Livestock organic residue management in the urban and suburban area of Bobo-Dioulasso (Burkina Faso)

Gomgnimbou Alain P.K[1*], Nacro B. Hassan[2], Sedogo P. Michel[3], Martinez José[4]
*[*1]INERA/Station de recherche de Farako-Bâ, 01BP 910 Bobo-Dioulasso, Burkina Faso*
[2]Université Polytechnique de Bobo-Dioulasso, Bobo-Dioulasso, Burkina Faso
[3]INERA, Laboratoire Sol-Eau-Plante, CREAF-Kamboincin, Burkina
[4]IRSTEA, 17 avenue de Cucillé CS 64427, 35044 Rennes, France
*[*1]Corresponding author:* gpkalain@yahoo.fr

Abstract
This study done in urban and suburban zone of Bobo-Dioulasso was conducted by 233 breed farms. Results show that the breeders have some inadequate infrastructures for the manure collection. Indeed, 83.69% of the farmers abandon manure in the open air and 16.31% have some built excrement tanks with an evacuation frequency of 12±20.
In the relation witch the types of improving the image of manure, four types of improving manure were identified. They are fertilizing fields (53%), selling (25%) to market gardeners, to cereal gardeners and to tree nursery men, exchanging against the agricultural products and some agricultural sub products(18%) and producing biogas (4%).
The management of the organic residues causes some environmental and sanitary problems to the farms residents who dread the smelling, the noise and the mosquitoes increasing.

Introduction
The breeding system nowadays enables to the developing countries to have low cost access to animal protein. Indeed, many recent publications insisted on the key roles that are supposed to be under the responsibility of husbandry for developing agriculture in the Third-World countries [1; 2].
At that respect, even talk about revolution within the livestock sector particularly at cities' borders to support population growth and moreover urbanization [1]. Indeed, in the context of the growing urbanization, two main issues emerge: food supply to urban people and create employment opportunities. The suburban livestock contributes to address these major issues [3; 4].
In general, the option favoring the semi-intensive systems require to guarantee an annual growth of these systems that are less realistic.
Despite the important roles urban livestock is playing, its practice in urban and suburban areas is raising many concerns about nature [5; 6]. These concerns are on one hand nuisance (bad smelling, noise, dirtiness, etc.) and on the other hand, water and air pollution.
The present study focused on the environmental and health problems caused by manure management in the area of Bobo-Dioulasso.

Material and methods

Study area
This study is carried out in the area of Bobo-Dioulasso, located at 365 km far from Ouagadougou (capital city of Burkina Faso). Benefiting from climate of Sudanian type characterized by annual rainfall ranging between 800mm and 1,100mm, the site temperature is between 25 ° C and 30 ° C [7]. In the area, 457 cattle farms and approximately 623 of pigs were identified including 15% of intensified farms [8]. .

Data collection and analysis
Data were collected in 2011 thanks to an exploratory survey in 233 urban and suburban farms (cattle, pigs, sheep, and poultry) in order to make the diagnosis (Table 1). The survey was done in one time and the interest points retained kept with the study objective. In total, 192 urban farms and 41 suburban farms have been diagnosed.

Table 1: sample distribution per farm and per species

Species	Number of farm	Frequency (%)
Pig	82	35.19
Cattle	68	29.18
Chicken	40	17.17
Sheep	39	16.74
Goat	4	1.72
Total	**233**	**100.00**

Results

Waste collection and operations

Existing feces collection material is summed up in Table 2. The results point out that farmers own equipment and infrastructure that are inadequate to collect the produced waste. In fact, 83.69% of farmers abandoned the waste in open air whereas 16.31% have constructed manure pits including evacuation frequency of 5 ± 11 for all the surveyed farms. However, the monthly evacuation of manure pit is higher in urban areas (7 ± 16) than in suburban (2 ± 4).

Table 2: Collection and management mode of manure at farm's level

	Variable	Urban	Suburban	Sample
Storage mode of manure	Open air and abandon	80.73%	97.56%	83.69%
	Manure pit	19.27%	2.44%	16.31%
	Number of excreta removed per month	7±16	2±4	5±11
Drainage mode of waste (%)	Channel toward pit	4.38%	7.23%	5.56%
	Outside enclosure	67.27%	32.44%	61.12%
	Roofless enclosure	6.20%	-	4.13%
	Not determined	23.15%	61.23%	29.19%
Litter	No litter	86.98%	79.27%	85.62%
	Presence of litter	13.02%	20.73%	14.38%
	Monthly number of litter change	13±20	1±1	12±20

Management and valorization practice of manure

Management and valorization modes of manure are analyzed in table 3 with respect to farm geographical location. Reading this table shed light on seven (7) forms of animal excreta valorization. The most common are fertilizing fields (61.97%), selling to market gardeners (23.32%), to cereal gardeners and to tree nursery men, as gift, exchanging against agricultural products and producing biogas.

Table 3: Destination of manure

Management choice	Urban (%)	Suburban (%)	Sample (%)
Fertilizing fields	59.90	71.95	61.97
Selling	22.84	25.61	23.32
Gift	7.11	-	5.88
Thrown away	4.06	-	3.36
No precise destination	3.05	2.44	2.94
Biogas production	2.53	-	2.10
Barter for getting back agricultural products	0.51	-	0.42

Issues generated from the manure production

Animal waste production derived on environmental and sanitary issues experienced by farmers through bad smelling, noise, and mosquitoes increasing. These problems that are similar to nuisance are stated on table 4. From the analysis, it is revealed that 58.37% of the entire people surveyed assert to do not perceive harmful aspects of their activities. In urban area, the non-perception of nuisance is however higher in urban (69.79%) than in suburban area (4.88%).

All these nuisances mentioned are also perceived by residents neighboring the livestock units. So to speak, flies, bad smelling emission and noise remain the concerns expressed by the neighboring residents and that are risky factors to the development of their business.

Table 4: Perception of bad effects by breeders

Type of bad effects	Urban (%)	Suburban (%)	Sample (%)
None	69.79	4.88	58.37
Not determined	12.50	17.07	13.30
Flies	7.81	31.71	12.02
smelling	6.25	21.95	9.01
Noise	3.65	24.39	7.30

Discussion

Analysis of the collection and management modes of manure at farm levels indicates that the open air is the most common in urban as well as in suburban areas. This highlights the shortness in adequate storage equipment of manure. This practice already highlighted is supportive to bad smelling emission [9; 10]. Indeed, to avoid nuisances particularly related to bad smelling emission, storing manure in pits is critical [11; 12; 13].

The use of manure to fertilize fields is approximately of 59.90% in urban area and of 71.95% in suburban breeders. These figures point out that livestock and agriculture are practiced in urban and suburban farms and that they are contributing to address social and economical issues [6; 14].

In addition, the monthly number of changing litter reaches 13±20 in urban area and that of suburban is only of 1±1. The high frequency of removing manure in urban area is practiced to avoid gathering huge amount of effluent that would cause nuisance and increase in mosquitoes. Many questions have been already asked about the negative environmental impacts caused by waste and manure. Work of [15; 3; 10; 16; 17; 18] emphasized water and soil pollution and bad smelling nuisance due to livestock units.

Conclusion and perspectives

The present study points out that the urban and suburban livestock of Bobo-Dioulasso is characterized by wide diversified aspects. Environmental diagnosis revealed typology of problems and constraints due to the insertion of this activity in its area. In fact, farms do not have manure storage infrastructure and pollution produced by the improper elimination of manure is an environmental issue. However, maintaining the balance between urbanization and livestock is possible [2]. Thus, all the field actors must absolutely and necessarily adopt integrated and concerted approach capable to not only improve the performance of the production systems and reduce bad effects and health risks, but also to consider livestock production in urban development plans.

Undoubtedly, an attempt to intensify livestock without acquiring the infrastructure necessary to control the issues related to effluents elimination may be the cause of multiplication and amplification of the pollution phenomena.

References

[1] Delgado C., Rosegrant M., Steinfeld H., Ehui S., Courbois C., 1999. Livestock to 2020. The next food revolution. Publ. IFPRI, Washington, USA, 17 p.

[2] Faye B., Alary V., 2001. Les enjeux des productions animales dans les pays du Sud. INRA Prod. Anim., 14, 3-13.

[3] FAO., 2006. Livestock's long shadow. Environmental issues and options. Rapport de la FAO 2006.391p
[4] Metzger R, Centres J.M, Thomas L, Lambert J.C, 1995. L'approvisionnement des villes africaines en lait et produits laitiers : un potentiel pour le développement rural. Études FAO, Production et santé animales. Rome : FAO, 1995 ; 124 : 101 p.
[5] Akinbamijo O.O, Fall S. T., Smith O. B., (éd.), 2002. *Advances in crop-livestock integration in West African cities*. Dakar, ITC/ISRA/CRDI, 213 p.
[6] Mbaye A, Moustier P., 2000. Market-oriented urban agricultural production in Dakar. In: *Growing cities, growing food: Urban agriculture on the policy agenda*. Feldafing (Allemagne): DES, 2000: 235-56.
[7] MED, 2005. Profil des régions du Burkina Faso. Document de synthèse, Ouagadougou, Burkina Faso, 282 pages.
[8] Hamadou S., Kamuanga., Marichatou. H, Kanwé A., Sidibé A. A, Pare J., 2002. Diagnostic des élevages périurbains de production laitière : Typologie des exploitations de la périphérie de Bobo-Dioulasso, Etude socio-économiques. Document de travail N°1, CIRDES Bobo-Dioulasso, 56p.
[9] Vua T.K.V., Tranb M.T., and Dangc T.T.S., 2007. A survey of manure management on pig farms in Northern Vietnam. Livestock Science 112 (2007) 288–297.
[10] Marquis A., Marchal P., 1998. Qualité de l'atmosphère à proximité des bâtiments d'élevage. Cahiers Agricultures 1998 ; 7 : 377-85.
[11]Burton C., Jaouen V., Martinez J., 2007. Traitement des effluents d'élevage des petites et moyennes exploitations. Eds QUAE, ISSN 1952-2770. France, 42 pages.
[12] Martinez J., Dabert P., Barrington S., Burton C., 2009. Livestock waste treatment systems for environmental quality, food safety, and sustainability. Bioressource Technology 100 (2009) 5527-5536.
[13] Martinez J., LE bozec G., 2000. Déjections porcines et problèmes environnementaux en Europe. Cahiers d'étude et de recherche francophone/agriculture. Vol 9, N°3, 181-190.
[14] Ly C., Diaw A., Faye A., 1997. Étables fumières et production laitière au Sénégal. *Cahiers Agricultures* 1997 ; 6 : 561-9.
[15] Mawdsley J. L and al. 1995. Pathogens in livestock waste, the potential for movement through soil and environment pollution. Applied Soil Ecology 2(1995) 1-15.
[16] Beopoulos N., 1997. L'intensification de l'agriculture grecque et les problèmes de l'environnement. Document CIHEAM-IAMM, 1997.Série B N'12. Etude et recherches. P.217-224
[17] Gangbazo G., Couillard D., Pesant A.R., Cluis D., 1993. Effets du lisier de porc sur la charge d'azote et de phosphore dans l'eau de ruissellement sous pluies simulées. Canadian Agricultural Engineering 35:097-103.
[18] Ding W., Yagi K., Cai Z., Han F., 2010. Impact of Long-Term Application of Fertilizers on NO and NO Production Potential in an Intensively Cultivated Sandy Loam Soil Water Air Soil Pollut (2010) 212:141–153.