

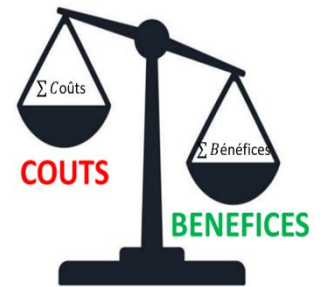
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WP3

Cost-Benefit Analyses of Agroecological Packages for Farmers, Collectors and Processors in Bobo-Dioulasso's Dairy Value Chain

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The CGIAR Initiative Transformational Agroecology across Food, Land, and Water Systems develops and scales agroecological innovations with small-scale farmers and other food system actors in seven low- and middle-income countries. It is one of 32 initiatives of CGIAR, a global research partnership for a food-secure future, dedicated to transforming food, land, and water systems in a climate crisis.

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1. Introduction

In Burkina Faso, the Initiative on Agroecology (IAE) is helping stakeholders in the Dairy Innovation Platform ('Plateforme d'Innovation Lait', PIL) achieve the dairy value chain's agroecological transition, taking the PIL's vision - which was defined in 2020 (during Africa-Milk), then reviewed and confirmed in 2023 at the beginning of the IAE (due to its compatibility with the principles of agroecology) - and putting it into action. In 2023, the PIL was further consolidated by integrating new partners who could provide valuable support towards the dairy industry's agroecological transition. As part of the IAE, we are working within this space known as the Agroecological Living Landscape (ALL), which focuses on the dairy value chain.

For 'ALL' players, the ultimate goal is "to increase the share of local milk in dairy products manufactured by Bobo-Dioulasso dairy processors, through innovations at farm level, in milk collection and processing, and in the governance of the dairy value chain". The idea behind the IAE's involvement is to support the co-design of an agroecological business model for the dairy value chain which could integrate all of these innovations based on the key principles of agroecology in order to guarantee the sustainability and resilience of this value chain.

To this end, IAE researchers support ALL stakeholders in co-designing changes (innovations) at different levels of the food system:

- At farm level: by strengthening agriculture-livestock integration in dairy production units to sustainably increase milk production (forage production and co-product recycling into fodder and manure)
- At collection level: through diversifying collector services, and especially milk collection centres, in order to increase milk collection in terms of quantity, quality and consistency
- At processing level: by diversifying dairy products to meet growing consumer demand

These changes are based on a range of practices that we call agroecological packages. We are therefore working on 3 main packages: 1) the agroecological production package (forage crops, organic manure, etc.); 2) the agroecological collection package (diversification of services to farmers and processors); 3) the agroecological processing package (diversification of dairy products).

To guide the ALL's implementation in an agroecological transition, the main objective of the IAE in Burkina Faso is to co-design an Agroecological Business Model (Ae BM) for the dairy value chain with ALL stakeholders. As shown in Figure 1, this work falls specifically within the scope of the IAE's WP3. However, the findings of all the other work packages (1 to 4) will need to be taken into account in the development of this agroecological business model.

The 'Cost-Benefits Analyses of agroecological packages' workshops for farmers, collectors and processors within Bobo-Dioulasso's dairy value chain (CBA workshops) represent a further step in the process of co-building the Ae BM, which began with:

- A literature review on the state of the dairy value chain;

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- The characterisation of current BMs for stakeholders operating upstream in the dairy value chain and the degree to which these BMs are agroecological.

Findings from these CBA workshops are added to the results of these first two stages to provide input for the next stage (Figure 1), namely:

- The drafting of a proposal for an agroecological BM;
- The co-building of a roadmap from the current BM to an agroecological BM (ToC, V2A).

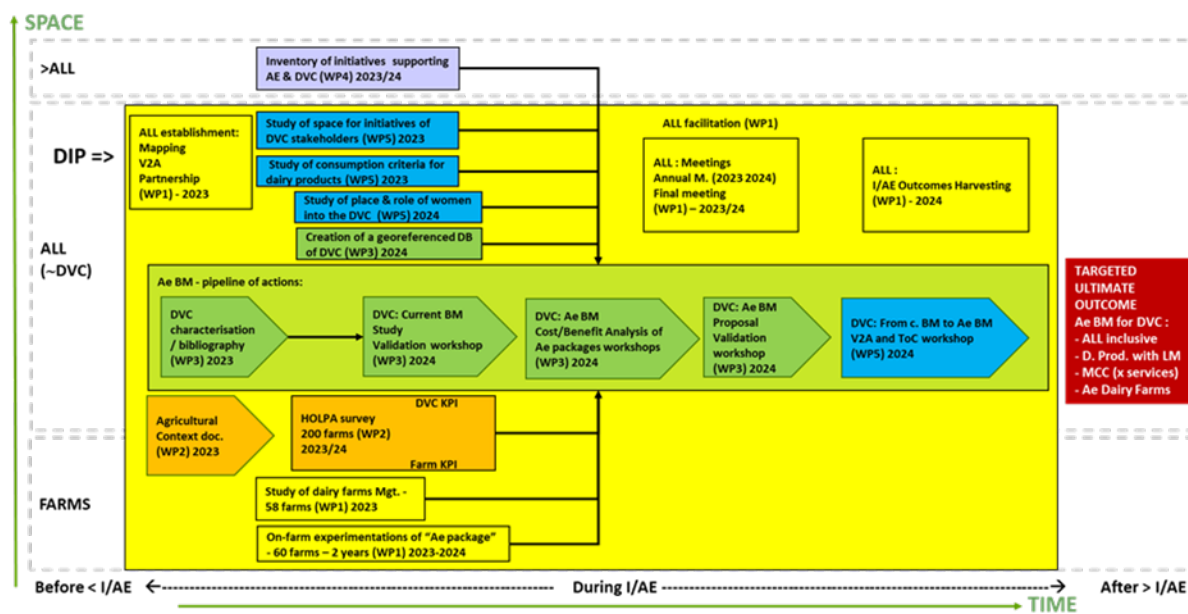


Figure 1. Interactions between the ultimate target (R/H side), the 5 work packages and their activities Interactions between the ultimate target and the WPS activities (Key: I/AE: initiative on agroecology; Ae: agroecology; Mgt. management; DVC: dairy value chain; BM: business model; DIP: dairy innovation platform of Bobo-Dioulasso; ALL: agroecological living landscape; V2A: vision to action; ToC: theory of change; MCC: milk collection centres; LM: local milk; D. Prod.: dairy products; DB: database)

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2. CBA workshop objective

The aim of these workshops was to carry out a Cost-Benefit Analysis (CBA) of the three agroecological packages (production, collection and processing) involving all of the relevant occupational groups (farmers, collectors and processors), with IAE researchers from Burkina Faso acting as facilitators.

3. CBA workshop participants

In the previous stage of characterising the current BM, we worked with these three occupational groups. Each group was actually comprised of 2 sub-groups representing the main variants encountered in the study area. The work was carried out with the same occupational groups and sub-groups, and with the same team of facilitators (Table 1).

Table 1. CBA workshop participants and facilitators

| Occupational groups | Focus Group Discussion | Participants | Facilitators & Secretaries |
|---------------------|------------------------|--------------|-------------------------------------------|
| Farmers | Agro-Pastoralists | 13 | Michel OROUNLADJI & Hati KONATE |
| | Mini-Farms | 8 | Désiré OUATTARA, Ollo SIB & Issouf TRAORE |
| Collectors | Independent Collectors | 7 | Michel OROUNLADJI & Hati KONATE |
| | Milk Collection Centre | 11 | Désiré OUATTARA, Ollo SIB & Issouf TRAORE |
| Processors | Using local milk | 12 | Michel OROUNLADJI, Ollo SIB & Hati KONATE |
| | Using milk powder | 8 | Désiré OUATTARA & Issouf TRAORE |

4. CBA workshop proceedings

A total of three CBA workshops (1 per occupational group) were held, with two days for the farmers’ workshop and one day each for the collectors’ and processors’ workshops. Representatives of both sub-groups took part in the same workshop. Work alternated between plenary sessions (two sub-groups together) and FGD sessions (two separate occupational sub-groups).

The workshops proceeded in three main stages:

1. Stage 1: Introduction to CBA workshops: context, workshop objectives, what is a CBA?
2. Stage 2: Participatory validation of the content of the three agroecological packages;
3. Stage 3: Inventory and scoring of Benefits and Costs arising from the agroecological package.

4.1 Introduction to CBA workshops

This first stage took place in plenary session (i.e. with both sub-groups together).

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4.1.1. Context and objectives of the CBA workshops

Participants were given a brief presentation of the study’s context and objectives, as set out in the introductory section of the workshop’s terms of reference, so that they knew why this workshop on cost-benefit analysis was being held and what was expected of them.

4.1.2. Cost-benefit analysis (CBA): What is it? Why use it?

In this section, the CBA principle was explained to the participants in simple terms and with clear illustrations, applying it to our case study.

CBA definition: A Cost-Benefit Analysis (CBA) aims to identify and quantify the positive consequences (benefits) and negative consequences (costs) of a decision, which are then expressed using a common unit for comparison: the monetary unit.

Application to our case study: Participants were reminded that the Cost-Benefit Analysis (CBA) applies to the implementation of the Ae package on their operations. In practical terms, this involved identifying the positive consequences (benefits) and negative consequences (costs) of implementing the Ae package in their business, before expressing (quantifying) them using a common unit for comparison: the proposed monetary unit was the ‘cowrie shell’. The more cowrie shells, the greater the benefit or cost (Figure 2).

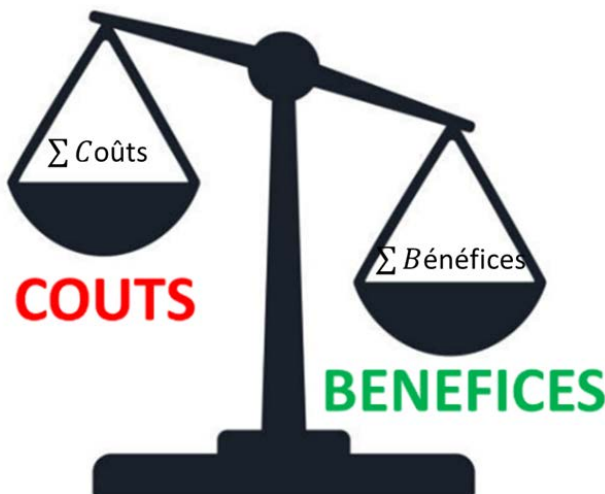


Figure 2. Illustration of the CBA

4.2. Validation of the content of the three agroecological packages

The second stage also took place in plenary session (i.e. with both sub-groups together) in order to approve the content of the agroecological packages with each occupational group.

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After discussion, the agroecological package of each selected occupational group was used for the inventory of costs and benefits.

4.2.1. Agroecological package for milk production

The agroecological 'Production' package primarily involves the following three agroecological principles (based on terminology suggested by Wezel et al. 2020): recycling (of crop and livestock co-products into fodder and organic manure), synergies (agriculture-livestock interactions), input reduction (cattle feed replaced/substituted by fodder, mineral fertilisers replaced/substituted by organic manure).

4.2.2. Agroecological package for milk collection

The agroecological 'Collection' package primarily involves the following two agroecological principles (based on terminology suggested by Wezel et al. 2020): economic diversification (of services rendered to farmers and processors), and connectivity (between production and processing stakeholders).

4.2.3. Agroecological package for milk processing

The agroecological 'Processing' package primarily involves the following two agroecological principles (based on terminology suggested by Wezel et al. 2020): economic diversification (dairy products), and food traditions (promotion of local products such as dèguè, gapal, wagashi, etc.).

4.3. Inventory and Scoring of Benefits and Costs arising from the agroecological package

During this third stage of the CBA workshops, participants from the 2 occupational groups were split up, with one FGD per occupational sub-group (Figure 3).



Figure 3. Inventory of benefits and costs in focus groups

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4.3.1 Inventory and Scoring of Benefits arising from the agroecological package

Facilitators encouraged the FG to think about the Benefits of implementing the agroecological package by considering all types of Benefits: economic (financial returns, reduced workload), social (acceptance of the agroecological package by the community), and environmental (possible environmental benefits of the agroecological package).

- Inventory of Benefits: B1, B2, ... BN. First, group members are given time to think individually about the Benefits. The facilitator then asks the group to come up with an initial Benefit. The group agrees on the description of this first Benefit. Once the description has been approved, the Benefit is recorded on a Post-it note and displayed on the board. The inventory of Benefits continues with follow-up questions on economic, social and environmental Benefits for as long as the participants have proposals to make. At the end, the list of Benefits is pasted on the board.
- Scoring the importance of each Benefit using the cowrie system. Once the inventory of Benefits is complete, we move on to scoring. Each participant is asked to score the importance of the Benefit for their activity using the cowrie system (1 to 5 cowrie shells depending on the importance of the Benefit for their activity: very low, low, medium, high, very high). For each Benefit, the number of scorers and the number of cowrie shells collected are recorded.

The second facilitator carefully records the following in a table for each Benefit: its description, the name of the group that suggested it, the number of scorers and the number of cowrie shells.

4.3.2 Inventory and scoring of Costs arising from the agroecological package

Cost inventory and scoring follows the same approach as Benefit inventory and scoring.

Facilitators encourage the FG to think about the Costs involved in implementing the agroecological package by considering all types of Costs: economic (financial charges, increased workload), social (problems raised by the implementation of the package in the community), and environmental (possible environmental damage caused by the package).

- Inventory of Costs: C1, C2, ... CN. First, group members are given time to think individually about the Costs. The facilitator then asks the FG to come up with an initial Cost. The group agrees on the description of this first Cost. Once the description has been approved, the Cost is recorded on a Post-it note and displayed on the board. The inventory of Costs continues with follow-up questions on economic, social and environmental Costs for as long as participants have proposals to make. At the end, the list of Costs is pasted on the board.
- Scoring the importance of each Cost using the cowrie system. Once the inventory of Costs is complete, we move on to scoring. Each participant is asked to score the importance of the Cost for their activity using the cowrie system (1 to 5 cowrie shells depending on the importance of the Cost for their activity: very low, low, medium, high, very high). For each Cost, the number of scorers and the number of cowrie shells collected are recorded.

The second facilitator carefully records the following in a table for each Cost: its description, the name of the group that suggested it, the number of scorers and the number of cowrie shells.

4.4. Quick presentation of the results to the occupational sub-group

At the end of the session, participants are presented with the Cost-Benefit balance, showing which way the scales might tip if the agroecological package is implemented - in other words, whether the agroecological package will result in more Benefits than Costs for their business overall, or the opposite (which is not desirable).

To this end, all the 'Cost' Post-it notes are placed on one side of the scales, and all the 'Benefit' Post-it notes on the other. The cowrie shells are counted on both sides to see which way the scales are tipping (Figure 4).

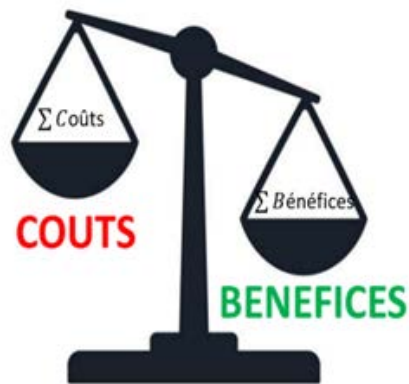


Figure 4. Balance of costs and benefits

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5. Complete analysis of CBA workshop data

Data for all FGs is entered into an Excel table, with 1 row per Benefit or Cost and with the following columns:

- Occupational group title
- Occupational sub-group title
- Type: Benefit or Cost
- Agreed description of Benefit or Cost
- Number of scorers (participants in the occupational sub-group)
- Number of cowrie shells collected
- Benefit or Cost scoring

The common valuation unit - the 'cowrie shell' - was used and the Cost and Benefit scores were aggregated using the model shown in Table 2.

Table 2. Cost-Benefit scoring aggregation model

| Occupational groups | | COSTS | BENEFITS | BALANCE PER FGD |
|----------------------|-------------------|-------------------|-----------------|-------------------|
| Farmers | Agro-Pastoralists | C1 ... CN | B1 ... BN | $\sum B - \sum C$ |
| | Mini-Farms | C1 ... CN | B1 ... BN | $\sum B - \sum C$ |
| Collectors | Independent | C1 ... CN | B1 ... BN | $\sum B - \sum C$ |
| | MCC | C1 ... CN | B1 ... BN | $\sum B - \sum C$ |
| Processors | Using local milk | C1 ... CN | B1 ... BN | $\sum B - \sum C$ |
| | Using milk powder | C1 ... CN | B1 ... BN | $\sum B - \sum C$ |
| TOTAL | | $\sum C$ | $\sum B$ | |
| COST-BENEFIT BALANCE | | $\sum B - \sum C$ | | |

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The research team then met to break down the Benefits and Costs according to the following categories/dimensions: economic, social, environmental and other (if relevant at the end of the inventory) for a more detailed analysis.

6. Application to Bobo-Dioulasso's dairy value chain

6.1. Agroecological package validated by each occupational group

6.1.1. Agroecological package for milk production

Following plenary discussions with Farmers (Agro-Pastoralists and Mini-Farms), the following agroecological package was selected:

- Quality fodder as a major substitute for livestock feed (FODD)
- Organic manure as a major substitute for mineral fertilisers (OM)
- Sound management of crop and livestock co-products (CPROD)
- Balanced rations for dairy cows at an acceptable cost (RATION)
- Use of medicinal plants as substitutes for veterinary drugs (when effective) (MEDPL)
- Optimum management of livestock and natural resources (MGT)

6.1.2. Agroecological package for milk collection

Following plenary discussions with Collectors (MCC and Independent Collectors), the following agroecological package was selected:

- Services to Farmers
 - Service 1: The MCC is a forum for dialogue between farmers and collectors (DIAL)
 - Service 2: Advice on agroecological management of dairy farms (techno-economic) (ADVICE)
 - Service 3: Input and credit support to farmers (CREDIT)
- Services to Processors
 - Service 1: Milk quality control (QUAL)
 - Service 2: Guaranteed delivery in terms of quantity and quality (GUARANT)
 - Service 3: Easier access to credit, inputs and equipment between farmers and processors (CREDIT)

6.1.3. Agroecological package for milk processing

Following plenary discussions with Processors (Processors using local milk and Processors using milk powder), the following agroecological package was selected:

- Traditional dairy products from local produce (TRADPROD): Gapal, Plain yoghurt, Sweetened yoghurt, Skimmed yoghurt, Pasteurised milk, Cottage cheese, Dêguê with pearl millet, Dêguê with corn, Cream yoghurt, Milk drink, Sour milk, Cream, Peul cheese (Wagashi), Butter.

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- Innovative dairy products (INNOVPROD): Date yoghurt, Theodo yoghurt, Kinkeliba yoghurt, Moringa yoghurt, Coconut yoghurt, Pineapple yoghurt, Horchata yoghurt, Néré yoghurt, Mango yoghurt, Banana yoghurt, Zaigainai yoghurt (Balanites).
- Milk-based cosmetics (COSPROD): Milk-based ointment, Milk soap, Milk oil.

6.2 Inventory of Benefits and Costs by occupational sub-group

6.2.1. Agro-Pastoral Dairy Farmers

The Benefits (27) and Costs (17) of the agroecological package for milk production, as identified by Agro-Pastoralists, as well as their intensity level, are shown in Tables 3 and 4 respectively.

Table 3. Inventory of Benefits for Agro-Pastoralists

| Ae package Benefit description | Ae Package Element | No. of scorers | No. of cowries allocated | Benefit scores (0 to 5) |
|---------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------|--------------------------|-------------------------|
| In the rainy season, grazing cows over very short distances increases milk production | MGT | 13 | 63 | 4.85 |
| In the dry season, grazing animals over short distances under good supervision in search of crop residues improves their growth | MGT | 13 | 61 | 4.69 |
| Batching animals in order to keep some of them in stalls increases the quantity of OM stored and improves their performance | MGT | 13 | 60 | 4.62 |
| Herdling animals to pasture over short distances improves their health | MGT | 13 | 52 | 4.00 |
| Collecting residues for manure pits is good for the environment | COPROD | 13 | 60 | 4.62 |
| Recycling livestock and crop co-products to produce organic manure reduces the need to purchase mineral fertilisers | COPROD | 13 | 56 | 4.31 |
| The availability of organic manure reduces the cost of purchasing mineral fertilisers | OM | 13 | 65 | 5.00 |
| The use of organic manure increases the sustainability of soil fertility | OM | 13 | 64 | 4.92 |
| Applying organic manure to fields produces healthier feed | OM | 13 | 63 | 4.85 |
| High levels of organic manure reduce the need to purchase mineral fertilisers | OM | 13 | 61 | 4.69 |
| The use of organic manure improves the organoleptic quality of feed | OM | 13 | 59 | 4.54 |
| The sale of organic manure generates income | OM | 13 | 58 | 4.46 |
| The use of organic manure improves soil fertility | OM | 13 | 57 | 4.38 |
| Applying organic manure to fields keeps the soil moist for longer | OM | 13 | 55 | 4.23 |
| Using quality fodder speeds up cow reproduction | FODD | 13 | 64 | 4.92 |
| Using quality fodder boosts milk production | FODD | 13 | 61 | 4.69 |
| Legume production improves soil fertility and boosts milk production through the recycling of their co-products as fodder | FODD | 13 | 59 | 4.54 |
| Availability of quality fodder improves animal care | FODD | 13 | 58 | 4.46 |
| The use of medicinal plants facilitates the treatment of specific diseases, including mastitis | MEDPL | 13 | 54 | 4.15 |
| The use of medicinal plants make calving easier for cows | MEDPL | 13 | 53 | 4.08 |
| The use of medicinal plants reduces the use of antibiotics | MEDPL | 13 | 51 | 3.92 |
| The use of medicinal plants reduces the costs of modern disease treatment | MEDPL | 13 | 48 | 3.69 |
| Cow rationing helps reduce or avoid feed wastage | RATION | 13 | 63 | 4.85 |
| Applying organic manure to fields improves soil maintenance | RATION | 13 | 62 | 4.77 |
| Cow rationing increases milk production | RATION | 13 | 62 | 4.77 |
| Rationing support and advice help improve animal feed management | RATION | 13 | 62 | 4.77 |
| Adopting balanced rations reduces feed purchasing costs | RATION | 13 | 57 | 4.38 |

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Table 4. Inventory of Costs for Agro-pastoralists

| Ae package Cost description | Ae Package Element | No. of scorers | No. of cowries allocated | Cost scores (0 to 5) |
|-------------------------------------------------------------------------------------------------------------|--------------------|----------------|--------------------------|----------------------|
| Moving animals over long distances in search of water reduces their performance (growth and reproduction) | MGT | 13 | 62 | 4.77 |
| Grazing cows over long distances reduces their productivity | MGT | 13 | 61 | 4.69 |
| Extensive transhumance reduces the amount of organic manure stored and increases conflicts | MGT | 13 | 58 | 4.46 |
| Equipment (cart, shovel, gloves, etc.) for organic manure production and transport is expensive | OM | 13 | 64 | 4.92 |
| Manure pit installation costs are high | OM | 13 | 60 | 4.62 |
| Pit manure production increases workload | OM | 13 | 59 | 4.54 |
| High labour costs for filling manure pits | OM | 13 | 59 | 4.54 |
| Difficulty in acquiring plots for legume production | FODD | 13 | 65 | 5.00 |
| Lack of fodder storage equipment increases production losses | FODD | 13 | 62 | 4.77 |
| Poor fodder storage/conservation reduces fodder quality | FODD | 13 | 62 | 4.77 |
| Occasional rainfall before harvesting/cutting forage at the end of the cycle deteriorates quality | FODD | 13 | 59 | 4.54 |
| Failure to protect forage production areas from roaming animals increases production losses | FODD | 13 | 53 | 4.08 |
| Cultivation operations (ploughing, sowing, harvesting) for legume production are costly | FODD | 13 | 49 | 3.77 |
| Travel expenses for people with medicinal plant knowledge in the treatment of animal diseases are expensive | MEDPL | 13 | 61 | 4.69 |
| Incorrect diagnosis causes damage when using medicinal plants | MEDPL | 13 | 58 | 4.46 |
| Failure to control the dosage of herbal recipes increases the risk of disease aggravation | MEDPL | 13 | 53 | 4.08 |
| Rationing leads to an increase in workload (for cutting cereal stalks and collecting legume tops) | RATION | 13 | 52 | 4.00 |

Overall, for agro-pastoralists, the benefits of the Ae package outweigh the costs (+591 cowries - Table 5). The elements of the package that bring the most benefits are "Balanced rations for dairy cows at an acceptable cost (RATION)" (+254 cowries), followed by "Organic manure as a major substitute for mineral fertilisers (OM)" (+240 cowries). Next comes "Sound management of crop and livestock co-products (CPROD)" (+116 cowries), followed by "Optimum management of livestock and natural resources (MGT)" (+55 cowries), and "Use of medicinal plants as substitutes for veterinary drugs (MEDPL)" (+34 cowries). Finally, the use of "Quality fodder as a major substitute for livestock feed (FODD)" seems to generate more costs than benefits. This is due to the fact that agro-pastoralists have limited land at their disposal, which they find difficult to secure, and also to their lack of knowledge and means of producing and storing fodder in good conditions.

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Table 5. Ae package Costs and Benefits per element for Agro-Pastoralists

| Ae production package elements | Benefits (cowries) | Costs (cowries) | Benefits-Costs (cowries) |
|---------------------------------------------------------------------|---------------------------|------------------------|---------------------------------|
| Quality fodder as a major substitute for livestock feed (FODD) | 242 | 350 | -108 |
| Organic manure as a major substitute for mineral fertilisers (OM) | 482 | 242 | +240 |
| Sound management of crop and livestock co-products (CPROD) | 116 | 0 | +116 |
| Balanced rations for dairy cows at an acceptable cost (RATION) | 306 | 52 | +254 |
| Use of medicinal plants as substitutes for veterinary drugs (MEDPL) | 206 | 172 | +34 |
| Optimum management of livestock and natural resources (MGT) | 236 | 181 | +55 |
| TOTAL | 1588 | 997 | +591 |

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6.2.2. Mini-Dairy Farms

The Benefits (31) and Costs (18) identified by Mini-Farms, as well as their intensity level, are shown in Tables 6 and 7 respectively.

Table 6. Inventory of Benefits for Mini-Farms

| Ae package Benefit description | Ae Package Element | No. of scorers | No. of cowries allocated | Benefit scores (0 to 5) |
|------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------|--------------------------|-------------------------|
| Stabling livestock increases milk and OM production | MGT | 8 | 40 | 5.00 |
| Stabling livestock reduces conflicts between crop and livestock farmers | MGT | 8 | 40 | 5.00 |
| Stabling livestock limits the introduction of disease into the herd | MGT | 8 | 36 | 4.50 |
| Stabling livestock reduces environmental degradation | MGT | 8 | 33 | 4.13 |
| Stabling livestock helps control production costs | MGT | 8 | 32 | 4.00 |
| Sound management of C.L. co-products yields more OM | CPROD | 8 | 35 | 4.38 |
| Sound management of C. co-products reduces the introduction of disease into the herd (avoids contamination by other animals) | CPROD | 8 | 32 | 4.00 |
| Sound management of C.L. co-products reduces inputs in rationing | CPROD | 8 | 30 | 3.75 |
| Sound management of C. co-products enables product diversification (potash, preservatives, fencing, sheds) | CPROD | 8 | 22 | 2.75 |
| The use of organic manure restores soil quality | OM | 8 | 38 | 4.75 |
| Organic manure production reduces the need to purchase mineral fertilisers | OM | 8 | 36 | 4.50 |
| The use of organic manure improves forage quality | OM | 8 | 33 | 4.13 |
| Organic manure production improves product quality | OM | 8 | 32 | 4.00 |
| Organic manure production increases income through the sale of OM | OM | 8 | 31 | 3.88 |
| The use of organic manure increases yields | OM | 8 | 29 | 3.63 |
| Producing quality fodder increases fodder and feed autonomy | FODD | 8 | 39 | 4.88 |
| Producing quality fodder reduces animal feed costs | FODD | 8 | 38 | 4.75 |
| Producing quality fodder reduces food poisoning (fewer pesticides used in fodder production) | FODD | 8 | 37 | 4.63 |
| Producing quality fodder boosts income | FODD | 8 | 37 | 4.63 |
| Using quality fodder increases milk production | FODD | 8 | 37 | 4.63 |
| Producing quality fodder lowers milk production costs | FODD | 8 | 33 | 4.13 |
| Producing quality fodder reduces animal diseases | FODD | 8 | 33 | 4.13 |
| Producing quality fodder reduces conflicts between crop and livestock farmers | FODD | 8 | 26 | 3.25 |
| The use of medicinal plants preserves milk quality | MEDPL | 8 | 35 | 4.38 |
| The use of medicinal plants prevents abortions | MEDPL | 8 | 31 | 3.88 |
| The use of medicinal plants reduces the cost of veterinary care | MEDPL | 8 | 28 | 3.50 |
| The use of medicinal plants reduces the need for some pharmaceutical products (antibiotics) | MEDPL | 8 | 27 | 3.38 |
| Balanced rations at an acceptable cost reduce feed costs and avoid waste | RATION | 8 | 35 | 4.38 |
| Balanced rations at an acceptable cost boost income and improve milk quality | RATION | 8 | 35 | 4.38 |
| Balanced rations at an acceptable cost increase milk production | RATION | 8 | 33 | 4.13 |
| Balanced rations at an acceptable cost reduce veterinary care costs | RATION | 8 | 31 | 3.88 |

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Table 7. Inventory of Costs for Mini-Farms

| Ae package Cost description | Ae Package Element | No. of scorers | No. of cowries allocated | Cost scores (0 to 5) |
|-------------------------------------------------------------------------|--------------------|----------------|--------------------------|----------------------|
| Cost of feed and water troughs for animals kept in stalls | MGT | 8 | 33 | 4.13 |
| Cost of housing animals in stalls | MGT | 8 | 33 | 4.13 |
| Costs related with keeping animals in stalls (labour, feed, watering) | MGT | 8 | 29 | 3.63 |
| Costs related to the acquisition of crop co-product recycling equipment | CPROD | 8 | 26 | 3.25 |
| Cost of collecting livestock waste | CPROD | 8 | 19 | 2.38 |
| Arduousness of C.L. co-product recovery work | CPROD | 8 | 17 | 2.13 |
| Cost of manure pit installation | OM | 8 | 27 | 3.38 |
| Cost of spreading organic manure | OM | 8 | 23 | 2.88 |
| Cost of filling manure pits | OM | 8 | 16 | 2.00 |
| Cost of emptying pits | OM | 8 | 16 | 2.00 |
| Cost of watering manure pits | OM | 8 | 12 | 1.50 |
| Costs related to the acquisition of quality fodder production equipment | FODD | 8 | 30 | 3.75 |
| Labour costs for quality fodder production | FODD | 8 | 28 | 3.50 |
| Arduousness of quality fodder production work | FODD | 8 | 27 | 3.38 |
| Seed purchase costs | FODD | 8 | 22 | 2.75 |
| Costs related to access to medicinal plants | MEDPL | 8 | 18 | 2.25 |
| Costs related to knowledge of medicinal plants | MEDPL | 8 | 17 | 2.13 |
| Training costs related to rationing | RATION | 8 | 23 | 2.88 |

Overall, for mini-farms, the benefits of the Ae package outweigh the costs (+618 cowries - Table 8). Unlike agro-pastoralists, the element of the package that brings the most benefits is "Quality fodder as a major substitute for livestock feed (FODD)" (+173 cauris). This is followed by "Balanced rations for dairy cows at an acceptable cost (RATION)" (+11 cowries), followed by "Organic manure as a major substitute for mineral fertilisers (OM)" (+105 cowries). Next come "Optimum management of livestock and natural resources (MGT)" and "Use of medicinal plants as substitutes for veterinary drugs (MEDPL)" (+86 cowries). Finally, "Sound management of crop and livestock co-products (CPROD)" (+57 cauris).

The more intensive production model of mini-farms, compared with agro-pastoralists, generates higher feed and fertiliser costs, which is probably why these farmers seem more interested in a model that would enable them to reduce feed and mineral fertiliser costs.

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Table 8. Ae package Costs and Benefits per element for Mini-Farms

| Ae production package elements | Benefits (cowries) | Costs (cowries) | Benefits-Costs (cowries) |
|---------------------------------------------------------------------|---------------------------|------------------------|---------------------------------|
| Quality fodder as a major substitute for livestock feed (FODD) | 280 | 107 | +173 |
| Organic manure as a major substitute for mineral fertilisers (OM) | 199 | 94 | +105 |
| Sound management of crop and livestock co-products (CPROD) | 119 | 62 | +57 |
| Balanced rations for dairy cows at an acceptable cost (RATION) | 134 | 23 | +111 |
| Use of medicinal plants as substitutes for veterinary drugs (MEDPL) | 121 | 35 | +86 |
| Optimum management of livestock and natural resources (MGT) | 181 | 95 | +86 |
| TOTAL | 1034 | 416 | +618 |

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6.2.3. Independent Collectors

The Benefits (12) and Costs (10) identified by Independent Collectors, as well as their intensity level, are shown in Tables 9 and 10 respectively.

Table 9. Inventory of Benefits for Independent Collectors

| Ae package Benefit description | Ae Package Element | No. of scorers | No. of cowries allocated | Benefit scores (0 to 5) |
|---------------------------------------------------------------------------|--------------------|----------------|--------------------------|-------------------------|
| Agroecological management advice helps produce quality milk in quantity | ADVICE | 7 | 34 | 4.86 |
| Agroecological management advice boosts income | ADVICE | 7 | 31 | 4.43 |
| Input and credit support helps collect more milk | CREDIT | 7 | 31 | 4.43 |
| Input and credit support strengthens relationships based on trust | CREDIT | 7 | 30 | 4.29 |
| Occasional orders from processors help sell more milk and reduce workload | GUARANT | 7 | 35 | 5.00 |
| Verbal contracts facilitate milk sales | GUARANT | 7 | 34 | 4.86 |
| Occasional orders from processors boost profits (reduce delivery costs) | GUARANT | 7 | 34 | 4.86 |
| Verbal contracts help plan milk deliveries | GUARANT | 7 | 32 | 4.57 |
| Verbal contracts build customer loyalty | GUARANT | 7 | 32 | 4.57 |
| Local milk-testing techniques prevent losses on delivery | QUAL | 7 | 35 | 5.00 |
| The availability of good-quality milk builds customer loyalty | QUAL | 7 | 34 | 4.86 |
| Local knowledge helps ensure the quality of milk delivered to processors | QUAL | 7 | 33 | 4.71 |

Table 10. Inventory of Costs for Independent Collectors

| Ae package Cost description | Ae Package Element | No. of scorers | No. of cowries allocated | Cost scores (0 to 5) |
|------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------|--------------------------|----------------------|
| Communication problems with farmers about milk availability | DIAL | 7 | 34 | 4.86 |
| Refusal to follow advice on agroecological animal husbandry leads to a reduction in the quantity of milk collected | ADVICE | 7 | 27 | 3.86 |
| Refusal to follow advice on feed management, milking, hygiene, etc. sometimes results in a loss of earnings | ADVICE | 7 | 26 | 3.71 |
| Refusal to follow advice on feed management, milking, hygiene, etc. sometimes leads to a breakdown in relations with farmers | ADVICE | 7 | 24 | 3.43 |
| The advice given to farmers generates additional expenses (purchase of fuel, call units, etc.). | ADVICE | 7 | 16 | 2.29 |
| Difficult credit recovery undermines collaboration | CREDIT | 7 | 13 | 1.86 |
| High cost of milk collection equipment | CREDIT | 7 | 11 | 1.57 |
| Farmer transhumance leads to non-compliance of their commitment to supply milk to collectors on a daily basis | GUARANT | 7 | 32 | 4.57 |
| Failure to meet commitments results in a reduction in the quantity of milk collected | GUARANT | 7 | 14 | 2.00 |
| The difficulty of guaranteeing milk quality through local knowledge leads to loss of earnings | QUAL | 7 | 7 | 1.00 |

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Overall, for independent collectors, the benefits of the Ae package outweigh the costs (+191 cowries - Table 11). The element of the package that brings the most benefits is "Guaranteed delivery in terms of quantity and quality (GUARANT)" (+121 cowries), followed by "Milk quality control (QUAL)" (+95 cowries). Far behind and roughly equal are "Input and credit support to farmers and processors (CREDIT)" (+37 cowries) and "The MCC is a forum for dialogue between farmers and collectors (DIAL)" (+31 cowries). The ranking of these two elements is not surprising as independent collectors are unlikely to be able to provide a space for dialogue and support in the search for credit. Finally, it should be noted that for these players, "Advice on agroecological management of dairy farms (techno-economic) (ADVICE)" is seen as generating costs without providing benefits (-93 cowries), which can be explained by the fact that collectors feel that their advice is never heeded by farmers.

Table 11. Ae package Costs and Benefits per element for Independent Collectors

| Ae collection package elements | Benefits (cowries) | Costs (cowries) | Benefits-Costs (cowries) |
|-------------------------------------------------------------------------------|---------------------------|------------------------|---------------------------------|
| The MCC is a forum for dialogue between farmers and collectors (DIAL). | 65 | 34 | +31 |
| Advice on agroecological management of dairy farms (techno-economic) (ADVICE) | 0 | 93 | -93 |
| Input and credit support for farmers and processors (CREDIT) | 61 | 24 | +37 |
| Milk quality control (QUAL) | 102 | 7 | +95 |
| Guaranteed delivery in terms of quantity and quality (GUARANT) | 167 | 46 | +121 |
| TOTAL | 395 | 204 | +191 |

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6.2.4. Milk Collection Centres

The Benefits (24) and Costs (14) identified by Milk Collection Centres, as well as their intensity level, are shown in Tables 12 and 13 respectively.

Table 12. Inventory of Benefits for Milk Collection Centres

| Ae package Benefit description | Ae Package Element | No. of scorers | No. of cowries allocated | Benefit scores (0 to 5) |
|---------------------------------------------------------------------------------------------------------------|--------------------|----------------|--------------------------|-------------------------|
| The MCC is a forum for dialogue, enabling collectors to obtain the quantity of milk they need from farmers | DIAL | 11 | 53 | 4.82 |
| The MCC provides a forum for sharing ideas and experiences to improve our business | DIAL | 11 | 51 | 4.64 |
| The MCC provides a forum for contract signing between farmers and collectors | DIAL | 11 | 49 | 4.45 |
| The MCC is a forum for dialogue which facilitates financial aid acquisition | DIAL | 11 | 48 | 4.36 |
| The MCC provides a forum for raising awareness of milk sales among certain farmers | DIAL | 11 | 47 | 4.27 |
| The CDC is a forum for dialogue which facilitates milk sales | DIAL | 11 | 47 | 4.27 |
| Ae livestock management advice ensures milk supplies are of the right quality and quantity | ADVICE | 11 | 44 | 4.00 |
| Ae livestock management advice ensures continuous milk supply (no break in supply) | ADVICE | 11 | 43 | 3.91 |
| Ae livestock management advice increases our income | ADVICE | 11 | 43 | 3.91 |
| Ae livestock management advice builds loyalty among dairy farmers | ADVICE | 11 | 42 | 3.82 |
| Ease of access to inputs and credit between farmers and processors ensures continuous milk production | CREDIT | 11 | 50 | 4.55 |
| Input and credit support to farmers means that new farmers can supply us with milk | CREDIT | 11 | 48 | 4.36 |
| Input and credit support to farmers helps build loyalty among dairy farmers | CREDIT | 11 | 46 | 4.18 |
| Ease of access to inputs and credit between farmers and processors increases our income | CREDIT | 11 | 46 | 4.18 |
| Input and credit support to farmers ensures milk supplies are of the right quality and quantity | CREDIT | 11 | 42 | 3.82 |
| Input and credit support to farmers strengthens links between farmers and collectors | CREDIT | 11 | 41 | 3.73 |
| Ease of access to inputs and credit between farmers and processors helps to increase the quantity of milk | CREDIT | 11 | 41 | 3.73 |
| Guaranteeing quantity and quality of deliveries to processors helps to secure inputs for our farmers | GUARANT | 11 | 45 | 4.09 |
| Guaranteeing quantity and quality of deliveries to processors makes it easier to negotiate higher milk prices | GUARANT | 11 | 43 | 3.91 |
| Guaranteeing quantity and quality of deliveries to processors helps to secure credit from processors | GUARANT | 11 | 38 | 3.45 |
| Milk quality control provides self-confidence and stability for the collector | QUAL | 11 | 51 | 4.64 |
| Milk quality control reduces losses from the collection of spoiled milk | QUAL | 11 | 46 | 4.18 |
| Milk quality control helps build trust between collectors and processors | QUAL | 11 | 46 | 4.18 |
| Milk quality control ensures cash sales | QUAL | 11 | 39 | 3.55 |

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Table 13. Inventory of Costs for Milk Collection Centres

| Ae package Cost description | Ae Package Element | No. of scorers | No. of cowries allocated | Cost scores (0 to 5) |
|-------------------------------------------------------------------------------|--------------------|----------------|--------------------------|----------------------|
| Monthly contributions at MCC level | DIAL | 11 | 38 | 3.45 |
| Cost of cleaning MCCs (maintenance of premises) | DIAL | 11 | 33 | 3.00 |
| Communication costs related to MCC consultation meetings | DIAL | 11 | 30 | 2.73 |
| Logistical costs related to consultations at MCC level | DIAL | 11 | 30 | 2.73 |
| Transportation costs to access MCCs as forums for dialogue | DIAL | 11 | 29 | 2.64 |
| Farmers often have long loan repayment terms | CREDIT | 11 | 39 | 3.55 |
| Cost of purchasing milk quality control equipment | CREDIT | 11 | 37 | 3.36 |
| Cost of maintaining means of transport to guarantee milk quantity and quality | CREDIT | 11 | 35 | 3.18 |
| Communication costs to help farmers secure credit and inputs from processors | CREDIT | 11 | 34 | 3.09 |
| Transportation costs to help farmers secure credit and inputs from processors | CREDIT | 11 | 34 | 3.09 |
| Costs associated with granting credit to farmers | CREDIT | 11 | 32 | 2.91 |
| Cost of input support to farmers | CREDIT | 11 | 27 | 2.45 |
| Cost of milk collection transport to guarantee milk quantity and quality | QUAL | 11 | 31 | 2.82 |
| Cost of maintaining collection equipment (cans) | QUAL | 11 | 27 | 2.45 |

Overall, for collection centres, the benefits of the Ae package outweigh the costs (+633 cowries - Table 14). The element of the package that brings the most benefits is "Advice on agroecological management of dairy farms (techno-economic) (ADVICE)" (+172 cauris). This service is followed in almost equal proportions by "The MCC is a forum for dialogue between farmers and collectors (DIAL)" (+135 cauris), "Guaranteed delivery in terms of quantity and quality (GUARANT)" (+126 cauris), and "Milk quality control (QUAL)" (+124 cauris). Far behind is "Input and credit support for farmers and processors (CREDIT)" (+76 cowries). This result gives a clear indication of the services that MCCs could develop from an Ae perspective:

- Advice to farmers
- A forum for dialogue
- Guaranteed delivery to processors in terms of quantity and quality
- Milk quality control

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Table 14. Ae package Costs and Benefits per element for Milk Collection Centres

| Ae collection package elements | Benefits (cowries) | Costs (cowries) | Benefits-Costs (cowries) |
|-------------------------------------------------------------------------------|---------------------------|------------------------|---------------------------------|
| The MCC is a forum for dialogue between farmers and collectors (DIAL). | 295 | 160 | +135 |
| Advice on agroecological management of dairy farms (techno-economic) (ADVICE) | 172 | 0 | +172 |
| Input and credit support for farmers and processors (CREDIT) | 314 | 238 | +76 |
| Milk quality control (QUAL) | 182 | 58 | +124 |
| Guaranteed delivery in terms of quantity and quality (GUARANT) | 126 | 0 | +126 |
| TOTAL | 1089 | 456 | +633 |

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6.2.5. Processors using local milk

The Benefits (22) and Costs (24) identified by Processors using local milk, as well as their intensity level, are shown in Tables 15 and 16 respectively.

Table 15. Inventory of Benefits for Processors using local milk

| Ae package Benefit description | Ae Package Element | No. of scorers | No. of cowries allocated | Benefit scores (0 to 5) |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------|--------------------------|-------------------------|
| Milk soaps are highly therapeutic (fight body infections, etc.). | COSPROD | 12 | 49 | 4.08 |
| Oil from local milk allows for better hair care | COSPROD | 12 | 41 | 3.42 |
| Milk-based cosmetics generate more revenue than innovative products | COSPROD | 12 | 35 | 2.92 |
| Innovative dairy products are therapeutic | INNOVPROD | 12 | 42 | 3.50 |
| Dairy products based on natural products consolidate links/relationships between processors and between processors and political/administrative authorities. | INNOVPROD | 12 | 42 | 3.50 |
| Innovative dairy products generate more profit than ordinary dairy products | INNOVPROD | 12 | 38 | 3.17 |
| Innovative dairy products help broaden customer base | INNOVPROD | 12 | 38 | 3.17 |
| Dairy products based on natural ingredients create training opportunities | INNOVPROD | 12 | 38 | 3.17 |
| Innovative NTFP-based dairy products help build relationships with farmers | INNOVPROD | 12 | 37 | 3.08 |
| Dairy products based on natural ingredients improve consumer health | INNOVPROD | 12 | 36 | 3.00 |
| Dairy products based on natural ingredients help build closer ties with neighbours | INNOVPROD | 12 | 32 | 2.67 |
| Dairy products based on natural ingredients create travel opportunities | INNOVPROD | 12 | 30 | 2.50 |
| Dairy products made from local milk are highly nutritious | TRADPROD | 12 | 53 | 4.42 |
| Processing local milk promotes the "Let's Eat Local" concept | TRADPROD | 12 | 50 | 4.17 |
| As a business, local milk processing is more competitive than milk powder processing | TRADPROD | 12 | 48 | 4.00 |
| Local milk processing creates job opportunities | TRADPROD | 12 | 45 | 3.75 |
| Local milk processing creates more job opportunities and income for women | TRADPROD | 12 | 39 | 3.25 |
| Fresh milk is widely used in traditional rituals | TRADPROD | 12 | 39 | 3.25 |
| Dairy products based on local produce boost income | TRADPROD | 12 | 37 | 3.08 |
| Local milk improves fertility in men | TRADPROD | 12 | 36 | 3.00 |
| Cream is of paramount importance in traditional rituals | TRADPROD | 12 | 30 | 2.50 |
| Dairy products based on local produce save you money | TRADPROD | 12 | 29 | 2.42 |

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Table 16. Inventory of Costs for Processors using local milk

| Ae package Cost description | Ae Package Element | No. of scorers | No. of cowries allocated | Cost scores (0 to 5) |
|----------------------------------------------------------------------------------------------------------------------|--------------------|----------------|--------------------------|----------------------|
| Difficulty in manufacturing cosmetics from local milk | COSPROD | 12 | 41 | 3.42 |
| Expensive additives for local milk processing | INNOVPROD | 12 | 47 | 3.92 |
| Local milk is highly perishable | TRADPROD | 12 | 53 | 4.42 |
| Buying poor-quality local milk results in a significant loss of income | TRADPROD | 12 | 52 | 4.33 |
| High cost of taxes (mayor's office, sanitation department) | TRADPROD | 12 | 50 | 4.17 |
| Breaks in the cold chain cause huge losses of dairy products | TRADPROD | 12 | 49 | 4.08 |
| High cost of processing equipment | TRADPROD | 12 | 49 | 4.08 |
| Lack of access to quality processing equipment | TRADPROD | 12 | 49 | 4.08 |
| High electricity and water costs | TRADPROD | 12 | 49 | 4.08 |
| High packaging costs | TRADPROD | 12 | 49 | 4.08 |
| High cost of dairy product testing at accredited laboratories | TRADPROD | 12 | 49 | 4.08 |
| Poor sales of local milk products, especially during the rainy season | TRADPROD | 12 | 48 | 4.00 |
| High purchase price for local milk | TRADPROD | 12 | 48 | 4.00 |
| High cost of leasing processing unit | TRADPROD | 12 | 48 | 4.00 |
| High cost of employee social security contributions | TRADPROD | 12 | 47 | 3.92 |
| High labour costs | TRADPROD | 12 | 46 | 3.83 |
| Reduced market share due to unfair competition with powdered milk-based products | TRADPROD | 12 | 45 | 3.75 |
| Unattractive packaging for dairy products made from local milk reduces market share | TRADPROD | 12 | 44 | 3.67 |
| High cost of staff medical check-ups (every 3 months) | TRADPROD | 12 | 43 | 3.58 |
| Low availability of local milk in the dry season | TRADPROD | 12 | 42 | 3.50 |
| Difficulty recruiting employees | TRADPROD | 12 | 42 | 3.50 |
| Unsuitable milk testing equipment resulting in poor quality processed products | TRADPROD | 12 | 42 | 3.50 |
| Lack of labels for dairy products made from local milk | TRADPROD | 12 | 41 | 3.42 |
| Packaging lacking the necessary information increases the lack of confidence in the quality of local dairy products. | TRADPROD | 12 | 40 | 3.33 |

Overall, for processors using local milk, the costs of the Ae package outweigh the benefits (-249 cowries - Table 17).

The element of the package that brings the most benefits is "Manufacture of innovative dairy products (INNOVPROD)" (+286 cowries), followed far behind by "Manufacture of milk-based cosmetics (COSPROD)" (+84 cowries). This shows that support for the production of innovative products (yoghurt based on local natural flavours) is definitely a priority avenue to explore for the development of the dairy value chain, in particular by seeking ways and means of reducing the cost of natural flavours (perhaps through supporting the development of a production activity for these natural flavours).

Under the heading "Manufacture of traditional dairy products from local produce (TRADPROD)", participants actually listed all the benefits and costs for all 3 product ranges (traditional products, innovative products, and cosmetics). The result shows that a large number of significant costs affect the

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viability of their business overall, but not specifically for traditional dairy products: personnel costs and social security contributions, raw material and energy costs, cost of materials, packaging and taxes. In the long list of costs mentioned by processors, some levers can certainly be used to reduce them and improve the profitability of their business. This is no doubt a point that will need to be developed when drawing up the Ae BM for processors.

Table 17. Ae package Costs and Benefits per element for Processors using local milk

| Ae processing package elements | Benefits (cowries) | Costs (cowries) | Benefits-Costs (cowries) |
|-------------------------------------------------------------------------|---------------------------|------------------------|---------------------------------|
| Manufacture of traditional dairy products from local produce (TRADPROD) | 406 | 1025 | -619 |
| Manufacture of innovative dairy products (INNOVPROD) | 333 | 47 | +286 |
| Manufacture of milk-based cosmetics (COSPROD) | 125 | 41 | +84 |
| TOTAL | 864 | 1113 | -249 |

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6.2.6. Processors using powered milk

The Benefits (08) and Costs (16) identified by Processors using powered milk, as well as their intensity level, are shown in Tables 18 and 19 respectively.

Table 18. Inventory of Benefits for Processors using milk powder

| Ae package Benefit description | Ae Package Element | No. of scorers | No. of cowries allocated | Benefit scores (0 to 5) |
|------------------------------------------------------------------------------------------|--------------------|----------------|--------------------------|-------------------------|
| Innovative dairy products improve health | INNOVPROD | 8 | 32 | 4.00 |
| Demand for innovative dairy products is high | INNOVPROD | 8 | 22 | 2.75 |
| Innovative dairy products improve corporate image | INNOVPROD | 8 | 21 | 2.63 |
| Dairy products based on local produce are easy to produce | TRADPROD | 8 | 36 | 4.50 |
| Dairy products based on local produce have a long shelf life | TRADPROD | 8 | 33 | 4.13 |
| Dairy products based on local produce attract many customers | TRADPROD | 8 | 33 | 4.13 |
| Raw materials for dairy products based on local produce are accessible and inexpensive | TRADPROD | 8 | 29 | 3.63 |
| Storage of raw materials for the production of dairy products from local produce is easy | TRADPROD | 8 | 26 | 3.25 |

Table 19. Inventory of Costs for Processors using milk powder

| Ae package Cost description | Ae Package Element | No. of scorers | No. of cowries allocated | Cost scores (0 to 5) |
|---------------------------------------------------------------------------------|--------------------|----------------|--------------------------|----------------------|
| Storage problems for certain innovative products | INNOVPROD | 8 | 32 | 4.00 |
| Training costs for the production of innovative products | INNOVPROD | 8 | 32 | 4.00 |
| High cost of some raw materials for the production of innovative dairy products | INNOVPROD | 8 | 22 | 2.75 |
| Electricity costs for product preservation | TRADPROD | 8 | 38 | 4.75 |
| Unstable prices for milk powder, sugar and fermenting agents | TRADPROD | 8 | 35 | 4.38 |
| Cost of deterioration of dairy products based on local produce (power cuts) | TRADPROD | 8 | 34 | 4.25 |
| Cost of maintaining production equipment | TRADPROD | 8 | 30 | 3.75 |
| Delivery costs (equipment maintenance and fuel purchase) | TRADPROD | 8 | 29 | 3.63 |
| Labour costs | TRADPROD | 8 | 29 | 3.63 |
| Packaging costs | TRADPROD | 8 | 26 | 3.25 |
| Taxes | TRADPROD | 8 | 26 | 3.25 |
| Rent-related costs | TRADPROD | 8 | 26 | 3.25 |
| Water costs for dairy production | TRADPROD | 8 | 24 | 3.00 |
| Costs related to the purchase of dairy processing equipment | TRADPROD | 8 | 23 | 2.88 |
| Gas costs for dairy production | TRADPROD | 8 | 22 | 2.75 |
| Workwear costs | TRADPROD | 8 | 12 | 1.50 |

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Overall, for processors using local milk powder, the costs of the Ae package outweigh the benefits (-208 cowries - Table 20).

For them, neither the "Manufacture of innovative dairy products (INNOVPROD)" (-11 cowries), nor the "Manufacture of milk-based cosmetics (COSPROD) (+0 cowries) are profitable activities. In reality, the proposed exercise is somewhat theoretical to them, as currently these processors seem to have little interest in developing innovative or cosmetic products, their strategy being primarily focused on cheap production.

As in the other group of processors, the element "Manufacture of traditional dairy products from local produce (TRADPROD)" lists all the benefits and costs for all 3 product ranges (traditional products, innovative products, and cosmetics). Like processors using local milk, this lengthy inventory shows the large number and heavy burden weighing on the viability of their business (minus the specific costs associated with using local milk).

Table 20. Ae package Costs and Benefits per element for Processors using milk powder

| Ae processing package elements | Benefits (cowries) | Costs (cowries) | Benefits-Costs (cowries) |
|-------------------------------------------------------------------------|---------------------------|------------------------|---------------------------------|
| Manufacture of traditional dairy products from local produce (TRADPROD) | 157 | 354 | -197 |
| Manufacture of innovative dairy products (INNOVPROD) | 75 | 86 | -11 |
| Manufacture of milk-based cosmetics (COSPROD) | 0 | 0 | 0 |
| TOTAL | 232 | 440 | -208 |

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6.3. Compilation of Cost-Benefit scores

FGDs yielded a total of 3,626 cowrie shells for costs and 5,202 cowrie shells for benefits when considering the socio-economic groups in the dairy value chain (Table 21). For agro-pastoralists, mini-farms, independent collectors and milk collection centres, benefits outweigh costs. By contrast, costs outweigh benefits for both processors using local milk and those using milk powder. All in all, the dairy value chain generates more benefits than costs.

Table 21. Total number of cowries allocated by scorers for costs and benefits by occupational group

| Occupational groups | | COSTS | BENEFITS | Balance |
|----------------------|-------------------|--------|----------|---------|
| Farmers | Agro-Pastoralists | 997 | 1,588 | +591 |
| | Mini-Farms | 416 | 1,034 | +618 |
| Collectors | Independent | 204 | 395 | +191 |
| | MCC | 456 | 1,089 | +633 |
| Processors | Using local milk | 1,113 | 864 | -249 |
| | Using milk powder | 440 | 232 | -208 |
| TOTAL | | 3,626 | 5,202 | |
| COST-BENEFIT BALANCE | | +1,576 | | |

6.4. Cost and benefit breakdown per dimension for stakeholders in Bobo Dioulasso's dairy value chain

6.4.1. All upstream players in the dairy value chain

The breakdown of costs and benefits along different dimensions (economic, social, environmental and health) for all stakeholders operating upstream in the dairy value chain is shown in Figure 5. The economic dimension is by far the most significant, with benefits and costs accounting for 37% and 35% respectively. The health (12%) and social (11%) dimensions are roughly equal. Lastly, the environmental dimension carries little weight (5%).

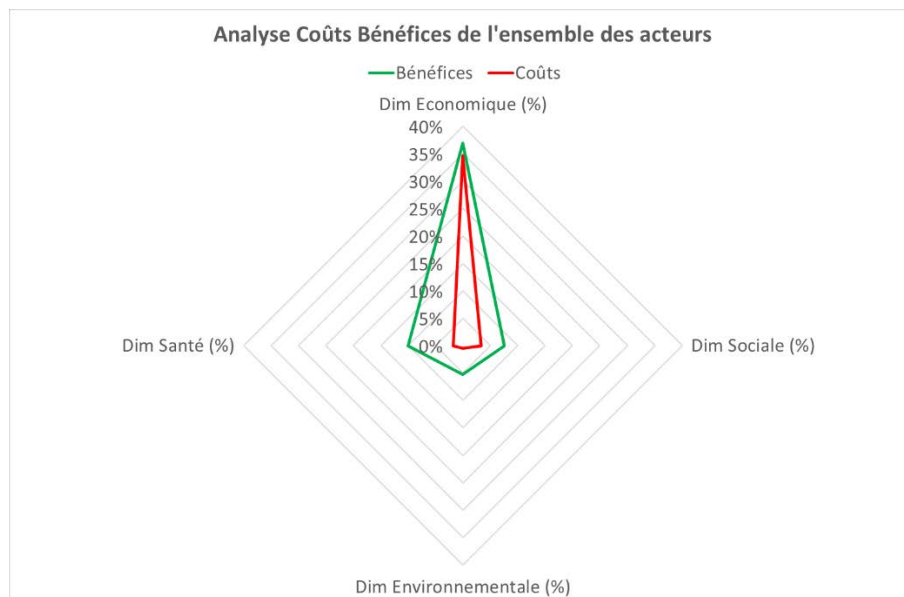


Figure 5. Cost and Benefit dimensions for all upstream stakeholders in the dairy value chain (Farmers, Collectors and Processors)

6.4.1. Dairy Farmers

The breakdown of Costs and Benefits for Dairy Farmers along different dimensions (economic, social, environmental and health) is shown in Figure 6.

For Agro-Pastoralists, the economic dimension carries the most weight (74% of Costs and Benefits), followed by the environmental dimension (17% of Costs and Benefits), then health (13% of Costs and Benefits) and finally the social dimension (6% of Costs and Benefits).

For Mini-Farms, the economic dimension is also the most significant (71% of Costs and Benefits), followed by health (16% of Costs and Benefits), and then the environmental and social dimensions (6% of Costs and Benefits each).

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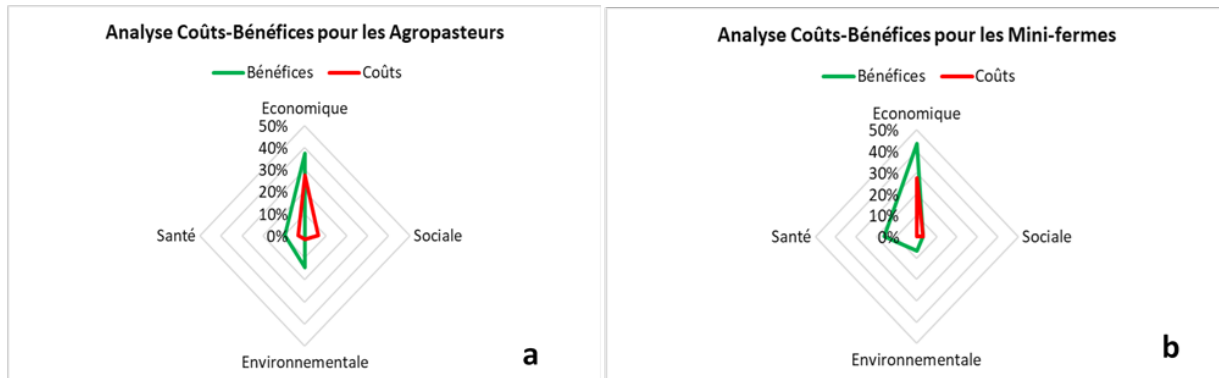


Figure 6. Costs and Benefits dimensions for Farmers

6.4.3. Collectors

The breakdown of Costs and Benefits for Milk Collectors (Independent Collectors and Milk Collection Centres) along different dimensions (economic, social, environmental and health) is shown in Figure 7.

For Independent Collectors, the economic dimension carries the most weight (74% of Costs and Benefits), followed by the social dimension (14% of Costs and Benefits), then health (11% of Costs and Benefits) and finally the environmental dimension (0% of Costs and Benefits).

For Collection Centres, the economic component is also the most significant (83% of Costs and Benefits), followed by the social dimension (12% of Costs and Benefits), then health (5% of Costs and Benefits) and finally the environmental dimension (0%).



Figure 7. Costs and Benefits dimensions for Collectors

6.4.5. Processors

The breakdown of Costs and Benefits for Milk Processors (DPUs using local milk and DPUs using milk powder) along different dimensions (economic, social, environmental and health) is shown in Figure 8.

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For Processors using local milk, the economic dimension carries the most weight (93% of Costs and Benefits), followed far behind by the social and health dimensions (4% of Costs and Benefits each), and finally the environmental dimension (0% of Costs and Benefits).

For Processors using milk powder, the economic dimension is again the most significant (65% of Costs and Benefits), followed by the social dimension (20% of Costs and Benefits), then health (15% of Costs and Benefits) and finally the environmental dimension (0%).

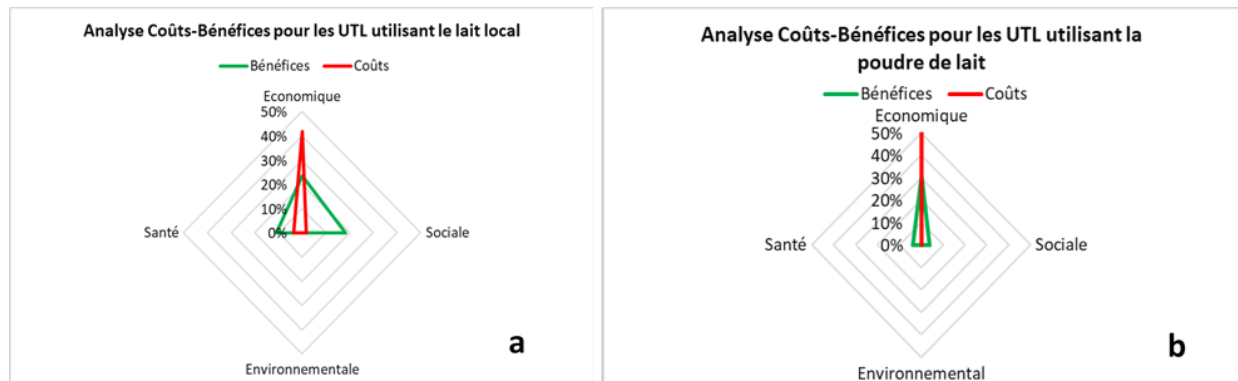


Figure 8. Costs and Benefits dimensions for Processors

7. Discussion

7.1. Main results

This study provided a qualitative analysis of the costs and benefits of agroecological packages (production, collection and processing) as perceived by socio-economic groups operating upstream in the dairy value chain. Overall, the results show that the benefits of the packages outweigh the costs for all upstream players in the value chain, suggesting that stakeholders as a whole should adopt an agroecological business model. However, there are distinctions at different levels in the chain. For dairy farmers and collectors, the benefits of the packages outweigh the costs, whereas for processors, costs outweigh benefits.

The cost/benefit analysis of Ae packages therefore helps identify the elements of these packages from which players can hope to derive the greatest benefits, and those that require further work to limit costs and increase benefits.

Among Farmers (Table 22), Agro-Pastoralists will certainly be more inclined to work on improving rationing and organic manure, and as far as fodder is concerned, there is much work to be done to find the right fodder that might convince them of the benefits of this practice. Conversely, in the case of Mini-Farms, these farmers will certainly be more open to working on issues of fodder intensification, the search for economically balanced rations, and manure enrichment.

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Table 22. Ranking of Ae Package elements for Farmers

| Ae production package elements | Agro-Pastoralists | Mini-Farms |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Quality fodder as a major substitute for livestock feed (FOOD) | 6 th place (-108 cowries) A lot of work to be done to find the right fodders for their needs | 1 st place (+173 cowries) |
| Organic manure as a major substitute for mineral fertilisers (OM) | 2 nd place (+240 cowries) | 3 rd place (+105 cowries) |
| Sound management of crop and livestock co-products (CPROD) | 3 rd place (+116 cowries) | 5 th place (+57 cowries) |
| Balanced rations for dairy cows at an acceptable cost (RATION) | 1 st place (+254 cowries) | 2 nd place (+111 cowries) |
| Use of medicinal plants as substitutes for veterinary drugs (MEDPL) | 5 th place (+34 cowries) | 4 th place (+86 cowries) |
| Optimum management of livestock and natural resources (MGT) | 4 th place (+55 cowries) | 4 th place (+86 cowries) |

Among Collectors (Table 23), Collection Centres will certainly be more inclined to work on improving advice, consultation management, guaranteed delivery and quality control. Independent Collectors, on the other hand, are more likely to be interested in guaranteed delivery and improved milk quality control.

Table 23. Ranking of Ae Package elements for Milk Collectors

| Ae collection package elements | Independent collectors | Collection centres |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------|
| The MCC is a forum for dialogue between farmers and collectors (DIAL). | 4 th place (+31 cowries) | 2 nd place (+135 cowries) |
| Advice on agroecological management of dairy farms (techno-economic) (ADVICE) | 5 th place (-93 cowries) They feel they are wasting their time giving advice that is not heeded | 1 st place (+172 cowries) |
| Input and credit support for farmers and processors (CREDIT) | 3 rd place (+37 cowries) | 5 th place (+76 cowries) |
| Milk quality control (QUAL) | 2 nd place (+95 cowries) | 4 th place (+124 cowries) |
| Guaranteed delivery in terms of quantity and quality (GUARANT) | 1 st place (+121 cowries) | 3 rd place (+126 cowries) |

Among Processors (Table 24), those using local milk will certainly be more inclined to work on innovative and cosmetic dairy products. However, work will also be needed on a number of aspects that are currently holding back their business development. The aim is to reduce the large number of significant costs weighing on the viability of their business as a whole, but not specifically for traditional dairy products: raw material costs (milk), costs generated by irregular milk supply, staff costs, social security contributions, raw material and energy costs, costs of equipment, packaging and taxes, and cost of quality control.

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Table 24. Ranking of Ae Package elements for Processors

| Ae processing package elements | Processors using local milk | Processors using milk powder |
|-------------------------------------------------------------------------|--------------------------------------|--------------------------------------|
| Manufacture of traditional dairy products from local produce (TRADPROD) | 3 rd place (-619 cowries) | 3 rd place (-197 cowries) |
| Manufacture of innovative dairy products (INNOVPROD) | 1 st place (+286 cowries) | 2 nd place (-11 cowries) |
| Manufacture of milk-based cosmetics (COSPROD) | 2 nd place (+84 cowries) | 1 st place (0 cowries) |

When costs and benefits are broken down into the various dimensions (economic, environmental, social and health), it becomes clear that the economic dimension carries far more weight than the others, since most of the benefits or costs listed are in terms of financial impact (positive or negative). The social dimension (which involves issues of collaboration/partnership, job creation, workload, traditional rites, crop-livestock farmer relationships, etc.) and the health dimension (when therapeutic, dietary and health aspects related to the use of local milk or cosmetic products based on local milk are taken into account) come in second place and appear to even out in terms of proportion in relation to their intensity levels in the cost and benefit dimensions. The environmental dimension only concerns farmers (the other players in the chain have little interest in these environmental costs and benefits). It becomes more relevant when considering the benefits of using organic manure.

7.2. Limitations of the method

The success of this participatory approach to qualitative cost-benefit analysis depends heavily on the commitment of stakeholders, the selection of FGD participants and the quality of moderation during the cost-benefit inventory process.

To this end, it is essential:

- To allow time to explain the process to participants and to carry out as exhaustive an inventory as possible;
- To select by socio-economic sub-group the key individuals likely to have the best insight into the positive and negative constraints of their activity;
- To prepare the workshop well in advance so that facilitators are fully equipped to lead discussions and provide summaries that reflect participants' opinions.

Carrying out a cost-benefit inventory with a focus group requires an average of a day and a half's work, including coffee and lunch breaks, depending on the size of the agroecological package and the number of participants.

Occasionally, it may also be necessary to repeat the exercise with several focus groups when a socio-economic group has many representatives and a sizeable agroecological package (as in the case of agropastoralists). Conversely, when a socio-economic group has few representatives, such repetitions are impractical (as in the case of processors using milk powder).

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Scoring methods for costs and benefits can certainly be improved to better reflect the number of benefits and costs identified per socio-economic group, and to review the weighting of cost and benefit intensity levels in order to highlight the specific features of each group. This quantitative approach, however complex it may seem, will make it easier to analyse the economic impact of benefits and costs for the socio-economic groups within the dairy value chain.

8. Conclusion

Cost-Benefit workshops on agroecological packages showed that benefits outweigh costs for dairy farmers and collectors, whereas costs outweigh benefits for processors. Overall, benefits outweigh costs for upstream players in the dairy value chain. As regards the dimensions associated with costs and benefits, the economic dimension proves to be more significant than the social and health ones. The environmental dimension is only relevant when considering the benefits of using organic manure.

These results form a solid basis on which to build an agroecological pre-business model for the local dairy value chain.

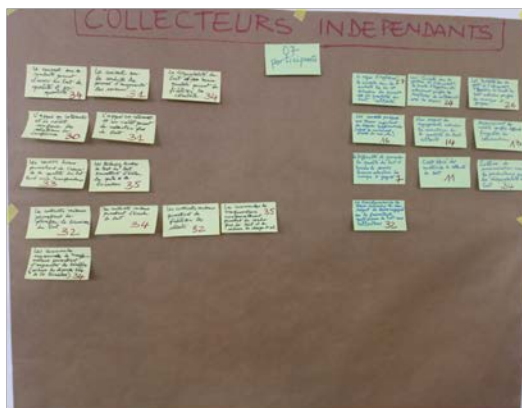
9. References

Meunier, V. (2009). Analyse coût-bénéfices : guide méthodologique. Numéro 2009-06 des Cahiers de la Sécurité Industrielle, Fondation pour une Culture de Sécurité Industrielle, Toulouse, France (ISSN 2100-3874). Available at URL <http://www.foncsi.org/>.

Wezel A, Gemmill Herren B, Bezner Kerr R, Barrios E, Rodrigues Gonçalves A L, Sinclair F (2020) Agroecological principles and elements and their implications for transitioning to sustainable food systems. A review. *Agron Sustain Dev* 40: 40. doi.org/10.1007/s13593-020-00646-z

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10. Appendices



Inventory of benefits and costs by occupational sub-group