Enabling value chains to create sustainable income for vulnerable people in crop-livestock systems of Burkina Faso and Niger

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Objectives

1) Improve crop-livestock systems through inclusive value chains and conducive policy environments.
2) Improve feed and feeding systems and animal health to improve animal-source food.
3) Participative development of improved scenarios of crop-livestock farming systems, which enhance resilience, productivity, and sustainability, and increase participation of youth and women in income-generating enterprises.

Involving stakeholders in crop livestock systems analysis through Innovation Platforms

Vincent Bado , André F. van Rooyen, Clarisse Umutoni, Anthony Whitbread

Introduction

- Crop-livestock values chains (CL-VC) are complex and involve many actors. Identifying and prioritizing interventions to improve CL-VC is a challenge.
- Interrelationships between problems need to be better understood to address them.
- A new participative approach (through innovation platforms, IP) was used in Niger and Burkina Faso to conduct a participatory and systemic analysis to identify entry point for actions to improve CL-VC.

Methods

- Sites: Torodi and Maradi (Niger) and Kaya and Dori (Burkina Faso)
- Implementation steps for innovation platforms:
  1. Identification of stakeholders
  2. Problem diagnostic
  3. Value chains analysis
  4. Identification of entry points for action

Strengthening actor networks and relationships can enhance innovation processes and outcomes.

Addressing the right problem is the first step towards success in the implementation of an innovation process.

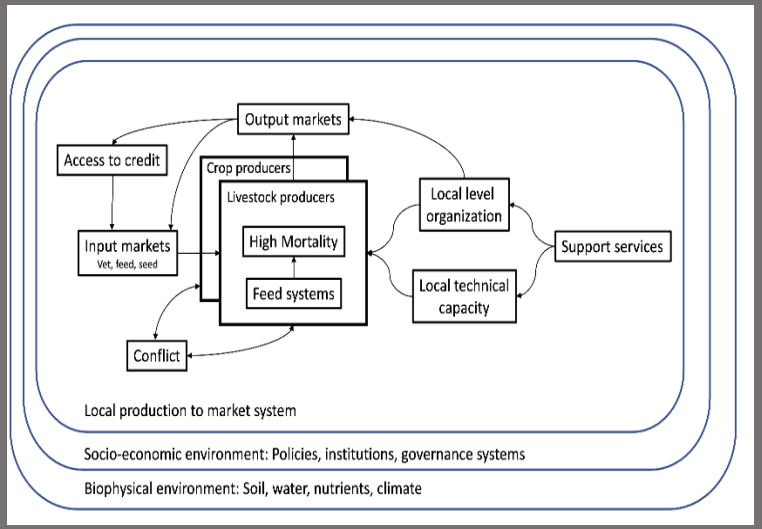


Figure 1. Diagram of the dynamics between the common problems in the crop-livestock value chains as identified by innovation platform members in Niger and Burkina Faso.

Stakeholders at IP meeting identifying their challenges

Problem identification

- Low level of education: 85% and 80% of household heads were illiterate in Torodi and Maradi regions (Niger) and 67% and 84% in Korsimoro and Sampelga, respectively (Burkina Faso).
- Common system challenges of the system were low access to inputs, feed shortages, poor veterinary care, low prices and poor markets, lack of knowledge and access to credit.
- Animal diseases and high mortality of animals are major constraints to livestock production
- There is mistrust between producers of livestock and extension services providers
- Low support to farmers from extension services providers
- Lack of organization among value chain actors

Relationships between problems

- There was a strong relationship between markets, inputs, production, and weak knowledge ((Figure 1)

Value chain mapping

- Actors were able to draw different links between the main components of the CL-VC
- Actors understood the need to organize themselves and/or strengthening their existing associations.

Assessment of stovers of dual-purpose pearl millet varieties as feed for sheep in Niger

Clarisse Umutoni, Vincent Bado, Anthony Whitbread, Augustine Ayantunde, Prakash Gangashetty

Introduction

- Pearl millet (*Pennisetum glaucum*) is a staple food popularly cultivated by smallholder farmers in Niger, and its stovers are also used as feeds for livestock as basal diet, especially during the cold dry season.
- Many dual-purpose millet varieties have been developpe by ICRISAT but the nutritional quality of their stover are not known.
- This research aimed at assessing the performance of four dual-purpose millet varieties as animal feed.

Methods

1. Materials: 5 varieties (4 dual purpose varieties and the local variety).
2. Animals: 30 male sheep (~27.1 ± 1.9 kg) randomly allotted to five treatments defined by type of millet variety.
3. Method: Feeding with combined treatments of Stover residues as basal feed and cowpea hay (600g/animal/day) as supplement
4. Measurements: feed uptake, animal live weigh gain over 90 days.
5. Participatory evaluation of millet varieties in farmer's fields with 60 farmers.

Stover of varieties ICMV167005 and ICMV167002 showed the highest nitrogen content (1.0%), nitrogen intake (4.1 g nitrogen/sheep/day), and *in vitro* digestibility (51.3% and 51.8%, respectively).

Animals fed with variety ICMV167005 had higher ($P<0.05$) average daily live weight gain.

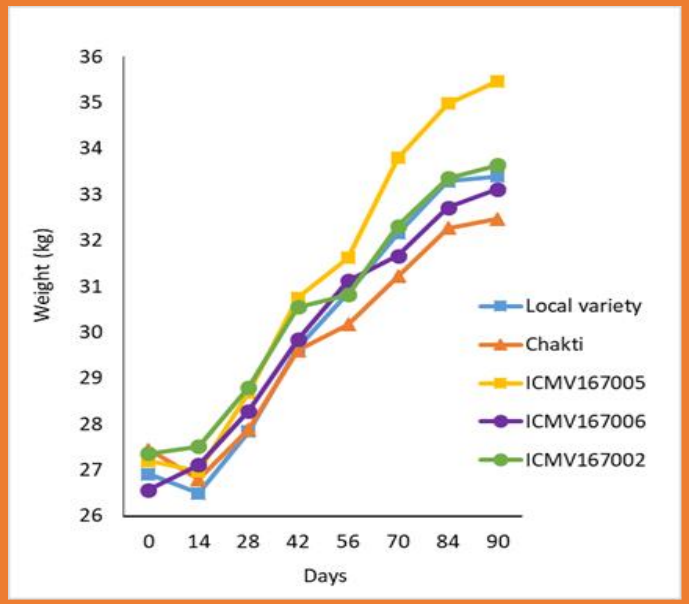


Figure 1. Cumulative live weight gain by sheep fed with stover of local variety and four improved dual-purpose millet varieties

Stover from different millet varieties is stored at the Sadore research station.

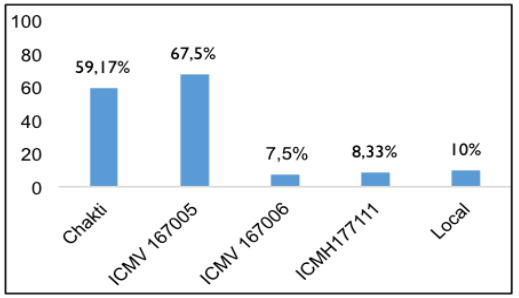


Figure 2. Index of farmer's [references for five millet varieties (4 improved varieties and one local variety) based on both grain and stover yields and quality of residues as feed for sheep at ICRISAT's Sadore research station

Recommendations

- By producing both good grain and stover yields, good quality residues as feed, the dual-purpose pearl millet variety ICMV167005 is recommended for increasing the productivity of cropping systems to improve crop-livestock farming

Silage of pearl millet stover: An alternative to the problem of feed shortage

Clarisse Umutoni, Zeydou Hamza, Vincent Bado

Introduction

- In West Africa Sahel open grazing and crop residues are the main sources of livestock feeds. Feed shortage constitutes a big challenge particularly during the dry season. Several dual-purpose cereal varieties such as pearl millet have been developed but the conservation of crop residues and the lost of quality over the season remain a constraint
- Objective: Promote the transformation of millet stover through making sileage. This can improve both feed quality and help overcome feed shortages during the dry season.

Methods

- Conducted at the ICRISAT research station Sadoré/Niger.
- Millet stovers of six pearl millet varieties, harvested at grain maturity stage. Stover were ensiled for 90 days in bag silo under an anaerobic environment: Millet stover were chopped into small part of 5cm put in bag silo. There were five silage treatments with three replicates each.
- The dry matter (DM) of the stover before silage was determined by oven drying for 48 h at 60° C. The silage pH was measured on the 60th day,
- Both pH and dry matter (DM) were measured to assess silage quality (Table 1)

Good quality silage has a greenish yellow colour, firm texture and good aroma.

Fruity and pleasant aromas were obtained with ensiled millet stover from the local variety and from 3 improved varieties of (Chakti, ICMV167005, Maywa).

Table 1: Assessing silage quality based on pH and dry matter (Grid of Decruyenaere et al., 2008)

Pearl millet variety	pH	DM (%)	Silage quality	Points
Chakti	4,18±0,11[a]	30,96±2,3	Very good	5
Mil de Siaka	4,57±0,19[b]	35,12±0,46	Good	3
ICRI-Tabi	**5,46±0,17**[c]	39,61±3,57	Poor	1
Alambana	4,65±0,12[d]	30,26±1,49	Poor	1
Maywa	4,60±0,14[d]	28,56±1,92	Good	3
Local from Sadoré	4,47±0,06[abd]	29,44±0,06	Good	3

The silage making process

1. Chopping millet stovers

2. Packing stover into a silo bag

3. Compacting millet stover

4. Ensiled pearl millet stover (after 60 days)

Recommendations

- Chakti, ICMV16700, Maywa and the local variety are recommended for silage.

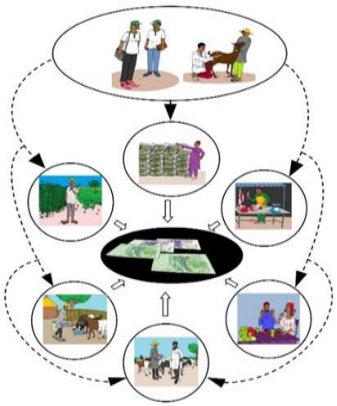
Future opportunities

- Conduct an accessibility study with sheep and goats and evaluation of effect of feeding the ensiled millet stovers on performance of small ruminants.

Developing a feed business model by linking actors

Clarisse Umutoni,, Vincent Bado, Abdoulaye Amadou

1 Identify areas of common interest

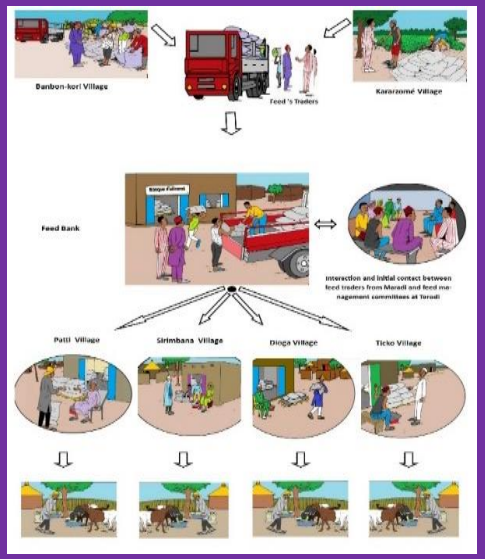


2 ...rs come together to shape their relationship & discuss ways to resolve feed issues

Supplied livestock farmers with **feed at affordable price** (30% lower of the market price).

Over a period of **4 months,** 4000 kg of cowpea glume, 2500 kg of cereal bran, 2700kg of groundnut haulms and 3400 Kg of cowpea hay have been sold to livestock's farmers of Torodi **(~3600 USD).**

3 Jointly develop a win-win strategy



Introduction

- Feed shortage constitutes a big challenge particularly during the dry season in the dry lands of West Africa Sahel such as Niger.
- Aim: Facilitate access to feed for livestock' farmers by developing feed market involving feed actors

Methods

- Research area: Torodi and Maradi, Niger
- Strategic Approach-Innovation Platform: Participative exchanges among feed value chains actors to identify action and strategy for implementation.

Results

- Identified business opportunities around feed value chain between Torodi (high demand of feed) and Maradi (availability of feed)
- Developed a feed market between Torodi and Maradi by linking actors (feed traders and livestock farmers between the two sites) in a business collaboration.

Recommendations

- Promoting business around feeds value chain is a business opportunity to improve feed availability while generating incomes and job for feed actors.

Future opportunities

- Scaling up the model to develop bigger feed markets at regional and national levels.

Co-designing profitable and resilient crop-livestock systems in Niger and Burkina Faso using a household modelling approach

Shalander Kumar, Soumitra Pramanik, Clarisse Umutoni, Abdoulaye Amadou, Vincent Bado, Anthony Whitbread

Introduction

- Challenges: water scarcity, frequent droughts, high vulnerability to climate change, food insecurity, gender inequality and widespread unemployment.
- Context specific integrated crop-livestock systems could be a key strategy for enhancing resilience of the livelihood systems.
- Integrated farming system assessment using whole farm modelling to identify the leverage points for achieving higher profitability and resilience under different crop-livestock farm types in the study regions.

Methods

1. Surveyed 400 households using a detailed survey instrument in the Maradi and Tillaberi regions of Niger and Centre-Nord and Sahel regions for Burkina Faso.
2. Considered six livelihood assets (Family size, Number of cattle, Number of small ruminants, Technology adopted, Land size and Access to animal traction), then
3. Used principal component analysis and k-cluster mean method to categorise households into three relatively homogenous farm types each for both the countries.
4. Generated the baseline as well as different alternative intervention scenarios using the Integrated Assessment Tool.

Results from the Base model

- **Three farm types** were identified in each country. **Cowpea, sorghum**, **millet** and **groundnut** are the major annual crops for Niger and Burkina Faso. **Tree crops** were more important in Niger households for their livelihood.
- Land size was 1.9 ha, 2.7 ha and 6.5 ha for farm type 1, 2 and 3, respectively in Niger and 1.1 ha, 4.7 ha and 6.3 ha, respectively in Burkina Faso.

Baseline farming system cash flows under three farm household types:

In Niger income share of **tree crop** was highest at **39%** and **42%** of total household income for farm group 1 and 2., while **income share of cattle** was highest at **36 %** for farm group 3.

In Burkina Faso, income share of **annual crops** was highest at **49%** and **48%** for farm type 1 and 2. respectively, while that of **cattle** was the highest for farm type 3.

Table 1. Potential impact of different interventions on household cash flows (% change from the baseline scenario)

Alternative intervention scenarios	Niger farm type			Burkina Faso farm type		
	1	2	3	1	2	3
1. Improved Cattle (replaces the local cattle)	64.6	44.3	44.3	5.0	14.3	4.6
2. Improved (Cattle+Millet)	75.7	72.1	78.8	31.5	25.2	16.4
3. Improved (Cattle+Millet+SR)	77	72.0	83.0	31.9	25.6	16.8
4. Improved (Cattle+Millet+SR) + 15% extra price of livestock	80.4	75.8	84.3	44.6	31.4	24.2
5. Improved Millet	9.33	21.2	27.3	24.4	19.9	7.2
6. Improved small ruminants (ISR)	5.8	6.1	3.2	0.4	0.4	0.4
7. Prophylaxis (SR)	0.9	8.1	1.1	2.2	2.0	1.8
8. ISR + Prophylaxis	6.4	9.4	4.5	2.7	2.5	2.2
9. ISR + Prophylaxis + 15% increase in price of ISR	8.6	10.75	6.4	4.8	4.2	4.5
10. 50% local Cattle + 50% improved Cattle	10.1	9.8	8.7	29.7	37.2	14.0
11. 30% legume area shifted to millet	-0.01	7.1	1.2	1.7	1.0	-0.8
12. 30% millet area shifted to legumes	-0.7	3.6	-2.5	-3.0	-0.5	1.0
13. 30% legume area shifted to improved millet	10.9	25.8	32.3	30.9	28.4	9.9

Recommendations

- It is crucial to conduct a context specific integrated crop-tree-livestock value chain interventions to effectively identify strategy for improving rural livelihoods and food security in the vulnerable regions.

Table 1. Potential impact of different interventions on household cash flows (% change from the baseline scenario)

Alternative intervention scenarios	Niger farm type			Burkina Faso farm type		
	1	2	3	1	2	3
1. Improved Cattle (replaces the local cattle)	64.62	44.25	44.26	4.98	14.25	4.61
2. Improved (Cattle+Millet)	75.67	72.07	78.77	31.46	25.17	16.39
3. Improved (Cattle+Millet+SR)	76.95	72.03	82.91	31.90	25.61	16.80
4. Improved (Cattle+Millet+SR) + 15% extra price of livestock	80.42	75.75	84.26	44.62	31.42	24.16
5. Improved Millet	9.33	21.22	27.30	24.42	19.89	7.21
6. Improved small ruminants (ISR)	5.81	6.12	3.21	0.42	0.44	0.41
7. Prophylaxis (SR)	0.96	8.11	1.05	2.16	2.01	1.79
8. ISR + Prophylaxis	6.39	9.35	4.52	2.70	2.52	2.23
9. ISR + Prophylaxis + 15% increase in price of ISR	8.56	10.75	6.42	4.84	4.23	4.53
10. 50% local Cattle + 50% improved Cattle	10.12	9.79	8.69	29.66	37.23	14.02
11. 30% legume area shifted to millet	-0.01	7.08	1.20	1.73	1.00	-0.76
12. 30% millet area shifted to legumes	-0.74	3.60	-2.53	-3.04	-0.48	0.98
13. 30% legume area shifted to improved millet	10.88	25.83	32.29	30.85	28.42	9.94