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IMPROVING THE SUPPLY OF QUALITY FEEDS IN BURKINA FASO: SUCCESSES AND LESSONS LEARNED

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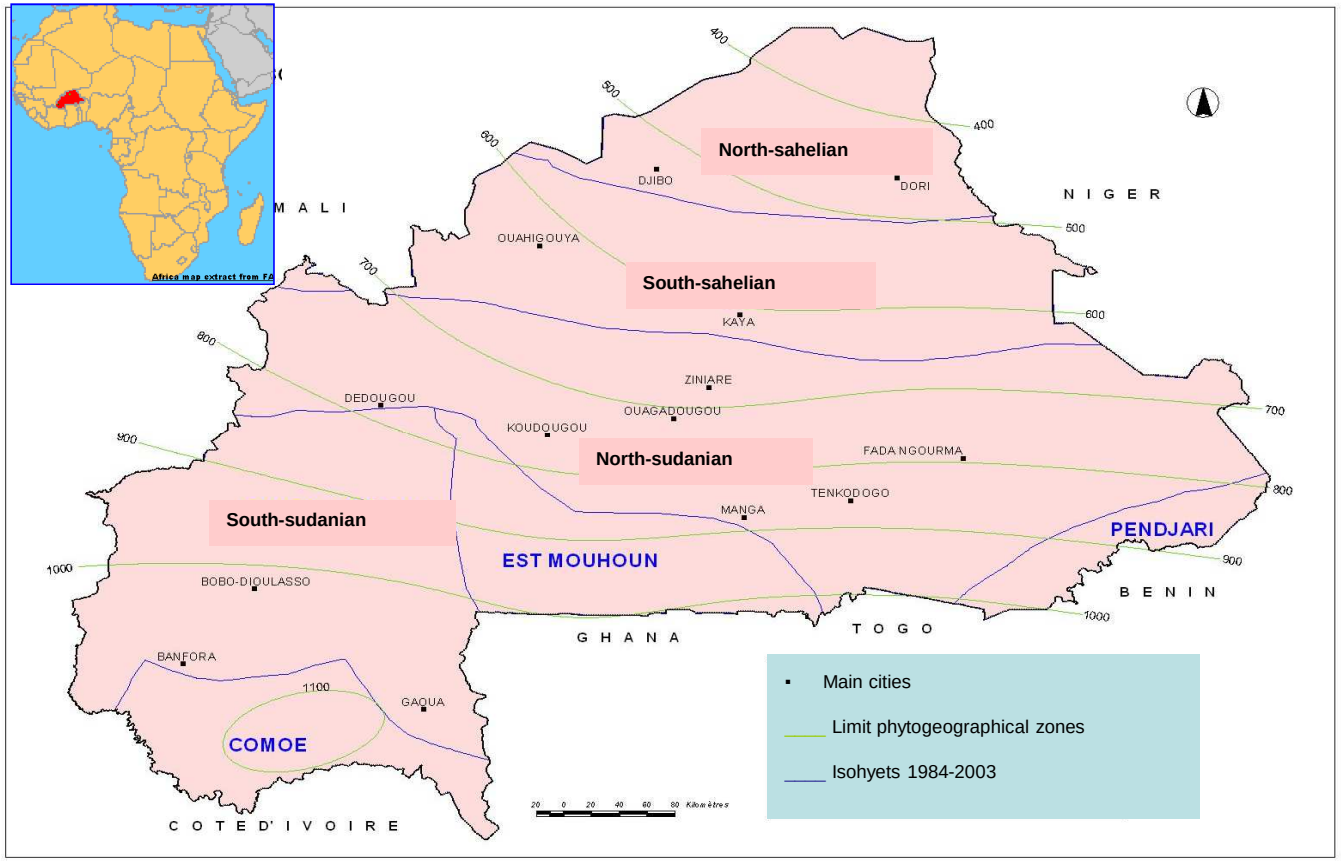
OUTLINE

1. Background
   - Potentialities of livestock production
   - Constraints to livestock production
2. Feeds resources
3. Improving the supply of quality feeds

I. BACKGROUND



I.1. Potentialities of livestock production

- **Livestock : 12.3% of GDP,**
- **3rd product of export after gold and cotton,**
- **The existence of large and diversified livestock population**
  - **Cattle: 8 234 000**
  - **Sheep: 8 003 000**
  - **Goats: 11 983 000**
  - **Poultry: 36 420 000**
  - **Pigs: 2 125 000**

- **The existence of efficient technologies / research results;**
- **The existence of traditional know-how;**
- **The growing demand for livestock products to meet the needs of a growing population;**
- **The existence of manufacturing units for agroindustrial by-products used as concentrated feed (cottonseed cake);**
- **Development of entrepreneurial-ship for intensification of animal production (installation of private farms);**
- **Varied production systems according to agro-ecological zones.**

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Transhumant family moving

Mix flock sheep & goats – many owners

Fattening sheep at Djibo market

Cattle grazing remaining crop residues

I.2. Constraints to livestock production

Feed resource level:

- **The dominance of traditional extensive livestock production systems, where natural pastures are the main feed resource of animal, contributing nearly 85% in the diet of animals:**
  - **Transhumant Fulani,**
  - **Sedentary agro-pastoral,**
- **The semi-intensive to intensive production systems are less developed:**
  - **Urban and peri-urban dairy farms,**
  - **Specialised cattle and sheep fattening.**

- **Decrease in pastureland productivity:**
  - **reduction in surface area,**
  - **overgrazing**
  - **climatic risk (fluctuation in forages resources)**
- **Increase in livestock number due to the control of major diseases, but also cultural habits, leading to increase pressure on natural resources;**
  - **As a result, competition for natural resources that are inextensible, resulting in frequent conflicts between crop farmers and herders.**

- **The use of agro-industrial by-products, cultivated fodder and hay is still low and improperly used by farmers as part of the diet of their animals, except in the case of improved production systems.**

<u>At the health level</u>

- **the prevalence of animal trypanosomiasis in the Sudanian zone**
- **Various diseases caused by external and internal parasites (ticks)**

In terms of animal productivity:

- Low productivity of local breeds / insufficient nutrition and insufficient knowledge of their inherent potential and research on genetic improvement

In terms of funding

- Despite the importance of livestock, the share of public investment in the sector is particularly low.
  - This situation is even more crucial in research that depends mainly on external funding for these activities (various agreements, subsidies)

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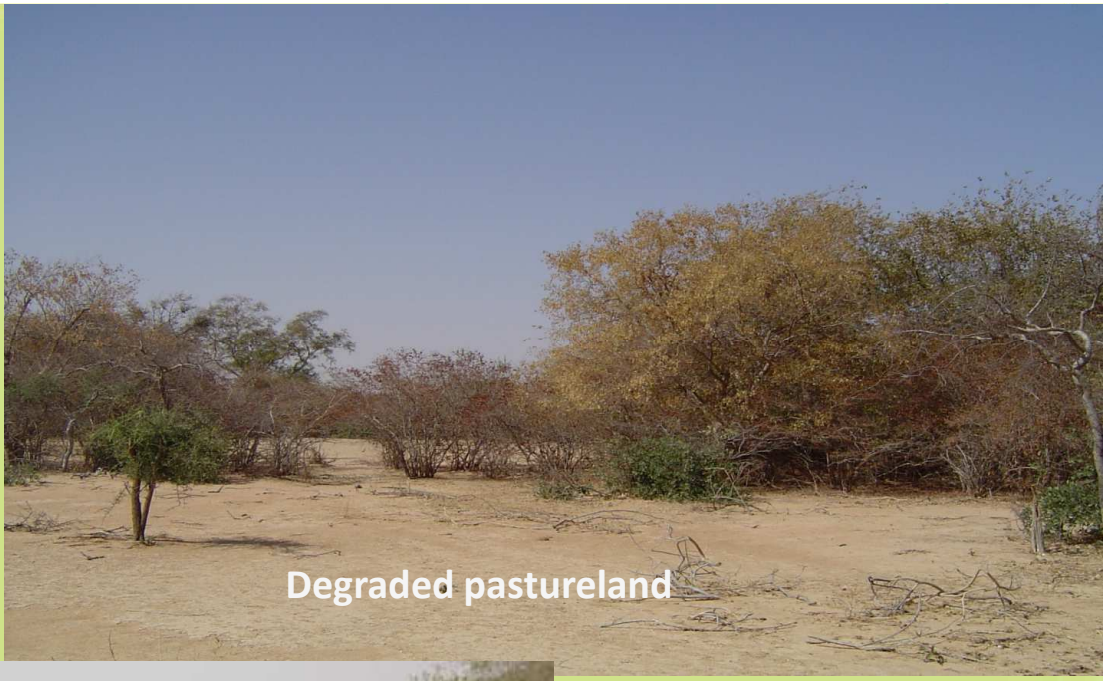
Cattle grazing remaining crop residues



Degraded pastureland

Bush fire in soudanian zone

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II. FEED RESOURCES IN ANIMAL PRODUCTION

- **The main feed resources for animals are:**
  - **Natural forages on pasture,**
  - **Crop residues**
  - **Fodder crop**
  - **Agro-industrials by-products**

2.1. Natural pasture

- **In Burkina Faso, natural pastures constitute about 85% of the feed for livestock, followed by crop residues, which account for less than 11%, then fodder crop and conserved forage.**
- **However, the availability of fodder resources in pasture is highly variable according to agroclimatical zones.**

<u>In the sahel</u>

- **Rangeland production is highly seasonal, with a rainy season occurring from June to September.**
- **The herbaceous layer is composed almost exclusively of annual plants, which composition and growth rate are strongly influenced by the pattern and amount of rainfall.**

- **The availability of the pasture resources is characterised by a peak in herbaceous production in the rainy season, with high N and E content, while in the dry season, the resources gradually decrease and are then unable to meet the maintenance requirement of the animals.**
- **Most of the shrubs and trees are deciduous and diversified with various fodder components (green and dry leaves, flowers and fruits) and have a longer period of availability than the herbaceous plants. Hence they constitute an essential resource for livestock during the long dry season.**
- **Overall the consumable yield of natural pasture in the arid and semi-arid zones is estimated at 200 to 500 kg DM/ha. However, high variability is reported between the sub-zones, also depending on the geo-morphological units.**

Ex. of pasture production according to the morpho-pédological units in Sahel of BF (Menegou – Province of Oudalan, 350 mm)

- **Glacis : 0 to 1500 kg DM /ha**
- **Dunes : 1500 to 2000 kg DM /ha**
- **Lowland: 2000 to 2500 kg DM /ha**
- **Pond vegetation : 5000 kg DM /ha**

The dominante pasture unit is glacis with low productivity.

In soudanian zone

- **The dominant vegetation type is Savannah with different forms : depending on the density of woody strata;**
- **Fodder production varie from 3-4 tons de DM/ha /yr in typical soudanian, to 6-7 tons de DM /ha/yr in south soudanian zone.**
  - **At this stage, the vegetation contains a high proportion of dead material, highly lignified and not very palatable to the animals.**
- **However, the fire organized by the breeders, allows regrowth of good nutritional value fodder and limits the encroachment.**

Ex. Pasture production in a Sudanian zone of the BF (site of Sibera-Gbonfrera – Province of Poni, 1050 mm)

- **Shrubby savanna: 3 600 kg/ha**
- **Sparse woody savanna: 3 300 kg/ha**
- **Dense woody savanna: 2 900 kg/ha**
- **Lowland vegetation: 10 600 kg/ha.**

Variation of pasture production according to agroclimatical zone in the dry and normal year

Zone	Average yield (kg DM/ha)	Rate of utilisation (%)	Carrying capacity (ha/LU)
Sahel	**400 to 800**	**40**	**7,5 to 15**
Sub-sahel	**625 to 1250**	**35**	**5,5 to 11**
North soudanian	**1050 to 1750**	**30**	**4,5 to 8**
South soudanian	**1440 to 2250**	**25**	**4 to 7**

II.2. Crop residues

- **The main crops in Burkina Faso are millet, sorghum, maize, cowpea, groundnut and some tubers;**
- **The contribution of crop residues in animal feeding is increasing, as a greater proportion of the land is brought under cultivation to meet the needs of a growing population.**
- **They can constitute 40 to 60% of the total DM intake by cattle in the Sahel.**
- **The management of crop residues for livestock feed differs depending on the type. Most of the cereal straws are grazed in situ, while leguminous residues are collected as haulm for sale or for stall-feeding due to their high quality.**

- For the use of cereal straws, the common practice in the Sahelian area is to remove a part, that is stored in the homestead or in the field before the animals are allowed to graze.
  - In more densely populated areas (Plateau Central), almost all crop residues may be harvested for livestock feed and or for sale;
- On their way towards humid zones, transhumant pastoralists make arrangements with crop farmers to graze their cattle directly on fields after harvest, exchanging feed for the provision of manure.
- However, the utilization of cereal straws as feed is limited by the low nutritive value (44 to 54g/kg DM of CP, 450 to 510 g/kg DOM and 7.1 to 8.1 MJ ME/kg OM, for millet and sorghum).

II.3. Fodder crops

- Fodder crops differred from natural fodder by their yield and nutritive value that are improved;
- Forage crops contribute to the sustainable development of livestock farming with the protection of the environment;
- they are an appropriate solution to ensure a quality diet for animals, while compensating for grazing shortages and deficits in concentrated feeds.
- Many types of fodder crop and have been tested in Burkina:

- Permanent fodder crop such as perennial grasses or legumes;
- temporary fodder crops including highly productive annual grasses and legumes, allowing multiple cuttings per year,
- Dual purpose crops for both food and fodder such as maize, sorghum and cowpea,
- shrubs and tree fodders.

- Many species have been introduced in BF; the ones which got success were dual purpose cowpea and sorghum, *Dolichos* and *Mucuna*;
- despite their interest and their introduction in Burkina longtime ago, forage crops do not seem to know appreciable boom.

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- **Several constraints have been reported:**

➢ **Establishment, maintenance and use require techniques and tools comparable to those of other agricultural crops;**

➢ **Land constraints due to extensive agriculture and low availability of cultivated land;**

➢ **Labor constraints due to overlap in cropping calendars with food crops;**

➢ **Financial constraint considering the economic cost for the establishment (seeds, fertilization, maintenance, harvesting, storage)**

➢ **the problem of supervision (good control is essential to the success of the operation)**

➢ **The problem of seed availability.**

Fodder crops studied in Burkina Faso

FORME BIOLOGIQ.	ESPECES	ZONE ECOLOGIQ (mm pluies)	PRODUCTION (T/ha)	V.N.		REFERENCE
				UF	MAD	
GRAMINEES ANNUELLES	*Pennisetum typhoïdes*	Saria	30 MV	-	-	IRAT
	Pennisetum pedicellatum	Saria, Farakobà	20 MV	-	-	IRAT
	Retboelia exaltata	Saria, Farakobà	-	-	-	IRAT
	Surghum arundinaceum	Farako-bà	-	-	-	IRAT
	Maïs fourrager	500 – 600	10– 12 MS	0,43	20,2	CERCI
	Sorgho fourrager	400 – 500	8 – 10 MS	0,42	12,6	CERCI
GRAMINEES PERENNES	*Andropogon gayanus*	Saria, Farakobà	20-30 MV	-	-	IRAT
	Brachiaria ruziziensis	Saria, Farakobà	16 MV	-	-	IRAT
	Cenchrus ciliaris	Bané	-	-	-	IEMVT
	Brachiaria ruziziensis	1000 - 1200	5 – 6 MS	0,44	31,2	CERCI
	Panicum maximum	850 - 950	3 – 4 MS	0,39	34,5	CERCI
	Pennisetum purpureum	1000 – 1200	4 – 5 MS	0,45	72,5	CERCI
	Sorghum almum	500 – 550	3 – 5 MS	-	-	CERCI
	Chloris gayana	650 – 700	2 – 3 MS	0,45	47,1	CERCI
	Cenchrus ciliaris	300 – 400	2 – 3 MS	0,44	43,7	CERCI

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Fodder crops studied in Burkina Faso

FORME BIOLOGIQ.	ESPECES	ZONE ECOLOG (mm)	PRODUCTIO (T/ha)	V.N.		REFEREN
				UF	MAD	
LEGUMINEUSES ANNUELLES	*Crotalaria juncea*	Saria, Farakobà	15-20 MV	-	-	IRAT
	Crotalaria intermedia	Saria, Farakobà	12-15 MV	-	-	IRAT
	Mucuna utilis	Saria	12-15 MV	-	-	IRAT
	Dolichos lablab	Saria	3-5 MV	-	-	IRAT
	Vigna unguiculata	Bané	-	-	-	IEMVT
	Vigna unguiculata	350 – 500	3 – 6 MS	0,42	91,8	CERCI
	Phaseolus aureus	300 – 350	1,5 – 2,5 MS	-	-	CERCI
	Carnavalia ensiformis	600 – 700	15 – 20 MS	-	-	CERCI
	Phaseolus lathyroïdes	650 – 700	3 – 4 MS	0,48	85	CERCI
	Dolichos lablab	650 – 700	3 – 4 MS	-	-	CERCI
LEGUMINEUSES PERENNES	*Stylosanthes gracilis*	-	-	-	-	IRAT
	Macroptilium atropurpureum	-	-	-	-	IEMVT
	Glycine wightii	-	-	-	-	IEMVT
	Stylosanthes guianensis	-	-	-	-	IEMVT
	Stylosanthes hamata	-	-	-	-	IEMVT
	Stylosanthes guyanensis	900 - 1000	5 – 6 MS	0,44	84	CERCI
	Stylosanthes hamata	600 – 650	3 – 4 MS	-	-	CERCI
	Pueraria phaseoloïdes	1200 – 1250	3 – 4 MS	0,44	103,6	CERCI
	Centrosema pubescens	1000 – 1100	3 – 4 MS	0,40	85,1	CERCI
	Desmodium intortum	900 – 1000	3 – 4 MS	0,38	81,7	CERCI
	Glucine wightii	750 – 800	3 – 4 MS	0,47	90,5	CERCI
	Macroptilium atropurpure.	750 – 800	2 – 3 MS	-	-	CERCI
ARBUSTES FOURRAGERS	*Leucena leucocephala*	750 – 800	2 – 3 MS	-	-	CERCI
	Cajanus cajan	750 – 800	2 – 3 MS			CERCI

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II.4. Agro-industrial by products

- In Burkina Faso, the most important agro-industrial products are cottonseed cake, molasses, bran.
- Their use is low in the rural areas due to the localization of the processing factories in urban and peri-urban areas. In consequence, the cost of transportation makes the products often quite expensive.
- Commercial farmers with purchasing power and availability of their own transport can easily have access cottonseed cake.
- The products are often exported by traders, which make them even less accessible to farmers lacking adequate infrastructure and marketing facilities.

III. IMPROVING THE SUPPLY OF QUALITY FEEDS

Successes and lessons learned in research and development efforts

Six different techniques can be considered in improving the supply of quality feeds in Burkina Faso:

1. **Hay making**
2. **Fodder crop**
3. **Concentrate feed**
4. **Urea treated straw**
5. **Supplementation with multinutritional block**
6. **Supplementation with Locally available feed resources (unconventional feed)**

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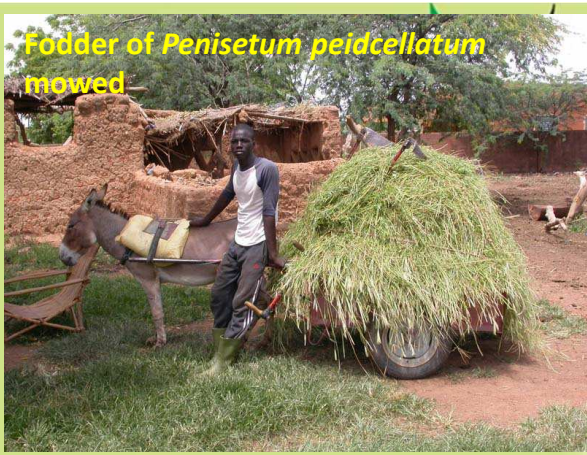
III.1. Hay making

- This technology is well known by farmers as it is popularize by the ministry in charge of animal production (MRAH); every year a competition is organized and the best haymakers are awarded;
- This activity allows a significant amount of biomass to escape bushfires, and secondly, to ensure the availability of quality fodder for the maintenance and production of animals.
- the activity is carried out, in collaboration with the Ministry in charge of the Environment in protected areas, which contribute to the promotion of sustainable management of natural resources.


Fodder of *Penisetum peidcellatum* mowed


Baling of hay


Bales of hay sell on road side

- **MRAH estimated the quantity of hay stored in 2016 to 48,211 tons;**
- **In order to allow better storage of hay, 150 fenils were built with the support of the MRAH. Mowing, packing and transport equipment was distributed also at subsidized prices.**
- **In addition to the ministry, NGOs and projects also support this activity:**
  - **APESS (association for the promotion of livestock breeding in Sahel and Savanna) organizes an annual forage fair in the North;**
  - **APIL also in the North Center supports farmers by reinforcing capacity in this technology.**

- **Research and development projects contribute in training the farmers on good practices of mowing and forage conservation.**
- **In the past, research through monthly technology review workshops provided training for extension agents who in turn trained the farmers.**

III.2. Crop fodder

- **Intensive forage production has always been a research concern in Burkina Faso.**
- **The work of the IRAT (1961-1968), then of the CERCI (1975-1981) who studied on the introduction and conducted adaptability tests of several fodder plants, were important basis for INERA, which is committed to consolidate the achievements.**

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- **The achievements focus on:**

1. **Technical references on forage plants cultivable in the BF;**
2. **Forage crop techniques for *Brachiaria ruziziensis, Dolichos lab-lab, Andropogon gayanus, Macroptilium atropurpureum*.**
3. **Forage production: *Dolichos lab-lab, Brachiaria riziziensis, Phaseolus aureus, Macroptilium atropurpureum, Cenchrus ciliaris, Stylosanthes hamata, Panicum maximum, Pennisetum purpureum, Vigna unguiculata, Cajanus cajan,* dual purpose maize;**
4. **Establishment of fodder preservation infrastructures based on local materials;**
5. **Mowing techniques and preservation of natural fodder.**

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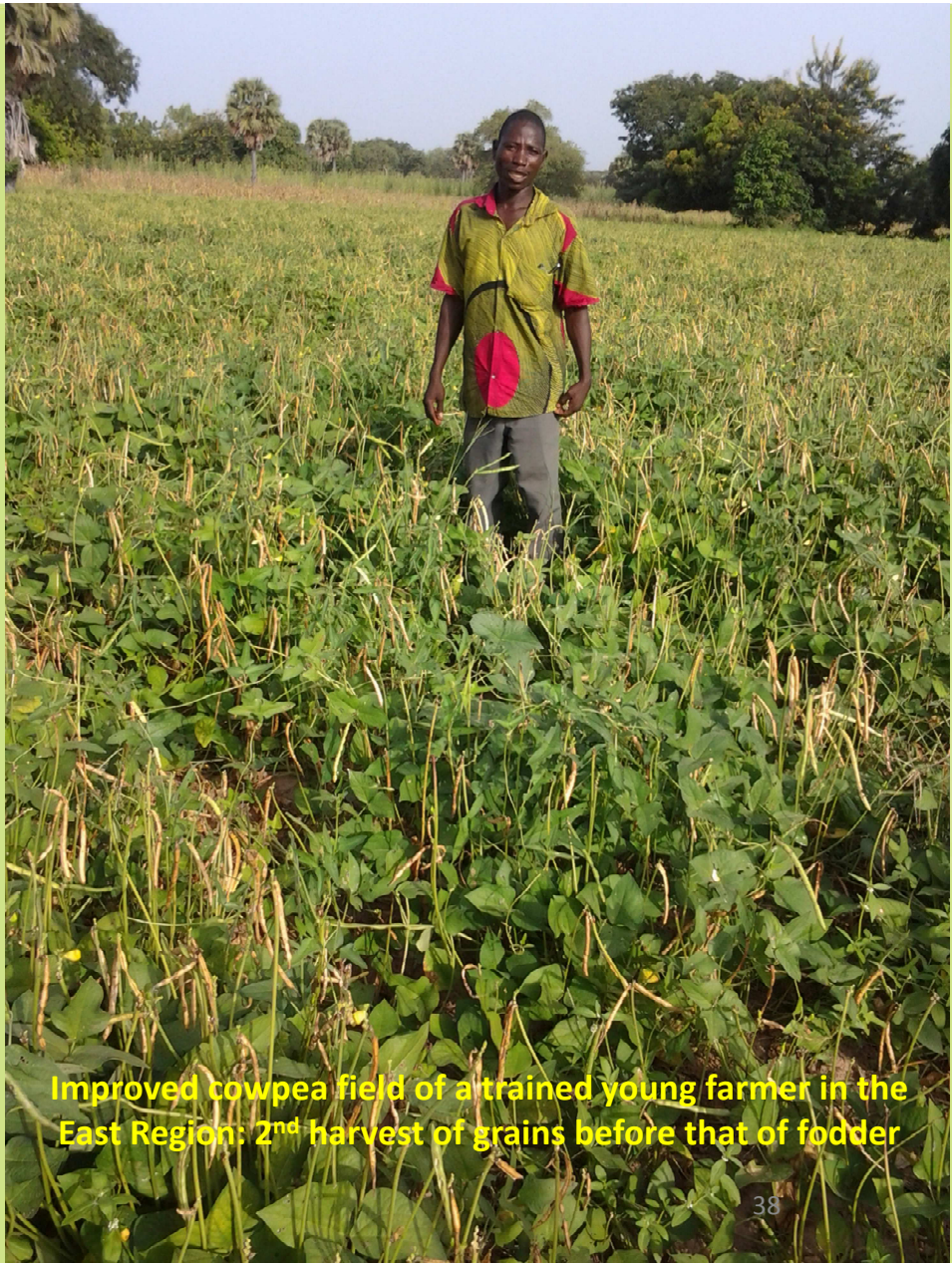
- **INERA through its regional direction of research ensures the production of basic seeds of the most requested species : *Brachiaria ruziziensis, Panicum maximum, Mucuna sp*, dual purpose sorghum, cowpea and maize;**
- **Several training sessions in the field of fodder production are given to farmers members or not of associations.**
  - **Ex: Project (PSCE) special job creation for young people and women (2012-2016) : INERA trained more than 200 participants in each of the 13 regions of the country in fodder farming techniques, mowing and conservation of fodder, allowing them to produce fodder and forage seeds for their own profit and to generate income from the sale of products.**

- The ministry support the production by providing seeds every year. In 2016, about 475 tons of fodder seeds were made available to farmers at subsidized prices;
- For the promotion of the crop-livestock integration systems, the production of dual purpose crops is encouraged:
  - the case of the SIIL project where dual purpose sorghum and cowpea seeds are distributed to producers in the project sites, to make them know these varieties and favor their adoption (quality grain and fodder).

Field of Panicum maximum at research station (Vallée du Kou)



Improved cowpea field of a trained young farmer in the East Region: 2nd harvest of grains before that of fodder

III.3. Concentrate feeds

- The main types of concentrated feeds are cottonseed cakes, cubed bran, cereal bran, compound feed, molasses and brewery malt.
- About twenty processing units of livestock feed were recorded in 2009;
  - Cottonseed cake produced by 75 per cent of the units; the factory prices vary between 53,000 and 168,000 CFA per ton.
  - Wheat bran produced by two units; the factory price ranges from 55,000 to 60,180 FCFA per ton.
  - Compound feeds provided by three units at 60,000 to 180,000 F CFA per ton.
  - Molasses is produced exclusively by the SOSUCO sugar company.
- The productions of these units are not well known.

- This production is apparently insufficient since regular imports are made from Côte d'Ivoire and Mali.
- The main supplier is SN CITEC with a livestock feed production capacity estimated at 60 000 tons per year.
- The other suppliers (small oil mills) have a very low capacity;
- Overall, Burkina Faso would produce about 150 000 tons of cottonseed cake per year.
- To support farmers, the ministry (MRAH) acquired and made available at subsidized prices 15,518 tons of SPAI in 2016;
- In addition, 1,218 tons of complete feed for poultry were made available to modern farms and producers in 2016.

III.4. Urea treated straw

- This technology, which consists in improving the nutritional value of poor forages such as cereal straws, is not well known in BF.
- Some projects as well as research contributes to training the farmers in the technique :
  - Ex. maize project on the valorization of high-yielding maize varieties (2015-2017) : organized each year training session for technical agents, agro-pastoralists in the processing of maize residues including urea treatment, into animal feed.
  - Livestock Extension Support Project (PAVE) contributed to the training and produced a documentary film on the theme which is a good tool for popularization.

III.5. Supplementation with multinutritional blocks

- **The MNB technology responds to the quantitative and qualitative shortage of fodder in the dry season, as well as the poor accessibility of agroindustrial by-products.**
- **They are intended to improve the use of roughage and poor pasture by ruminants, especially during the dry season.**
- **These blocks are homogeneous mixtures containing essential nutrients such as minerals, nitrogen, energy and sometimes vitamins.**
- **They are made from available local resources such as cereal brans, ground corn, kaolin, bone meal, pods and fodder tree leaves (*Acacia raddiana, Pterocarpus lucens, Moringa oleifera, Parkia biglobosa* etc.), which facilitates their accessibility.**

- The production costs of the MNB are very competitive, 90 to 110 FCFA / kg, compared to the industrial mineral blocks sold at 300 to 600 FCFA / kg; in addition they contain nutrients other than minerals.
- The equipment needed to manufacture the blocks is within the reach of farmers because of locally available materials.
- Research has gathered significant gains in this area, notably through the establishment of innovation platform in certain areas of the country, with the support of the government to promote the results of research.
- Projects and NGOs are also involved in the field; ex. Zébu Azawak project, partner of INERA in the animation of the innovation platform at Dori.

MNB production unit at Dori (President of the association)

III.6. Supplementation with Locally available feed resources (unconventional feed)

- **The locally available feed resources are mainly fruits and pods of trees / fodder shrubs: pods of *Acacia sp*, pulp of *Parkia biglobosa*, pods of *Piliostigma reticulatum*, ...**
- **Several works have been carried out by the research to validate the nutritional value of these products used by farmers and have given some interesting results;**
- **The use of *Piliostigma* pods is well known in many parts of the country and in some cases women collect, ground and sell as income generating activities.**

- The powder of Parkia fruit pulpe, which is also used in human nutrition, is often mixed with bran, to improve the ration of productive animals;
- The research even carried out work to add value to these resources by transforming the pods of A. raddiana into pellets like the well-known cottonseed cakes.
- Other resources concern fruit and vegetable processing by-products: the case of mango residues resulting from the manufacturing of dried mango or juice, was used in a formula incorporating peelings and mango kernels with other resources and processed into pellets.

Grounded Piliostigma pods used in ration for fattening animal

CONCLUSION

- Many efforts are being made by the public and private sectors to increase the availability of quality feed for livestock
- However, one can recognized that these efforts are not always followed by expected results, due to the low adoption of technologies by farmers for various reasons, among which the lack of knowledge on the technologies and sometime their unwillingness.
- But hope is allowed, because with the orientation of production more and more towards the market, farmers are aware of the need to change their way of doing things.

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