	24%	8%	6%	24%	8%	6%
	Poor	9	10%	5%	4%	13%	6%	6%
	Rich	11	10%	11%	7%	15%	15%	9%
Total	Very poor	**24**	**56%**	**9%**	**59%**	**68%**	**11%**	**54%**
	Poor	**24**	**18%**	**9%**	**15%**	**25%**	**13%**	**19%**
	Rich	**24**	**14%**	**19%**	**11%**	**19%**	**25%**	**14%**
	Total	**72**	**29%**	**12%**	**28%**	**38%**	**16%**	**29%**

Table 4.6b. Contribution of livestock activities to household income by category of dominant livestock system (in the situation without change) in the mixed irrigated zone (MI).

Without (without change)

			Contribution of livestock production to income (dominant system)			Contribution income livestock production (all livestock farming systems)		
		Number of households	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow	Income from livestock/Total income	Income from livestock/Poverty line	% livestock production cash flow
Cattle								
	Small	11	36%	10%	60%	41%	11%	27%
	Medium	21	39%	10%	26%	46%	13%	33%
	Large	19	16%	7%	16%	21%	8%	19%
Sheep								
	Small	0						
	Medium	0						
	Large	0						
Goats								
	Small	0						
	Medium	0						
	Large	1	31%	4%	2%	50%	7%	27%
Camels								
	Small	0						
	Medium	0						
	Large	0						
Poultry								
	Small	0						
	Medium	20	26%	21%	26%	42%	32%	37%
Swine								
	Small	0						
	Medium	0						

The Figure 4.5 shows similar results observed in the MR zone with a positive impact of the intervention in terms of income for the categories of 'cultivator' and a negative impact concerning the 'rich' breeders because they are obliged to invest in concentrates. The highest positive impact concerns the 'rich' group in the categories of 'cultivator,' 'mixed,' and, to a lesser extent, 'off-farm' systems. We can note that this intervention has positive impacts on the coverage of protein needs for the category of 'poor' that mainly self-consume their milk production, compared to 'very poor' or 'rich' categories that market a large part of their milk production, and this whatever the specialization (Fig 4.6).

Figure 4.5. Effect of the different interventions (livestock management improvement) on the contribution of livestock income to achieve the poverty line for each household category in the mixed irrigated zone (MI).

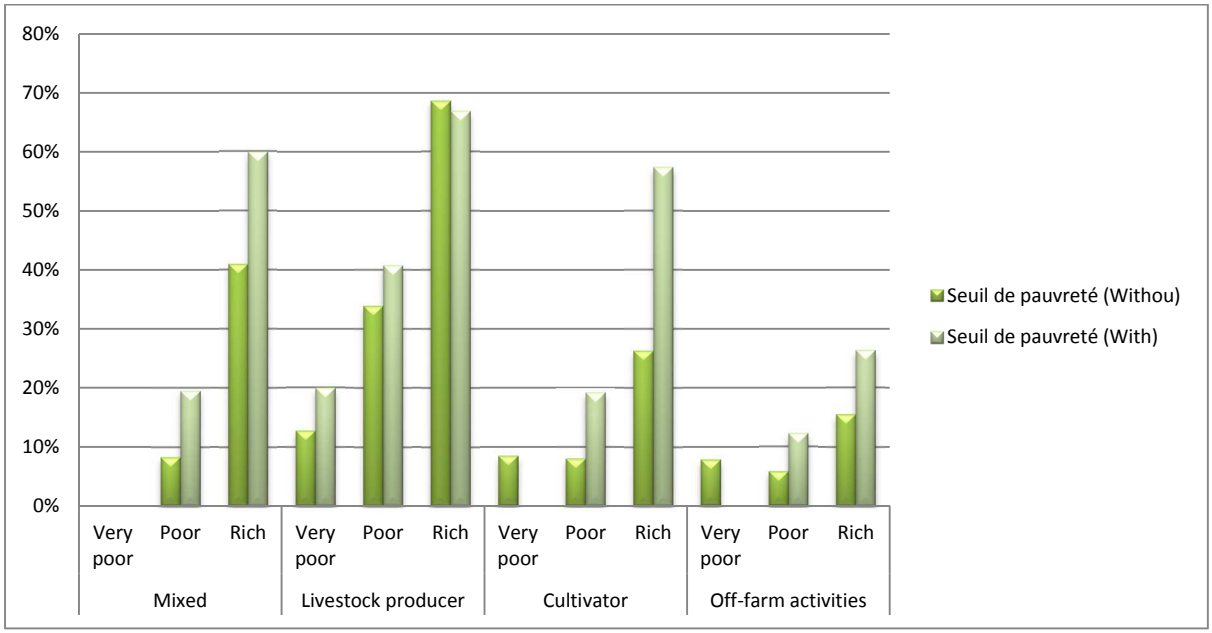


Figure 4.6. Effect of the different interventions (livestock management improvement) on the contribution of on-farm livestock consumption to cover the protein needs for each household category in the mixed irrigated zone (MI)

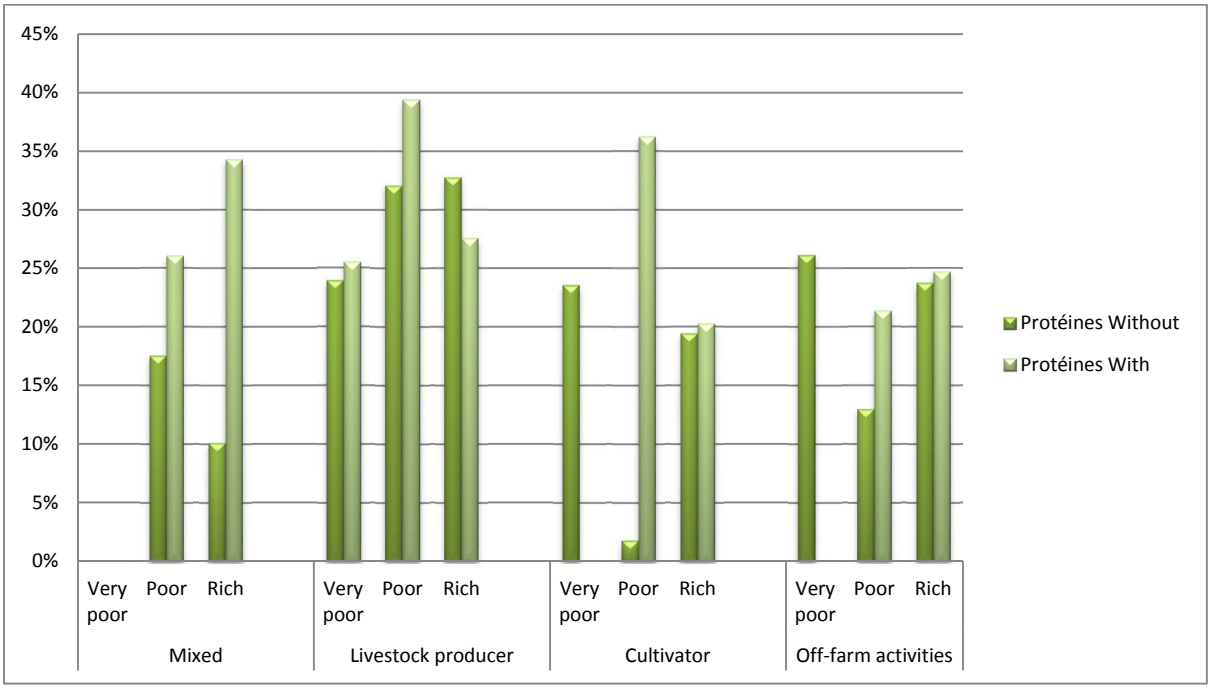


Table 4.7 confirms the highest positive impact of the intervention for the category of 'cultivator,' with a decrease of poverty incidence from 70% to 22%, and then on 'off-farm' categories with a decrease of incidence from 71% to 56%. These results show that an intervention regarding dairy intensification could benefit to the majority of mixed crop-livestock systems.

Table 4.7. Impact of the intervention on the indicators of incidence and depth of poverty in (MI) zone

	Without changes			With changes		
	Incidence	Depth	Distribution of the poor	Incidence	Depth	Distribution of the poor
Total	78%	0.45	100%	68%	0.32	100%
Households according to type of activity						
Mixed	67%	0.25	7%	67%	0.27	12%
Livestock producer	95%	0.73	38%	86%	0.79	63%
Cultivator	70%	0.39	29%	22%	0.02	4%
Off-farm activities	71%	0.26	27%	56%	0.18	20%

4.3. Impact assessment at the national level

At the national level, the toolkit allows assessing the impact of the changes (like technology improvement interventions) on the total added-value (GDP) and the overall national poverty according to the number of households depending on these activities.

4.3.1. Impact assessment on the GDP

Table 4.8 shows the different distribution of the added-value generated by livestock products according to the type of product or the main subsystem. The main change concerns the increase of the milk added-value from 32.9% in the situation without change to 35.7% with the intervention on milk price and feed supplementation. We also note an increasing contribution of the sheep system in the LG zone passing from 0.8% to 4.5% of the total added-value generated by the livestock sector.

Table 4.8. Share of livestock sector in the GDP at the time horizon of 15 years (with and without change) (VA for added value)

	Breakdown of Total VA %	VA direct	Monetary VA/Total VA	Non-monetary	VA indirect (%)
A. WITHOUT change (T0)					
4. Synthesis/product					
Meat	44.5%	57.5%	57.9%	45.5%	
Milk	32.9%	42.5%	42.1%	54.5%	
Eggs	0.0%	0.0%	0.0%	0.0%	
Hides, skins & wool	0.0%	0.0%	0.0%	0.0%	
Manure	22.6%	0.0%	0.0%	0.0%	100.0%
Energy	0.0%	0.0%	0.0%	0.0%	0.0%
Other	0.0%	0.0%	0.0%		
Total	100%	100%	100%	100%	100%
5. Synthesis by main subsystem					
LG	0.8%	2.7%	2.7%	2.7%	0.0%
MR	12.9%	0.0%	2.5%	-9.6%	14.6%
MI	86.3%	97.3%	94.8%	107.0%	85.4%
Other village (swine mixed+village poultry=4 systems)	0.0%	0.0%	0.0%	0.0%	0.0%
Other specialized (fattening, periurban dairy, intensive poultry)	0.0%	0.0%	0.0%	0.0%	0.0%
Other species	0.0%	0.0%	0.0%	0.0%	0.0%
Total*	100%	100%	100%	100%	100%
B. WITH change (T1)					
4. Synthesis/product					
Meat	42.6%	54.4%	57.9%	45.5%	
Milk	35.7%	45.6%	42.1%	54.5%	
Eggs	0.0%	0.0%	0.0%	0.0%	
Hides, skins & wool	0.0%	0.0%	0.0%	0.0%	
Manure	21.7%	0.0%	0.0%	0.0%	100.0%
Energy	0.0%	0.0%	0.0%	0.0%	0.0%
Other	0.0%	0.0%	0.0%		
Total	100%	100%	100%	100%	100%
5. Synthesis by main sub-system					
LG	4.5%	13.3%	13.3%	13.0%	0.2%
MR	73.1%	0.1%	12.3%	-46.9%	99.8%
MI	22.4%	86.6%	74.4%	133.9%	0.0%
Other village (swine mixed+village poultry=4 systems)	0.0%	0.0%	0.0%	0.0%	0.0%
Other specialized (fattening, periurban dairy, intensive poultry)	0.0%	0.0%	0.0%	0.0%	0.0%
Other species	0	0	0	0	0.0%
Total	100%	100%	100%	100%	100%

4.3.2. Impact assessment on the poverty indicators

Table 4.9 gives the main results concerning the impact of the interventions on the poverty indicators. If you observe an overall increase of total net income per capita for all the subsystems (except the goat subsystem in LG), the incidence of poverty is the most significant for the 'rich' category in the two main agricultural zones (i.e., Mixed rainfed (MR) and irrigated (MI)).

Table 4.9. Income distribution and poverty analysis without and with the change in the three agroecological zones

		A. Without change				B. With change (T1)			
		Total household net income per capita	% income from livestock production	Incidence of poverty	% of net income from livestock	Total household net income per HH	% income from livestock production	Incidence of poverty	% of net income from livestock
Grass land system (LG)									
Sheep	O1LG	2 287	37%	93%	1.6%	2 332	39%	94%	1.7%
	O2LG	3 320	42%	87%	1.3%	3 503	51%	84%	1.9%
	O3LG	3 884	46%	77%	3.9%	4 284	52%	75%	5.3%
Goats	G1LG								
	G2LG	617	93%	100%	0.1%	298	118%	100%	0.1%
	G3LG	1 755	73%	100%	1.0%	1 619	50%	100%	0.9%
Camels	C1LG								
	C2LG	1 287	78%	100%	0.3%	1 377	79%	1	0.3%
	C3LG				0.0%				0.0%
					8.2%				**10.2%**
Mixed rain-fed system (MR)									
Cattle	B1MR	8 203	21%	68%	0.2%	8 790	28%	60%	0.5%
	B2MR	5 397	28%	74%	0.5%	5 422	28%	74%	0.6%
	B3MR	18 296	34%	46%	4.2%	18 419	36%	43%	4.7%
Sheep	O1MR								
	O2MR	9 745	1%	0%		9 745	1%	0%	
	O3MR	7 829	47%	63%		6 767	49%	67%	
Goats	G1MR	2 117	2%	100%	0.0%	2 117	2%	100%	0.3%
	G2MR	8 938	1%	33%	0.2%	8 938	1%	33%	
	G3MR	9 088	5%	43%	0.9%	7 145	8%	50%	
					6.0%				**6.0%**
Mixed irrigated system (MI)									
Cattle	B1MI	2 801	41%	82%	11.8%	3 445	52%	83%	18.3%
	B2MI	3 020	46%	86%	30.3%	3 992	60%	82%	80.1%
	B3MI	4 818	21%	84%	19.4%	7 316	47%	52%	138.4%
Goats	G1MI								
	G2MI								
	G3MI	807	50%	100%	15.9%				
					77%				**237%**
Other village backyard systems (V)									
Poultry	V1OV								
	V2OV	5 534	42%	60%	8.39%	5 929	62%	33%	5.31%
					8.4%				**5.3%**
Total					**100%**				**258%**

Inequality and poverty indicators without change (T0)								With change (T1)					
		LG	MR	MI	V	O	All	LG	MR	MI	V	O	All
Income levels (total)													
Income of the poorest		617	2 117	807	5 534	0	**617**	298	2 117	3 445	5 929	0	**298**
Income of the richest		3 884	18 296	4 818	5 534	0	**18 296**	4 284	18 419	7 316	5 929	0	**18 419**
Inequality indicators													
Gini coefficient*		0.34	0.51	0.32				0.33	0.50	0.26			
Income of the richest/poorest		6	9	6	1		**30**	14	9	2	1		**62**
Incidence of poverty by system and relative contribution													
% poor households		83%	52%	87%	60%		**84%**		86%	70%	33%		**73%**
System's contribution to the poor population		2%	4%	92%	2%	0%	**100%**	3%	9%	87%	1%	0%	**73%**
Incidence of poverty according to the relative importance of livestock farming as main or secondary activity													
	Main income	13%	0.0%	14%	0%		**13%**		0.0%	48%	33%		**45%**
50%	Secondary income	70%	51.5%	87%	60%		**83%**		85.6%	22%	0%		**28%**
*Other village backyard systems (V) included in each main system (LG, MR, MI)													

4.3.3. Impact assessment on the inequity

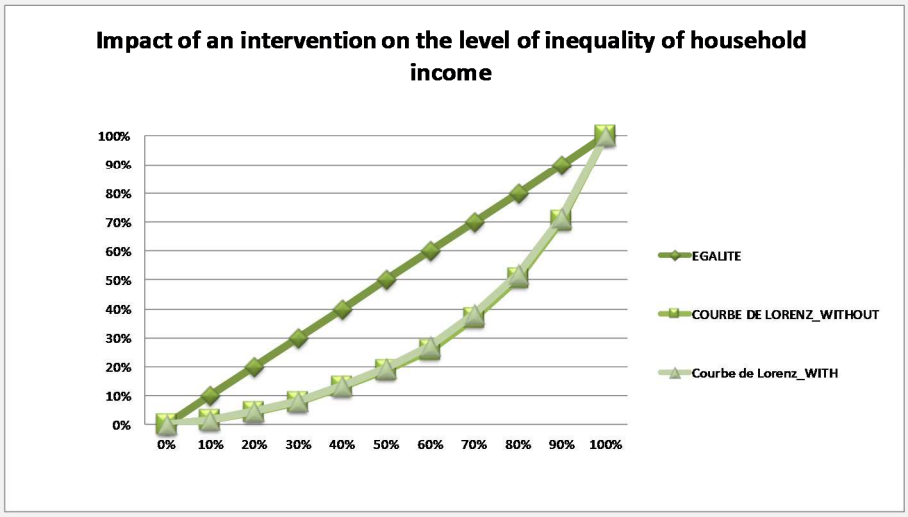
Figures 4.7 shows the Gini indicators and curb of Lorentz in the LG zone (a), MR zone (b), and MI zone (c). The major impact of the intervention in terms of reduction of inequity is noted in the MI zone (c) with a reduction of the Gini indicator from 0.32 to 0.25 even if the three zones registers a positive impact of the change in terms of equity. These figures also highlight the high inequity in the newly reclaimed lands (MR) in link with the land attribution in the region over the last 60 years (see Alary et al, 2018).

Figure 4.7. Gini indicators and curb of Lorentz in the LG zone (a), MR zone (b) and MI zone (c)

(a)

GINI coefficient (the closer the coefficient is to 1 the more unequal the income structure)

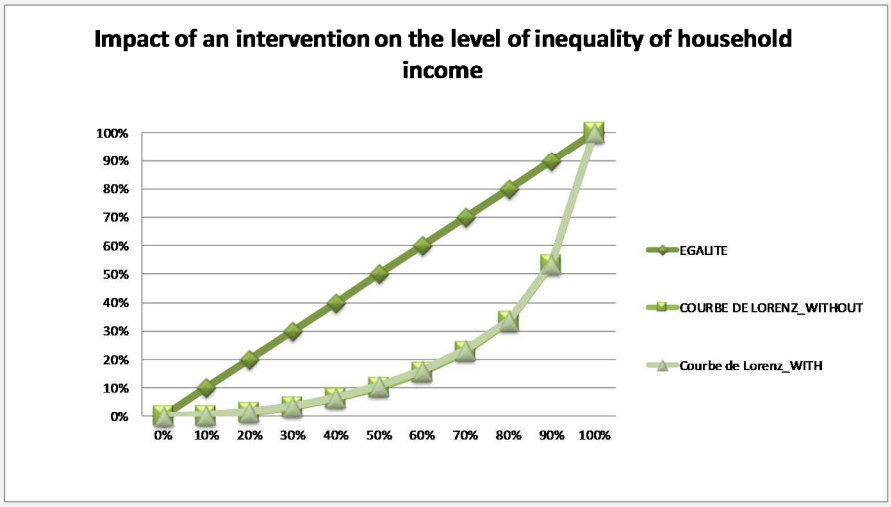
Without change (without):	**0.343**
With change (with):	**0.328**



GINI coefficient (the closer the coefficient is to 1 the more unequal the income structure)

Without change (without): **0.509**
With change (with): **0.500**

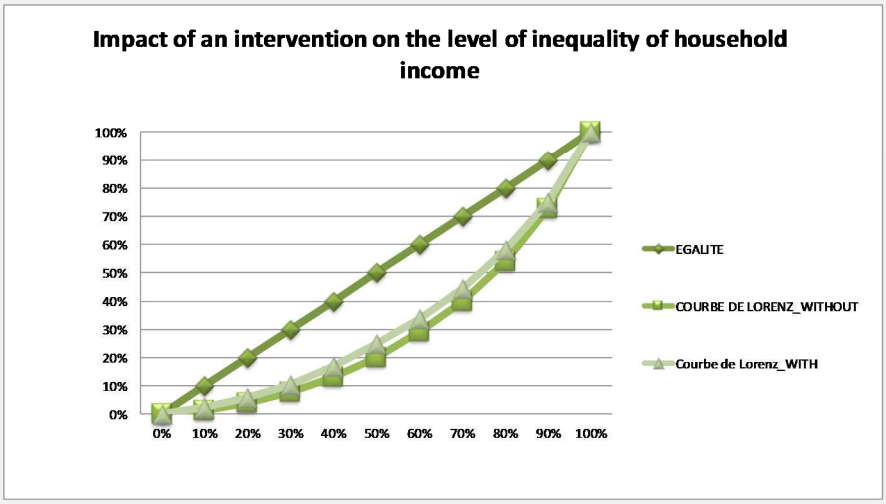
(b)



GINI coefficient (the closer the coefficient is to 1 the more unequal the income structure)

Without change (without): **0.318**
With change (with): **0.259**

(c)



5. Discussion and conclusion

5.1. Impact assessment of technological options in Egypt

Firstly, the majority of indicators in the situation without change (called T0) confirms the high importance of livestock activities in terms of income contribution for the categories of 'very poor,' corresponding to the first tercile of income distribution in the three zones. However, the contribution of livestock activity in the household cash flow comes mainly from the other secondary livestock species, like poultry and goats. The difference between the contribution of livestock to income and cash flow at the household level underlines the importance of the combination of animal species on the farm, especially for the small farms with few land access.

Secondly, this first exercise of impact assessment of technology changes issued from research activities highlights the importance of the two domains of intervention, i.e., dairy improvement in the mixed crop-livestock systems of the old and new reclaimed lands and the selection improvement of resistant breed for sheep and goat, mainly in pastoral and agro-pastoral zones. However, the overall results clearly show that the major impacts of these interventions reach the category of 'rich' due mainly to the initial endowment (live capital). Consequently, due to the majority of the categories of 'very poor' and 'poor,' we can note a slight effect in terms of equity improvement.

However, these first simulations don't take into account the overall changes in the value chains (meat or dairy) nor the institutional improvement, notably in the availability of concentrates all over the country; this constitutes a major uncertainty for an effective implementation of an intervention regarding livestock systems due to their wide dispersion in small scale units.

5.2. Methodological issues and opportunities of the LSIPT Toolkit

Assessing existing policies or developing new policy options require indicators to describe the current situation, to identify possible solutions, to select and implement new investment programs, and to monitor and evaluate the effects and, finally, to communicate the outcomes at all steps of the implementation. This toolkit based on a multi-scale and multi-indicator approach from the analysis of the diversity of livestock and household systems to the estimation of national indicators allows apprehending the multiplier effects of an intervention on different categories of households according to the total net income and livestock systems. However, this approach raises also some questions.

5.2.1. Data availability

The main challenge to have a good representation of the role and place of livestock in the poverty alleviation and livelihood improvement lies in combining different indicators with taking into consideration the complex status of animals within the diversity of family farms. So, the guide proposes some tools and methods to compile and interpret existing household incomes and livelihood data. However, the main problem remains the availability of reliable data in the livestock sector. This approach can require a rapid appraisal survey to collect complementary data in view to enable the differentiation of social strata of livestock dependent poor.

In the present document, we have tested the toolkit with research data collected in three regions of Egypt. These first results demonstrate that with a small sample of around 150-200 farms by zone, it is possible to have a good proxy of the national situation. However, for a prospective analysis at the national level, the sample should be targeted in link with existing national data to represent the whole diversity of farm systems. Moreover, if our data do not address the poultry sector, especially in the very small farms, these first simulations allow capturing the non-negligible role of this backyard system, especially in terms of cash flow and probably in terms of reduction of gender inequity.

This last point automatically questions the typology. As the aggregation rule to compute GDP at the national level relies on the determination of the livestock systems, the main difficulty is to identify a large enough number of systems to proxy the diversity observed in the country. Yet limiting their number facilitates the collection of reliable data on the relative weight of each of them (the greater the number, less reliable are data on their representativeness).

From this case study, we can say that the definition of subsystems and the sample should be conducted at the national level and not globally for all countries. But we could develop a standard data collection system for all countries.

5.2.2. Multi-functionality

One of the major difficulties in assessing livestock contribution at the different scales of analysis is to apprehend the multiple and complex contributions of livestock activities to the household economy through their direct and indirect products, the intra-annual and inter-annual rhythm of production, and the particular status of the animal between capital-treasury-saving-social asset. In recent years, many researchers have pointed to the importance of the 'human support capacity" of livestock thanks to the production and consumption of milk and meat, mainly in pastoral and agro-pastoral African pastoral societies (e.g., in Payne, 1990; Davis and Bennett, 2007). While avoiding an overriding view of the non-monetary aspirations and goals of breeders, mainly pastoralists, and their ability to manage risks (Roe et al., 1998), this multi-indicator approach must keep in mind the multi roles of livestock.

In this line, the LSIPT approach allows distinguishing different types of the contribution of livestock activities in the added-value, i.e., intermediate or final goods or service or monetary/in-kind exchange of goods or services. However, the static approach of the toolkit does not allow capturing the changes in animal product's valorization due to an intervention or an event. For instance, we can imagine that the intervention related to milk price and feed purchase could change the ratio between milk marketing and milk family consumption and, consequently, it will have an important impact on the overall direct and indirect GDP. Similarly, some interventions or extreme events like drought can have an impact on the price system in short, medium or long terms. These types of events that affect the whole management require more flexibility of the EcoRUM tool to take into account the changes in farm management over the 20 years.

5.2.3. Aggregation

At the first beginning, the question was to aggregate the data from the livestock systems for each agro-ecological production system at a national level and the data from the sectors to obtain an overview of the livestock sector in the national economy. So, in the LSIPT, we proposed 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 did not take into account the added-value created upstream (suppliers of inputs or raw material, etc.).

The toolkit, LSIPT, generates three livestock GDP: the direct monetary GDP, the direct non-monetary GDP, and indirect GDP. All these monetary and non-monetary resources from the livestock sector come from the aggregation of added-values evaluated at the scale of the livestock system (LS) in module 3. Then, they are compared with the official data giving the agricultural GDP or total GDP annually. Firstly, the aggregation based on individuals (i.e., system) and not products as it is usually done gives a more accurate picture of the national level. This approach of the GDP also involves the social and human contributions of livestock through home consumption, exchange or bartered products at the system level. In this way, the GDP provides a better measure of well-being. So, the global approach of the toolkit aims to give a comprehensive understanding of the contribution of livestock based on multidimensional indicators.

In the toolkit, the analysis of the livestock production sector's contribution to poverty alleviation and inequity reduction are deduced from four main series of indicators: (i) the generation of direct and indirect income (deduced from the GDP, see above), (ii) the contribution of animal nutrient in the food balance demand-supply; (iii) the relational and cognitive resources, securing resources and "capabilities" evaluated in the module 3 for each household system; and, (iv) the increase in participation in decision making ("empowerment"). In this working paper, we have only used two sets of indicators: the relative part of livestock income in the total income and the incidence of poverty or according to the relative contribution of livestock in the total income. This basic assessment reveals contrasting contributions of the different livestock species at the household level. These results call for a more integrative approach to the sustainable intensification process at the family level.

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Annex A

ELVUMED data

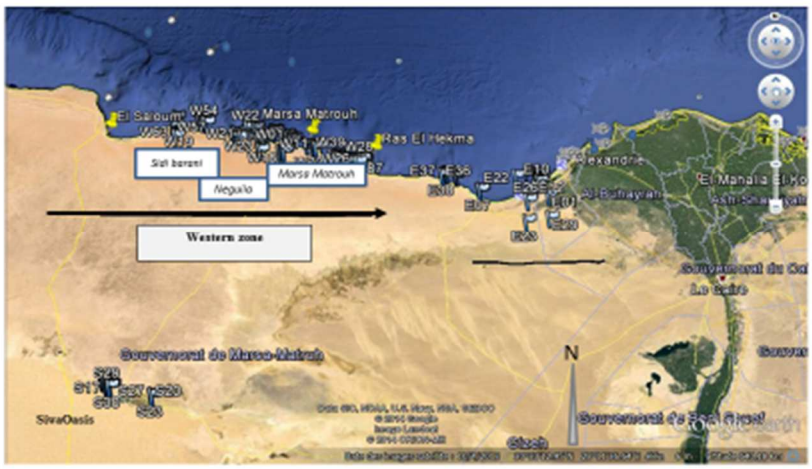

Fig. 1a. Map of the 3 districts in the rainfed agro-climatic zones (West) of the coastal zone of Western desert (Egypt) (From Google Earth 2011)

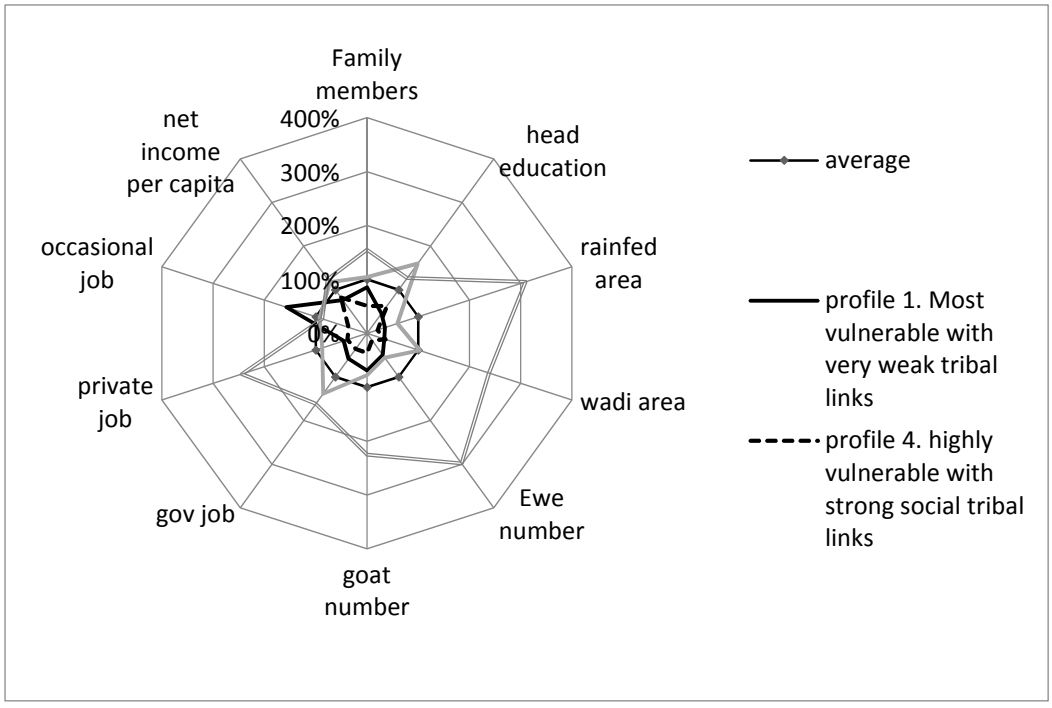

Fig A1b. Profiles of vulnerability of families in Matruh governorate (Alaty et al, 2016)

Table A1. Descriptive data of each profile in the Elvulmed project and choice of prototype for LSIPT in Land Grazing area (LG)

Cluster	**4**	**1**	**2**	**3**	**Total**
Profiles	profile 4. Highly vulnerable with strong social tribal links	profile 1. Most vulnerable with very weak tribal links	profile 2. Less vulnerable with only tribal links	profile 3. Least vulnerable with strong out and in-tribal links	
Prototype LSIPT	O1LG (W60);G1LG (W56);	O2LG (W83); G3LG (W55); C1LG (W62);C2LG(W55); B1LG (W18)	G2LG(W52)	O3LG (W19); C3LG(W88)	
Clusters (nb)	18	28	28	20	94
Family size (members)	11.2	18.7	22.8	26.5	20.1
Family labour (nb)	3.3	5.0	6.6	5.0	5.2
Bovine (heards)	0.0	0.1	0.1	0.2	0.1
Sheep (heads)	20.4	33.8	85.0	181.3	87.0
Goat (heads)	8.7	19.2	18.9	36.2	20.7
Camel (heads)	0.0	0.9	0.0	10.5	2.5
Cultivated agricultural area (fed.)	10.5	14.9	29.7	97.1	36.0
Off farm net income (Egp/year)	5430	8671	12265	15501	10574

CLIMED data

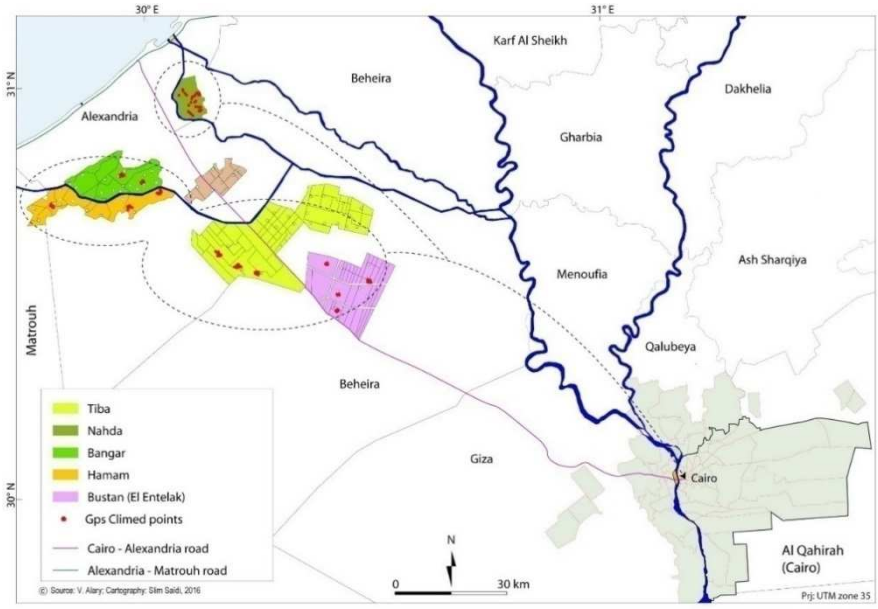

Figure A2a: Geographical location of the selected zones in the Nubaria area (Alary et al. 2018)

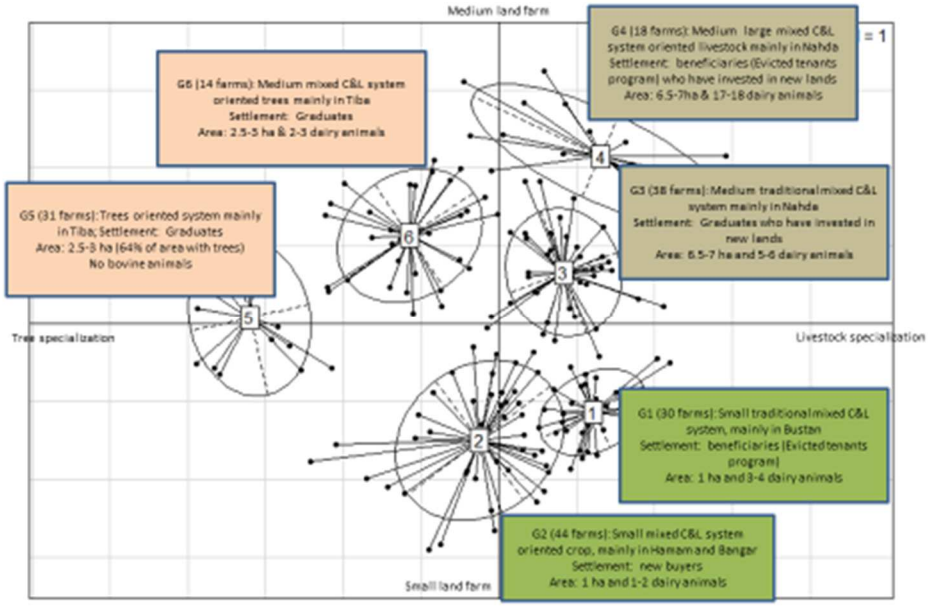

Figure A2b: Representation of the six family farming systems and their main characteristics in the first factorial plan (F1*F2)

Table A2. Descriptive data of each profile in the CLIMED project and choice of prototype for LSIPT in mixed rainfed zone (MR)

Clusters	1	2	3	4	5	6	Total
Profiles	**Small mixed C&L system**	**Small mixed C&L system oriented crop**	**Medium mixed C&L system**	**Large mixed C&L system oriented livestock**	**Graduates oriented fruit trees**	**Medium mixed C&L system oriented tree**	
Prototype LSIPT	O2MR (130)	B1MR (225); O3MR (308); G2MR (115); G3MR(312)	B2MR (413); O1MR (221)			B3MR(218); G1MR(207)	
Clusters (nb)	30	44	38	18	14	31	175
Family size (members)	8.1	8.3	10.2	12.6	5.6	7.0	8.7
Family labour (nb)	3.3	3.4	4.3	6.7	1.7	3.0	3.7
Educational level	1.3	2.0	2.6	4.4	6.1	5.8	3.3
Buffaloes (heads)	1.4	0.5	2.7	13.3	0.0	1.2	2.5
Crossbreed (heads)	4.4	1.5	5.2	19.6	0.1	2.4	4.7
Baladi Bovine (heads)	0.3	0.8	0.6	0.1	0.0	0.9	0.5
Sheep (heads)	2.7	2.3	9.0	17.2	0.7	0.5	4.9
Goat (heads)	2.0	1.3	1.4	2.2	0.6	1.8	1.6
Cultivated agricultural area (fed.)	2.6	3.2	7.1	17.0	7.2	7.1	6.4
Off farm net income (Egp/year)	527	1120	386	1511	557	847	806

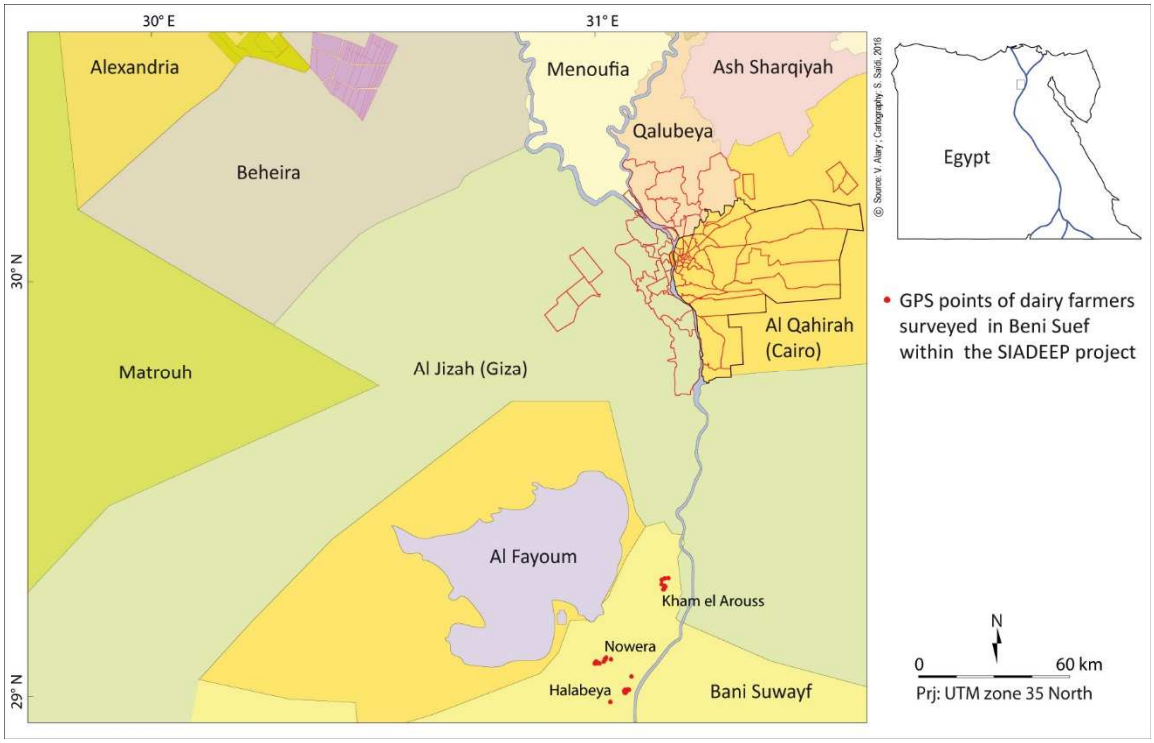

Figure A3a: Location of the surveyed farmers in the three villages investigated in Beni Suef governorate (Egypt) (SIADEEP project)

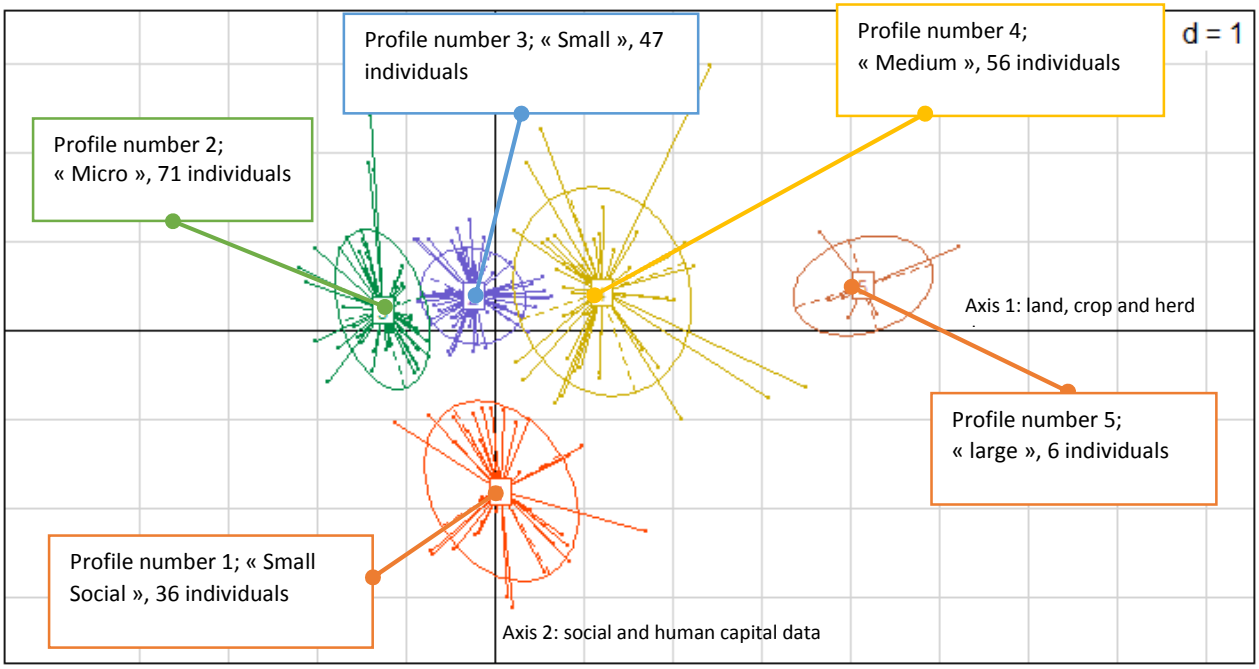

Figure A4b: Typological group projection on the two first axes of the factorial plan (with one colour for each group) (sample: 72 farmers, 2014)

Table A3. Descriptive data of each profile in the SIADEEP project (Beni Suef governorate) and choice of prototype for LSIPT in mixed irrigated zone (MR)

Cluster	1	2	3	4	5	Total
Descriptive	N°1: Small farm , nuclear family, high eduction level, good technical performances and governmental job	N°2: Micro farm, medium family size (av. 7), low educational level and occasional jobs	N°3: Small farm, medium family size, low social relationships	N°4: Medium farm, large family size, low to medium social relationships	N°5: Large farm, small to medium family size, low education level, good social network given access to permanent jobs	
Prototype LSIPT	G1MI (1120); G3MI (1105)	B1MI (1114);O2MI (1106)	O1MI (1112)	B2MI (1419)	B3MI (1308)	
sample	12	24	13	20	3	72
Family size (numbers)	4.8	7.0	7.1	8.9	5.7	7.1
Family labour (numbers)	4.0	4.8	5.2	6.1	4.3	5.1
Bovine & buffaloes (heads)	3.7	3.0	4.8	7.8	16.7	5.3
Sheep (heads)	1.9	0.9	1.9	1.5	0.0	1.4
Goat (heads)	0.6	0.5	1.0	1.3	2.0	0.9
Total cultivated area (feddan)	0.8	0.4	0.7	1.2	3.3	0.9
Off farm net income	15100	7850	10062	7800	27600	10267

Annex B: Objectives and activities for each module of the LSIPT Toolkit

Module	Objective	Main activities
M1- Initial assessment	Basic requirements fulfilled for addressing the need for wider inclusion of livestock sector issues in the PRSP.	1.Rapid assessment of the importance of the livestock sector based on available national or international key-parameters check list and key-documents (M1-SM1); 2. Identifying objectives of the current PRSP and extent of inclusion of livestock (M1-SM2).
M2-Coalition of change	An effective livestock sector coalition established with adequate financial and institutional support and a voice amongst key decision makers	1. Staffing a livestock sector team (M2-SM1); 2. Reviewing module 1 and assessment of current policy contexts (M2-SM2); 3. Characterizing the stakeholder network (M2-SM3); 4. Accessing or creating dissemination pathways (M2-SM4); 5. Drafting arrangements for implementing the methodology (M2-SM5)
M3-Livestock in household economy	Develop multiple indicators of technical and economic performances of the livestock farming systems, of products processing and marketing activities at chain level, and impact on the vulnerability at the household level.	1. Analysis of the production systems (M3-SM1) 2. Analysis of the livestock value chains (M3-SM2) 3. Evaluation of the stakeholders' OPLI (M3-SM3)
M4-Livestock in the national economy	Evaluate the contribution made by the livestock sector to the national economy and its potential for growth	1. Specify the livestock sector's contribution to the creation of wealth (GDP), food security, and the reduction of poverty and inequalities (M4-SM1) 2. Simulate the livestock production sector's potential in terms of supply-demand, competitiveness, feed resource, etc. (M4-SM2) 3. Appraisal of the political and institutional environment in the livestock production sector (M4-SM3)
M5- Strategies and action plan	Develop a Livestock Sector Development Plan	1. Summary of the main results of the diagnostic modules (M5-SM1); 2. Fix the longer term Strategic Objective (s), the risks and necessary mitigating actions, and the key monitoring indicators (M5-SM2) 3. Definition of the interventions and the ex-ante evaluation of the main interventions (M5-SM3); 4. Definition of the supporting activities, the financing plan and a chronogram of the different operations (M5-SM4).
M6 - Learning-based monitoring and evaluation,	Arrangements in place for a learning-oriented M and E system allowing effective evaluation of the methodological process and its wider outcomes	1. Establishing and developing the monitoring and evaluation system (M6-SM1); 2. Facilitating and conducting monitoring and evaluation (M6-SM2);