

Dynamics for the agroecological transition (DyTAEL)

In Fatick, Senegal

Analysis of the level of agro-ecological transition, profitability, levers and obstacles for players in the school canteen goat milk value chain



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INITIATIVE ON
Agroecology





1. Introduction

In Senegal, food insecurity among children is a real obstacle to school attendance. To remedy this, school policies in the most vulnerable areas, such as the Fatick region, rely on school canteens to support children's schooling and education. Established in at least 11% of Senegal's elementary schools, these canteens provide pupils with two meals a day. In the Fatick region, the canteens are supplied with local products such as millet, the main staple cereal, and milk. These school canteens therefore represent a real opportunity to promote local products and shorten supply chains, in favour of a circular economy.

As well as shortening commercial circuits with the school canteens, the farmers and agropastoralists of Fatick are already committed to the agro-ecological transition. They have co-created a local agro-ecological transition dynamic (DyTAEL), affiliated to a national multi-actor movement (DYTAES). The DyTAEL, made up of a number of players including farmers, civil society, politicians and national and international research, has drawn up a vision for an agro-ecological Fatick by 2035. The aim of this citizens' organisation is to promote agro-ecological transition in the department of Fatick. In particular, this framework has facilitated dialogue between science and the local community on the knowledge acquired over several decades on the evolution of agricultural practices and technical and organisational innovations, so that the agro-ecological transition can be conducted in a way that is adapted to local needs.

It is in this favourable local context that the CGIAR Agroecology Initiative in Senegal (IAE) is carrying out its activities to promote agroecology. In fact, the Agroecology Initiative team has chosen DyTAEL as a platform to support, among other things, the implementation and co-development of profitable agroecological business models that are sensitive to the principles of agroecology, notably based on the circular economy and the development of inclusive, resilient and sustainable local food systems. These activities are part of WP3 of the IAE project, the aim of which is to promote business models that are based on equitable commercial models founded on the principles of agroecology.

The aim of this study is twofold. The first is to assess the level of agro-ecological transition of the various local players in the milk value chain working on school food. The second is to analyse the levers and obstacles of local value chains based on school food. Specifically, the aim is to: i) carry out a holistic assessment of the level of agroecological alignment of each stakeholder in the milk value chain (processing unit, goat's milk producers and cow's milk supplier producers) in school canteens; ii) carry out a cost/benefit assessment of the operating and/or business accounts of the three stakeholders; iii) and carry out a SWOT analysis for each stakeholder. The aim of this study is to produce scientific evidence to help stakeholders in the Fatick milk value chain to design business models, and to support advocacy for the use of local agro-ecological products in school canteens.



II. METHODOLOGY

This work is based mainly on data from three (3) days of participatory workshops with stakeholders in the school canteen milk value chain. Secondary data were also used (annual project activity reports, documentation, etc.) to complete and deepen the analysis of the results. The study was carried out from 24 to 30 November 2024 in the department of Fatick, more specifically in the commune of Niakhar, with the school canteen milk producer-processors, who are supported by the NGO Humundi via the association ANPDI and ARECAP.

The commune of Niakhar is located in the department of Fatick, which is characterised by mixed rain-fed farming systems in the Sudano-Sahelian region (400-600mm), with a single growing season from June to October (**see Figure 1**). The wells in the fossil valleys make it possible to diversify the farming system, particularly with market gardening. Livestock rearing and the exploitation of natural resources (non-timber forest products) are the two main agricultural activities carried out throughout the year. These different activities are interconnected at ecosystem level, contributing to an agro-ecological trajectory at regional level.

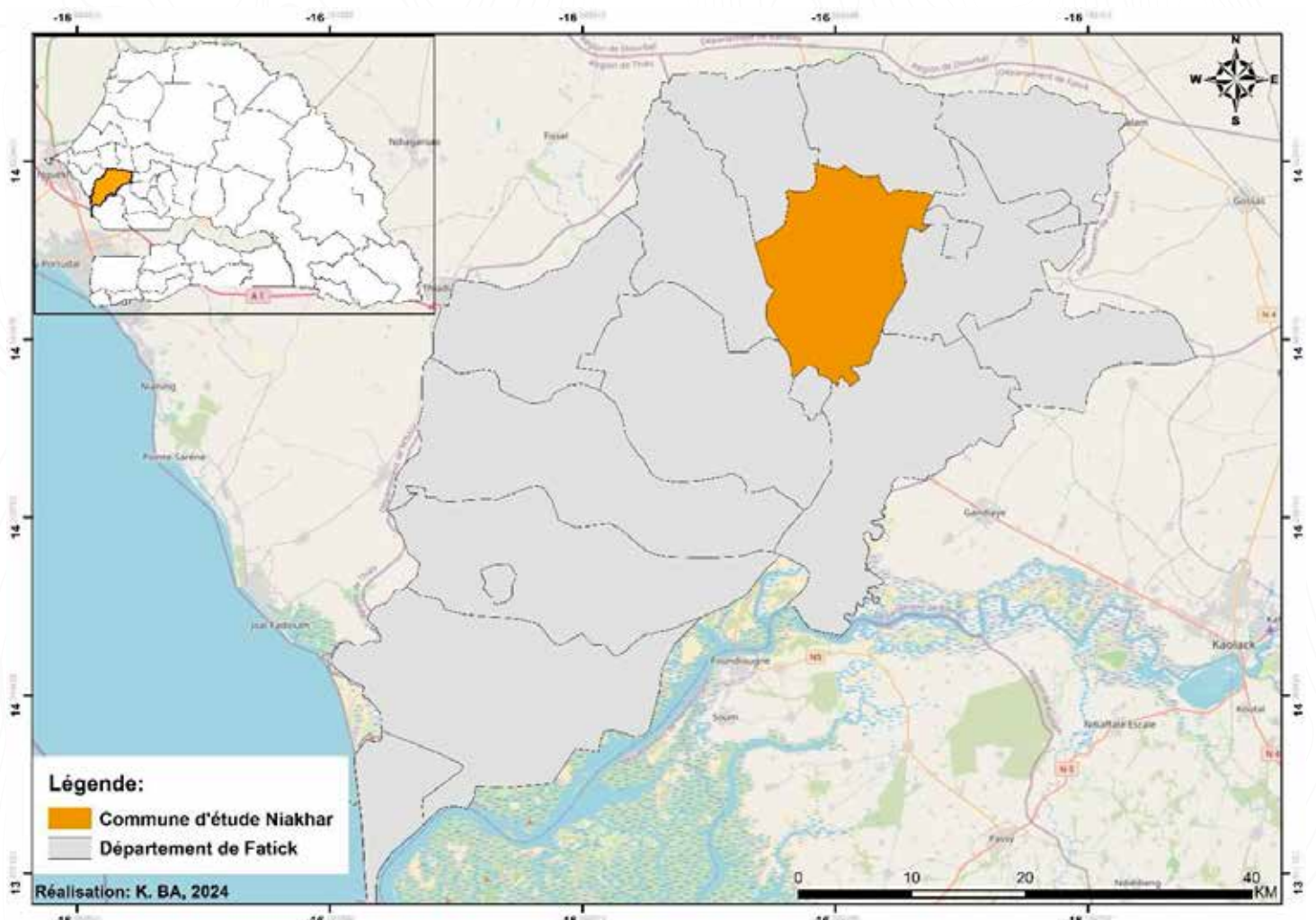


Figure 1: Location map of the Niakhar (Fatick) study area

The multi-criteria assessment tool B-ACT tool, developed by Biovision, was used for data collection, to assess the level of alignment of businesses with the principle of agroecology. Other tools were used to carry out the cost/benefit assessment and

the SWOT analysis in order to determine the companies' profitability, risks and opportunities. So, before going back over the 3 days of workshops in detail, we will first present the B-ACT tool and the various players who were invited to take part in this exercise.

II. METHODOLOGY

1. B-ACT tool presentation

The Business Agroecology Criteria Tool (B-ACT) is designed to assess the degree to which companies are aligned with each of the 13 principles of agroecology. The B-ACT assesses a company's level of agroecological transition in relation to the three pillars: i) building resilience; ii) ensuring social equity; iii) and improving resource use (see Figure 2). The questions in the tool help

to determine whether or not the company's business model or strategy is potentially in line with agroecology. B-ACT is a tool designed for a wide range of stakeholders (research, companies, producers, political decision-makers, professional organisations, etc.) to provide information that can be used to measure a company's level of agro-ecological transition or to inform decision-making.

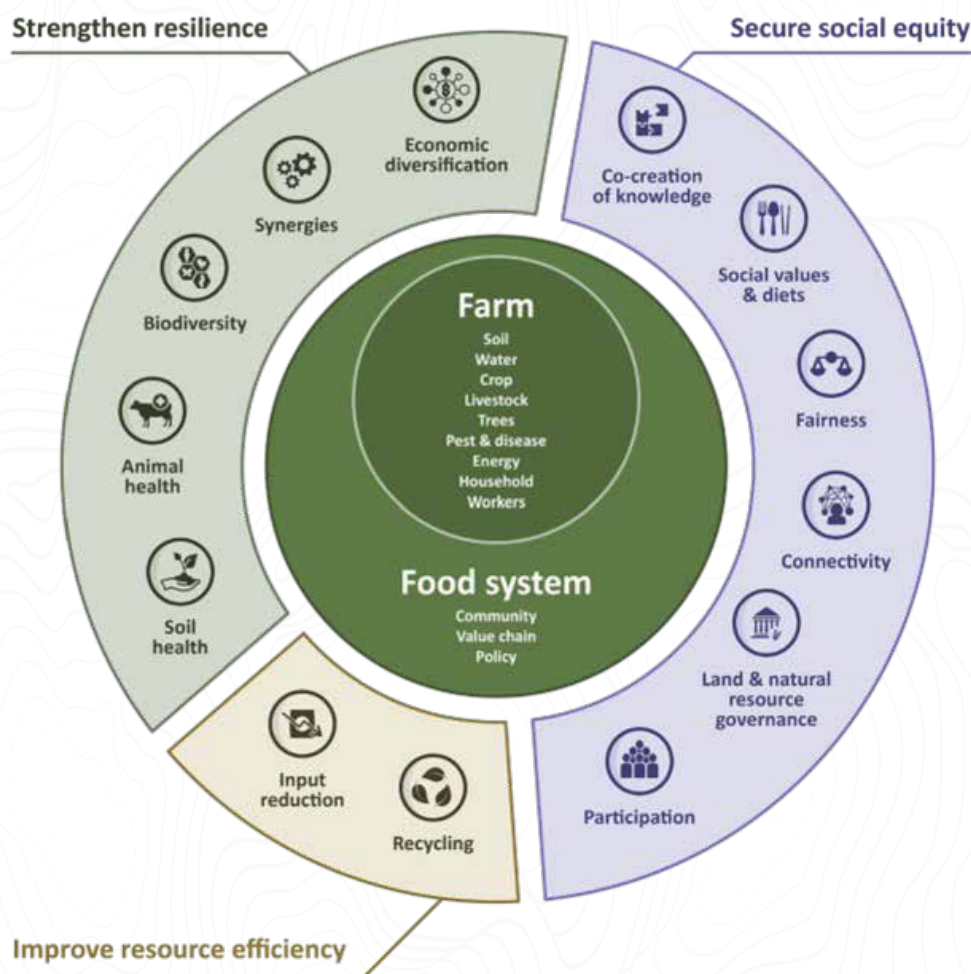


Figure 2: Diagram of the 13 agro-ecological principles divided into 3 pillars

In order to produce results, all the principal questions must be fully completed. The B-ACT consists of 77 questions which evaluate the company's operations and activities in relation to each of the 13 principles of agroecology. Each question

has three possible answers: Yes, No or N/A (not applicable). It is also important to indicate N/A when a question does not apply to a company, as selecting No would result in an unfair reduction in the agroecology score.

II. METHODOLOGY

2. The actors in the school canteen milk value chain

a. Milk processing unit

The processing unit is made up of a group of women processors from Ngoyère, in the commune of Niakhar. The unit has over fifty (50) members who produce and process goat's milk. Nearly 90% of the women processors are also goat milk breeders and producers (Diassé, 2020). The women processors collect goat's milk from other women goat farmers in the villages of Sassar, Keur Ngothie, Languème and Niodone.

The milk collected is processed into yoghurt to supply the school canteens in the surrounding villages of Sorokh, Sagne and Ndiémou. The school canteens are supplied with yoghurt twice a week (Tuesday and Thursday) over a radius of between 4 and 10 km (Diallo et al., 2023). In addition to yoghurt, the processing unit makes other dairy products such as cheese and soap for its customers in other marketing channels.

II. METHODOLOGY

2. The actors in the school canteen milk value chain

b. Producers of goat's milk

In the Fatick region, goat rearing is mainly practised by women because of its ability to respond to household social emergencies (Ba et al., 2024). Virtually all goat-rearing activities, from production to marketing, are managed by women. This reflects both the importance attached to this activity by women and the lack of resources to recruit paid labour.

around the concessions. This practice allows the goats to graze on natural grasses and prevents them from wandering onto the crops. In this production system, concentrates are rarely, if ever, fed to the goats. This is mainly due to the lack of financial resources on the part of the producers. Milk is very rarely milked, and is used primarily to feed the kids (Gillerot, 2018).

Two goat rearing systems have been identified in Fatick: i) a typically traditional rearing system, the main objective of which is to sell live animals; ii) and a mixed rearing system in which milk production plays a key role. The former is characterised by extensive rearing, with the herd roaming in the dry season; the goats are picketed during the winter crops

In the mixed farming system, goats are mainly fed on natural pasture and crop residues (groundnut haulms, cowpea straw, etc.), often supplemented with concentrates (groundnut meal, millet or wheat bran, industrial feed, etc.). Fodder crops are increasingly grown by women producers affiliated to groups or professional organisations.

The transition from the traditional goat system to a mixed system is being supported by development projects such as ARECAP and ANPDI (Diassé, 2020). These projects provide training for women farmers in techniques for harvesting and conserving natural fodder to improve their livestock's diet. They also support women producers with land to grow fodder crops. In this way, the mobilisation of food

resources makes it easier to stall goats in the concessions in order to improve their productivity. Milking is carried out on a regular basis, lasting between 2 and 3 months, with an average daily production of 0.25 to 0.5 litres per goat. Production is mainly used for processing and for own consumption. However, this mixed farming system is currently underdeveloped in Fatick; the extensive system still predominates.

II. METHODOLOGY

2. The actors in the school canteen milk value chain c. Producers and suppliers of cow's milk

The suppliers of cow's milk to the processing plant are rural agropastoralists, the majority of whom are Serer. Agriculture and livestock farming have long been complementary. They practise rain-fed farming, mainly for food (millet, groundnuts, cowpeas, etc.), with only surpluses (particularly groundnuts) being marketed. In the past, cattle were sedentary, as their primary function was to fertilise crop land. They were kept on fallow land during the cropping season, driven to pasture near the village and on harvested land during the dry season. Milk production lasted only during the winter months and was exclusively for self-consumption. However, these farming practices were transformed by the droughts of the 1970s and 1980s. The scarcity of food resources and falling yields led to the expansion of cultivated areas and the consequent shrinkage of grazing land, forcing farmers to send their cattle on transhumance. However, the primary function of the herd is

still to fertilise the land. Crop residues are stored until the lean season to feed the herd. The workforce is mainly family-based, but salaried labour is often used to maintain the herd. Other activities include fattening, livestock trading and milk production. The latter activity is gradually taking hold in agro-pastoral households now that the Ngoyère processing unit buys milk from them. Producer suppliers have seen the value of investing in this activity, as they now have access to the milk market with the women processors. The breeds used for milk production are generally local and mixed. They are kept in semi-stable conditions in the backyard of the concessions and supplemented with concentrated feed.

A litre of milk is sold for between 600 and 700 CFA francs to the school canteen processing unit. Income from milk is used primarily to maintain the herd and secondarily to meet some family expenses (Ba et al., 2021).

II. METHODOLOGY

3. The workshops

Three (3) days of workshops were held in total, with each day devoted entirely to one stakeholder in order to study their level of agro-ecological transition. The first day of the workshop was devoted to processing stakeholders, in particular the women from the unit that processes goat's milk for school canteens. We invited three (3) women processors and two (2) representatives of the ANPDI association (see Figure 3). This organisation is a key and very strategic partner, as it is our gateway to school canteen stakeholders. This is why they were present throughout the workshops to share their knowledge and experience of each stakeholder. The second workshop was devoted to women goat milk producers, with three (3) producers present and two ANPDI

representatives (see Figure 4). Finally, the third and last day of the workshop was devoted to producers supplying cow's milk; there were two participants: 1 cow's milk producer and 1 woman producer (see Figure 5). The people invited to the workshops were chosen by the managers of the processing unit to be available and capable of providing the information needed for the study. This inclusive approach reflects a participatory approach in which the stakeholders are at the heart of the knowledge creation process. In addition, two trainees in rural economics from ENSA Thiès also took part in the workshop activities and were involved in organising and leading the activities. This approach also contributes to their training and supervision for their final dissertations.

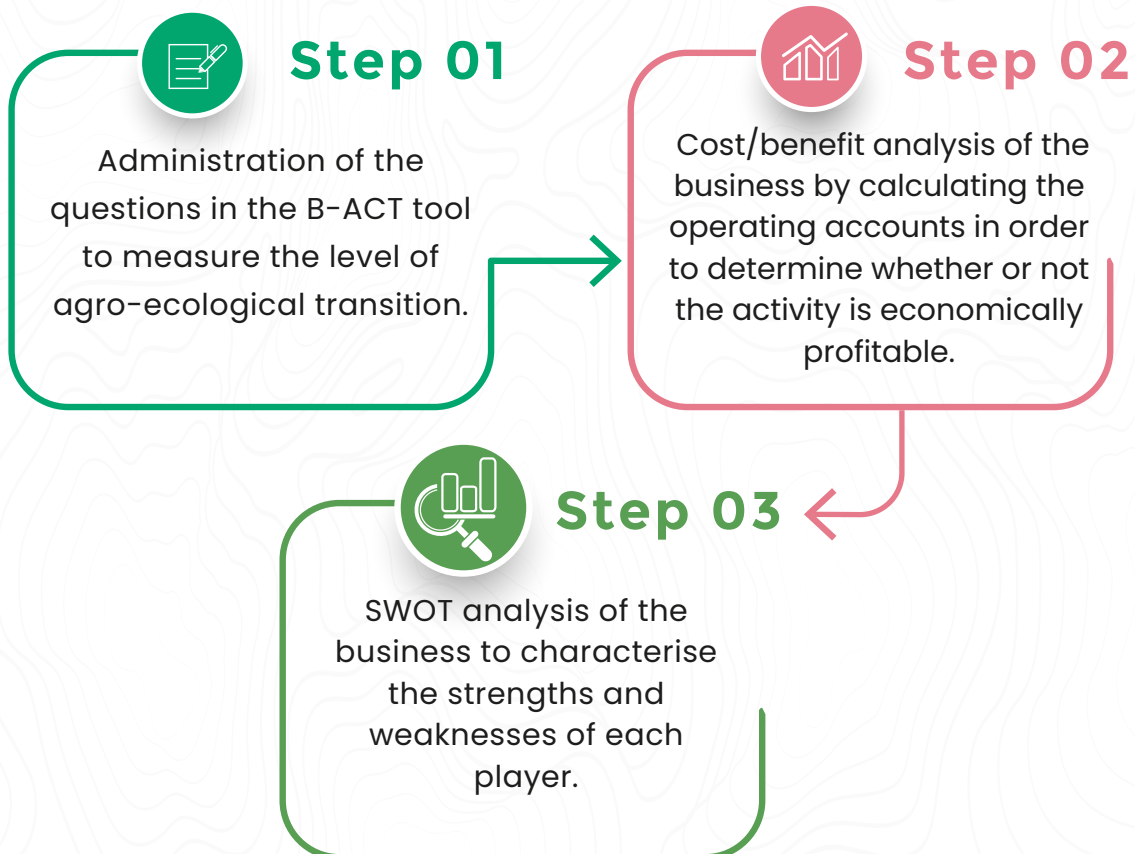




Figure 3 : Workshop with women from the goat's milk processing unit at Ngoyère (Fatick)



Figure 4 : Workshop with goat's milk producers from Niakhar (Fatick)



Figure 5 : Workshop with producers supplying cow's milk to the processing unit

III. RESULTS

1. Goat milk processing unit

a _ Level of agroecological alignment

The goat's milk processing unit has a very high level of agro-ecological transition, with an overall score of 92% on all the agro-ecological principles. The agro-ecological pillar Guaranteeing social equity has the highest score at 100%, followed by the Building resilience pillar at 97%, and the Improving resource use pillar comes last with a score of 70%. The results for the processing unit for school canteens are reliable, as the average percentage of unanswered questions is relatively low, at 30%. The highest score was observed for the Resilience Building pillar (39%), followed by Social Equity (25%) and Resource Use Efficiency (15%) (see Figure 6).

The perfect score for the Social Equity pillar is essentially explained by the very active organisational dynamics of the members of the processing unit. The women's group has received a number of training courses (processing techniques, business management, etc.) from their partners, and are particularly committed to promoting local products in school canteens. The women processors also ensure that the profits from the unit's activities are distributed fairly and equitably to all members. In addition, they regularly organise exchange visits and workshops and/or knowledge-sharing meetings.

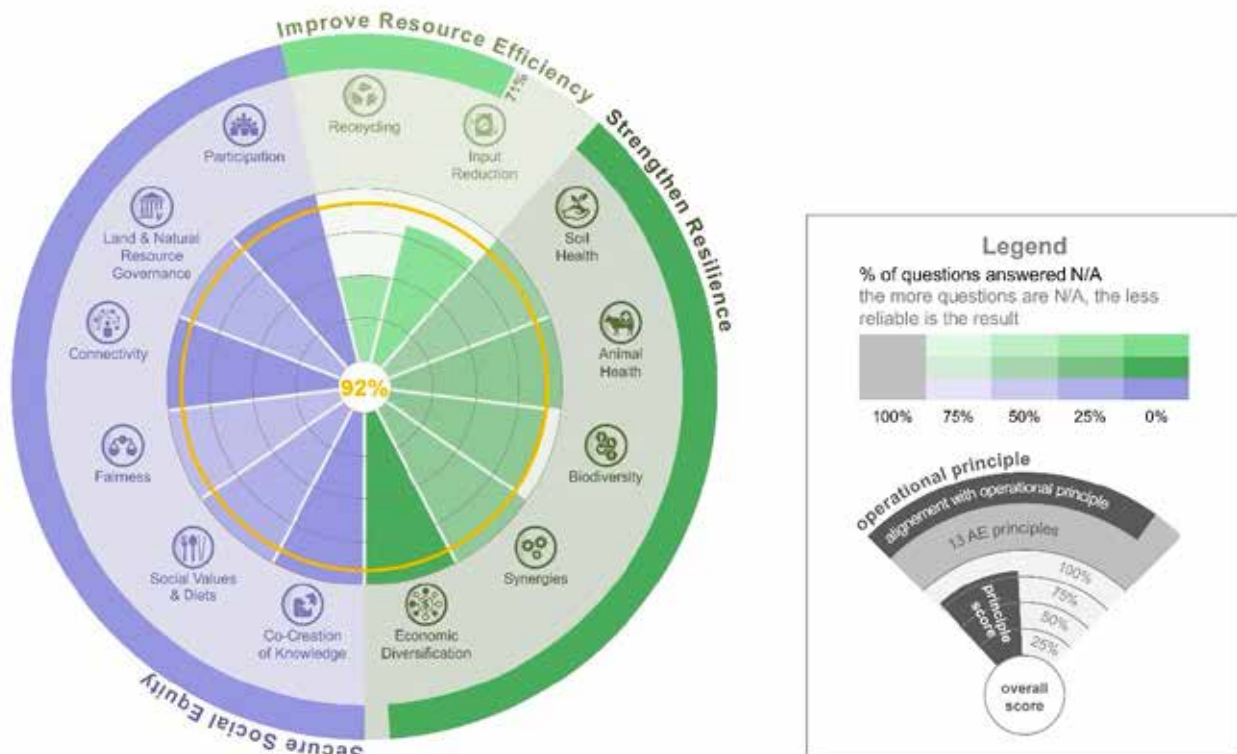


Figure 6 : Diagram of the level of agroecological alignment of the Nгойère goat's milk processing unit (Niakhar/Fatick) according to the 13 principles of agroecology

The score for the Strengthening Resilience pillar is almost perfect, as the processing unit has developed a diversified customer network. This strategy is backed up by a diversification of income sources through the processing of other dairy products (soap, yoghurt) in order to capture several marketing channels. Women processors also market cereal products and local juices. Not to mention that their marketing strategies favour short distribution channels, with sales on the spot and to canteens, even though sales are often made outside the region.

The good score for the Resource Efficiency pillar is justified by the optimal recycling of by-products from processing. For example, the liquid from cheese processing is not thrown away, but reused to water the

animals. This liquid is also used to ferment the cheese, which helps to reduce the use of fermentation chemicals. Water from cleaning equipment is used to water plants and to make compost. All these practices reflect the optimal use of water resources. The use of resources is therefore perfectly in line with agro-ecological practices. However, despite good recycling practices, one of the weaknesses of this pillar is the unrestrained use of water in processing activities. Women processors therefore need to make an effort to use water, a scarce resource, more sparingly. The other agro-ecological weakness of this pillar relates to the failure to use a renewable energy source in the processing unit; the women processors use exclusively fossil energy (electricity, gas) in their processing.

III. RESULTS

1. Goat milk processing unit b_ Cost/benefit analysis

The cost/benefit calculation for the school canteen yoghurt processing unit shows that the activity has not been monetarily profitable over the last six years. In fact, the BCR is 0.71, a figure lower than 1 and meaning that the production costs of the processing unit are actually higher than its benefits (see table 1).

A more detailed analysis of the results shows that investment and production costs are higher than yoghurt sales

turnover in all the reference years, particularly from 2018 to 2023. As a result, a cash flow deficit of FCFA 6,515,251 was recorded on the unit's operating account between 2018 and 2023. However, the results as presented hide other realities in the cost/benefit analysis of the Ngoyère goat's milk processing unit. It is therefore appropriate to return to these reasons in order to make more explicit the economic unprofitability of the activity.

Table 1 : Cost/benefit assessment of the goat's milk processing unit

Discount rate	BM Yoghurt processing unit for school canteens		
8%			
Year	Benefits cashflow (Bt)	Costs cashflow (Ct)	Discounted Net Benefit
1	1 929 000	2 923 972	-925 556
2	2 717 000	3 662 561	-818 225
3	700 000	1 912 657	-976 141
4	1 980 000	3 550 847	-1 176 251
5	5 850 000	6 391 276	-377 030
6	1 395 000	2 644 938	-809 912
Present Value of cashflows	10 266 493	14 539 696	-4 273 203
BCR	0,71		

Firstly, the cost/benefit calculation was only applied to a single product, namely yoghurt intended exclusively for school canteens. This methodological choice is justified by the fact that our analysis focuses on school canteens. However, we mentioned above that the unit offers other dairy products (cheese and soap). Including these dairy products in the analysis could perhaps produce the opposite results, or at least reduce the cash-flow deficits. In any case, we have to admit that producing yoghurt for school canteens is not economically profitable. This raises the legitimate question of how the processing unit was able to invest so heavily in production factors.

This question leads us to revisit the sources of investment in the unit's equipment, which may

also explain the cash-flow deficits. The biggest investments in processing equipment (pasteuriser, refrigerator, cooking pot, STO, etc.) were donated by ANPDI. This association has provided a great deal of support to women producers by equipping the unit with processing equipment. Consequently, the evaluation of this equipment in the analysis undoubtedly influences production costs and reduces the benefits that the processing unit could potentially gain. These are some of the reasons why the yoghurt processing unit for school canteens might not be economically viable. To better confront this hypothesis, the cost/benefit analysis of the other players in the milk value chain will enable us to confirm or refute this trend towards economic unprofitability.

III. RESULTS

1. Goat milk processing unit

c. SWOT Analysis

The SWOT analysis of the goat milk processing unit for school canteens shows that one of the strengths of the unit is that the women processors are the pioneers of this activity in the Niakhar area. This has allowed them to gain recognition from their customers, because the unit is renowned for its diversified, quality and agroecological products. This reputation also opens up market opportunities with school canteens in the region, at fairs and in supermarkets. The recognition of the local product is also explained by a quality human resource, which has benefited from capacity building training on the technical and organizational level. These training offers are made possible by effective support from technical and financial partners (ANPDI, ARECAP, etc.). In addition, the members of the unit are active and very committed to the smooth running of the group. On the other

hand, the women producers are faced with equipment problems; The unit does not have its own premises to carry out its activities. The other weakness of the unit is linked to the high cost of production, especially of the raw material, which means that the processing activity is not currently economically profitable. This weakness is reinforced by the deficits in goat's milk production leading women processors to resort to cow's milk. This undoubtedly increases production costs and makes the activity economically unviable. In addition, the lack of competitiveness of the product (yogurt) exposes it to a real threat of competition from industrial dairy products, which are more economically accessible. A threat which is also exacerbated by the fluctuation in the prices of raw materials and climate change, which will have an impact on local production conditions.

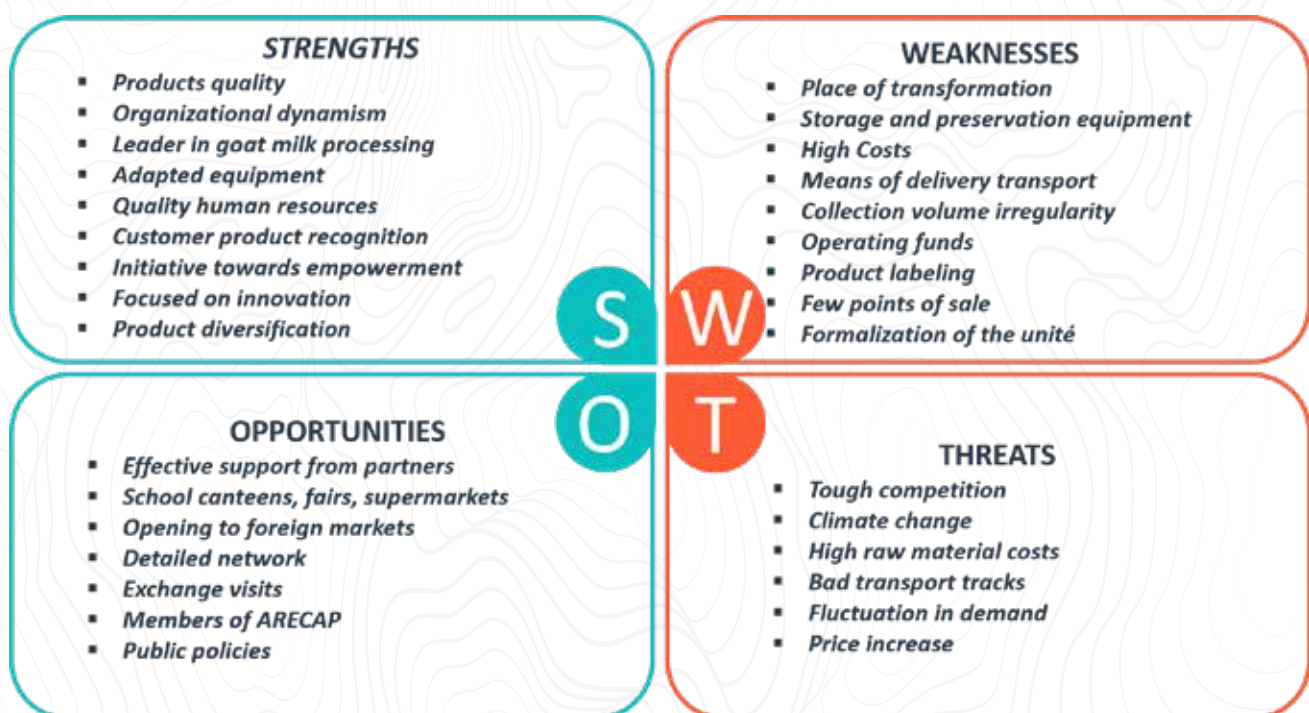


Figure 7 : SWOT Analysis of goat milk processing unit

III. RESULTS

2. Goat milk producers

a. Level of agroecological alignment

Niakhar women goat milk producers have a very good score (91%) in terms of agroecological alignment level on all the principles of agroecology. The Resilience Building pillar ranks first with a score of 97%, followed by the Social Equity pillar (94%) and finally Resource Efficiency (73%). The

percentage of unanswered questions (N/A) is on average 43%, including 42% for the Resource Efficiency, Social Equity (43%) and Resilience Building (44%) pillars. These figures therefore attest to the reliability of the results, especially since the scores are clearly below the average of unreliability (see Figure 8).

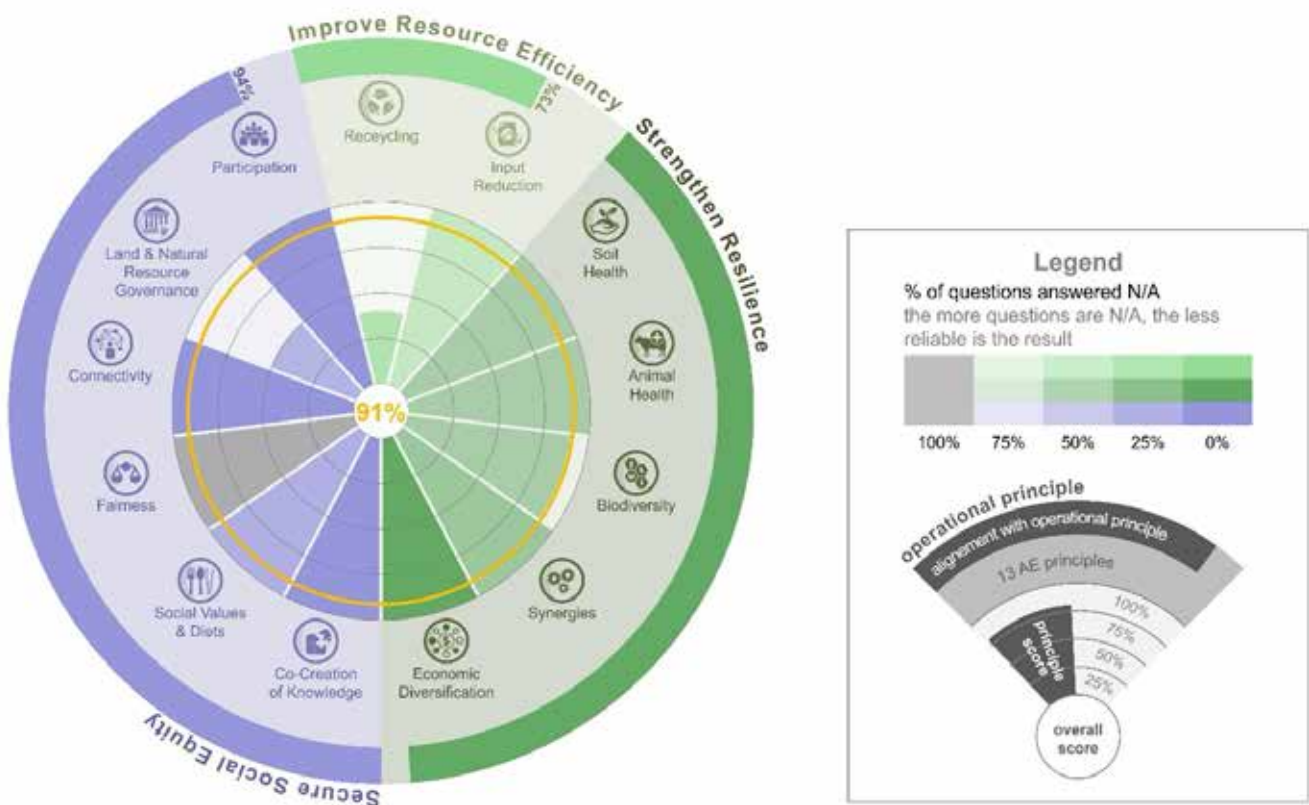


Figure 8 : Diagram of the level of agroecological alignment of women goat milk producers in Niakhar (Fatick) following the 13 principles of agroecology

The performance of the score on the Strengthening Resilience pillar is due above all to a strong integration of livestock/agriculture. The association of agriculture and livestock, two complementary activities, is a very old practice and anchored among women producers. The association of these two activities contributes on the one hand to maintaining the health of the

soils, and on the other hand, makes it possible to mobilize fodder resources for feeding animals. Women producers use in their fodder crop farms fertilizer trees, compost and cowpea residues to enrich the soils. As an illustration, the presence of the *Acacia Mellifera* tree on the farm acts as a windbreak to combat soil erosion of their nutrients by the wind.

All this flow of biomass and organic matter allows sufficient maintenance of the croplands without resorting to mineral fertilizers. In addition, crop rotations are practiced to effectively ensure soil maintenance. The major innovation is notably the construction of a stable, with the support of partners, which is equipped with all the amenities to ensure the comfort of the animals. In addition, the techniques of fodder conservation and production of nutritional blocks (see figure 9) make it possible to offer the goats a suitable diet,

which meets their maintenance and production needs. The fodder stock finally makes it possible to stable the animal in order to prevent the herd from wandering. The breeds of goats exploited are diversified to both ensure the conservation of local species, and to improve productivity thanks to the introduction of improved breeds in the farm. Finally, one of the major assets of women producers is economic diversification thanks to the sale of live animals and milk, which is oriented towards several marketing channels.



Figure 9 : Nutritional block and handmade bush straw bale for goats

Source : <https://www.anpdisn.org/modele-integre-delevage-caprin/>

The Social Equity pillar also has a very good score, because the training received, for example, on breeding techniques, is disseminated and shared among producers. These women regularly participate in fairs to popularize the nutritional benefits of products processed into goat milk. However, the weakness of this pillar lies in the governance of natural resources because awareness-raising on

the preservation of resources is not a very developed initiative.

Finally, the good score of the Resource Efficiency pillar is justified on the one hand by the recycling of all milk production, because unprocessed milk is either intended to feed kids or for family consumption. On the other hand, this score is explained by housing adapted to the conditions of the animals.

The stables are built in such a way that the milking dock, feeders, waterers and grazing areas are adapted to the goats (see Figure 10). In addition, the location of the milking dock next to the feeders facilitates milking on the one hand, and on the other hand helps to reduce milk losses during the milking operation. In

addition, the equipment used in production activities (milking utensils, drinkers, transport containers, etc.) can be reused for a long time. In addition, water is used economically during maintenance or cleaning of equipment. However, wastewater is not recycled, it is not recovered and is therefore thrown away after use.



Figure 10 : Location of the feeding through and milking platform in a producer's stable in Niakhar

Source : <https://www.anpdisn.org/modele-integre-delevage-caprin/>

III. RESULTS

2. Goat milk producers

b _ Cost/benefit analysis

The cost/benefit analysis of women goat milk producers reveals that the activity has not been economically profitable for the last five (5) years. The BCR is 0.11 and indicates that production costs are significantly higher than the turnover from the sale of milk. Between 2019 and 2020, the cost/benefit ratio shows a cash-flow deficit (see table 2). For 2019, the deficit is due to the large investments made in production factors (construction of stables, fencing of fodder plots, purchase of goats and small

equipment), while the quantities produced for this year were low to cover all these expenses. However, it should be noted that these large investments were financed by ANPDI. Then, the year 2020 was marked by the covid 19 pandemic where schools and informal milk marketing markets were closed. However, for the years 2021 and 2022, sales were higher than production costs, and therefore the production activity was economically profitable during these two years.

The economic profitability of goat milk production fades from the following year, because the operating account for 2023 shows a cash deficit. In summary, the cost/benefit analysis of women producing goat

milk reveals that the activity is more loss-making than economically profitable. This reinforces the initial results of the cost/benefit analysis of the economic unprofitability of local milk in Niakhar.

Table 2 : Cost/benefit assessment of goat milk producers

Discount rate	BM_Goat milk producers in Niakhar		
8%			
Year	Benefits cashflow (Bt)	Costs cashflow (Ct)	Discounted Net Benefit
1	39 900	1 473 500	-1 333 581
2	2 400	105 410	-89 138
3	53 500	25 000	22 941
4	80 000	47 000	24 710
5	36700	54 260	-12 232
Present Value of cashflows	167 726	155 5025	-1 387 299
BCR	0,11		

III. RESULTS

1. Goat milk processing unit

c_ SWOT Analysis

The SWOT analysis indicates that one of the strengths of women goat milk producers is a strong integration of agriculture and livestock farming. This association makes it possible to mobilize, in addition to fodder crops, significant fodder resources for animal feed. The support offered by ANPDI and ARECAP is also a major strength, as it has made it possible to

benefit from equipment and maximize production. For example, goat stables facilitate production and milking activities and substantially reduce milk losses. The high demand for goat milk by the processing unit and informal market customers is a major asset for increasing productivity.

Moreover, current production does not cover the entire year's demand and leaves market margins for goat milk. However, the lack of equipment (stables, materials) combined with a deficit of means and high-potential dairy genetics currently do not allow us to take full advantage of demand. The weakness of goat milk producers therefore lies in the inadequacies of production factors. However, market opportunities are to be exploited with public policies that plan to expand school canteens in the coming

years. The integration of the DYTAEL platform offers other opportunities to better promote agroecological products and to establish new partnerships. In addition, one of the threats that goat milk producers must face is obviously climate change. This phenomenon is reflected in Niakhar by rainfall deficits and salinization of the land, inevitably leading to a progressive reduction in animal feed resources. A threat that is also accentuated by diseases and the high cost of inputs, which causes additional production costs for women producers.

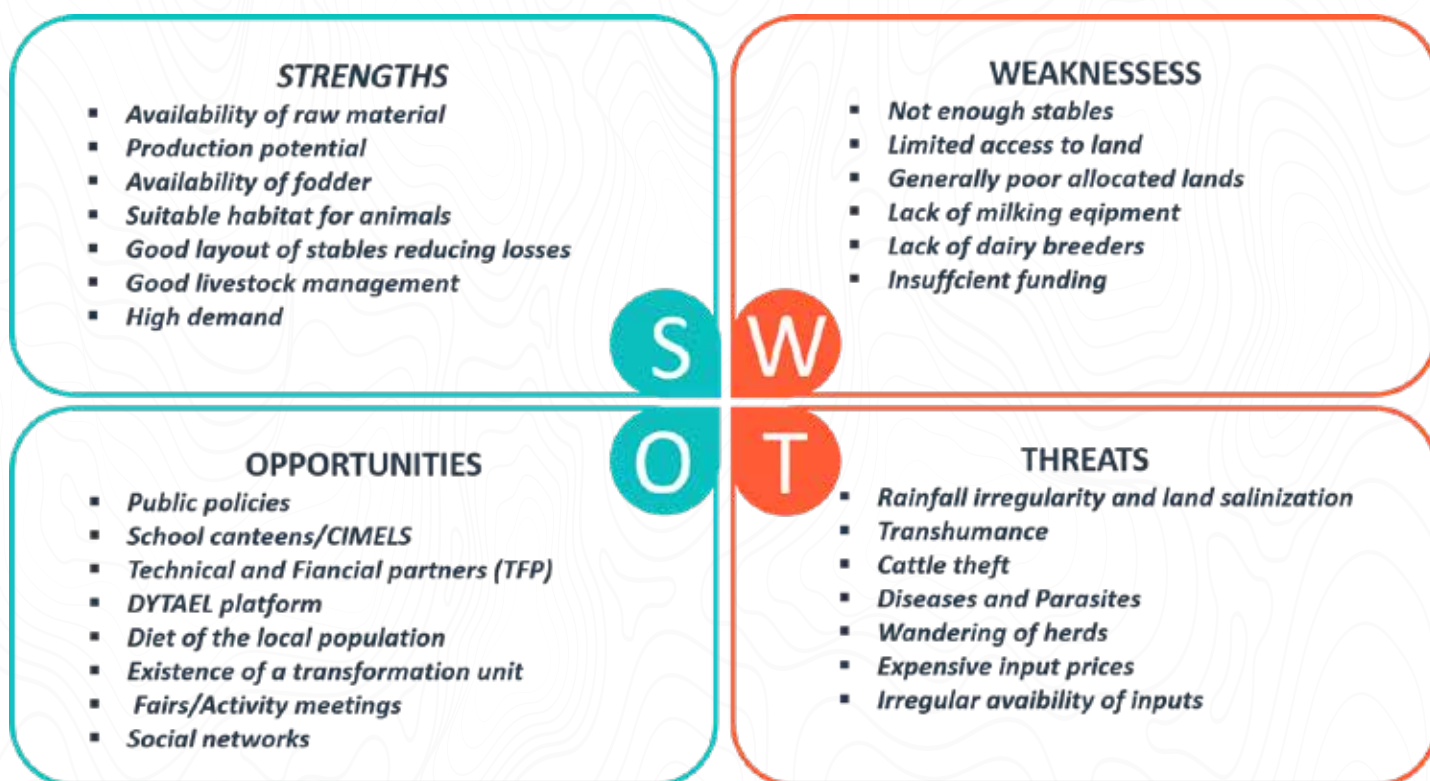


Figure 11 : SWOT Analysis of women goat milk producers

III. RESULTS

3. Cow's milk producers suppliers

a. Level of agroecological alignment

The producers supplying cow's milk to the processing unit have a score of 71%, a good score for the level of agroecological transition compared to the 13 principles. The Resource Use Efficiency pillar has the highest score with 89% and the two pillars Strengthening Resilience and Social Equity have equal scores, i.e. 67% for each. The average percentage of unanswered questions (N/A) is slightly below the average, it is 52%. The percentage of N/A is 50% for the Resilience Strengthening pillar, Resource Use Efficiency 53% and Social Equity 57% (see Figure 12). These percentages, despite a slight excess of the average, do not necessarily reflect a lack of reliability of the data. This is mainly explained by the fact that several questions in the tool do not apply to producers supplying cow's milk.

The high score in the Resource Use Efficiency pillar is mainly due to the excellent

performance achieved on the agroecological principle of reducing inputs. Chemical products, such as antibiotics, are only administered to animals during serious illnesses. Similarly, chemical fertilizers are not used on cropland because they deplete the soil. They instead favor organic manure to enrich the land with nutrients. Water resources are used optimally and without waste when they water their animals. Their means of transport do not cause CO2 emissions, because they mainly use horse carts for their travels. In addition, the containers used during milking are traditional and help to avoid production losses. Recycling is an agroecological practice anchored among these supplier producers. They use all of the milk produced, because part of it is intended for sale and the unsold milk is reused for family consumption.

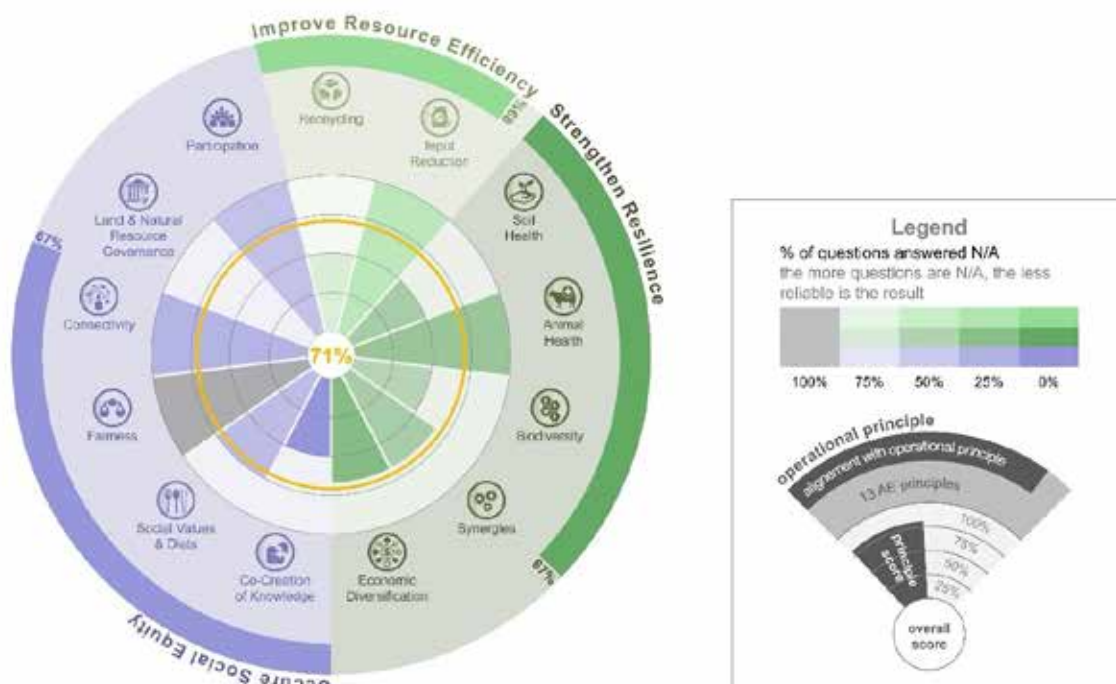


Figure 12: Diagram of the level of agroecological alignment of producers supplying cow's milk to the processing unit following the 13 principles of agroecology

The equal and relatively high scores of the Resilience Building and Social Equity pillars are explained on the one hand by score performances on certain principles, and on the other hand, by underperformance on others. For example, for the Resilience Building pillar, exploits are achieved on the agroecological principle of animal health. They distribute a rich diet to the dairy core using concentrates (cotton seed, millet bran, peanut cake, etc.) in order to increase their productivity. The cow pens are equipped with all the equipment to ensure their comfort. In a word, they ensure the comfortable conditions of the dairy cows to avoid them as much as possible from stress factors. On the other hand, their farms are not rich in biodiversity because

the presence of trees is practically non-existent on the farm. Similarly, they have not taken any measures to combat soil erosion of their nutrients. As for the Social Equity pillar, remarkable agroecological actions are observed on social values and diets because they mainly consume local products. Agricultural yields and milk constitute the basis of food, only surplus agricultural yields are marketed. But for example, they have not undertaken any action to ensure fair and sustainable governance of the use of resources. Finally, organizational dynamics are non-existent among producers supplying cow's milk to the goat's milk processing unit for school canteens.

III. RESULTS

3. Cow's milk producers suppliers b_ Cost/benefice analysis

The cost/benefit analysis of cow's milk supplier producers shows that the activity has not been economically profitable over the past four years. The BCR is 0.38 and indicates that production costs are all higher than income from milk sales between 2020 and 2023 (see Table 3). In other words, cash flows are in deficit during all these years of milk production and marketing. A more detailed analysis of the evolution of expenses reveals that

investments in production factors (equipment, inputs, etc.) multiply from one year to the next while milk income barely covers half of the expenses. This situation is all the more worrying, especially for these types of producers, who do not benefit from any financial and technical support from any partner. Faced with such an observation, we can state without fear of being wrong that the activity of production, processing and marketing of local milk in Fatick is not economically profitable.

Tableau 3: Cost/benefit assessment of cow's milk supplier producer

Discount rate	BM_Producers supplying cow's milk to the processing unit		
8%			
Year	Benefits cashflow (Bt)	Costs cashflow (Ct)	Discounted Net Benefit
1	246 000	1 903 000	-1 541 395
2	288 000	378 000	-77 880
3	1 229 000	2 575 500	-1 083 879
4	381 500	568 000	-139 651
Present Value of cashflows	1 753 017	4 595 823	-2 842 806
BCR	0,38		

The cost/benefit analysis of cow's milk supplier producers shows that the activity has not been economically profitable over the past four years. The BCR is 0.38 and indicates that production costs are all higher than income from milk sales between 2020 and 2023 (see Table 3). In other words, cash flows are in deficit during all these years of milk production and marketing. A more detailed analysis of the evolution of expenses reveals that

investments in production factors (equipment, inputs, etc.) multiply from one year to the next while milk income barely covers half of the expenses. This situation is all the more worrying, especially for these types of producers, who do not benefit from any financial and technical support from any partner. Faced with such an observation, we can state without fear of being wrong that the activity of production, processing and marketing of local milk in Fatick is not economically profitable.

III. RESULTS

3. Cow's milk producers suppliers c_ SWOT Analysis

The SWOT analysis shows that one of the strengths of cow's milk supplier producers is an increase in the quantities of milk produced as well as an improvement in quality. This is explained by the stabling of the dairy core and investments in animal feed, which substantially increase

production. The assiduity of customers, particularly the processing unit, is a major asset and pushes producers to increase their investments in order to increase income from milk sales. The hardiness of the animals is also a strength of the farm, as it reduces livestock maintenance costs.

However, the lack of resources (technical, financial, equipment, etc.) is a major weakness of these producers to truly boost productivity. Dairy production is a profession, and consequently, the lack of training impacts on the farm's performance. This lack of capacity in milk production is accentuated by the lack of organizational dynamics of these said producers. However, despite seasonal milk production, opportunities arise for producer suppliers with the increase and diversification of demand for milk. This leads us to wonder how producers could capture these market

opportunities without additional means of production. Given this observation, it seems obvious that dairy producers have an interest in setting up a professional organization to facilitate their search for means. Finally, producers supplying cow's milk are faced with the threat of climate change. This is manifested by rainfall deficits and irregularities, which are manifested by a reduction and scarcity of food resources (water and pasture) for animals. Rural exodus also constitutes a major threat, because it materializes by the scarcity of labor.



Figure 13 : SWOT analysis of cow's milk suppliers



IV. DISCUSSION CONCLUSIVE

The analysis of the agroecological transition levels of the actors in the Fatick milk value chain demonstrates very high performances; so much so that the processing unit and the goat milk producers have the best scores compared to the cow milk supplier producers. The excellent agroecological alignment level scores of the unit and the women producers are essentially justified by the determining role that ANPDI and ARECAP have played in promoting agroecological products in school canteens. These two associations have in fact been supporting the actors in the Fatick goat milk value chain for several years in promoting local products. In this regard, it seems obvious to us to mention some important achievements of ANPDI and ARECAP to better appreciate the determining role that these partners have played in the agroecological transition performances.

The emergence of school canteens has been an initiative of the Senegalese government and the World Food Programme (WFP) since 2014 in Fatick, the aim being to improve the nutritional status of children at school. However, the supply of food products to school canteens was provided by the WFP with mainly imported products (Diallo et al., 2023). A noble programme but which did not contribute to the promotion of local products. Faced with this observation, the supply of school canteens has been driven since 2018 by the commitment of local animation partners such as ANPDI and ARECAP.

ANPDI has played a major role in the system for supplying agroecological

products to school canteens through short circuits. It has contributed greatly to the promotion of territorial resources and local production sectors. It is in this context that ANPDI's support for actors in the milk value chain is part of this. In 2008, the Fatick Integrated Development Program (PDIF, now ANPDI) began to develop intervention strategies to support the development of the goat sector.

Financing and goat farm establishment activities were launched. These include the construction of enclosures, the purchase of breeding goats and bucks, veterinary products and food supplements (Gillerot, 2018). Thus, in 2011, the costs of setting up the 11 individual goat farms of the first generation amounted to a total of 16 million FCFA (Ibid.). ANPDI's achievements also focus on strengthening the technical capacities of groups and breeders, through the organization of training sessions on methods of conducting and managing goat farming, deployed under different modules such as the maintenance of enclosures, veterinary care, feeding and fodder crops. In addition, the association organizes monitoring missions every year, providing technical and organizational support and advice to beneficiaries. All these activities are made possible by large investments because, between 2017 and 2021, the budget allocated to all activities related to the development of the goat sector amounts to nearly 51 million FCFA (ANPDI, 2022). The inventory of ANPDI's achievements is far from exhaustive; but these few figures allow us to better appreciate the leading role played in the agroecological transition of the producers and processors of goat milk in Niakhar.

The Regional Association of Goat Breeders (ARECAP) was created in 2010 with the financial and technical support of ANPDI and PAFC (Goat Sector Improvement Program) to support the organizational dynamics and development of the Fatick goat milk sector. ARECAP is made up of 134 goat village groups and 31 individual breeders (Ba et al., 2024). ARECAP has provided several technical and organizational supports to the processing unit and women producers of goat milk. It organizes donations of batches of medicines to all its members every year. Training in animal feed is carried out in particular with women producers. The Association regularly organizes training sessions on first aid for a herd and on hygiene and dairy processing techniques. ARECAP facilitators are also responsible for animating women's groups to improve their organizational functioning. These animation activities also explain the strong organizational dynamics of the women processors of Ngoyère and their performance on the Social Equity pillar. The technical support of women producers is particularly significant, because the association organizes a deworming campaign combined with the vaccination of goats every year. For example, in 2023, 10,000 goats were vaccinated against Peste des Petits Ruminants (PPR), 12,000 vaccinated against pasteurellosis and more than 9,000 goats dewormed in the Fatick region (PAFC, 2023). All these achievements therefore demonstrate the crucial role that ARECAP has played in promoting goat's milk in school canteens.

Despite all these actions carried out by ANPDI and ARECAP, efforts still need to be made because the cost/benefit analysis of the study shows that the local goat milk value chain in Niakhar is not economically profitable. This observation is not new, experiences of collecting and processing local milk in Senegal have shown similar results. Indeed, in the 1990s, the multiple failures of mini-dairies collecting and processing local milk testify in another way to the unprofitability of this activity (Corniaux, 2015). This means that the failure of local milk collection experiences so far refers to a problem of production cost (Ba, 2024). This study confirms this argument because production costs remain a major challenge for all stakeholders in the Fatick milk value chain. The heavy costs of producing and processing local milk make it difficult to produce dairy products at competitive prices. In this regard, there are questions about the sustainability of the Ngoyère goat milk processing unit after the departure of its technical and financial partners (ANPDI and ARECAP). This uncertainty also represents a point of hope for the value chain, because ANPDI and ARECAP have been thinking and working for years on inclusive financing mechanisms to sustain the activities of goat milk producers and processors for school canteens. The sustainability of the agroecological potential of this value chain, thanks to a substantial reduction in production costs, will undoubtedly contribute to a more developed local economy and to strengthening children's nutrition through school canteens.



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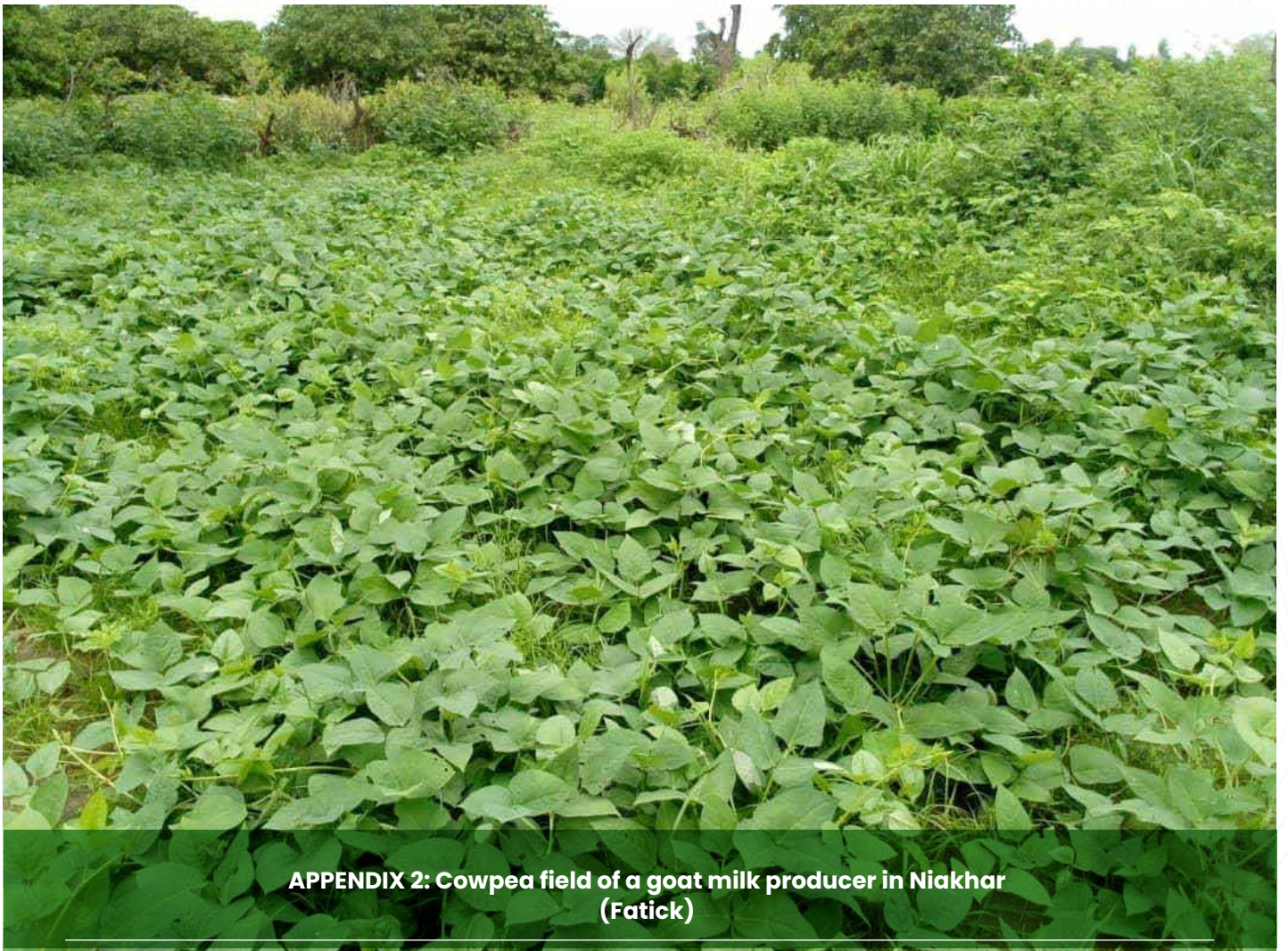
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ANNEXES



APPENDIX 1: Working session with the team on the B-ACT tool on the eve of the start of the workshops



APPENDIX 2: Cowpea field of a goat milk producer in Niakhar (Fatick)

The breakdown of principles that form an agroecological organisation.	How your enterprise scores per principle based on the information provided.	A progress bar of your score per principle.	N/A answers are not counted within the percentage.
	Percentage		% of Questions answered N/A
Agroecology	91,5%		30,39%
Improve resource efficiency	70,6%		15,00%
Recycling	50,0%		25,00%
Input Reduction	81,8%		8,33%
Strengthen resilience	97,0%		38,89%
Soil Health	100,0%		50,00%
Animal Health	100,0%		40,00%
Biodiversity	91,7%		40,00%
Synergy	100,0%		41,67%
Economic Diversificator	100,0%		0,00%
Secure social equity	100,0%		25,00%
Co-Creation of Knowledge	100,0%		0,00%
Social Values and Diets	100,0%		28,57%
Fairness	100,0%		44,44%
Connectivity	100,0%		0,00%
Land and Resource Governance	100,0%		33,33%
Participation	100,0%		0,00%

APPENDIX 3: Detailed results on the level of alignment of the goat milk processing unit for school canteens with the 13 principles of agroecology organized on the 3 pillars

The breakdown of principles that form an agroecological organisation.	How your enterprise scores per principle based on the information provided.	A progress bar of your score per principle.	N/A answers are not counted within the percentage.
	Percentage		% of Questions answered N/A
Agroecology	91,2%		43,56%
Improve resource efficiency	72,7%		42,11%
Recycling	40,0%		28,57%
Input Reduction	100,0%		50,00%
Strengthen resilience	96,7%		44,44%
Soil Health	100,0%		50,00%
Animal Health	100,0%		50,00%
Biodiversity	90,0%		50,00%
Synergy	100,0%		41,67%
Economic Diversificator	100,0%		0,00%
Secure social equity	93,8%		42,86%
Co-Creation of Knowledge	100,0%		0,00%
Social Values and Diets	100,0%		28,57%
Fairness	N/A	N/A	100,00%
Connectivity	100,0%		0,00%
Land and Resource Governance	50,0%		33,33%
Participation	100,0%		0,00%

APPENDIX 4: Detailed results level of alignment of women producing goat milk on behalf of the processing unit with the 13 principles of agroecology organized on the 3 pillars

The breakdown of principles that form an agroecological organisation.	How your enterprise scores per principle based on the information provided.	A progress bar of your score per principle.	N/A answers are not counted within the percentage.
	Percentage		% of Questions answered N/A
Agroecology	70,8%		52,48%
Improve resource efficiency	88,9%		52,63%
Recycling	50,0%		71,43%
Input Reduction	100,0%		41,67%
Strengthen resilience	66,7%		50,00%
Soil Health	50,0%		50,00%
Animal Health	100,0%		40,00%
Biodiversity	50,0%		60,00%
Synergy	66,7%		50,00%
Economic Diversification	66,7%		25,00%
Secure social equity	66,7%		57,14%
Co-Creation of Knowledge	50,0%		0,00%
Social Values and Diets	75,0%		42,86%
Fairness	N/A	<div style="background-color: #cccccc; width: 100%; text-align: center;">N/A</div>	100,00%
Connectivity	100,0%		33,33%
Land and Resource Governance	0,0%		66,67%
Participation	100,0%		50,00%

APPENDIX 5: Detailed results on the level of alignment of producers supplying cow's milk to the processing unit with the 13 principles of agroecology organized on the 3 pillars



INITIATIVE ON Agroecology



Dynamics for the agroecological transition (DyTAEL)

In Fatick, Senegal

Analysis of the level of agro-ecological transition, profitability, levers and obstacles for players in the school canteen goat milk value chain

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