REPUBLIC OF SENEGAL

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MINISTRY OF AGRICULTURE AND RURAL EQUIPMENT

Projet d'Appui à la Sécurité Alimentaire dans les régions de Louga, Matam and Kaffrine

Impact Assessment Report of the Food Security Support Program in the Louga, Matam and Kaffrine Regions:

Livestock farming

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ACRONYMS

AGR **Income-generating activities**
ATEAgent **Technique d'Élevage**
ANSDAgence Nationale de la Statistique et de la Démographie (National Agency for Statistics and Demography)
ADB African Development Bank
CG Management Committee
CSE Ecological Monitoring Center
CTCollectivité territoriale
COPIFOR Drilling Steering Committees
DGPRE Directorate of Planning and Management of Water Resources
DEFCCS Department of Water, Forests, Hunting and Soil Conservation DRH Regional Hydraulics Division
DIREL Direction Régionale de l'Elevage
EAAdult Equivalent
FCFA CFA Francs
FIARA Foire Internationale de l'Agriculture et des Ressources Animales
Strengths , Weaknesses, Opportunities, Threats (FFOM)
GPF Groupement de promotion Féminine
GPS Global Positioning System
IFPRI International Food Policy Research Institute ISRA Senegalese Institute for Agricultural Research
ISS semi-structured interviews
LOASP Agro-Sylvo-Pastoral Orientation L a w
OPHI Oxford Poverty and Human Development Initiative
ORANA Office for Research on African Food and Nutrition

PASA/LOU-MA-KAF Project to support food security in the Louga, Matam and Kaffrine regions

ROM Rapport d'Orientation Méthodologique (Methodological Orientation Report) UBTUnité Bétail Tropical (Tropical Livestock Unit)
USAID United States Agency for International Development
PMU Project Management Unit
UP Pastoral Unit

Executive summary

This report assesses the impact of the livestock component of the Food Security Support Project in the Louga, Matam and Kaffrine regions on the well-being of beneficiary populations. This program was launched in the Louga, Matam and Kaffrine regions by the State of Senegal, with support from the Global Fund for Agriculture and Food Security and the African Development Bank (ADB). The aim of the project is to boost food security by increasing the livestock production of pastoralists and agro-pastoralists, and to improve the incomes of the target populations while ensuring their food security, through the construction of pastoral and livestock hydraulic infrastructures, boreholes, watering troughs, gallows, ponds, vaccination pens, feed storage warehouses, fodder storage sheds, goat and poultry sheds, rural tracks, dairies and dairy barns; institutional and logistical reinforcement of livestock services and the capacity of agro-pastoralists through the construction/rehabilitation of services, veterinary posts, veterinary equipment and logistics.

After six years of implementation, it became clear that a project impact study was needed. The aim is to show the extent to which the project has contributed to changes in the situation of beneficiary populations in terms of food security, vulnerability, women's autonomy, well-being and health, and income from livestock production.

This report is organized around the following points:

- section 1: description of the methodology used ;
- section 2: analysis of food security and income trends ;
- section 3: description of women's autonomy levels and changes in the standard of living index ;
- section 4: qualitative analysis of project results.

The methodological approach adopted combines quantitative and qualitative methods. For the quantitative analysis, the approach consisted in determining a target sample and a control sample with the same characteristics. Secondary data from the *General Census of Population and Housing*, Agriculture and Livestock conducted in 2013 were used to select the comparison group using the propensity score matching method. Impact analysis was carried out using the simple difference method, which involves comparing targets and controls over a single period.

Several types of survey were carried out:

Quantitative household **surveys** between January 13 and February 28, 2020. 03 regions and 62 villages, including 24 target villages and 38 control villages. Household surveys were carried out on 508 households for a total sample of 5,690 people. 62 village surveys were also carried out. 91 women were interviewed to analyze their empowerment, and 283 people who had been ill during the last 4 weeks prior to the interviewers' visit were also interviewed.

The **qualitative survey was** based on semi-structured interviews, individual interviews and focus groups using interview guides.

The data was used to establish results relating to livestock ownership, livestock income, farm and non-farm income, food security, household vulnerability, women's empowerment and the household standard of living indicator. Qualitative findings emerged from the qualitative interviews.

The **evaluation of the impact of** the Livestock component of PASA/Lou-Ma-Kaf revealed some very encouraging positive results.

Thus :

In the sample as a whole, the target household owns more goat stock than the control household, with a statistically significant difference. The number of goats owned by the targets is estimated at 206 units, compared with 16 units in the control areas. However, for all other animal categories, the two types of household are similar.

On a zonal scale, the Louga zone has the highest stock of draught animals (Asians, cattle, goats, horses, sheep and poultry), followed by the Matam zone, with Kaffrine in last place.
In terms of **income,** PASA/Lou-Ma-Kaf's Livestock Component activities generated an average annual gain of 125,000 FCFA for its beneficiary households. This result is even more positive for the Louga region, with an additional annual contribution of 596,066 FCFA. On the other hand, the Kaffrine and Matam regions did not record any positive gains. In Kaffrine, the targets earned less than 285,697FCFA compared with the controls, while in Matam this amount was estimated at 127,798FCFA.

Heat consumption also improved significantly. For the three regions as a whole, the rate of at-risk households dropped by 9%, while 19% of households became very satisfactory in terms of consumption. The same trends were confirmed for the Louga and Kaffrine regions, while Matam achieved rather mixed results.

In terms of **vulnerability**, the results show a levelling of situations between target and control households across the regions. At regional level, the health needs of target and control households are poorly covered, with a relative availability of durable goods. As a result, the average level of at-risk households rose from 38% to 48%, i.e. an additional 10 points. Despite the progress noted in the coverage of food needs, we note in all regions the low coverage of capacities to satisfy health and durable goods needs, leading to an increase in the overall level of household vulnerability. Households at risk in the Louga region rose from 38% to 50%, and those in Matam and Kaffrine from 25% to 44%. In these two regions, the gains made in terms of meeting food needs have been eroded by the very poor coverage of health and durable goods needs. In the Matam region, on the other hand, good coverage of durable goods has led to significant improvements. The level of

vulnerability fell from 44% to just 47%, outstripping even households in the Louga region, where the overall risk is 50%.

Thus, in the study area, the recorded lean season is relatively longer in the control zones than in the target zone, and this trend is also effective in the three regions. Overall, it is estimated at 2.39 months in the target zone, compared with 2.92 months in the control zone. In the Kaffrine region, the lean period is estimated at 1.85 months for the program's target localities, compared with 1.90 months for the controls. In Louga, the target zone recorded a lean period of 2.60 months, compared with
3.24 months in the control area. Finally, for the Matam region, the lean period is 3.13 months in the target zone compared with 4.15 months in the control zone.
In terms of standard of living as measured by ownership of durable goods, the program did not have a significant impact. However, analysis of the heterogeneity of the impact revealed a massive effect for the wealthiest individuals. The same trend was also observed for the women's empowerment index. One possible explanation for this finding is that the PASA-LOUMAKAF program has not yet reached maturity, so the effects on beneficiaries are not yet very visible.
The results of the qualitative interviews suggest that ASAP is **relevant** insofar as it targets three of the country's poorest regions, which also account for a third of the national territory.
In terms of **efficiency**, the project has achieved most of its physical objectives, and in some cases, results have even exceeded expectations. This is the case for vaccination pens, rural tracks, sheepfolds/chèvreries, dairy barns, fodder storage sheds, firewalls, etc. It has also raised the incomes of many vulnerable households headed by widowed women or heads of household, people living with disabilities, low-income earners (with no land or livestock, etc.). The livestock component of PASA has also helped to open up its intervention zone, giving people access to livestock markets and basic socio-economic structures. The natural resource management component has also made significant progress in this sector, in conjunction with local organizations (pastoral units, management commissions and committees, management plans). The livestock breeding component of the program has made a significant contribution to securing livestock in areas of high precariousness (triangle of thirst, where one of the 3 planned boreholes is currently being exploited, etc.).
The project has been **efficient** to some extent, as the resources deployed have exceeded the expected results. For example, for the 500 kilometers of firewalls planned, 1,338 kms have been built, i.e. nearly 267%. The same is true of the vaccination pens, with 60 actually completed for the 30 planned. The same applies to poultry barns, where 100 have been built out of the 60 planned, while 121 units have been built out of the 100 planned. But it is probably in the empowerment of the actors that the efficiency of the project (beneficiaries, partners...) should be seen.
As far as **sustainability is** concerned, we note that the project has set important milestones for the sustainability of the actions carried out, by opting from the outset to involve the technical services of the State, the legitimate repository of all public action and its ultimate beneficiary.
At the end of the study, we can conclude that the Livestock Component of PASA/Lou-Ma-Kaf, in view of the objectives assigned to it and the means implemented, has proved to be relevant, effective and efficient. It is a highly strategic project, with its various components geared towards sustainability. However, to better ensure its sustainability, it

would be legitimate to call for a new phase of the program, to better determine its real impact in the medium and long term.

I. Background and justification

Reflection on the development and sustainability of agriculture raises the question of the optimal allocation of resources and appropriate forms of support for the major agricultural and livestock sectors, in order to meet the needs of both the domestic and export markets. It was against this backdrop that the Projet d'Appui à la Sécurité Alimentaire (PASA) was launched in the Louga, Matam and Kaffrine regions by the State of Senegal, with support from GAFSP and the African Development Bank (ADB). The aim of this project, which is designed to strengthen support for agricultural and livestock services, is to increase animal and crop production by agro-pastoralists. Overall, it aims to reduce poverty and strengthen food security. Through the construction of pastoral hydraulic infrastructure, boreholes, vaccination pens, fodder storage sheds, feed stores, goat and poultry sheds, rural tracks, the institutional strengthening of livestock services and the empowerment of agro-pastoralists, the project aims to improve the income and food security of the target populations. The Projet d'Appui à la Sécurité Alimentaire (PASA Lou-Ma-Kaf) operates in the 3 regions of Louga, Matam and Kaffrine, which together make up a third of the national territory, comprising 10 departments and 83 rural communities.

Overall, it aims to reduce poverty and strengthen food security. In its livestock component, the project aims to combat poverty by strengthening the technical and organizational capacities of agro-pastoralists and preserving the foundations of production.
In terms of standards, the project is part of the implementation of the 2004 agro-sylvo-pastoral law, inspired by the following three principles**: economic efficiency, social equity and environmental sustainability**. For the livestock sector, the LOASP aims to ensure :

- recognition of pastoralism as a land development method in its own right,
- reducing the impact of climatic, economic, environmental and health risks to improve food security and ultimately achieve food sovereignty and a better standard of living for rural populations
- definition and implementation of a national livestock plan and a policy to secure herds and combat cattle theft;
- setting up a social protection scheme to improve living conditions in rural areas and protect the environment and manage natural resources sustainably

FSEP aims to reduce poverty and strengthen food security through a sustainable increase in: plant and animal productivity, respectively, by more than 22,000 and 5,000 tonnes; income for small-scale producers, particularly women, from 80,000 to 3,000,000 FCFA/year.
It operates in the Louga, Matam and Kaffrine regions and covers an area of around 70,000 Km^2 or a third of the national territory. This area is divided between 10 départements and 83 communes. It is characterized by

- A population of 1,960,000

- A high poverty index: 45.2% and 63.8% respectively
- A global acute malnutrition rate of between 11 and 14%.
- Low rainfall, varying between 350 and 750 mm,
- Degraded and sparse vegetation cover resulting from a combination of natural (drought) and man-made (bush fires, high pressure on natural resources) factors;
- A high concentration of the country's livestock, estimated at 3,300,000 ruminants;
- Extensive pastoral to agro-pastoral production systems;
- A vulnerable ecological zone, under-supported and under-equipped, with a serious lack of basic socio-economic infrastructure (water, education, health, roads, etc.).

All in all, the area is characterized by its ecological and socio-economic vulnerability, with fragile ecosystems and production systems strongly affected by precariousness and vulnerability. This justifies the intervention of the project, which aims to combat poverty and promote the resilience of populations to the effects of climate change by :

- facilitating access to productive water,
- improving land security, soil fertility and access to appropriate inputs,
- strengthening the technical and organizational capacities of players,
- improving small producers' access to diversified infrastructures,
- improving governance of natural resources ;
- promoting vulnerable groups (women, young people, people with disabilities, etc.).

In view of these different objectives, the present study aims to measure the program's impact on the well-being of the population. More specifically, the report attempts to establish the impact of the livestock component on beneficiaries' income, food security, household vulnerability and women's empowerment.

This report on measuring program impact is organized as follows:

- The methodology used is described in section 1 ;
- food security and income trends are analyzed in section 2 ;
- women's autonomy levels and changes in the standard of living index are described in section 3 ;
- The qualitative analysis of project results is the subject of section 4.

II Methodology

II.1 Sampling

In this study, two-stage stratified probability sampling was used. In the first stage, the program villages were selected. In the second stage, a number Y of beneficiary households or individuals was selected in each village. In this way, each district/village of a commune constitutes the sub-sample that will produce statistically representative results. After studying the different themes of the study, we determined our sample size of 600 households, including 240 target households and 360 control households, using the power calculation method. However, this sample size takes into account the phenomenon of attrition, which was overestimated by 20%.

In addition, focus groups were held with producer organizations, dairies, borehole users' associations, etc. (see appendix for list of beneficiaries interviewed).

II.2 Choosing a control group

The PASA program had not carried out a baseline study with target and control groups from the outset. This is why, when the consultant wanted to carry out an analysis of the program's impact at the end of the project, he was faced with the problem of the non-existence of a control group. To overcome this major difficulty, it was decided to use data from the **2013 general population census** as the reference situation. Based on this census data, target and control groups for the program were identified on the basis of observable characteristics. The propensity score harmonization method was used to select the control group. This approach is all the more relevant in that the census was carried out just before the start of the program.

II.3 Quantitative data collection

The study's data collection tools include: a household questionnaire, a focus group interview guide and an infrastructure questionnaire.
The household questionnaire provided us with answers to the following questions:

- increased consumption o f healthy, nutritious food b y beneficiaries,
- increasing resilience and incomes, particularly for nutritionally vulnerable groups,
- empowering women,
- level of education.

The household questionnaire is designed to include sections on household composition, education, health, food security, women's empowerment and income. It also takes into account livestock, durable assets, household expenditure, housing, as well as shocks and vulnerabilities and the activities of women and young people, etc...

With regard **to food security**, the calorific consumption measurement method has been implemented. The lean season was used to collect data to better assess the food security situation in households during this period.

II.3-1 Surveys households

The survey for the impact assessment of the livestock component of PASA LOUMAKAF was carried out between February 13 and 28, over a total period of 15 days. Visits were made to 62 villages in the regions concerned by the study. Of the 62 villages, 24 were target villages, while the other 38 were control villages. The survey covered 508 households, with a total sample size of 5,690 people[1] .

[1] There is a difference of 88 households between the calculated sample and the surveyed sample. The reason for this is that some of the villages surveyed did not have 10 households, whereas 10 households should have been selected. However, this does not call into question the statistical validity of the results, given that the sample size calculation allowed for a loss rate.

The following categories were surveyed:

- 508 heads of household or persons in charge in the household to collect information on the situation of the household;
- 491 women to study their autonomy ;
- 283 people ill during the four (4) weeks prior to the interviewers' visit;
- 62 village surveys.

II-3.2 Data collection process and choice of statistical units II-3-2-1 : Data collection process

The survey was carried out by 15 interviewers divided into 03 teams of 5 people each. Each team comprised 04 interviewers and 01 supervisor.
Data collection was carried out electronically, using tablets as survey instruments. The SurveyCTO software was installed on each tablet, and the entire questionnaire was programmed into it. The advantage of this method is that SurveyCTO software enables data to be transferred after each interview. The transfer was carried out via the Internet, and all telephones were connected for this purpose.

The advantages of this method are manifold, as the computerization of the survey brings the following benefits:

- Significant **cost savings** in data reprocessing**,** since results can be entered instantly;
- **A qualitative gain**: by combining data capture with data collection, the associated loss of data is avoided;
- **Time savings**: the duration of each survey is significantly reduced, as data entry is accelerated by conditioning certain questions on previous answers. For example, if a household member declares that he or she is not ill, questions relating to the number or location of consultations become irrelevant.

II-3-2-2 The choice of units statistics

The households surveyed in this study were visited only once. We do not have their reference situation for most of the variables used. In each village, 10 households were selected at random.

In each household, the interview was conducted with the head of the household, assisted by two or three other household members to clarify the questions asked. For the study on women's autonomy, the wives of the head of household were chosen, as well as any other married adult women. Interviews were conducted in private, without any assistance.

In each locality, we carried out a census of all producer organizations to discuss their perception of the program. Focus groups were organized with group members; semi-structured interviews were also held with the authorities in the areas visited.

II.4 Methodology Qualitative

A participatory approach was adopted for the qualitative evaluation, and information was collected both in the documentary survey and during field surveys using focus groups and semi-structured interviews (SSIs) with project beneficiaries and partners.

II.4.1 Methodological approach

The study adopted an approach based on the principles of participation and inclusion. It was therefore :

- participatory, inclusive, iterative, based on continuous improvement and a shared diagnosis of the various players in the livestock value chain;
- carried out with due regard for the project's institutional framework and its organizational options, and centered on the empowerment of government technical services on the basis of protocols and agreements,
- cross-functional, in that it has sought to examine a number of issues that primarily involve the synergy of independent but complementary players, with the guiding principle of combining economic efficiency, social progress and sustainable environmental management,
- oriented towards enriching public policies and facilitating innovation, insofar as the proposals made aim to make future actions more coherent, clearer and more effective;
- built on a multi-stakeholder steering organization; the involvement of multiple stakeholders in steering is a particular feature of sustainable projects.

II.4.2 Methodology

Our approach is based on an inclusive and iterative process involving key players in the management of livestock resources. The aim is to examine, with all stakeholders, the extent to which the project has helped to improve living conditions for the population and to secure the productive base of its intervention zone in the long term.

Our work system favours direct design control by the customer, with :

- involving customers to anticipate their concerns;
- working closely in the field with project representatives and their collaborators (executing agencies or focal points;...);
- visiting a large number of the project's partners and achievements in the three regions (Louga, Matam, Kaffrine), with a focus on the department where livestock activities are concentrated;
- taking into account the diversity of the players and the specific objectives assigned ;

This approach had the advantage of involving a good cross-section of the project's stakeholders, in all their diversity and specificity. We believe that this approach enabled us to reach a representative sample of livestock stakeholders. The mission was an opportunity to share with the various project stakeholders their perceptions, feelings, opinions, fears, reservations and, above all, their proposals for the future.

II.4.3 Preliminary activities

These are all the start-up activities whose completion should ensure proper execution of the mission. They include :

- Mobilization of experts to re-share the mission's terms of reference, harmonization of understanding, confirmation of availability and commitments, readaptation of the work plan and a start on the distribution of tasks between experts;
- Scoping meeting with PASA LOUMAKAF, livestock section;
- Identification of partners to be involved in the mission: these were technical partners such as DIREL and its decentralized services, DEFCCS services, DRH (regional division of hydraulics), etc.
- Drawing up and validating the methodological orientation report (ROM): The aim of this report is to reiterate the methodological approach, refining it on the basis of the results of the various discussions with the project owner.

II.4.4 Documentary survey

The documentary research and analysis component was an important part of the study, as it was imperative to collect the project's basic documentation: project document, periodic reports, various evaluation documents, etc. Thus, during this phase, the following documents were collected:

- data available at project level: directory of sites housing activities (directory of boreholes drilled, livestock shelters, stores, UPs, etc.).
- the results of the latest ANSD population and livestock census by village;

Documentary collection and analysis enabled us to better prepare and conduct the field survey, taking into account the project owner's requirements and compatible with the mission's time and resources.

II.4.5 Development of survey tools and field survey

Additional field data collection was preceded by :

- The preparation of inventory sheets in accordance with the terms of reference. These sheets were validated by the DGPRE before being distributed to water stakeholders.
- Programming and material organization of field missions: programming took into account certain constraints, notably access conditions in certain regions.

Tools and media used

The tools used to carry out the assignment were the Interview Guide, which took into account the various sections of the project, semi-structured interviews and prepared observation.

Once these preliminaries had been completed, the consultant conducted the field study as follows:

- deployment of the team of experts in charge of the mission (mission leader, socio-environmentalist, research assistant, livestock specialist);
- The organization of meetings in the form of semi-structured interviews, focus groups or discussion groups with technical departments (livestock, water and forestry, hydraulics, etc.), local authorities, elected representatives, and discussions with the various project beneficiaries (hydraulic infrastructure, IGAs, storage facilities, vaccination pens, pond management, capacity building, etc.);
- Processing and analysis of the data collected using an interpretation grid based on the terms of reference and the project results framework and impact measurement requirements;
- Report preparation: in accordance with the terms of reference, this report was prepared by the experts under the guidance of the mission leader.
- Regular debriefing sessions with the PASA/LOUMAKAF PCU
- Drafting of an interim report, feedback and inclusion of observations in the final report.

II.5 Analysis methods Impact

For a proper analysis of the program's impact, a simple difference was made between beneficiaries and non-beneficiaries. In addition, several time-invariant control variables were used.

We define two outputs or potential results for each individual $_{y1}$ and $_{y0}$ y_1 is the potential .

random variable characterizing the situation of the individual benefiting from the $_{y0}$ is program.

the individual's situation when not benefiting from the program. These two quantities exist for each individual, whether or not he or she has benefited from the program. The causal effect is defined as :

$\Delta = _{y1} \boxtimes _{y0}$

This is the difference between the situation of an individual using the program and the situation if he or she had not used it.

Heterogeneity of impact was also analyzed where possible. Similarly, the study carried out a qualitative investigation to explain the quantitative results.

II-6 Food safety analysis methods

The notion of food security encompasses several types of indicators. These are derived from physical, human and capital factors. The physical factors of vulnerability can be climatic variability, soil fertility, bush fires, etc., which can be materialized by the types of production within the household, yield and production levels, crop diversity, etc.). The human environment characterizes human resources. These include indicators of work capacity, health, education, employment, literacy rate, unemployment rate, etc.). The capital factor characterizes the resources of all sectors of activity (production per capita, average number of LU per capita, monetary income per capita, average income, etc.).

To assess the level of food security advocated by the project's interventions, three main factors were taken into account in terms of meeting primary needs: food, health needs and the level of goods that condition household life (housing materials or equipment, assets, etc.). The latter are factors that reinforce

household investment and production capacity. All these food security needs are met by the household's available resource potential (the level of agricultural production, the level of net livestock income (no data available in livestock units) and the level of net non-agricultural income and transfers). This makes it possible to estimate the level of real household income. This income is broken down into agricultural versus non-agricultural income per head of population and per equivalent unit, and so on. This level of real income determines the household's potential capacity to meet its multiple needs.

Food consumption requirements are expressed in calories per head or per adult equivalent unit. Thus, the consumption profile of the adult equivalent corresponds to the consumption needs of each household member according to age and gender. Consumption per head, on the other hand, depends solely on the number of people in the household. The adult equivalent is the unit of measurement of household size that really takes into account the intrinsic correspondence of each individual's calorie requirements in relation to his or her age and gender (table 1). According to the Office de Recherche sur l'Alimentation et la Nutrition Africaine (ORANA), each adult equivalent (AE) needs 3,000 kcal per day (ORANA, 1993). This standard required by ORANA corresponds to the actual requirement for a healthy life per adult equivalent (EA) per day under Senegalese conditions. However, 80% of this standard, i.e. 2400 kcal, is considered a minimum requirement. Thus, after estimating the resources available at household level to reach this standard, any household that falls below this threshold of 2400 kcal/EA/day is declared a household at risk. Households deemed more than satisfactory exceed 3000 kcal per EA. This first profile is relevant because it is the first level of vulnerability. If a household is unable to satisfy its primary need for food, it cannot satisfy the rest of its other needs.

Table 1: Standard for calculating adult-equivalent units per household

	Gender	
Age	Male	Female
0-<1 year	0,27	0,27
1-<2 years	0,39	0,39
2->3 years	0,45	0,45
3->4 years	0,52	0,51
4->5 years	0,57	0,56
5-> 6 years	0,62	0,60
6->7 years	0,67	0,63
7->8 years	0,71	0,67
8->9 years	0,75	0,70
9->10 years	0,79	0,74
10->13 years	0,87	0,78
13->16 years	0,97	0,83
16->20 years	1,02	0,77
20+ years	1	0,73

Source: ORANA, 1993 in Kelly et al., 1998.

In the second level of analysis, we consider quality-of-life variables such as health, the level of equipment and assets, etc. For health, we analyze the rate of visits to the doctor versus the number of sick people per household. For health, we analyze the ratio of the number of consultations to the number of sick people per household; the level

of health expenses in relation to the number of sick people. The quality of the household's standard of living is also characterized by the existence of durable goods (housing, toilets, equipment, etc.) identified as possession of durable goods. These factors characterize the quality of the food security state and its sustainability. The final step is the overall assessment of the household's level of vulnerability by combining these three indicators, weighted by their degree of importance. On a scale of 5, satisfaction of food consumption needs would be 5, satisfaction of health needs 4 and satisfaction of durable goods 2. Depending on the configuration of these factors and their arrangement, we arrive at the degree of vulnerability and the level of their representativeness by community, by zone and between the various target groups.

III Study results

III.1 Safety results

Food security, defined as **access for all people, at all times, to enough healthy food to lead a healthy life,** requires three conditions. The first is the assurance of sufficient availability of the food supply, both nationally and locally. This availability is used for domestic consumption or to generate export revenues. The second is the stability of this availability over time (from one period to another) and space (from one region to another). The final dimension is the accessibility of these food products. Households must have access to food, either materially (whether they produce it or it is available in their locality) or in monetary terms (access to products through income). These three dimensions are conceived through a national policy vision of production, processing/marketing and consumption.

Food insecurity can be the result of a combination of factors. These may include inability to access production, crop or livestock losses, loss of employment or lack of income, difficulty in meeting health costs, falling export earnings with difficulties in importing, natural or man-made disasters, and so on. This makes it difficult to assess this concept at household level, as it brings together several factors. The aim is therefore to develop policy intervention choices and strategies to improve these factors, with the ultimate aim of strengthening household resilience capacities. It is in this context that the State and its development partners have implemented PASA. What is the impact of the project's interventions on the level of income and food security of the target populations? What are the political implications? These are all questions that challenge decision-makers and justify this investigation.

III.1.1 LIVESTOCK OWNERSHIP AND INCOME

III.1.1.1 LEVEL OF OWNERSHIP OF LIVESTOCK

In all the study areas, the level of livestock ownership at household level is shown in Table 2. The average is 17 cattle, 92 goats and 30 sheep. This shows that the survey area is more dominated by small ruminants. In the sample as a whole, the target household has more than twice as much goat stock as the control household, with a statistically significant difference. For

In all other animal categories, the two types of household are similar. There is no significant difference between zones. Furthermore, the structural weaknesses of livestock farming in Senegal and its vulnerability to climatic conditions and other risks have had a profound impact on the level of animal resources in these areas.

Table 2: Average number of animals per household in the entire sample

	Indicator	**Target**	**Total**	**Difference**
	Average	Average	Average	
Draught animals	3	3	3	-0.006
Asin (donkeys)	3	3	3	0.015
Cattle	17	18	17	0.015
Goat	16	206	92	0.004
Equine (horse)	2	2	2	-0.017
Ovine	30	30	30	-0.005
Poultry	11	12	11	-0.006
Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.				

On a zonal scale, the Louga zone has the highest stock of animals, followed by Matam and then Kaffrine. In Louga, the average number of small ruminants is 192, in Matam 81 and in Kaffrine 14 (table 3). The fact that this area is part of the sylvopastoral zone justifies the higher number of animals per household in Louga. Moreover, most of these animals are small ruminants, with goats predominating. The surprise is the low average number of cattle per household. The average number of cattle per household is higher in Matam (30 head) than in Louga (18). The figure for Kaffrine is 6 head per household. These results can be explained by the strategy adopted by livestock farmers, depending on the grazing available. The department of Ranérou is a protected reserve zone, which means that fodder is available all year round. In Linguère, there are fewer cattle to reduce the risks in the event of drought: cattle are therefore replaced by small ruminants for transhumance (small species better adapted to transhumance in the event of drought than cattle, and therefore with fewer losses). The link must also be made with agro-climatic specificities and the diversity of activities (Kaffrine is rainier and therefore more suited to agricultural activities).

Table 3: Average number of animals per target and control household, by region

Designation	**Indicator**	**Target**	**Total**	**Difference**
Louga	Average	Average	Average	
Draught animals	3	3	3	-0.025
Asin (donkeys)	4	4	4	0.012
Cattle	16	21	18	0.020
Goat	21	407	159	0.012
Equine (horse)	2	2	2	-0.038
Ovine	33	33	33	0.003
Poultry	11	15	13	0.015
Matam				
Draught animals	3	2	2	0.056

Asin (donkeys)	4	3	3	0.045
Cattle	35	25	30	0.004
Goat	12	18	15	-0.084
Equine (horse)	2	1	2	0.061
Ovine	48	55	51	-0.051
Poultry	9	8	9	-0.031
Kaffrine				
Draught animals	3	3	3	0.007
Asin (donkeys)	2	2	2	0.011
Cattle	6	7	6	0.019
Goat	8	7	7	0.013
Equine (horse)	2	2	2	-0.027
Ovine	6	9	7	0.007
Poultry	9	9	9	-0.030

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

The situation at community level between target and control households varies by region. In the Louga region, communities targeted by the project have more animals than controls, with the particularity that the number of goats is 20 times higher. In the Matam area, while target households own more small ruminants (an average of 73 versus 60), they are outnumbered by controls in other animal categories. Control households own an average of 35 cattle per household, compared with 25 for target households (table 3). In the Kaffrine zone, where the average stock of animals is lower due to the predominance of agricultural activities, target and control households show the same ownership trends across all categories. In all zones, the average number of draught animals remains the same between zones and between control and target households (on average 3). This favors agricultural intensification activities in these zones among the rural population, in the groundnut basin in particular (south of the Louga and Kaffrine regions). In addition, the results reveal a fairly high level of resource capital in terms of savings potential represented by animals in rural areas. In terms of its role in feeding the population (by-products), its contribution to income and the proportion of the working population involved in this type of activity, the livestock sector is dynamic, although the cattle stock is relatively low compared with the norm in sylvopastoral areas.

III.1.1.2 INCOME LEVEL

The surveys reveal that the average total household income is estimated at 1,484,416 FCFA in all three (3) regions for the year 2019/2020 (table 4). This income varies between 1,559,850 FCFA among households supervised by the project and 1,434,210 FCFA among control households, i.e. a difference of 125,640 FCFA in favor of the targets. Likewise, income per adult equivalent was 228,183 FCFA for the target group, compared with 188,836 FCFA for the control group. However, due to the smaller size of control households, per capita income is 21,346 FCFA higher in the control group.

Table 4: Annual household income for all zones

Designation	Indicator	Target	Total	Difference
Total income	1 434 210	1 559 850	1 484 416	125 639,887
Per capita income	169 950	148 604	160 674	-21 346,386

Income per adult equivalent	188 836	228 183	204 559	39 347,700
Farm income and farm benefits	172 697	124 891	154 679	-47 806,65
Income from livestock production	822 617	1 164 982	947 014	342 365,129
Non-farm income	1 074 148	1 052 435	1 065 463	-21 712,301
Income migration	65 872	80 670	71 785	14 797,813
Income from loans	73 748	121 906	92 992	48 158,858
Share of farm income and farm benefits	7,82%	4,91%	6,63%	
Share Livestock income	37,24%	45,78%	40,61%	
Share Non-farming income	48,62%	41,35%	45,69%	
Share Migration income	2,98%	3,17%	3,08%	
Share Income from loans	3,34%	4,79%	3,99%	
Total share	100,00%	100,00%	100,00%	

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

The agricultural sector in its broadest sense contributes 47% of rural household income in the sample as a whole. The livestock sub-sector accounts for 86% of overall household agricultural income. For target households, agricultural income represents 51% of total income, 91% of which is derived from the livestock sector. The income of control households is 45% from the agricultural sector. In the case of control households, 83% of their agricultural income comes from the livestock sector. This shows the importance of the livestock sector in the income of households in the sample. This is amply justified by the project's focus on supporting livestock farmers. Nevertheless, the importance of non-agricultural activities can be noted everywhere, with income representing 48% for control households and 41% for target households. Next comes income from agricultural production and services, varying between 5% of overall income in target households and 8% in control households. Income from transfers and migration varies between 3% and 5% of target and control households for the whole sample. These results show that the households surveyed are more dependent on livestock activities, which help finance non-agricultural activities such as trade and services.

The overall level of household income for the entire sample masks the disparity in impact levels by region. Indeed, the level and diversity of income sources varies greatly by region, as does the impact of project interventions on households.

In the **Louga region**, the overall income of the households surveyed averaged 1,730,195 FCFA (table 5). This income is by far the highest of the three regions concerned. The livestock sector contributed 47% of total household income, followed by non-agricultural income (40%) and income from agricultural production and services. This indicates that household income in the Louga region is heavily dominated by the agricultural sector in the broad sense (53%), 83% of which is derived from livestock-related activities. The dominance of the livestock sector is justified on the one hand by the positioning of the Louga region in the sylvopastoral zone, which is heavily dominated by livestock, and on the other by the project's focus on agro-pastoral interventions. The level of non-agricultural activities (40%) and income from migration (3%) refers to the particularity of this region dominated by trade, service and immigration activities. Furthermore, per capita income, estimated at an average of 172,979 FCFA, is well above the average for the region.

lower than the national average 256,000 FCFA (ANSD, 2019), but higher than in the three project regions. Average income per adult equivalent is 248,000 FCFA. It is higher than that obtained from households in Matam and Kaffrine. These higher income levels in the Louga region are justified by its smaller average household size (10 people) and high number of assets (04), and in particular the contribution of income from livestock (on average 1, 1 million FCFA).

Table 5: Level, impact and diversity of annual income sources in the Louga region

	Indicator	Target	Total	Difference
Total income	1 516 987	2 113 053	1 730 195	596 066
Income per head	164 398	186 218	172 979	21 820
Income per adult equivalent	201 455	331 413	247 940	129 958
Farm income and farm benefits	174 547	143 057	164 051	-31 491
Income from livestock production	896 275	1 545 246	1 115 689	648 972
Non-farm income	953 280	991 934	968 284	38 654
Income migration	63 383	107 376	79 119	43 993
Income from loans	53 401	105 925	72 188	52 524
Share Income farm and farm benefits	8%	5%	7%	
Income from livestock production	42%	53%	47%	
Share Non-farming income	45%	34%	40%	
Share Migration income	3%	4%	3%	
Share Income from loans	2%	4%	3%	
Total	100%	100%	100%	
Broad agricultural sector	50%	58%	53%	
Share of livestock in the agricultural sector	84%	92%	87%	

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

The impact of the project in the **Louga region** on overall annual household income is estimated at 596,066 FCFA, representing the difference in income between the supervised (2,113,053 FCFA) and control households (1,516,987 FCFA). This dominance is strongly induced by the contribution of income from livestock production activities. The average income of target households from this sector is 1.15 million FCFA, while that of control households is 896,275%. Beyond this variation, we note that agricultural income in the broad sense is constant in the income of target (58%) and control (50%) households in the zone, with livestock dominating, representing between 84% and 92% for controls and targets respectively. In target households, per capita income is estimated at 186,218 FCFA, 21,820 FCFA higher than in control households. Income per adult equivalent is 331,413 FCFA, 39% or 130,000 FCFA higher than in control households. The income of target households is strongly dominated by activities induced by the livestock project, representing 53%, followed by income from non-agricultural activities (trade and services) at 34%. In the case of control households, income from non-agricultural activities contributed the most (45%) to average household income, followed by livestock activities (42%). These results show that the project is well-targeted on agropastoral areas, with a strong dominance of the livestock sector, and that the project's interventions have improved the income levels of the target populations in the Louga region.

In the **Matam** region, overall average household income is estimated at 1,092,055 FCFA (table 6). It ranks last among the average incomes of the three regions. This income is also dominated by the agricultural sector in the broad sense (62%), almost entirely pastoral, representing 99% of the livestock sector. Income from non-agricultural activities contributes 34%, while transfers and migration each account for 2%. The positioning of the project in the Ferlo zone of the Matam region justifies this income pattern in this agricultural region. In this zone, per capita income averages 166,657 FCFA, well below the national average (256,000 FCFA). Income per adult equivalent is 229,569 FCFA, the second highest after the Louga region. These incomes are still dominated by the livestock sector, combined with non-agricultural activities.

Table 6: Level, impact and diversity of household income in the Matam region

	Indicator	Target	Total	Difference
Total income	1 149 654	1 021 856	1 092 055	-127 798
Income per head	173 570	160 107	166 657	-13 464
Income per adult equivalent	257 463	195 574	229 569	-61 889
Farm income and farm benefits	12 000	3 914	8 997	-8 086
Income from livestock production	949 797	741 813	860 661	-207 984
Non-farm income	375 419	605 409	470 887	229 990
Income migration	13 487	36 406	23 817	22 919
Income from loans	51 667	11 281	33 465	-40385,42*
Share of farm income and benefits	1%	0%	1%	
Income from livestock production	68%	53%	62%	
Share Non-farming income	27%	43%	34%	
Share Migration income	1%	3%	2%	
Share Income from loans	4%	1%	2%	
	100%	100%	100%	
Broad agricultural sector	69%	53%	62%	
Livestock share	99%	99%	99%	

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

In terms of impact, control households had higher income levels than target households in the Matam region. The average income of control households in the region was 1,149,654 FCFA, while that of target households was 1,021,856 FCFA, a difference of 128,000 FCFA (table 6). Among control households, average per capita income was estimated at 173,570 FCFA, with the livestock sector dominating (68%).
% of income), followed by non-agricultural activities (27%). Target households earned a lower average per capita income, estimated at 160,107, with the livestock sector still contributing 53% and income from trade and service activities strongly represented (43%). Income per adult equivalent also follows the same trends, with control households dominating (257,463 FCFA), i.e. 62,000 FCFA more than target households. Transfer income contributed 4% of the income of control households and less than 1% of that of target households. It should be noted that it is the very poor beneficiaries who, with such incomes, are closer to the control groups (non-targeted because more affluent). This reduces the poverty gap between targets and controls.

In the **Kaffrine region,** average overall household income stands at 1,280,774 FCFA (table 7). Unlike in other regions, income is strongly dominated by income from non-agricultural activities (69%), followed by livestock (12%) and crop production (8%). Income from transfers accounts for 7% and income from immigration for 4%. The results show the importance of non-agricultural activities in rural areas. This shows that agricultural income in rural areas is not sufficient to satisfy the demand for food products from rural households, which are diversifying their source of income. In this region of the southern groundnut basin, with the decline in groundnut and cereal production due to the effects of rainfall deficits and irregularities, producers are turning to trade, services and other activities. Average household income from crop production is estimated at just 184,081 FCFA, compared with 267,322 FCFA from livestock production. The results show that per capita income is 140,000 FCFA, or less than 45% of the national per capita income. Income per adult equivalent remains even lower (130,804 FCFA).

Table 7: Level, impact and diversity of annual household income in the Kaffrine region

	Indicator	Target	Total	Difference
Total income	1 406 674	1 120 977	1 280 774	-285 697
Income per head	176 469	95 672	140 421	-80 797
Income per adult equivalent	140 513	118 480	130 804	-22 033
Farm income and farm benefits	223 727	134 523	184 081	-89203,846*
Income from livestock production	292 685	229 278	267 322	-63 407
Off-farm income	1 631 797	1 379 366	1 528 300	-252 431
Income migration	90 707	66 987	80 254	-23 720
Income from loans	116 768	186 346	147 429	69 578
Share of farm income and benefits	10%	7%	8%	
Income from livestock production	12%	11%	12%	
Share Non-farming income	69%	69%	69%	
Share Migration income	4%	3%	4%	
Share Income from loans	5%	9%	7%	
Total	100%	100%	100%	
Broad agricultural sector	22%	18%	20%	
Share of livestock in the agricultural sector	57%	63%	59%	

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

Comparison of average incomes between target and control households shows an advantage for unsupervised populations, with an additional gain of 285,697 FCFA. Control households benefited strongly from income derived from non-agricultural activities (69%) and livestock production (12%). Both populations received a modest contribution from the agricultural sector in their income formation (between 7% and 9% for target and control respectively). Per capita income remained at 176,469 FCFA for control households, compared with 95,672 FCFA for target households, the lowest of all regions. Similarly, the income per adult equivalent of control households is estimated at 140,513 FCFA, i.e. 22,033 FCFA higher than that of target households. In this predominantly agricultural area, a poor agricultural season can lead to such results, and this shows the vulnerability of these households. The difference in favor of the control households is clearly due to the contribution of the

non-agricultural activities, generating an additional 252,430 FCFA on the overall average income of control households. In addition, income from the livestock sector contributed an additional 63,407 FCFA to the average income of control households. Income from migration also contributed an additional 23,720 FCFA among control households. Income from transfers alone contributed an additional 69,578 FCFA in favor of target households.

Fluctuations in agricultural production exacerbate the risk and vulnerability of rural households heavily dependent on farming. While average non-farm income is rising overall, some households still have very low farm incomes. Farm households that do not diversify their sources of income are the most vulnerable in years of low agricultural production. Their survival strategies are highly dependent on climatic conditions (rain-fed agriculture, for the most part) and low-productivity technologies. Indeed, this production system, which is overly dependent on agriculture, requires the adoption of high-productivity technologies if it is to survive. The aim is to improve productivity levels by strengthening the technical capacities of stakeholders and encouraging the adoption of new technologies, with a view to producing substantial positive effects in terms of increased crop and livestock production.

While the agricultural sector in the broadest sense is dominant everywhere, particularly in livestock production, in the occupations of rural farming populations, income is also diversified and specialized by region. The livestock sector is highly dominant in the Louga region, followed by non-agricultural activities. In this region, support for the livestock sector has had a high impact on income, with average household income of 596,066 FCFA, an additional 21,820 FCFA per head and 130,000 FCFA per adult equivalent unit per year. Income in the Matam region, although also dominated by the livestock sector and non-agricultural activities, did not give the target households a sufficient advantage over the controls. The very low level of income from crop production among the targets (on average 3,914 FCFA) was unable to redress the overall income level of the target households. However, income from non-agricultural activities is largely dominant in the Kaffrine region. In the southern groundnut basin, agriculture should have been dominant, with a diversification of crops (millet/sorghum, groundnuts, fonio, cowpeas). These crop types occupy 74% of acreage according to ISRA (2018).

III.1.2 SAFETY STATUS FOOD

III.1.2.1 LEVEL OF CONSUMPTION FOOD

According to the surveys, the average level of household consumption is estimated at 3,796 Kcal per adult equivalent (AE) per day across the sample (table 8). This indicates a level of satisfaction above the required optimal standard of 21%. For both target and control populations, the 3,000 Kcal standard was significantly exceeded by project beneficiary households (4,815 Kcal per AE/day). The consumption level of control households also exceeded the required standard (3,117 kcal/EA/day). Thus, households targeted by the project had a calorie consumption level 35% higher than those not monitored, with a highly significant statistical difference. This result shows a positive project impact of 1,697 kcal/EA/day across the three regions. This means that more than 71% of target households are at a satisfactory level of food consumption coverage, with 58% of households at a very satisfactory level. Nevertheless, 29% and 38% of target and control households respectively are at risk, with

consumption levels below the acceptable norm of 2400 kcal/EA/day. Overall, the majority (62%) of calories consumed come from staple products (cereals), 31% from condiments and 7% from animal products. Most of this household consumption comes from purchases made thanks to their level of income (89%), from the harvest (10%) and the remainder from gifts and loans. However, this overall picture masks wide variations at both zonal and community level.

Table 8: Level of coverage of household calorie/EA consumption needs

	Indicator	**Target**	**Total**	**Difference**
Average household heat consumption (in K calories)	3117	4815	3796	1697.176
Household ranking by heat consumption				
Very satisfactory	38,69 %	58,13 %	46,46 %	0,194***
Moderately satisfactory	23,28 %	13,30 %	19,29 %	-0,100**
At risk or vulnerable	38,03 %	28,57 %	34,25 %	-0,095*
Origin of calories in % of total calories				
• Base product (%)	60,73%	64,13 %	62,4%	
• Animal products (%)	7%	6,75%	6,88%	
• Condiment products (%)	32,27%	29,11 %	30,72%	
Origin of products consumed				
• Harvest (in %)	9,49 %	10,03 %	9,71 %	0,005
• Purchase (in %)	89,64 %	88,34 %	89,11 %	-0,013
• Don	0,76 %	1,63 %	1,11 %	0,009***
• Loan	0,11 %	0,00 %	0,06 %	-0,001*

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

In the Louga region, the study shows that each adult equivalent consumed an average of 4,102 kcal/day (table 9). This exceeds around 27% of calorie requirements, or over 1,815 kcal/EA/day. Self-consumption from crops accounts for 94%. Other income covers the remainder. In terms of composition, 58% of the calories consumed by these households come from staples, 7% from animal products and 35% from condiments. We note that 38% of households in the region are considered **at-risk households** (less than 2400 kcal/EA/day). This means that 62% of households in this area are satisfactorily meeting their food requirements. On the other hand, 20% of households in the region are moderately satisfied. On average, they consume between 2,400 and 3,000 kcal per EA/day. Households exceeding the satisfaction standard are around 42%. These households fully cover their calorie needs and are sufficiently protected. The high level of their diversified real incomes has contributed to this stability at household level.

Table 9: Coverage of household food consumption needs by region

All 3 regions				
Designation	**Indicator**	**Target**	**Total**	**Difference**
Average consumption (kcal/EA/day)	3117	4815	3796	1697,176
Level of satisfaction Kcal requirements				
• Very satisfactory	38,69%	58,13%	46,46%	0,194***
• Moderately satisfactory	23,28%	13,30%	19,29%	-0,100**
• At risk or vulnerable	38,03%	28,57%	34,25%	-0,095*
Origin of calories in % of total calories				
• Base product (%)	60,73%	64,13%	62,40%	
• Animal products (%)	7%	6,75%	6,88%	
• Condiment products (%)	32,27%	29,11%	30,72%	
Source of products consumed				
• Harvest (in %)	9,49%	10,03%	9,71%	0,005
• Purchase (in %)	89,64%	88,34%	89,11%	-0,013
• Don	0,76%	1,63%	1,11%	0,009***
• Loan	0,11%	0,00%	0,06%	-0,001*
LOUGA				
Designation	**Indicator**	**Target**	**Total**	**Difference**
Average consumption (kcal/EA/day)	2812	6419	4102	3607,625
Level of satisfaction Kcal requirements				
• Very satisfactory	34,73%	54,84%	41,92%	0,201**
• Moderately satisfactory	24,55%	12,90%	20,38%	-0,116*
• At risk or vulnerable	40,72%	32,26%	37,69%	-0,085
Origin of calories in % of total calories				
• Base product (%)	53,60%	60,69%	57,50%	
• Animal products (%)	8,86%	5,75%	7,15%	
• Condiment products (%)	37,53%	33,56%	35,35%	
Source of products consumed				
• Harvest (in %)	94,11%	94,61%	94,30%	0,005
• Purchase (in %)	5,26%	3,94%	4,76%	-0,013*
• Don	0,52%	1,45%	0,87%	0,009**
• Loan	0,11%	0,00%	0,07%	-0,001
MATAM				
Designation	**Indicator**	**Target**	**Total**	**Difference**
Average consumption (kcal/EA/day)	3139	2987	3071	-152,692

Level of satisfaction Kcal requirements				
• Very satisfactory	43,59%	46,88%	45,07%	0,033
• Moderately satisfactory	15,38%	6,25%	11,27%	-0,091
• At risk or vulnerable	41,03%	46,88%	43,66%	0,058
Origin of calories in % of total calories				
• Base product (%)	56,48%	55,06%	55,84%	
• Animal products (%)	6,03%	8,20%	7,01%	
• Condiment products (%)	37,49%	36,75%	37,15%	
Source of products consumed				
• Harvest (in %)	7,34%	7,95%	7,62%	0,006
• Purchase (in %)	90,13%	88,99%	89,61%	-0,011
• Don	2,53%	3,06%	2,77%	0,005
• Loan				
KAFFRINE				
Designation	**Indicator**	**Target**	**Total**	**Difference**
Average consumption (kcal/EA/day)	3625	3651	3636	26,682
Level of satisfaction Kcal requirements				
• Very satisfactory	43,43%	66,67%	53,67%	0,232**
• Moderately satisfactory	24,24%	16,67%	20,90%	-0,076
• At risk or vulnerable	32,32%	16,67%	25,42%	-0,157*
Origin of calories in % of total calories				
• Base product (%)	68,24%	71,23%	69,52%	
• Animal products (%)	5,41%	8,04%	6,53%	
• Condiment products (%)	26,35%	20,73%	23,95%	
Source of products consumed				
• Harvest (in %)	17,57%	19,42%	18,36%	0,019
• Purchase (in %)	81,58%	79,09%	80,51%	-0,025
• Don	0,72%	1,49%	1,05%	0,008
• Loan	0,13%	0,00%	0,08%	-0,001

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

At the community level, households benefiting from the FSEP project seem to be doing better in terms of meeting their food requirements than those not receiving assistance, with a highly significant statistical difference. Indeed, target households in the region consume an average of 6,419 Kcal/EA/day, more than double the required standard. Compared with non-targeted households, the result indicates an impact of 3,607 Kcal/EA/day. The project's impact on income in this region amply justifies this level of satisfaction of consumption needs, with over 95% of calories coming from crops. Households with very satisfactory consumption levels account for 54% of targets, compared with 35% of controls. Similarly, target households have the fewest at-risk households (33% versus 41% among controls). These results show that the households supervised by the project cover their food consumption needs very satisfactorily.

In **the Matam region**, the average level of calorie satisfaction is slightly above the required standard (3,071 kcal/EA/day). However, it is below the required standard for target households (2,987 kcal/EA/day) and below that of control households (3,139 kcal/EA/day). This shows that in this zone, control households are the best at covering their consumption needs. These calorie consumption levels in this zone are only 8% covered by the harvest and the rest by the food.

90% of purchases. This indicates the importance of non-agricultural income, which benefits control households much more than the targets, who recorded a relatively low level of agricultural income for this year. By origin, we note that staples provide 56% of calories, animal products (7%) and condiments account for 37%.
%. On the other hand, this region has **the** highest rate of **at-risk households (**44%). In this situation, 47% of target households were at risk, compared with 41% of control households. In the Matam region, the results are not in favor of supervised households. As illustrated by the impact on income, households dependent on the agricultural sector are more exposed to risks linked to the predominantly rain-fed growing conditions. Income from livestock farming is also dependent on the vagaries of the weather, particularly when it comes to feeding livestock to produce more milk and meat. Nevertheless, 45% of households in the region are at a very satisfactory level, comprising 47% of target households and 44% of control households. These households benefit from the considerable contributions of income from livestock farming and the very small size of their family units.

In the **Kaffrine region**, the adult equivalent consumes an average of 3,636 kcal per day, 17% above the 3,000 kcal norm. This is particularly surprising given the region's irregular rainfall. Non-agricultural activities, however, contributed satisfactorily. This satisfied calorie consumption of
80% comes from purchases and the rest from harvests (18%). Thus, self-consumption was relatively the lowest compared to other regions. The origin of calories consumed at household level is drawn 61% from staple foods, 7% from animal products and 24% from condiments. It should be noted, however, that this relative zonal stability is not equally shared between target and control households. In fact, the project had a low impact of just 27 kcal/EA/day.

The adult equivalent in target households in the Kaffrine region consumes 3,651 kcal/day, compared with 3,625 kcal/day in control households. This has led to a sharp reduction in the number of **vulnerable households** in the target households, which represent only 17% (the lowest of all regions). This improvement in well-being among target households was best illustrated among households with very high levels of satisfaction, which increased by 23% compared to control households, with a statistically significant difference. It's a case of levelling upwards. These better-off households in the target group benefit from both off-farm income and livestock production. The average off-farm income of target households is estimated at 1,379,366 FCFA, and that of livestock at 229,278 FCFA. The results show that in the Kaffrine region, the project has positively induced an increase of 27 Kcal/EA per day and increased by 23% the category of households with very high levels of satisfaction of food needs, leading to a sharp reduction in households at risk (17%).

All in all, we can see that the satisfaction of food needs varies from region to region and from community to community. There is considerable variability in incomes, livestock stocks, household size in EA, etc., and this has an impact on the way food consumption needs are met (accessibility and availability through purchase with induced income or through self-consumption of harvests). We note that Louga and Kaffrine are impacted by the project's induced effects on the coverage of food consumption needs. The impact is 3,608 kcal/EA/day for the Louga region and 26 kcal/EA/day for households in the Kaffrine region. This has led to an 8% reduction in at-risk households and a 20% increase in households with a very high level of satisfaction in terms of food needs coverage in the Louga region, with a further impact on

average household income of 596,066 FCFA or 21,819 FCFA per head or 129,958 FCFA per EA. In the Kaffrine region, the impact led to a 16% reduction in households at risk and a significant 23% increase in households with very satisfactory consumption levels. Target households in these regions have fewer households at risk of not meeting their calorie requirements (only 17% and 32% for Kaffrine and Louga respectively). The spin-offs from livestock sector activities and the diversity of non-agricultural incomes in these households enable them to ensure their food security in terms of covering their food consumption needs.

The impact of the project is not obvious in the Matam region. The low level of agricultural income in the broad sense of the term, which is the most decisive factor in covering the demand for food products in the Matam region, partly justifies this negative impact. Indeed, beneficiary households saw a drastic drop in their annual income from crop production (3,914 FCFA on average for the entire campaign, compared with 12,000 FCFA for the controls). Similarly, income from livestock production was 207,984 FCFA less productive than that of the controls. In fact, the stock of livestock counted in control households was higher than in target households, except for small ruminants. This means that control households fare better, with a strong contribution from their agricultural and livestock income. We note that this result reveals a process of emergence from poverty. Poor households begin to capitalize on poultry and then small ruminants. Moreover, target households have been able to turn their situation around thanks to non-agricultural income. This highlights the complementary role of non-agricultural income in rural areas, especially during poor seasons. Further analysis is required to clarify these results. Nevertheless, the impact is negative in this region. However, if we consider the differences at start-up, we can see that the situations are getting closer...

III.1.2.2 HEALTH

The state of people's health is also seen as a good indicator of quality of life. It is the primary condition of resources or investment capital at household level. Thus, the level of health of household members reveals the perception of the quality of the household's human resources. The survey revealed that over the last 4 weeks prior to the interview, more than 95% of households had recorded sickness. The average number of registered sick is 2 per household during this short period for all zones (table 10). This indicates a high rate of sickness for such a short period. These results vary, however, by region and by target and control households. The average number of patients was one person per household in the Matam region, 2 in Kaffrine and 3 in the Louga region. In all regions, the control households recorded more patients than those targeted by the project.

Table 10: Average number of registered patients and level of healthcare expenditure

Designation	*Indicator*	*Target*	*Total*	*Difference*
All three regions				
Average number of patients	2	1	2	-1,052***
Total healthcare expenditure	55 622	56 065	55 799	442,816
Healthcare expenditure per head	5 674	5 230	5 496	-444,574
Expenditure per adult equivalent	7 299	6 750	7 080	-548,272
Louga Region				
Average number of patients	3	1	2	-1,663***

Total healthcare expenditure	62 580	57 106	60 622	-5473,478
Per capita healthcare expenditure	6 337	6 720	6 474	382,363
Expenditure per adult equivalent	8 279	8 544	8 373	264,942
Matam region				
Average number of patients	1	1	1	0,23
Total healthcare expenditure	57 519	22 613	41 786	-34906,1**
Healthcare expenditure per head	8 503	2 703	5 889	-5800,1**
Healthcare expenditure by EA	10 880	3 809	7 693	-7071,2**
Kaffrine Region				
Average number of patients	2	1	2	-0,138
Total healthcare expenditure	43 138	68 547	54 336	25409,052
Healthcare expenditure per head	3 441	4 490	3 903	1048,368
Healthcare expenditure by EA	4 235	5 819	4 933	1584,411

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

Overall, 95% of households in the Louga and Matam regions, and 98% in the Kaffrine region, recorded sickness. In these cases, 91%, 92% and 97% of households in the Louga, Matam and Kaffrine regions respectively sought medical advice. The reasons for non-consultation varied. In the Louga region, the main reason was that the illness was not serious (44% overall and 100% among target households in the region). This is followed by lack of resources and availability of medicines at home (19%). The remoteness of health services (12%) also explains this lack of consultation. In the Matam region, the low level of consultation is due to a lack of financial resources (100%). The absence of consultation in the Kaffrine region is due to a lack of means in 67% of cases, or to the disease not being considered serious (33%). The results show the vulnerability of rural populations, with the high number of patients recorded during this short period. We also note the relative availability of medicines at home among households in the Louga region. Is this due to drug distribution campaigns or self-medication?

Analysis of healthcare expenditure shows a high average cost of 55,799 FCFA across all zones during the period under review (table 10). Target households spent an average of 56,065 FCFA, while control households with more patients spent slightly less (55,622 FCFA). This expenditure, distributed at household level, averaged 5,674 FCFA per capita in control households and 5,230 FCFA per capita in target households. In the Louga region, expenditure averaged 6,474 FCFA, with 382 FCFA more among target households, while in the Matam region, health expenditure averaged 5,889 FCFA per capita. In this region, control households spend more than the overall average for all regions, at 8,503 FCFA. The Kaffrine region recorded an average of 3,903 FCFA per capita, the lowest level of health expenditure of the three regions. Target households in Kaffrine spend an average of 4,490 FCFA per head, 1,048 FCFA more than control households. These results can also be explained by the remoteness of health posts in the target regions. This estimate enabled us to draw up a typology of households according to their satisfaction with the level of coverage.

health expenditure per patient at household level and by agro-ecological zone (table 11).

Table 11: Level of coverage of health needs by household type and region

	Indicator	Target	Total	Difference
All 3 regions				
○ Very adequate	24,59 %	21,18 %	23,23 %	-0,034
○ Satisfactory	11,80 %	12,32 %	12,01 %	0,005
○ Low	63,61 %	66,50 %	64,76 %	0,029
Louga				
○ Very adequate	24,59 %	21,18 %	23,23 %	-0,034
○ Satisfactory	11,80 %	12,32 %	12,01 %	0,005
○ Low	63,61 %	66,50 %	64,76 %	0,029
Kaffrine				
○ Very adequate	20,20 %	24,36 %	22,03 %	0,042
○ Satisfactory	14,14 %	3,85 %	9,60 %	-0,103*
○ Low	65,66 %	71,79 %	68,36 %	0,061
Matam				
○ Very adequate	38,46 %	15,63 %	28,17 %	-0,228*
○ Satisfactory	12,82 %	18,75 %	15,49 %	0,059
○ Low	48,72 %	65,63 %	56,34 %	0,169

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

Table 11 shows that the majority of households (65%) fail to cover their health needs to an average level in all regions, in both target (66%) and control (63%) groups. Nevertheless, more than a third of these households manage to cover their health needs adequately. This trend is also similar between target and control households, with no statistically significant difference. However, the level of coverage varies by region. In the Louga region, the level of satisfaction with health coverage is 35%, of which 23% is very satisfactory. Despite high incomes among target households in this region, the level of vulnerability in health coverage remains high (66% versus 64% among controls). These results show that the priority may lie elsewhere. In this region, 100% of target households declare that their patients are not serious (table 11). It should also be noted that cultural perception plays an important role in meeting health needs.

In the Matam region, the level of coverage is much higher at 44%, 16% of which is very satisfactory. Control households in this region cover their health needs better than target households, who cite lack of resources as the reason (table 11). Among target households, the majority (66%) are vulnerable in terms of covering their needs in the Matam region. In the Kaffrine region, although the need for health expenditure is the lowest per capita, the population still covers its health needs the least. The level of vulnerable households is 68%, ranging from 66% of control households to 72% of target households. The level of coverage of health needs is therefore very low for households in the Kaffrine region. Income from their activities does not allow them to adequately cover their needs, in both target and control households.

It's true that the project's objective was not health-related; but the spin-offs from the induced activities generate income and resources enabling them to meet their so-called primary needs, as in the case of the target households in the Louga region. The results are also interesting in terms of health orientation and planning. Patient care remains limited by the lack of sufficient resources at household level. Per capita health expenditure is fairly high (over 5,000 FCFA), except in the Kaffrine region. A reduction in the cost of medicines would therefore contribute to the proper management of illnesses. It should also be noted that there is a strong presence of traditional medicine. The frequent recourse to these practices, especially in rural areas, also leads to reductions in the cost of treating patients.

III.1.2.3 LEVEL OF DURABLE GOODS

The indicator of household living conditions or well-being is assessed according to the level of ownership of durable goods. These are made up of real-estate assets, such as houses and agricultural equipment. These enrichment assets or durable goods strengthen the household's investment and production capacities. They can contribute to stability in the event of a structural downturn, and constitute factors of good condition. The characterization of these household assets by region is illustrated in table 12. This information shows that most households are modest to poor. Across all regions, the average number of household durables is 13, with a relatively small difference of one point in favor of the targets. Most households are poorly endowed with durable goods. In the Louga and Matam regions, for example, the average level of durable goods ownership is 13, always one point higher than for target households. Households in the Kaffrine region appear to be the best endowed in terms of durable goods, with an average of 16 per household, and a one-point advantage over target households. Households in these regions retain their rural character, with a strong presence of zinc roofing and banco wall materials. Households in Matam (in the Senegal River valley) are less well-equipped due to the use of mechanized service providers, unlike other areas which rely on their own equipment, albeit very light and often dilapidated (hoe, daba, seed drills, etc.).

Table 12: Number and coverage of durable goods requirements by region

	Indicator	Target	Total	Difference
Three regions together				
Average number of durable goods	13	14	13	1,028
Satisfaction level coverage				

• Very adequate	22,37 %	25,12 %	23,47 %	0,028
• Satisfactory	29,28 %	26,11 %	28,01 %	-0,032
• Low	48,36 %	48,77 %	48,52 %	0,004
Louga				
Durable goods Louga	13	14	13	0,717
Satisfaction level coverage				
• Very adequate	21,56 %	22,58 %	21,92 %	0,010
• Satisfactory	31,74 %	20,43 %	27,69 %	-0,113*
• Low	46,71 %	56,99 %	50,38 %	0,103
Matam				
Durable goods Matam	13	14	13	0,717
Satisfaction level coverage				
• Very adequate	18,42 %	37,50 %	27,14 %	0,191
• Satisfactory	44,74 %	31,25 %	38,57 %	-0,135
• Low	36,84 %	31,25 %	34,29 %	-0,056
Kaffrine				
Durable Goods Kaffrine	15	17	16	1,909
Satisfaction level coverage				
• Very adequate	18,18 %	28,21 %	22,60 %	0,100
• Satisfactory	35,35 %	33,33 %	34,46 %	-0,020
• Low	46,46 %	38,46 %	42,94 %	-0,080

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

In terms of durable goods coverage, 52% of households in all three regions are satisfied (table 12). In terms of satisfying durable goods needs, the majority of target (51%) and control (52%) households use firewood at satisfactory levels. The **Louga** region, with fewer durables per household, has the highest number of vulnerable households: 57% of target households and 47% of control households are vulnerable.

In contrast to the Louga region, only a third of the population surveyed in the **Matam** region is dissatisfied with durable goods. In the Matam region, 69% of target households are satisfied with the availability of durable goods, of which 37% are relatively very satisfied, while control households are 63% satisfied with the availability of durable goods, of which only 29% are very satisfied. Nevertheless, 31% and 34% of target and control households respectively remain vulnerable. Despite having the highest number of durables, the **Kaffrine** region recorded 43% of vulnerable households in durable goods coverage, although 62% of target households in the region were at a satisfactory level, compared with 53% of control households. In this area, target households have progressed much more from moderately satisfactory to very satisfactory.

Overall, target households in the Matam and Kaffrine regions are better endowed with durable goods than control households, with a statistically significant difference, indicating a positive effect of the project on durable goods endowment, which may be an acquisition of new equipment or real estate, or a change in housing structure. Thus, the project's impact has induced a change or a slight improvement in modernity or comfort in the target communities. Nevertheless, the disparity in resources between the regions merits further reflection; we note certain factors of variation which partly explain this disparity in resources and living conditions. Indeed, the higher level of urbanization (telephone, road, health post, etc.,); the proximity of service infrastructures, credit institutions and markets; and the opening-up of the road infrastructure (relatively easier access for goods in and out, and lower transport costs) all contribute to the advantage of some sites over others, which, theoretically, should offer opportunities for incentives to improve welfare conditions (change of roof from banco to zinc or cement, etc.). Strengthening the infrastructural capacities of rural areas (roads, production tracks, creation of markets, etc.) would help to boost the incomes of rural populations through the development of extra-agricultural activities and an increase in durable goods, which has been one of PASA's intervention policies.

III.1.2.4 STATE OF VULNERABILITY

Meeting calorie needs is certainly important, but it is not the only criterion for assessing risk. Indeed, a household's state of vulnerability or insecurity goes beyond food. Vulnerability analysis involves a multiple dimension that reflects the ability of populations to satisfy their food, health and other non-food needs. Thus, **the inability of populations to compensate autonomously for the effects of a cyclical imbalance (rainfall deficit, food crisis, etc.) shows their intrinsic vulnerability**. This vulnerability is measured by the degree of permissiveness to food (crises), health and other needs, due to a combination of negative physical, climatic, economic and/or social factors. The state of vulnerability is analyzed through the combination of several indicators that help to identify the satisfaction of a household's food security needs. In this study, all three criteria are considered (health, level of consumption and level of endowment in durable goods). The three scales are used to level out the household's ability to meet its needs. Weighting coefficients are used here (in terms of level of importance in this objective of meeting needs). The reassessment of household satisfaction or vulnerability is presented in Table 13.

The results show a levelling of situations in the regions between target and control households. At regional level, the health needs of target and control households are poorly covered, with a relative availability of durable goods. As a result, the average level of at-risk households rose from 38%, with food coverage alone, to 48%, i.e. an additional 10 points. Despite the progress noted in the coverage of food needs, we note in all regions the low coverage of health needs and durable goods, leading to an increase in the level of at-risk households.

of household vulnerability. Households at risk in the Louga region rose from 38% to 50%, and those in Kaffrine from 25% to 44%. In these two regions, the gains made in meeting food needs were eroded by the very low level of coverage of health and durable goods needs. In the Matam region, on the other hand, good coverage of durable goods has led to significant improvements. The level of vulnerability fell from 44% to just 47%, surpassing even households in the Louga region, which are at 50% risk overall. Some households that were at risk when it came to satisfying their calorie needs are now at an advantage, given their very satisfactory level of durable goods. Under these conditions, their overall situation is less vulnerable than in other regions.

In the Louga and Kaffrine regions, the levelling is based on the compression of moderately satisfactory households in terms of food needs coverage. This was not the case for households in Matam. Because of their low level of durable goods provisioning (43-50% of households) and the fairly low level of their proper coverage of health needs (36-68% of households), the level of vulnerability remains for 44-50% of households. Combining these three indicators, Kaffrine becomes the least vulnerable area (44%), followed by Matam (47%). Whereas with only the consumer goods criterion, the Louga region was the least vulnerable, with only 38% of households at risk on average. There are several understandable reasons for this. Households in the Louga region are faced with a crying lack of agricultural materials and equipment, and give less priority to health needs, according to the results of the study. All of these factors justify the levelling up of these households. Indeed, households that were in a very satisfactory situation in terms of caloric needs have fallen. This means that households that are not vulnerable in any respect have been reduced to just 48% across the three regions. These results seem logical. In fact, the Louga area is pastoral; it is less equipped because the farms are predominantly pastoral, unlike Kaffrine, a better-equipped region with predominantly agricultural farms. Breeders are less equipped than farmers.

Table ***13: Level of household vulnerability by zone***

	Cons Calorie			*Health*			*Dot. Resources*			*Weighted criteria*			*Actual level Satisfaction*		
Regional	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**
% Household Very Satisfactory	39%	58%	46%	25%	21%	23%	22%	25%	23%	3,37	4,26	3,72	31%	39%	34%
% Medium-satisfactory household	23%	13%	19%	12%	12%	12%	29%	26%	28%	2,22	1,68	2,01	20%	15%	18%
% Household at risk	38%	29%	34%	64%	67%	65%	48%	49%	49%	5,41	5,06	5,27	49%	46%	48%
Weighting coefficient	5	5	5	4	4	4	2	2	2	11	11	11	100%	100 %	100%
	Cons Calorie			**Health**			**Dot. Resources**			**Criteria**			**Actual level**		
LOUGA	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**
% Household Very Satisfactory	35%	55%	42%	25%	21%	23%	22%	23%	22%	3,15	4,04	3,46	29%	37%	31%
% Medium-satisfactory household	25%	13%	20%	12%	12%	12%	32%	20%	28%	2,33	1,55	2,05	21%	14%	19%
% Household at risk	41%	32%	38%	64%	67%	65%	47%	57%	50%	5,51	5,41	5,48	50%	49%	50%
Weighting coefficient	5	5	5	4	4	4	2	2	2	11	11	11	100%	100 %	100%
	Cons Calorie			**Health**			**Dot. Resources**			**Criteria**			**Actual level**		
MATAM	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**

% Household Very Satisfactory	44%	47%	45%	38%	16%	28%	18%	38%	27%	4,09	3,72	3,92	37%	34%	36%
% Medium-satisfactory household	15%	6%	11%	13%	19%	15%	45%	31%	39%	2,18	1,69	1,95	20%	15%	18%
% Household at risk	41%	47%	44%	49%	66%	56%	37%	31%	34%	4,74	5,59	5,12	43%	51%	47%
Weighting coefficient	5	5	5	4	4	4	2	2	2	11	11	11	100%	100 %	100%
	Cons Calorie			**Health**			**Dot. Resources**			**Criteria**			**Actual level**		
KAFFRINE	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**	**Indicator**	**Target**	**Set**
% Household Very Satisfactory	43%	67%	54%	20%	24%	22%	18%	28%	23%	3,34	4,87	4,02	30%	44%	37%
% Medium-satisfactory household	24%	17%	21%	14%	4%	10%	35%	33%	34%	2,48	1,65	2,12	23%	15%	19%
% Household at risk	32%	17%	25%	66%	72%	68%	46%	38%	43%	5,17	4,47	4,86	47%	41%	44%
Weighting coefficient	5	5	5	4	4	4	2	2	2	11	11	11	100%	100 %	100%

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

At regional level, the state of vulnerability has risen sharply with the inclusion of the other components. The levelling out of situations has contributed to an increase in the number of households at risk by region, as the resources available at household level cannot adequately take into account all three needs in order to be protected from the effects of a crisis. Thus, the level of food security has improved with the project to take into account primary food consumption needs. However, other types of intervention are needed to further alleviate the situation of these very disadvantaged rural households. The fact that durable goods are now taken into account contributes to the relative drop in the vulnerability rate. **The demographic profile of households in the Louga and Kaffrine regions (on average, a high household size of 11 to 14 people, with a low number of workers (4 to 7)) shows a high dependency coefficient**. **This, combined with this year's limited agricultural resources for a highly agricultural region, justifies its high level of insecurity, despite the good results achieved with the project**.

III.1.2.5 Analysis of welding

A global analysis of the weld was carried out, as well as regional analyses.

III.1.2.5.1 Overall analysis of welding

The "soudure" is the period between the end of consumption of the previous year's harvest and the harvest period of the following year. During this period, households are forced to find other means of ensuring the continuity of their food supply. It is the length of the hunger gap that determines the severity of the food crisis or food insecurity in rural areas. Table 14 below shows the duration of the hunger gap in months, as well as survival strategies in the regions where the livestock breeding component of the project is active.

Table 14: Duration (in months) of the hunger gap and survival strategies in the study area

	Indicator	Targets	Total	difference
Duration of the lean period	2.92	2.39	2.71	-0.527*
Member who has done paid work	27.60 %	28.39 %	27.90 %	0.008
Sale of goods	58.40 %	53.55 %	56.54 %	-0.049
Beasts	89.73 %	90.36 %	89.96 %	0.006
Carts	2.05 %	0.00 %	1.31 %	-0.021
Production tools	5.48 %	3.61 %	4.80 %	-0.019
Physical assets	7.53 %	7.23 %	7.42 %	-0.003
Withdrawal of other resources (e.g. store)	4.11 %	6.02 %	4.80 %	0.019
Others to be specified	1.37 %	1.20 %	1.31 %	-0.002
Exodus of a household member	21.20 %	16.77 %	19.51 %	-0.044
Skip meals	28.80 %	30.97 %	29.63 %	0.022

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

In the 2020 project zones, we found that the lean season was shorter in the target zone than in the control zone. In both target and control villages, the lean season was 2 months 21 days. However, we found that the hunger gap was relatively shorter in the program areas than in the control areas. Among program beneficiaries, the length of the hunger gap was 2 months 11 days, whereas among controls, the surveys revealed a duration of 2 months 28 days, with a significant difference in favor of the beneficiary populations. This situation could be due to the importance of the program's efforts to achieve food security in rural areas.

Faced with this situation, survival strategies have been developed. The main strategy is the sale of animals, reported by 89% of target and control households. Other strategies, such as paid work and selling goods, are fairly common. The survival strategies developed are fairly similar between the target and control areas, as none of the differences is significant.

However, the overall analysis masks disparities between the regions visited. In the following paragraphs, we analyze the level of welding in each project region.

III.1.2.5.2 Analysis of the hunger gap and survival strategies at Kaffrine

In the Kaffrine region, the duration of the hunger gap is relatively shorter than the average for the three regions combined. The lean season lasts 1 month 27 days, and this situation is identical in both target and control areas.

We also note that the most widespread survival strategies include selling livestock, with 55% of control households claiming to have done so, compared with 60% in the target zone. Paid work by a member is also practiced by 26% of target households, versus 33% of control households. The sale of goods also appears in almost the same proportions as paid work. The sale of production tools is more prevalent in control areas, as is rural exodus, while skipping meals is more prevalent in target areas.

Table 15: Duration (in months) of the hunger gap and survival strategies in Kaffrine

	Indicator	Targets	Total	Difference
Welding period	1.90	1.85	1.88	-0.053
Member who has done paid work	33.33 %	26.15 %	30.14 %	-0.072
Sale of goods	33.33 %	23.08 %	28.77 %	-0.103
Beasts	55.56 %	60.00 %	57.14 %	0.044
Carts	3.70 %	0.00 %	2.38 %	-0.037
Production tools	25.93 %	20.00 %	23.81 %	-0.059
Physical assets	33.33 %	26.67 %	30.95 %	-0.067
Withdrawal of other resources (e.g. store)	7.41 %	26.67 %	14.29 %	0.193
Others to be specified	7.41 %	6.67 %	7.14 %	-0.007
Exodus of a household member	18.52%	16.92 %	17.81%	-0.016
Skip meals	13.58 %	15.38 %	14.38 %	0.018

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

III.1.2.5.3 Analysis of the hunger gap and survival strategies at Louga

In the Louga region, the lean period is still estimated at 3 months. A better situation is nevertheless obtained in the target zones, with a length of the period of 2 months 18 days versus 3 months 7 days in the control zone. Such a difference could be explained by the program's intervention, which makes the beneficiary populations much more resilient.

The sale of goods and livestock remain the most widespread strategies. In the program's target localities in this region, all households reported having resorted to selling animals to cope with the hunger gap. Rural exodus as a strategy is less prevalent among the zone's targets compared to the controls, while meal skipping is more prevalent.

Table 16: Duration (in months) of the hunger gap and survival strategies in Louga

	Indicator	Targets	Total	difference
Welding period	3.24	2.60	3.01	-0.637
Member who has done paid work	24.44 %	23.08 %	24.00 %	-0.014
Sale of goods	68.15 %	75.38 %	70.50 %	0.072
Beasts	97.83 %	100.00 %	98.58 %	0.022
Carts	2.17 %	0.00 %	1.42 %	-0.022
Production tools	1.09 %	0.00 %	0.71 %	-0.011
Physical assets	1.09 %	0.00 %	0.71 %	-0.011
Withdrawal of other resources (e.g. store)	4.35 %	0.00 %	2.84 %	-0.043*
Exodus of a household member	23.70 %	13.85 %	20.50 %	-0.099
Skip meals	26.67 %	32.31 %	28.50 %	0.056

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

III.1.2.5.4 Analysis of the hunger gap and survival strategies in Matam

The Matam region appears to be the area with the longest hunger gap. In both the program and control zones, the average was 3 months 20 days. However, the program's target zone showed much more positive results. The duration of the lean period recorded there was 3 months 4 days, compared with 4 months 4 days in the control area. The difference obtained is around 30 days in favor of the program zones. This result could be justified by the benefits obtained from the program's intervention.

The most common strategies for coping with the lean season in the target and control areas are overtime work, selling livestock, selling material goods and paid work by a household member.

Table 17: Duration (in months) of the hunger gap and survival strategies in Matam

	Indicator	Targets	Total	difference
Duration of sealing period	4.15	3.13	3.69	-1.029
Member who has done paid work	26.47 %	48.00 %	35.59 %	0.215
Sale of goods	79.41 %	76.00 %	77.97 %	-0.034
Livestock sales	96.30 %	89.47 %	93.48 %	-0.068
Cart sales	3.70 %	10.53 %	6.52 %	0.068
Resource extraction	0.00 %	5.26 %	2.17 %	0.053

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

In addition to the food security analysis, we also carried out an analysis of household living standards and women's empowerment.

III.2 Analysis of living standards for households

The standard of living indicator is obtained by principal component analysis on the number of goods owned in each of the following categories: iron, sewing machine, television, car, refrigerator, radio, electric water heater, motorcycle, bicycle, wardrobe, bed, computer, cell phone, air conditioner, etc. The indicator, once estimated, is normalized to the range 0-100 for description purposes, and standardized (mean 0 and standard deviation 1) for modeling purposes. Once estimated, the indicator is normalized to the range 0-100 for descriptive purposes, and standardized (mean 0 and standard deviation 1) for modeling purposes.

The estimation of a single value measuring the standard of living of households is made possible by the fact that the alpha coefficient is estimated at 0.83, the desired minimum being equal to 0.60. By its very construction, the standard of living indicator does not establish whether an individual is rich or poor. On the contrary, it simply aims to classify individuals according to their level of well-being.

III.2.1 Description of the indicator

In Table 1 below, we present some distributional elements of the standard of living indicator.

Table 18: Distribution of the household standard of living index

Average	12.0
P10	3.5
P25	5.1
P50	9.1
P75	15.0
P90	24.5

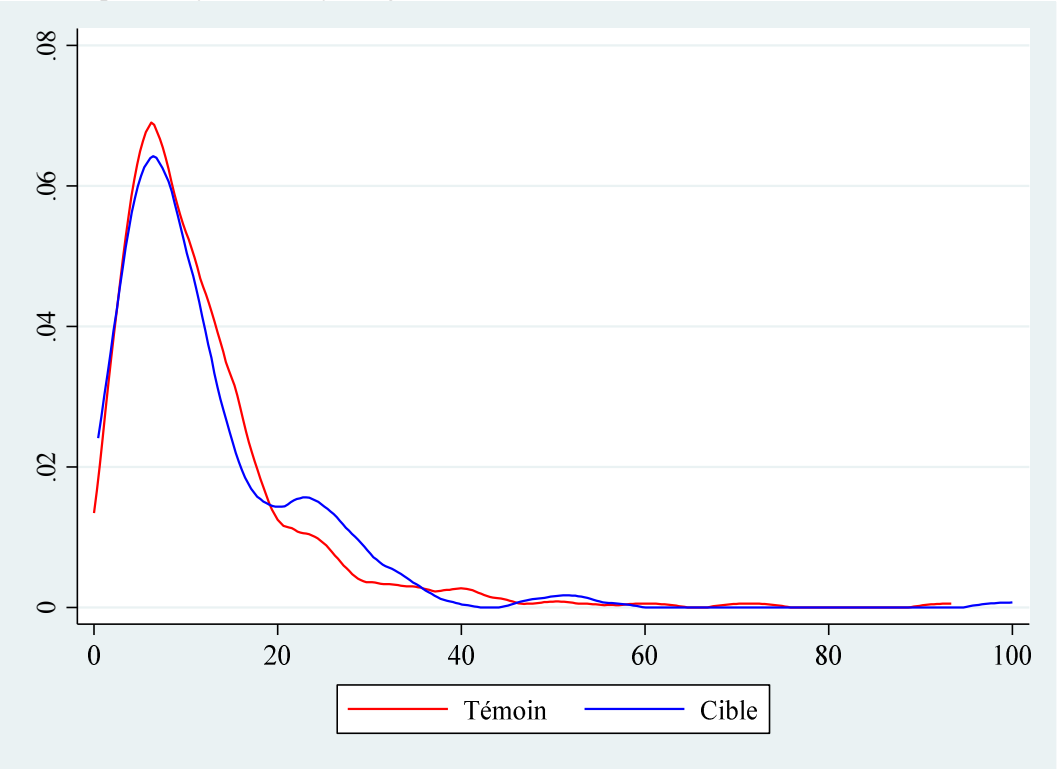
Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

According to the figures in Table 18, half the individuals have a value of 9.1 or less (out of a possible maximum of 100). Three-quarters have a value of 15 or less. These values thus testify to the degree of "lack" in the households surveyed. While individuals are "poor" overall, there are some differences between groups.

The distribution of the standard of living indicator is asymmetrical on the left; this is very consistent with the values noted for the different percentiles of the indicator,

the wealthiest people barely exceeding the value of 50 (out of a possible maximum of 100).

Figure 1: Comparison of standard of living indicator between treatment and control



III.2.2 Estimated impact of PASA-LOUMAKAF on the standard of living indicator

This section aims to estimate the average impact of the project. We operationalize this through a regression whose equation is presented below:

$$_i y = \alpha + \beta T_i + Z\Delta + v_i \quad (1)$$

In this equation, T_i measures the benefit of the PASA-LOUMAKAF program; this variable for individual *i*, is equal to 1 for beneficiaries and 0 for non-beneficiaries. The variable y_{it} measures the level of individual *i's* living standards indicator, while Z is a matrix of invariant household characteristics[2] and Δ the vector of associated parameters. The impact of the treatment is estimated by the coefficient β. The results of this regression are reported in the following Table 2.

We also specify quantile regressions (in the form of equation 1) to estimate the effects on the distribution of the standard-of-living indicator. The calculated effects are presented at the aggregate level and by region.

[2] The characteristics considered are age, gender, level of education and region.

Table 19: Effects of treatment on treated animals

	National	Kaffrine	Louga	Matam
... average	0.080	0.294	-0.028	0.066
... percentile 10	-0.054	-0.117	-0.050	-0.040
... percentiles20	-0.001	-0.004	0.002	-0.022
... percentile 30	0.034	0.110	0.002	0.070
... percentile 40	0.049	0.144	0.064	0.026
... percentile 50	0.063	0.119	0.076	0.037
... percentile 60	0.066	0.172	0.018	0.021
... percentile 70	0.079	0.613**	-0.000	0.109
... percentile 80	0.201	0.772***	-0.015	0.143
... percentile 90	0.351**	0.394	0.149	0.234

*** p<0.01, ** p<0.05, * p<0.1

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

In the light of Table 19, the average effect of the program on the standard of living of treated people is insignificant overall (and even within regions). The same is true of the program's effects on almost the entire distribution of the standard-of-living indicator. However, we note a massive effect for the wealthiest individuals in the sample. This effect is estimated at 35% of the standard deviation of the standard-of-living distribution. Similarly, the Kaffrine region shows significant effects (61% and 77% standard deviation) at deciles 7 and 8. As a result, only the wealthiest individuals benefited from the project.

One possible explanation for this finding is that the project is not yet fully mature, so that the effects on beneficiaries are not visible to all. It is therefore suggested that this analysis be repeated after one or even two years, in order to assess the longer-term effects of the project.

III.3 Empowering women

The Women's Empowerment in Agriculture Index is a measure exclusively dedicated to quantifying women's independence and inclusion in agricultural decision-making. The index was designed jointly by USAID, IFPRI and OPHI.

Launched in February 2012, USAID uses this index to assess the extent to which the program's objectives in terms of women's empowerment are being achieved. The

Table 20 below shows the different dimensions used to calculate the index, along with the weight of each.

Table 20: Dimensions and weights in the Women's Empowerment Index

Domain	Indicators	Weight
Decision-making in production	Input into production decisions	1/10
	Autonomy in production	1/10
Access to productive resources	Ownership of assets or property	1/15
	Purchase, sale or transfer of assets or property	1/15
	Access and credit decisions	1/15
Control over the use of income	Control over the use of income	1/5
Community leadership	Group membership	1/10
	Public speaking	1/10
Time allocation	Workload	1/10
	Leisure	1/10
Total weight		1

Source: IFPRI, 2012[3]

The index can also be used to answer other questions. In particular, the index can be used as a diagnostic tool to identify specific geographical regions where women's empowerment is very low. Targeting could thus be envisaged to empower women in areas with low average levels of empowerment. The index can also prove extremely useful for researchers. The latter could, for example, study the links between the empowerment index and household well-being (which we test in this document), or assess the robustness of the index in relation to competing indicators for measuring women's empowerment. By design, this indicator of women's level of independence in agriculture takes its values in the 0-100 interval.

III.3.1 Status of the women's autonomy indicator

Table 21 shows some distributional elements of the women's empowerment indicator. Half the women have a value of 46.0 or less for the empowerment indicator. Three-quarters have a value of 61.8 or less. These values thus testify to the low level of women's empowerment in the regions under consideration.

Table 21: Distribution of the women's empowerment indicator

Average	47.7
P10	23.5
P25	34.1
P50	46.0
P75	61.8
P90	74.1

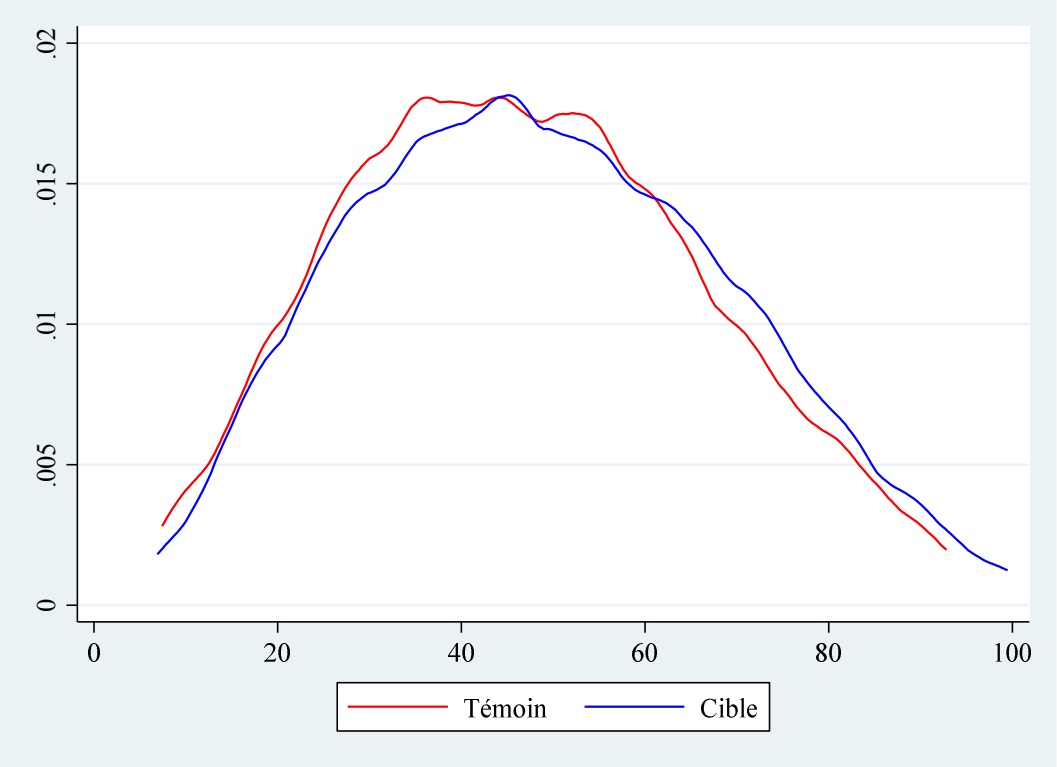
Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

A minimum value of 0.8 is required to decide that a woman is empowered. The result, according to our estimates, is that just 6.9% of women are empowered.

[3] IFPRI. 2012. Women's Empowerment in Agriculture Index. Washington, D.C., IFPRI.

reached the status of empowered women. The following graph shows the distribution of the empowerment index according to group (treatment and control).

Figure 2: Comparison of women's autonomy indicator between treatment and control



A visual examination of this graph suggests similar means, but also differences in the percentiles of the empowerment index distribution. We test these differences (in appearance) with the appropriate tools in the next section.

III.3.2 Estimating the impact of PASA-LOUMAKAF on the autonomy of women

As before, the program's impact on women's empowerment will be assessed using a linear regression model and quantile regression models. The results are presented in Table 22, and suggest a lack of average program effect both overall and across regions. Similarly, the program's distributional effects are absent (at both global and regional levels) on the deciles of the women's empowerment index distribution.

Table 22: Effects of treatment on treated patients

	National	Kaffrine	Louga	Matam
... average	0.067	-0.025	0.101	0.206
... percentile 10	0.076	-0.080	0.235	0.171
... percentiles20	-0.131	-0.343	0.053	0.344
... percentile 30	0.047	-0.064	0.184	0.304
... percentile 40	0.093	0.006	0.085	0.288
... percentile 50	0.095	0.119	0.003	0.144
... percentile 60	0.045	-0.020	0.028	0.170
... percentile 70	0.081	0.221	0.195	0.266
... percentile 80	0.139	0.157	0.168	0.058
... percentile 90	0.037	0.053	-0.091	-0.087

*** p<0.01, ** p<0.05, * p<0.1*

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

These results suggest, as before, that the project has not yet achieved its desired objectives. It therefore seems important either to **reconsider the package offered to households, or to reassess the results of this project over a longer period**.

III.3.3 Determinants of empowerment for women

What variables are likely to have an effect on women's empowerment? This is the question relevant to public policy aimed at empowering Senegalese women. To answer this question, we have estimated a linear regression model in which we model women's empowerment index as a function of the age, gender and education level of the household head, and the monogamous or polygamous nature of the household. We have also introduced as explanatory variables the standard of living index and the geographical location of the household.

Several regression models, presented in the following Table 23, are developed:

- A linear regression model (column 1) ;
- Regression models on deciles (columns 2 to 9).

The results of this table indicate (rather surprisingly) that household standard of living is unrelated to the women's empowerment index, except very weakly at the median of its distribution (column 6). Another result (also counter-intuitive) is that the empowerment index is positively correlated with polygamy at its low values (decile 2, column 3). In other words, among women with a low level of empowerment, polygamy tends to play a positive role.

The model also presents expected results, in particular with regard to the relationship of the empowerment index with the level of education of the household head:

- Systematically, women living with a head of household who has never been to school or who has only attended Koranic school are less empowered than those living with a head of household who has at least secondary education.
- On average and towards the middle of the distribution (deciles 2, 3, 4 and 5), women living with a literate head of household are less empowered than those living with a head of household who has achieved at least secondary education.
- Women living with a household head with primary education are less empowered than those living with a household head with at least secondary education. This result does not hold for decile 7 of the female empowerment index distribution.

In addition to these results, it appears that, on average and for the last three deciles (7, 8 and 9), women living in Kaffrine and Louga are more empowered than those living in other regions. than those living in à Matam.

Table 23: Determinants of women's empowerment

	(1) OLS	(2) Q10	(3) Q20	(4) Q30	(5) Q40	(6) Q50	(7) Q60	(8) Q70	(9) Q80	(10) Q90
Household standard of living	1.05	0.72	-0.43	1.15	1.48	1.90*	1.52	1.50	0.86	0.55
	(1.28)	(1.80)	(1.65)	(3.35)	(2.29)	(1.11)	(1.22)	(1.25)	(2.23)	(1.84)
Treatment (1=Target)	1.12	1.61	-1.23	0.24	1.33	2.58	1.60	1.68	3.60	1.21
	(2.31)	(2.72)	(3.10)	(2.99)	(2.58)	(2.63)	(2.79)	(3.04)	(4.21)	(2.81)
The Head of Household (HH) is a woman	8.00**	9.98	8.21	7.26	7.35*	8.99**	8.27**	9.36**	4.25	8.31
	(3.31)	(6.32)	(5.16)	(6.02)	(4.18)	(4.27)	(4.20)	(4.64)	(5.49)	(7.07)
CM age	0.07	0.15	0.02	0.02	0.05	0.09	0.06	0.03	0.09	0.09
	(0.07)	(0.09)	(0.09)	(0.12)	(0.10)	(0.09)	(0.12)	(0.11)	(0.13)	(0.08)
The household is polygamous	2.44	1.67	5.94**	2.44	3.80	0.59	1.24	3.30	0.32	4.02
	(1.93)	(2.74)	(2.84)	(3.42)	(2.59)	(2.23)	(2.72)	(3.05)	(3.78)	(3.29)
CM's level of education = None	-24.16***	-17.00**	-35.97***	-28.35***	-26.05***	-28.41***	-26.24***	-22.36***	-29.52***	-24.83***
	(4.91)	(7.56)	(5.38)	(6.27)	(5.53)	(5.01)	(7.17)	(7.35)	(7.58)	(6.65)
CM's level of education = Literate	-13.00**	-6.37	-25.91***	-18.12**	-17.02***	-15.88**	-10.15	-9.24	-16.49	-9.80
	(5.24)	(7.97)	(8.38)	(7.65)	(6.37)	(6.29)	(6.90)	(7.57)	(12.53)	(6.91)
CM's level of education = Primary	-17.38***	-19.38*	-25.18***	-21.99***	-18.04***	-20.08***	-18.24***	-12.28	-20.89***	-19.75***
	(5.80)	(10.02)	(6.79)	(7.61)	(6.45)	(5.52)	(6.76)	(8.66)	(7.73)	(5.17)
CM's level of education = Koranic school	-18.61***	-12.82*	-29.18***	-23.92***	-21.01***	-20.96***	-17.53***	-15.09**	-23.32***	-20.20***
	(4.56)	(7.78)	(5.14)	(5.04)	(5.32)	(4.21)	(5.82)	(6.43)	(7.02)	(5.71)
The household lives in Kaffrine	6.94*	1.80	0.75	0.83	3.39	2.36	7.02	8.50* 17.7 3 * * *	12.41**	
	(3.84)	(4.95)	(5.53)	(5.40)	(4.04)	(4.48)	(5.46)	(4.80)	(5.41)	(4.04)
The household lives in Louga	6.16*	4.05	0.77	4.00	4.10	3.03	6.36	8.06* 10.8 1 * * *	9.82**	
	(3.30)	(2.99)	(3.74)	(4.50)	(3.92)	(4.17)	(4.82)	(4.15)	(4.28)	(3.02)
Constant	55.47***	24.06***	55.24***	56.22***	54.29***	58.79***	60.71***	61.17***	72.26***	73.77***
	(5.24)	(9.14)	(6.85)	(7.90)	(6.04)	(6.03)	(7.91)	(8.27)	(7.35)	(5.58)

Comments	**488**	**488**	**488**	**488**	**488**	**488**	**488**	**488**	**488**	**488**

R^2	**0.12**	**0.09**	**0.10**	**0.10**	**0.12**	**0.11**	**0.12**	**0.12**	**0.11**	**0.11**

Adjusted sampling design standard errors in brackets

**** p<0.01, ** p<0.05, * p<0.1*

Source: Impact assessment of the PASA LOUMAKAF Project, CRDES 2020.

The lack of effect of household standard of living on the women's empowerment index may result from a misspecification of the functional form linking these two variables. To assess the robustness of our results, we therefore test additional specifications linking these two variables, incorporating first linear, then quadratic and finally cubic forms of the household standard of living index.

In the light of the results presented in the following table 24, it appears that :

- The coefficients of the linear term are significant in all three models;
- The coefficients of the quadratic term are not significant in models (2) and (3) ;
- The coefficient of the cubic term is not significant in model (3).

Table 24: Functional form tests linking the empowerment index to the standard of l i v i n g index

	(1) Linear	**(2) Quadratic**	**(3) Cubic**
Household standard of living	3.13**	4.58***	4.61**
	(1.22)	(1.42)	(1.78)
Household standard of living		-0.45	-0.49
		(0.37)	(1.30)
Household standard of living per cube			0.01
			(0.15)
Constant	47.65***	48.08***	48.10***
	(1.20)	(1.22)	(1.40)
Comments	**490**	**490**	**490**
Adjusted R²	**0.02**	**0.03**	**0.02**

Adjusted standard errors of sampling design with cluster effects in brackets
**** p<0.01, ** p<0.05, * p<0.1*

Source: Impact assessment of the PASA LOUMAKAF project, CRDES 2020.

These results therefore indicate that the quadratic and cubic specifications are not relevant in the functional form that links women's empowerment index to their household's standard of living index. The linear specification implemented in the identification of determinants is therefore adequate for linking these two variables.

III.3.4 Summary

The evaluation of this project revealed that the expected results have not yet been achieved: only one effect was observed, namely a massive improvement (35% standard deviation overall and 60-80% standard deviation in Kaffrine) in the standard of living of the wealthiest individuals in the sample. One possible explanation for this finding is that the PASA-LOUMAKAF program has not yet reached maturity, so the effects on beneficiaries are not yet visible. It is therefore suggested that a new evaluation be carried out after a few years to better assess the program's effects.

III.4 Results qualitative

The qualitative evaluation of the PASA LOU-MA-KAF project focused on the **perceptions** that the various beneficiaries and partner actors of the livestock component have of the project in relation to its contribution to :

- access to pastoral hydraulics;
- improving incomes through income-generating activities;
- governance of natural resources and t h e environment through local institutions (UP);
- genetic improvement and securing breeding activities with the construction of standard shelters
- The construction of collective facilities to boost livestock production (stores, sheds, vaccination pens, etc.);
- Taking gender and social inclusion into account ;
- Capacity building and communication.

The various questions submitted for this evaluation are assessed against criteria of:

- Relevance
- Efficiency
- Efficiency
- Durability

III.4.1 Hydraulics pastoral

Pastoral water supply is the main activity of the PASA- Lou-Ma-Kaf livestock development program in the main intervention regions. Whether we're talking about pastoral units, vaccination pens, feed stores or firewalls, it's always a water point - in this case a borehole - that constitutes the epicenter that polarizes activities. This option is justified by the fact that the main constraint in these areas is the availability of water in sufficient quantity and quality. This is why, as a priority, the project drilled 10 boreholes and rehabilitated 8 existing ones, all in areas where demand was very pressing. By way of illustration, three boreholes are located in the Tessékéré, Amali and Widou Thiengolly triangle, known as the "thirst triangle". Indeed, between these areas, 35 to 40 km apart, there were no water points.

At the same time, the project built 8 temporary ponds to improve the water supply in these areas, where the major constraint to economic and social development is the lack of water. The purpose of these ponds was to retain water throughout the dry season and reduce production costs for pastoralists and transhumants (free water), thus having a direct impact on pastoral productivity.

It has to be said at the outset that these initiatives to make water available have had a significant impact in the project area. These impacts can be seen in terms of poverty alleviation through improved livestock production (sheepfolds, goatfolds, chicken coops, protection of fodder resources, etc.), improved incomes through income-generating activities, management of natural resources and the environment, etc., and improved living conditions for the local population.

The project has made it possible to densify the network of water points in the most sensitive areas (Linguère, Ranérou and Koungheul departments) by rehabilitating boreholes and developing and protecting ponds against various forms of degradation.

Despite these major efforts, the project has not had the full impact expected, as most of the boreholes that have been completed are encountering problems with pump capacity (Kossas Namary) and network installation (Kossas Namary, Lougueré Thiolly, Souye Touba, Amali, Widou Thiengolly, Labardi, Wendou Boki, etc.). The project includes multi-village boreholes with public and private connections. At Souye Touba in the Barkédji district, for example, the borehole and water tower have not been completed, and the borehole cannot be put into service due to the poor quality of the work and the absence of connections to supply both the drinking troughs and the antennas planned for satellite villages such as Loumbi Doulo and Bélel Kédé. The same problem applies to Kossas Namary in Ranérou, where the water troughs and antennas are not connected. Despite people's satisfaction with the boreholes, several points of dissatisfaction were mentioned: work not completed due to delays on the part of contractors, undersized pumps/oversized generators, water troughs not connected, villages planned but not connected ....
At the Lougueré Thiolly borehole, which has been rehabilitated (lift area, water tower), the drinking troughs are not connected, and the borehole drains into a ground basin, enabling users to replenish their supplies.
Although in terms of quantitative objectives, the project has achieved its results, with 8 boreholes drilled or rehabilitated (although some finishing work remains to be done) and the development of 8 temporary ponds, much remains to be done to achieve full exploitation of the hydraulic infrastructures. There is still considerable potential for exploiting this particularly important aspect of the project, which was strongly emphasized by the local population during the mission. All the civil engineering work needs to be completed, in terms of connecting all the planned sites and equipment (antennas, drinking troughs, standpipes, standpipes, private connections, etc.), and support needs to be provided to beneficiaries in the initial phases of operation**.** For the development and protection of ponds, a great deal of work has been carried out in conjunction with the UPs, to the great satisfaction of the beneficiaries.
The people we met felt that the impact of the hydraulic infrastructures and equipment could have been much greater if the remaining civil engineering work had been completed. Work needs to be done in this sector, in conjunction with the contractors, to finish all the work that is essential to achieving the project's objectives. Lastly, mechanisms need to be put in place to support users during the first years of operation of these water points.

III.4.2 Income-generating activities and enhancement of animal habitats

The project has developed a significant income-generating activities component, which includes poultry farming, the development of small ruminant breeding, fattening, dairy barns, the valorization of livestock by-products with support for dairies, etc.
These beneficiaries, the vast majority of whom are from the poorer sections of the population, gave a positive assessment of this project option. As far as results are concerned, they are generally interesting insofar as the majority of beneficiaries claim to have improved their income levels and living conditions.
The entry point or prerequisite for IGAs for livestock farming has been the improvement of animal housing, which aims to provide security (through the construction of buildings) against theft and predators on the one hand, and hygiene, animal health and animal insurance on the other.

part. These objectives have been coupled with an approach aimed at improving breeds in the various breeding categories.
Project beneficiaries are selected from the most vulnerable strata of society, after prior targeting by the local ATE. The list of targeted people is then presented to a selection committee chaired by the prefect of the applicant's department. Vulnerable people are eligible for funding: widowed women or heads of household, people living with disabilities, people recognized as poor and receiving family grants, etc.
This targeting respected vulnerability standards, with a few exceptions in Lougueré Thiolly in Ranérou, Pire Ndawène in the department of Koungheul, Birkilane and Touba Mbeléla. But it should also be mentioned that the project has taken into account the fact that the recipients are people who practice the type of livestock farming for which they are bidding. The fact of supporting people who already had their "hands in the paw" was very probably a factor in the success of this sub-component, which, according to the vast majority of people we met, had a positive impact on poor households.
The poultry sub-component was the most popular. Most of the recipients who were involved in the sector mentioned that their standard of living had improved significantly in terms of income, food, health care and children's access to school.

Poultry farming. This sub-component of the project was probably the most popular with beneficiaries. Several of the beneficiaries we met can corroborate this.
That of **Gnilane FAYE** from the village of Sikilo, 06 km from Kaffrine, to whom the Project built a henhouse and gave a rooster to improve his poultry yard, and who succeeded, through effort and commitment, in developing a small poultry business. The success of his operation enabled him to diversify his livestock with the acquisition of goats. These results were viewed positively by the project, which decided to support her innovation by building a goat barn next to the poultry house. This breeding enables this operator, whose husband is unemployed, to provide adequately for her family's needs: food, health, children's education.
In addition to this "success story", there are several other cases in point. The **Codou Faye woman** from Birkilane, after receiving initial support, developed an entire modern diversified farm, experimenting with the breeding of pedigree chickens (Bleu de Hollande, Rhodes Islan Red, etc.), an electric incubator and a flourishing trade in pedigree chickens. With her good results, she converted part of her house to build a larger henhouse. At the same time, she got a large number of women members of GPFs in the Birkilane department involved in poultry farming.
Apart from these two examples, there are many others who have testified to having significantly improved their level of income thanks to family poultry farming: Hawa Ndiaye from Vélingara Ferlo, Baidy ba from Ranérou or Couna Ndiaye Diop from Lougueré Thiolly...

Small ruminant breeding was appreciated in different ways by the beneficiaries. Most of those interviewed felt that the goat farms had been rather interesting, while the sheep farms had produced mixed results, although not all.

Goat farms seem to have had a better impact than sheepfolds. Bineta Thiam's goat farm in Dara Salam Nguith is a case in point. With the support of her husband, she now also cultivates fodder crops to bolster her livestock, which provides her with a regular income. Lady Bia Aidara from Vélingara

Ferlo, a beneficiary of a fattening operation, sold the sire provided by the project to buy goats and continue her breeding. She justifies her initiative by the fact that the ram supplied is not of the breed and that sheep are difficult to care for, unlike goats, which are reputed to be more resistant.

Many shepherd's croft owners have great difficulty in maintaining their animals throughout the year.
Amy Ndiaye's sheepfold in Linguère is an exception: she has benefited from the project's support, which has enabled her to diversify her livestock, even start growing fodder crops (malalfafa on an experimental basis) and generate income to support her family as a widow.

Bamba Babou, president of the Association des Handicapés de la Sous-Préfecture de Vélingara Ferlo, a beneficiary of a fattening operation, complains about the high cost of sheep rearing in terms of feed and veterinary care. He believes that support from the project to improve access to these products would have enabled this activity to have a greater impact on the income levels of the beneficiaries.

Penda Faty SOW from Yonouféré, Fatimata Dia from Ranérou and Saliou Ba from Saré Mbam, all beneficiaries of sheep pens and breeding stock, were unable to develop this activity. The reason given was that the breeding stock were sick and unfit for reproduction. These beneficiaries would like to sell these animals to make other investments, but are waiting for authorization from the livestock services. Several beneficiaries of sheepfolds complain that they have to pay for the care of the offered breeding stock, and that the veterinary services do n o t give priority to their animals, despite the insurance taken out.

What's more, animal insurance policies contain clauses that are difficult for beneficiaries to meet in order to receive reimbursement for the 80% of the animal's value. For example, it is very difficult for them to mobilize the veterinary services to carry out a report in the event of the animal's death, as this is a prerequisite for claiming reimbursement.

For Aliou Ba from Saré-Mbam in the Mbirkilane region, a beneficiary of first-generation sheepfolds, the breeding function has been extinguished and the sheepfold transformed into family housing. The conversion of sheepfolds and goat barns into family housing has been attempted by several recipients, who point out with irony that the quality of these facilities, intended for the animals, are sometimes, by far, better than their own homes.

Dairy cowsheds With the Largal dairy cooperative, PASA has developed important initiatives in the field of dairy farming and fattening, with interesting results in terms of substantial improvements in milk production and beneficiaries' incomes. With dairy cows, milk production has increased from 3 liters per day to an average of 12 liters per day. A liter of curdled milk is sold for between 300 and 350 FCFA, and fresh milk for between 500 and 600 FCFA.
There are 7 dairies in Dahra. The mission visited the new dairy barn and a dairy located in Dahra that packages milk and yoghurt...

Cowsheds were built for Khady Sow with an F1 crossbred cow, which enabled a significant improvement in the breed thanks to artificial insemination of the cows in the cowshed.

(local, Guzera, Hilstein, Monbéliard). Substantial income is generated by these fattening activities.

Constraints in this sector are mainly linked to marketing, but also to the problem of feeding improved breeds, which consume a lot of feed.
The operators are waiting for the project's tricycle to cover a wider area for milk sales, which will improve marketing.

III.4.3 Facilities: stores and vaccination parks at

Equipment is a key factor in improving people's working conditions in terms of performance in the various livestock-related activities.
The project has built a large number of infrastructures and facilities that have had a major impact on the living conditions of people in the beneficiary areas.
Vaccination parks. In terms of physical achievements, the project went far beyond the number of parks planned. A total of 60 vaccination parks have been set up throughout the project area, compared with the 30 initially planned, representing a 200% completion rate. These parks have been greatly appreciated by the beneficiaries and their partners, who point out that they have significantly increased the rate of livestock vaccination.
What's more, these pens, which replace wooden ones, help to relieve the pressure on natural resources. What's more, the pens are mixed so that both cattle and small ruminants can be vaccinated.

Livestock feed stores: In all, the project has built 12 livestock feed stores and rehabilitated the central store in Linguère, enabling the decentralization of livestock feed distribution. In the opinion of the people interviewed, these facilities have brought the products closer to the beneficiaries. The stores also make it possible to secure livestock feed in the event of early or out-of-season rains and other bad weather. Before the stores were built, people were obliged to rent houses or shelters to store their produce, which had an impact on feed costs and discouraged the group supply of livestock feed. In off-peak periods, the warehouses are used to store various agricultural inputs according to rules to be defined with the management committees set up.
These stores were enthusiastically welcomed by the beneficiaries, who had just received 70 tonnes of revolving livestock feed at each site at the time of the mission. In all, the project has installed 840 tonnes of feed.
Store management committees have been set up with the support of the project, and are made up of people from the villages polarized by each store. These management committees are in need of support, which may be lacking as the project draws to a close. It would therefore be important to set up a transitional mechanism that could rely on decentralized livestock services to take on this role.

Rural trails. PASA has built 66 kilometers of tracks out of the 60 planned. Today, these access roads play an essential role in the fight against poverty, enabling populations to reach the various urban centers and weekly markets where livestock and animal by-products are sold. They also provide access to various inputs (foodstuffs, livestock feed, etc.), to health centers to facilitate medical evacuations, and to schools for the children of herders who are often quite mobile.

In a nutshell, these tracks improve the connectivity of local areas and facilitate the synergy of development efforts.

Firebreaks. The project has set a new record in this sector, opening 1,338 km of firebreaks compared with the 500 km initially planned. This achievement was made possible thanks to the collaboration between the project and the Water and Forestry Directorate's services and projects, which played an active role in opening the firebreaks (using their equipment, personnel and follow-up logistics). These firewalls are complemented by the actions of local people through bushfire control committees as part of the active fight against bushfires (203 committees set up out of 200 planned). In addition to the firebreaks, as part of the active fight against the degradation of natural resources, there are committees to combat bush fires, abusive logging and pruning. These committees, like those in the UPs, have benefited from capacity-building activities (equipment and materials).

Development and monitoring of ponds. Ponds that have always played an important role in providing pastoralists with access to water have been **landscaped** and re-profiled. Access to these pools, and the establishment of camps around them, is now regulated under the UP management plan. These are conservation measures to avoid any degradation of the water (pollution, change in the configuration of the pond or even its extinction) and preventive conflict management**.** These ponds are supervised by the local population, who rigorously enforce the defined management rules.

Construction of livestock housing. The project has demonstrated innovation in shelter construction. In terms of quantity, the project has built 121 goat and sheep pens (100 planned), 100 chicken coops (60 planned), 2 dairies and 15 dairy barns, and 25 fodder storage sheds. The construction of these infrastructures is accompanied by an effort to improve the breeds of both ruminants and poultry by providing breeding stock for each livestock category. The security aspect of domestic livestock production was highlighted as one of the project's most visible results in this area. Issues relating to livestock theft and the various predators that discouraged breeding activities have been resolved with the creation of livestock habitats. Hygiene and the protection of livestock against bad weather such as early rains, and the training of local relays to vaccinate poultry are all initiatives that have created favorable conditions and made this activity attractive. The various players and partners we met found this option innovative and beneficial.

Dairy cowsheds and dairies had the dual function of producing large quantities of milk in all seasons and improving the breed by providing beneficiaries with an artificial insemination service.
The case of the Largal women's cooperative, which has benefited from a dairy processing unit, is a case in point, in addition to the dairy built at Ourossogui. The Largal dairy has enabled them to multiply their production and access new markets outside their department, such as Touba, Louga and Thiès. These successes were made possible by the construction of new cowsheds for women in the commune of Dahra, with the support of Pasa, and the acquisition of Guzera breed dairy cows with the support of the Ministry of Livestock, all of which improved milk and meat yields.

As President Largal puts it: "The project has enabled us to move from quantity to quality", emphasizing capacity building (training and other support).

According to the different categories of people we met, the infrastructure and equipment installed as part of the IGAs play an important role in the project's impact. The various types of housing built for livestock (dairy barns, sheepfolds, goat barns, chicken coops), by providing security for the animals, have created new entrepreneurial vocations. This activity has spread, which is an important indicator of impact.

III.4.4 Governance of natural resources and the environment

Governance of natural resources is an important component of the livestock component of the Lou-Ma-Kaf PASA. By the concept of governance, we mean the management of space and basic natural resources through local institutions, in this case pastoral units and the partners who support them in this mission. They are responsible for managing the space and resources of their terroir through tools, the most important of which is the management plan. They sign local agreements with the communes. These plans define the perimeter of the UP, the sectors, and the roles and responsibilities of the parties involved. The UP is managed by a board headed by a president. The UP is run by four commissions:

- animal health commission ;
- commission to welcome transhumants ;
- environment committee ;
- livestock feed commission.

The UP's main mission is to manage local resources and the distribution of economic activities according to the vocation of the different areas of the terroirs.
The project has supported the 25 existing UPs in its intervention zone, including 12 this year for training/retraining.
The UPs are important organizations in the process of participatory and sustainable management in the syslvopastoral zone. Our investigations have shown that, although the UPs are relevant institutions, much remains to be done to enable them to play the role they are truly expected to play, i.e. integral management of their terroir. Several UPs are in a state of lethargy from the animation point of view, and for those that are more or less functional, work is generally limited to a few one-off activities. The transhumant reception committee seems to be the most dynamic. People are quick to use the UP to contain or even confine incoming transhumants. The other commissions operate on an ad hoc basis, although the environment commission, in charge of bushfire control, is often called upon to support local bushfire control committees.
First-generation UPs such as Kossas Namary and Lougueré Thiolly appear to be more dynamic than newly-created ones (Mbame, Salalatou, Moguéré....).
"Most UPs only move on command," according to Barkédji's CPV.
It should be noted, however, that local people are very satisfied with the role played by the UP in the organization of space through the management plan. Above all, because the plan makes it possible to welcome transhumants with a minimum of conflict, and to settle them in dedicated areas.

In the first-generation UPs (Barkédji, Vélingara, Lougueré Thiolly, etc.), the rules are generally well known to all. In most cases, transhumant herders go directly to UP officials to ask about the rules, with a view to complying with them. In cases where transhumants do not take this step themselves, the commission goes to them to present the local management plan and the management rules before inviting them to comply. UP managers say they have significantly improved their approach to transhumants thanks to the exchanges and training they have received. "In the past, we used to arrive with our weapons to summon the transhumants to leave, and if they resisted, there were bloody fights; but since the UPs were set up, we have acquired a new pedagogy consisting in calmly presenting our plan to the new arrivals before showing them the area reserved for them; the new system has enabled us to avoid many conflicts and to better manage our areas (pastures, etc.) Mr. SOW President UP Kossas Namary.

The Environment Commission works closely with the Water and Forestry Department, with support from the project, to combat bush fires, improper logging and pruning. Local bushfire control committees have been provided with small-scale fire-fighting equipment (cutters, rakes, boots, fire-battles, sprayers, etc.).

With support from the project, these committees have organized several bushfire awareness campaigns aimed at honey and gum arabic collectors and transhumant herders.

In the opinion of some of the partners we met, the UPs could have developed economic activities based on the exploitation of certain non-timber forest products, such as oil and the fruit of Balanites (soump), jujube, gum arabic and monkey bread, by exploiting or taxing operators to finance themselves.

The UP of Mogueré in the commune of Barkédji has set up a team to manage haymaking. Rates have been set for collectors: a truck pays 30,000 CFA francs, a Pick up L200 10,000 CFA francs and a cart 3,000 CFA francs. In the same vein, he has set up a committee to collect gum arabic from the jujube tree and balanite fruit (sump), as well as baobab fruit and leaves. Collectors pay modulated taxes to the UP. The money collected is paid into a fund to finance UP activities. The operation is free of charge for members of the Unité Pastorale who take part in the commissions.

The management of ponds is also part of UP's remit. In this area, management instructions are followed closely, which means that the ponds - both those that have been developed and those that have not - are put to better use.

The evaluation revealed that pastoral units play an important role in the sustainable management of natural resources and land. However, they need more support if they are to play the role expected of them. The support required is mainly institutional and organizational (clear legal status, formalization, clear understanding of the role and responsibilities of PUs, etc.). Indeed, it is important to revisit the UP's status and define its relationship with the commune and other stakeholders. Commissions need to be empowered so that they can play their roles effectively. It is essential that the UPs be supported to avoid being hijacked by presidents who will reduce them to the vertical and macro-cephalic organizations so familiar in our countries.

There are some UP members who hold important positions but know nothing about the organization. They have generally applied for these positions just because they are notables who claim to govern everything that is done on the land. They disappear the very day they are elected. Consequently, the way in which UP managers are appointed should be reviewed.

be reviewed in depth to improve these institutions, which have good potential to carry pastoralism high.
In most cases where UPs operate, they are in conflict with local authorities (Louguéré Thioly, several UPs in the Barkédji district). They often tend to take the place of the mayor or the administration, even though it is the municipal council that has the prerogative of approving the management plan. The UPs often commit abuses by allocating land, policing the forest, etc., all of which shows that they are unaware of their roles, and in some cases abuse them. These are important confusions that need to be clarified to ensure sustainable management of natural resources.
The dissemination of texts on the agro-sylvo-pastoral law, and in particular the rules on livestock grazing, could help improve UP governance. The pastoral unit approach is a real paradigm shift and a multi-stakeholder approach, but although it seems to have been taken on board by the herders, its effective implementation will require time and hard work. Having worked closely with the project, the head of the Ranérou departmental water and forestry service says that "the PASA project has given real content to protected areas through the UPs in the department".

III.4.5 Capacity building

The PASA LOUMAKAF project has done a great deal to build capacity in the livestock value chain. By strengthening the institutional capacities of its main technical arms, the permanent government departments of livestock, water and forestry, and hydraulics, the project has become part of a post-project dynamic. Indeed, the livestock services in the project's intervention zone have benefited from substantial institutional support in terms of refurbishment or construction of premises, allowances, fuel supplies, motorcycle equipment and veterinary products/materials...
Capacity-building for partners has taken several forms, which can be grouped mainly into two categories: (i) training and (ii) equipment and materials:
Training. The project has trained partners in fields as varied as management (dairy, poultry farmers, small and large ruminant breeders, management committees, COPIFOR, etc.), early detection of certain diseases, vaccination, hygiene, artificial insemination, bushfire control, pond protection, conflict management, etc. **Forage crops.** The importance of introducing the "MalalFafa" or NEMA fodder plant must be emphasized. Its adoption, which has yet to take place, could be of great benefit to livestock breeders in the project area. In the meantime, the local population has been trained in grass-cutting techniques and equipped with mowers. to the great delight of the beneficiaries.
Provision of products and equipment. The provision of equipment and materials to the various players includes kits for poultry vaccinators and ATEs, materials for IGA beneficiaries and organizations, equipment for bushfire control committees, and mower equipment to improve livestock feed.

For a better understanding of the project's impact, let's give some details on a few non-exhaustive aspects of the capacity-building subcomponent, including :

- Payment of allowances, motorcycle equipment and fuel to livestock service agents at regional, departmental and sub-prefecture level;

- Training of 1,500 vaccinators to carry out regular vaccinations, notably against Newcastle disease. They are also trained in livestock feeding and hygiene, all useful skills for efficient livestock breeding. Vaccinators are provided with starter kits comprising a cooler, syringes, gloves and vaccines. Vaccinators charge between 15 and 30 francs for the services they provide, which is an attractive extra;
- Several training courses in modern management of sheepfolds, goat houses and chicken coops have been given, and monitoring notebooks are regularly kept, recording all operations: vaccination, acquisition, sale, donation, mortality.... The focus here is on introducing beneficiaries to modern management of their economic unit;
- Support for the Light Motorized Units of the Water and Forestry Service, and provision of fuel to combat bush fires; this support has enabled the Water and Forestry Services to carry out their regalian task properly; these services have been strengthened in their role of combating bush fires, abusive tree-cutting, pruning and all violations of protected areas;
- Establishment, revitalization, awareness-raising and training of borehole user associations in their role of representing users; support in the selection, choice and training of borehole managers and drivers.
- Training in animal hygiene and feeding are two activities that are highly appreciated by the local population; these project initiatives have significantly improved the supply of animal health care; some 37,000 people have benefited from this training;
- The beneficiaries of the sheepfolds, goat barns, chicken coops and cowsheds have all undergone training that has had a ripple effect. With this large number of breeders able to do so, the entire value chain has been positively impacted;
- Training of trainers on the role and responsibilities of CG and UP members,
- Training elected officials and municipal assistants to support pastoral populations

It should be noted, however, that the capacity-building component suffered greatly from the delay in setting up the funds. The allowances and endowments of the various agents, as well as the financing of several activities, could not be implemented on time. This has had a knock-on effect, limiting some of the project's impact, particularly on UPs.
Some of the training courses were deemed too short to ensure that the targets were properly involved. Nevertheless, this aspect can be considered one of the project's strengths.

III.4.6 communication

Communication has been developed through agreements signed with community and local radio stations (Dahra, Linguère, Louga, Matam...). But it has also been achieved through various exchange meetings at local, regional and national level (FIARA, JNE, JML, etc.).

III.4.7 SWOT table (Strengths, Weaknesses, Opportunities, Threats)

As a summary, the SWOT table is presented to help identify the project's strengths and areas for improvement.

Table 25: FFOM

Forces	Opportunities

- The vast majority of planned objectives have been achieved; - Several unplanned activities carried out; - a densification of borehole hydraulics and the beginning of the elimination of the thirst triangle; - improving the incomes of the poor through IGAs, - involvement and motivation of technical livestock services ; - Construction and rehabilitation of veterinary posts, - A large number of capacity partners - Development of synergies with various partners (E & F, CSE, etc.) - Conditions for the sustainability of the actions taken into account from the outset of the project ; - post-project support ;	- The willingness of partners to support a succession program ; - The government's political will to support livestock farming; - laws in favor of pastoralism (LAOSP) - Well-prepared services for the future, - Local institutions trained ;
Weaknesses	**Threats**
-Delay in the implementation of funds and allowances for agents ; - Unfinished connection work for boreholes ; - pastoral units that are not very operational; - a lot of confusion in the relationship between UPs and CTs; -Targeting of IGA beneficiaries is sometimes inadequate ; - Forage crops with little experience ; - little initiative from UPs, - Rapid deterioration of cemented parts of vaccination pens; - Conditions for insurance reimbursement difficult for beneficiaries to meet - Irregular veterinary monitoring of sheep and goat barns.	- unavailability of funds; - economic conditions ; - delays in the formulation and implementation of the succession program ; - Slow implementation of probationary financing - Insufficient support in the operational phase for beneficiaries of infrastructure and equipment delivered at the end of the project.

IV- Conclusion and Recommendations

IV.1 Conclusion

The analysis of food security calls for a structural dimension that reflects the ability of populations to satisfy their food needs, either through sufficient and sustained local production, or through the possibility of generating sustainable income to meet these needs. Food must therefore be available and accessible on a sustainable basis, and the state of vulnerability takes charge of the other dimensions of household stability and security. The results of this study show that households in each zone or community are at different levels of vulnerability. However, these needs are mainly met by the livestock sector. The **project's contribution has had a positive impact on meeting food needs, particularly in the Louga and Kaffrine regions**. **Households in the Louga region have also benefited from substantial impacts on their income**. Increasing the productivity of the livestock sector, in the context of good natural resource management, is a fundamental aspect of the fight against food insecurity.

At the end of our investigations, it appears that **the livestock component of the PASA LOU-MA-KAF project has helped to significantly improve access to water for pastoralists in an area that was so lacking in it, particularly in the thirst triangle.** With 18 boreholes, including 10 new ones and 8 rehabilitated ones commissioned or nearing completion, and a significant sub-component dedicated to income-generating activities in various forms (sheepfolds, goat houses, poultry farming, etc.) and which has reached a large number of households, the project will undoubtedly have a significant impact on the intervention zone. In the field of natural resource governance, the empowerment of stakeholders has had a positive impact in the target areas.

The various project headings were analyzed on the basis of the project's results framework, on the one hand, and the criteria of relevance, effectiveness, efficiency and sustainability, on the other.

Based on the study carried out and the testimonies and analyses of stakeholders, the following conclusions have been drawn.

The project is **relevant** insofar as it targets three of the country's poorest regions, which moreover represent a third of the national territory. It has intervened in a vast area characterized by under-equipment and under-supervision, and where water shortages are endemic, to drill boreholes and rehabilitate, develop and protect ponds.

In terms of **effectiveness**, the project has achieved most of its physical objectives, and in some cases the results have even exceeded expectations. This is the case of the vaccination parks, the rural tracks... It has also helped to raise the incomes of many vulnerable households headed by widowed women or heads of household, people living with disabilities, low-income earners (without land or livestock...). PASA Volet élevage has also helped to open up its intervention zone, giving people access to livestock markets and basic socio-economic structures. The natural resources management component has also made significant progress in this sector, in conjunction with local organizations (pastoral units, commissions and committees). The PASA livestock component has made a significant contribution to securing livestock in areas of high precariousness, including the triangle of thirst.

Livestock habitats have been significantly improved, with all the safety required (the Achilles' heel of livestock farming). A new dimension that encourages stabling.

To a certain extent, the project was **efficient**, as the resources deployed exceeded the expected results: for example, for 500 km of firewalls 1
338 km have been completed, i.e. almost 268%, and the same is true for the vaccination parks, with 60 completed for the 30 planned. But it is probably in the empowerment of the players that the efficiency of the project (beneficiaries, partners, etc.) should be seen.
As far as **sustainability** is concerned, it has to be said that the project has set important milestones for the sustainability of the actions undertaken. Firstly, by opting from the outset to involve the State's technical departments, which are the legitimate custodians of its action and will assume responsibility for it once the project is complete.
By building infrastructure and structural facilities (boreholes, tracks, stores, animal housing, etc.), he is leaving a lasting legacy to the livestock breeders in his area.
The project has trained a significant number of local people and organizations, sowing the seeds for the sustainability of its interventions. At the level of breeders alone, almost 37,000 people were trained out of a forecast 19,700.

To sum up, in view of the above, the project has made a significant contribution to the fight against poverty, and has significantly improved the incomes and diets of vulnerable groups in its intervention zone. The income-generating activities are beginning to have an impact, insofar as the vast majority of the beneficiaries we met confess to meeting most of their social and economic needs (food, schooling, health, etc.) thanks to the income generated by these activities.
One of the most remarkable aspects of the project, in our view, is that it has encouraged people to take up hut farming. With the construction of animal housing and the improvement of breeds, the shift from quantity to quality is beginning to interest people who were previously reluctant because of their long tradition of extensive livestock farming.
From the point of view of approach, the project has greatly favored the integration and synergy of the various partners, including government departments.
In terms of limitations, the project's stakeholders placed a great deal of emphasis on the delay in setting up the funds and carrying out work on the equipment. This will influence many of the activities planned for the end of the project. Support for the operation of many of the facilities will be affected.
Civil engineering work that has not yet been completed has had a major negative impact on the project's impact, particularly in the hydraulic sector. The absence of borehole connections is temporarily undermining efforts.
Much work remains to be done to bring the UPs up to standard, which will require structural change and clarification of their status, roles and responsibilities, particularly in relation to the communes.
The targeting or selection of IGA beneficiaries sometimes posed problems with recipients who were not part of the eligible groups.

IV.2 Recommendations

Beyond the technical aspects, the levers of food security must also be based on the promotion of factors that encourage the strengthening of factor endowments and the assumption of responsibility for health needs. Investment in basic social factors (access to drinking water, health posts, markets, credit, etc.) is a prerequisite. This will help to create an environment conducive to development, rural job creation and opportunities, and thus help to keep people in their local areas. In addition, the Senegalese situation is characterized by strong

institutional and agro-climatic constraints. As a result, it is always necessary to mobilize all agro-ecological zones in order to consolidate an agricultural policy. The territorial nature of most of these policies does not take into account local development dynamics and trajectories. The results of this study on the existence and level of vulnerability of rural households are a challenge for the formulation of homogeneous and appropriate development policies and poles.

The qualitative analysis led to the following recommendations:
They are formulated and addressed firstly to the project owner (ministry in charge of livestock), and secondly to the technical and financial partners and those responsible for implementing the succession program, where applicable.
In terms of work, the study recommends :

- complete all connection work, without which it would be difficult to speak of impacts;
- Proceed with the final acceptance of the boreholes and transfer management to the beneficiaries so that they can take initiatives in terms of new connections;
- Provide support for new management committees, especially for facilities handed over at the end of the project, to ensure that they are properly operated;

For other equipment and structures :

- get elected representatives more involved in the maintenance of structures (boreholes, trails, firebreaks, etc.);
- Strengthen the technical and management capacities of beneficiaries in order to enhance the value and sustainability of infrastructure and equipment;
- develop and implement ongoing training programs for facility management bodies;

For UP :

- Clarify their relationships with local authorities and various administrative bodies;
- Establish a contractual framework between UP and the CTs, with specifications and performance contracts, to put an end to the two-headed approach that is gradually taking hold between UP and CTs. Most of the activities carried out by UP fall within the scope of powers transferred to the communes;
- Capacity building: development and implementation of a continuous capacity building program;
- In the end, following the example of the Prefect of Linguère, who said that "the project needs a follow-up", all the people we met expressed a desire for a second phase of the project. The program currently being developed could be the first step towards meeting this strong demand.

V. APPENDICES

V.1 List of people and institutions

MEETING SERVICES

ORDER NO.	FIRST NAME AND LAST NAME	CONTACT	LOCALITY	FUNCTION
01	Dr MBENGUE NDEYE COUMBA	77 342 39 15	LINGUERE	PASTORALIST EXPERT
02	MAMADOU MOUSTAPHA CISSE	77 555 80 11	LINGUERE	DEPARTMENTAL SDEL
03	PAPA ABOUBACAR TOURE	77 379 88 92	LINGUERE	ADJOINT SDEL
04	MBASSA SENE	77 529 05 75	LINGUERE	PREFECT OF LINGUERE
05	MAMADOU BASSIROU NDAO	77 529 07 18	BARKEDJI	SUB-PREFECT OF BARKEDJI
06	THOMAS MANGA	77 408 79 54	BARKEDJI	BARKEDJI CPV
07	HAMADOU MBALLO	78 169 69 19	BARKEDJI	CP WATERS AND FORESTS BARKEDJI
08	MOUSTAPHA BIAYE	77 960 33 98	DAHRA	CPV DE DAHRA
09	ALASSANE NIANG	77 415 26 28	LOUGHERE THIOLLY	CPV DE LOUGHERE THIOLLY
10	MODOU NIANG	77 796 65 92	YOUNOUFERE	CPV YOUNOUFERE
11	DJIBY NDIAYE	77 611 26 75	NGANDA*	NGANDA CPV
12	MOR LY	77 509 47 23	RANEROU	DEPARTEMENTAL ELEVAGE
13	CPT MOCTAR BOCAR SALL	77 539 80 04	RANEROU	WATER AND FORESTRY SECTOR MANAGER
14	CHEIKH OUMAR T KAMARA	77 529 07 23	VELINGARA	SUB PREFET
15	SEYDOU NOUROU AW	77 529 08 93	VELINGARA	ASSISTANT DEPUTY PREFECT
16	GASTON NDEY	77 434 86 19	VELINGARA	ANGENT ANCAR
17	Dr FATOU KA	77	KAFFRINE	CREL REGIONAL D'ELEVAGE
18	AMADOUNE DIOP	77 529 05 61	KAFFRINE	PREFECT OF KAFFRINE
19	OUMAR DIBA	77 529 07 84	KAFFRINE	DEPUTY PREFECT OF KAFFRINE
20	IBRA DIAW	77 542 29 25	MALEM HODAR	DEPARTEMENTAL D'ELEVAGE
21	MODOU SENE	77 534 70 60	SAGNA	CPV DE SAGNA
22	SALIOU NDIR	77 308 77 80	KOUNGUEL	PASA ANIMATOR
23	SAIBO DANSOKHO	77 641 91 37	BIRKILANE	BREEDING DEPARTMENT
24	MAMADOU TOURE	77 323 27 24	TOUBA MBELLA	CPV TOUBA MBELLA
25	MANSOUR BASS	77 617 88 30	KEUR MBOUKI	CPV KEUR MBOUKI

*DJIBY NDIAYE CPV OF NGANDA WAS VISITING LOUGHERE THIOLLY **PEOPLE**

INTERVIEWED IN THE FIELD

N°	FIRST NAME AND LAST NAME	CONTACT	LOCALITY	OCCUPATION

ORDER				
01	AWA NDIAYE	77 414 47 88	LINGUERE	BENEFICIARY BERGERIE
02	BINETA THIAM	77 579 11 33	LINGUERE	BENEFICIARY CHEVRERIE
03	DEMBA LEWOUYEL SOW	77 566 89 84	SOUYE TOUBAA	PASTORAL UNIT MANAGER
04	MAMADOU NIAGA SOW	77 555 11 30	MOGHERE	PDT U.P MOGHERE
05	AMINATA DEMBA SOW	77 660 07 44	MOGHERE	BENEF. POULAILLER
06	KHADY SOW	77 564 31 55	DAHRA	COOP. LARGAL MINI DAIRY
07	OUMAR MBALLO	77 927 83 02	KOSSAS	DRILLING OPERATOR
08	MAHMOUDOU SOW	77 042 91 43	KOSSAS	MANAGEMENT COMMITTEE MEMBER
09	OUSMANE MAMADOU SOW	77 042 91 43	KOSSAS	PASTORAL UNIT MANAGER
10	EL HADJI MALICK NDIAYE	77	LOUGHERE THIOLLY	COMM. COUNCIL
11	MBACKE FALL	77 927 92 54	LOUGHERE THIOLLY	LARGE GREEN MIRAILLA
12	COUNA NDIAYE	77 788 26 41	LOUGHERE THIOLLY	BENEFICIARY CHICKEN COOP
13	HAMADY SIDY BA	77 948 18 04	LOUGHERE THIOLLY	PASTORAL UNIT MANAGER
14	BANKEL DIALLO	77 315 22 61	LOUGHERE THIOLLY	BENEF. MOTOR MOWER + SHED
15	ALASSANE DIALLO	77 797 46 73	LOUGHERE THIOLLY	PDT COM. DRILLING
16	HAMATH SAMBA BA	77 109 40 33	LOUGHERE THIOLLY	PDT COM. PLAIDOYER
17	FAMBAYE BABOU		YOUNOUFERE	BENEFICIARY SHEEPFOLD
18	PENDA FARY SOW	70 724 32 99	YOUNOUFERE	BENEFICIARY BERGERIE
19	OUMAR AMADOU DIALLO	78 236 17 65	DAROU NEMA	PDT COM.GEST LIVESTOCK STORE
20	FATY CISSE BA		RANEROU	BENEFICIARY CHICKEN COOP
21	FARMATA DIA		RANEROU	BENEFICIARY BERGERIE

22	FATY SAMBA BA		RANEROU	BENEFICIARY CHICKEN COOP
23	MARIAMA NDAYE		VELINGARA	BENEFICIARY CHICKEN COOP
24	BAMBA BABOU	77 481 18 33	VELINGARA	BENEFICIARY BERGERIE
25	BIA AIDARA	77 817 27 88	VELINGARA	BENEFICIARY
				BERGERIE
26	GNILANE FAYE	77 554 90 08	KAFFRINE	BENEF. HENHOUSE AND SHEEPFOLD
27	PAPE MAMOUR NDAO	77 506 76 37	MALEM HODAR	BENEFICIARY BERGERIE
28	BAHAT DICKO	77 204 22 04	KOUNGHEUL	PDT COM.GEST ABATOIR
29	MOUHAMED THIAL	78 546 32 32	NIOLE OULOF	PDT COM. GEST BORNE FONTAINE
30	MAMADOU BA	78 514 47 40	NIOLE PEULH	WATERING OPERATOR
31	IBRA KA	77 764 19 35	SARE SAM NIALE	DRILLING OPERATOR
32	FARANG KA	78 288 74 27	SARE SAM NIALE	VILLAGE CHIEF
33	SANDY KA	78 288 74 27	SARE SAM NIALE	PASTORAL UNIT MANAGER
34	SAMBA PENDA KA		SARE SAM NIALE	RELAIS
35	NGUEDA KA		SARE SAM NIALE	WATERING OPERATOR
36	HAWA BA		SARE SAM NIALE	BENEFICIARY CHICKEN COOP
37	MBAGNICK NDIAYE	77 687 91 55	TOUBA MBELLA	BENEFICIARY BERGERIE
38	FATMA SY	77 805 04 64	TOUBA MBELLA	BENEFICIARY CHICKEN COOP
39	SALIOU BA	77 120 65 48	KEUR MBAM	BENEFICIARY SHEEPFOLD 1ER GENE
40	CODOU FAYE	77 618 68 46	BIRKILANE	BENEFICIARY CHICKEN COOP
41	IBRAHIMA SARR	77 522 84 48	KEUR MBOUKI	BENEFICIARY BERGERIE
42	NDEYE SANKARE	77 389 89 41	KEUR MBOUKI	BENEFICIARY CHICKEN COOP
43	HABIDINE COUNTA	77 577 03 58	KEUR MBOUKI	HUSBAND OF NDEYE SANKARE

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