

Jana Publication & Research

Characteristics of feed production for intensive broiler breeding in Burkina Faso: the case of the of OUAGADOUGOU ...

 VRC40

 BioTech

 Institut Seni Indonesia Surakarta

Document Details

Submission ID

trn:oid:::1:3429201843

Submission Date

Dec 1, 2025, 2:46 PM GMT+7

Download Date

Dec 1, 2025, 3:46 PM GMT+7

File Name

IJAR-55022.pdf

File Size

704.8 KB

16 Pages

5,400 Words

26,641 Characters





10% Overall Similarity

The combined total of all matches, including overlapping sources, for each database.




Filtered from the Report

- Bibliography
- Quoted Text

Match Groups

-  **27 Not Cited or Quoted 7%**
Matches with neither in-text citation nor quotation marks
-  **9 Missing Quotations 3%**
Matches that are still very similar to source material
-  **0 Missing Citation 0%**
Matches that have quotation marks, but no in-text citation
-  **0 Cited and Quoted 0%**
Matches with in-text citation present, but no quotation marks

Top Sources

- 9%  Internet sources
- 7%  Publications
- 2%  Submitted works (Student Papers)

Match Groups

- 27 Not Cited or Quoted 7%**
Matches with neither in-text citation nor quotation marks
- 9 Missing Quotations 3%**
Matches that are still very similar to source material
- 0 Missing Citation 0%**
Matches that have quotation marks, but no in-text citation
- 0 Cited and Quoted 0%**
Matches with in-text citation present, but no quotation marks

Top Sources

- 9% Internet sources
- 7% Publications
- 2% Submitted works (Student Papers)

Top Sources

The sources with the highest number of matches within the submission. Overlapping sources will not be displayed.

1	Internet	www.european-poultry-science.com	<1%
2	Internet	www.researchsquare.com	<1%
3	Publication	Kanté-Traoré Hyacinthe, Inoussa Ky, Jean Axel T. Kaboré, Micheline Millogo, Ella R...	<1%
4	Internet	hal.science	<1%
5	Internet	docs.lib.purdue.edu	<1%
6	Internet	assets-eu.researchsquare.com	<1%
7	Internet	www.frontiersin.org	<1%
8	Internet	www.pure.ed.ac.uk	<1%
9	Publication	Hassane Ouédraogo, Blaise Kabré, Benjamin Lankoandé, Anne Mette Lykke, Ama...	<1%
10	Internet	www.scirp.org	<1%

11	Internet	www.mdpi.com	<1%
12	Internet	1library.net	<1%
13	Internet	refubium.fu-berlin.de	<1%
14	Internet	www.p4arm.org	<1%
15	Internet	dspace.lboro.ac.uk	<1%
16	Internet	www.fao.org	<1%
17	Internet	www.scielo.br	<1%
18	Internet	www.veterinarypaper.com	<1%
19	Internet	dicames.online	<1%
20	Internet	iksadyayinevi.com	<1%
21	Internet	ohada.org	<1%
22	Internet	www.overbergagri.co.za	<1%
23	Publication	Mamadou Abdoulaye Konare, Cheickna Cisse, Nouhoum Diarra, Marius K. Somda,...	<1%
24	Publication	Michel Dione, Guy Ilboudo, Abdoul Aziz Ouedraogo, Sidonie Aristide Ima et al. "C...	<1%

25

Publication

"Equine nutrition", Walter de Gruyter GmbH, 2015

<1%

Characteristics of feed production for intensive broiler breeding in Burkina Faso: the case of the city of OUAGADOUGOU

Abstract:

Background: One of the major constraints of intensive peri-urban poultry farming in Burkina Faso is the loss of production and mortality of broilers, frequently linked to problems of nutritional feed quality. The aim of the present study was to characterize the quality of feed produced for broiler rearing in the peri-urban zone of the city of Ouagadougou.

Methods: In fact, a survey was carried out among the main feed manufacturers in order to inventory the different types of feed produced, and to take samples of these products for laboratory analysis. A total of 83 feed samples were collected and analyzed using standard methods to determine their bromatological and mineral compositions.

Results: Analysis of the feeds studied showed that the energy, protein, calcium and phosphorus contents were globally higher than those recommended in the literature. Average Crude protein (CB) levels were 21.13 ± 3.63 , 17.61 ± 5.64 and $20.43 \pm 4.41\%$ for the starter, grower and finisher phases respectively. Mean ME values were 3745.67, 3704.92 and 3704.92 kcal/kg DM for starter, grower and finisher feed respectively. Phosphorus levels were 4.78 ± 2.16 , 5.35 ± 1.97 and 4.63 ± 1.79 g/kg DM for the starter, grower and finisher phases respectively. Calcium levels were 11.38 ± 2.29 , 8.15 ± 3.75 and 8.94 ± 3.25 g/kg DM for the start-up, growth and finishing phases respectively.

Conclusion: These various results could be used as a referential for the animal feed industry and Burkinabe government officials responsible for monitoring and inspecting feed to ensure it meets nutritional and health standards.

Keywords: Intensive poultry farming, nutritional problems, feed raw materials, mineral sources, feedstuffs, Burkina Faso

1. Introduction

In Burkina Faso, the poultry flock is estimated at over 44 million head and the production segment of the sector involves nearly 1.6 million households[1]. It is the main source of income for over 86% of rural households. Its products are used to supplement cereals in the

human diet and help meet protein requirements[2–4]. Three systems coexist in poultry farming in Burkina Faso: extensive, semi-intensive and intensive one[5,6]. In the semi-intensive and intensive systems, poultry production requires special management, due to its more than commercial objective[7]. Semi-intensive and intensive poultry farming practices are particularly prevalent in peri-urban areas. On these improved farms, birds are raised in almost complete confinement and are unable to roam freely in nature searching for nutrients that are missing from their basic feed. In poultry farming, feed is the main factor affecting economic profitability, as it can account for 70% of variable costs [8]. High-quality feed is therefore a key factor in the success of modern poultry farming. Feed must provide the nutrients needed to cover the nutritional requirements of poultry in line with production targets[9]. They must also contain the required quantity and balance of nutrients known as protective and metabolism-activating nutrients, such as minerals. Calcium and phosphorus are the main minerals most widely distributed in the chicken body. Bones serve as a mineral reservoir in chickens, and the recovery of calcium and phosphorus from the diet plays an essential role in maintaining biological homeostasis[10].

Trace elements such as zinc, copper, iron, selenium and manganese play vital roles in animal growth and metabolism [11,12]. Suboptimal levels or unbalanced incorporation of these nutrients in poultry feed cause declines in production or lead to mortality. This considerably limits the zoo-economic yields of poultry farms, particularly those for meat production[13]. A Contrarious, for the majority of modern poultry farms in Burkina Faso, the supply of poultry feed remains highly varied in sources and their quality poorly controlled. The aim of the present study was to contribute to a better characterization of the nutritional potential of feeds for poultry on intensive peri-urban farms in Ouagadougou.

2. Materials and methods

2.1 Data collection from feed mills

Surveys were conducted among the main feed manufacturers. The choice of these feed manufacturers focused on those who were in compliance with the regulations of the Ministries in charge of animal and fisheries resources and industry, trade and handicrafts, and who were listed in the databases of these two ministerial departments. Eight (8) feed mills were selected for the surveys. Using survey forms, these eight (8) feed mills were initially asked to collect

data identifying the factory unit, and to inventory the different types of feed produced for broiler feed. Data were also collected on how these products were packaged and stored. Feed samples were taken using a ladle for laboratory analysis. The sampling was preceded by the operator wearing protective gloves, and between successive samples, the measuring cup was thoroughly cleaned. Samples were immediately stored in a Ziplock bag and labelled according to pre-established codes for each sampling site. A duly completed sampling sheet was used to record information on the targets and food samples collected. A total of 83 feed samples were collected for laboratory's analyses.

2.2. Laboratory's analyses:

The parameters analyzed in the laboratory were: dry matter (DM), total nitrogen matter or Crude protein (CP), fat matter (FM), crude cellulose (CC), mineral matter (MM) or crude ash, phosphorus (P), calcium (Ca), zinc (Zn), copper (Cu) and iron (Fe) for feed only.

The determination of dry matter (DM) and mineral matter (MM) was based on AOAC standard methods (AOAC, 1984).

Dry matter was determined after oven-drying 2.5 g of the sample for 12 hours at 105°C. After drying, the sample was weighed to determine DM.

For crude ash (total mineral matter), feed samples were weighed and placed in an electric muffle furnace at 550°C for 3 hours, and the products obtained were weighed and expressed as relative dry matter values for each sample.

Nitrogenous matter was determined using the method of [14], which involves mineralizing the samples with sulfuric acid (95%) at 480°C for 167 min in the mineralizer, distilling using a distillation apparatus and titrating the distillates.

Fats were dosed using the [15] method, in accordance with ISO 659[16] using di-ethyl ether as the solvent [17].

Calcium, zinc, copper and iron were determined by atomic absorption spectrophotometry (AAS), using the Perkin Elmer AAS 300 Equipment, according to Beer-Lambert's law. One (1) ml of extract is diluted with 10 ml of 1% lanthanum solution. The diluted solution is then run through the AAS 300 to determine the above-mentioned elements [18].

P levels in the mineralization were determined using a manual colorimeter in the presence of potassium tartrate antimony and ammonium molybdate as indicator.

Determinations of DM, CP, CC and MM were carried out at the Laboratory of Research in Animal Production and Health (LaRePSA) of the Institute of the Environment and the Researches on Agriculture (INERA) of the National Center for Scientific and Technological Research (CNRST) of Burkina Faso.

Fats were determined at the laboratory for feed biotechnology (LBTA) of the Institute for Research in Applied Sciences and Technology (IRSAT) of the National Center for Scientific and Technological Research (CNRST).

Mineral analyses were carried out at the Bureau National des Sols (BUNASOL) laboratory of the Burkina Faso Ministry of Agriculture, Animal and Fisheries Resources (MARAH) of Burkina Faso.

For the determination of feed energy, two (2) equations reported by [19] were used, one applying to simple feeds (raw material feeds) for the determination of gross energy (GE) and the other applying to compound feeds (feeds from poultry feed manufacturers) for the determination of metabolizable energy (ME).

The equation of [20] was used to determine the gross energy (GE) of feedstuffs:

$$GE = 57.2 \times CP + 95.0 \times FM + 47.9 \times CC + 41.7 \times NNE + \Delta t, \text{ (in kcal/kg)}$$

With:

GE = gross energy (in kcal/kg)

CP = crude protein (in p.100)

FM = fat (in p.100)

CC = crude cellulose (in p.100)

134 NNE = non-nitrogenous extractive (in p.100)
 135 Δt = correction factor for certain raw materials
 136
 137 Sibbald's equation (1982) was used to determine the metabolizable energy (ME) of compound
 138 feeds:
 139
 140 $ME = 3951 + 54.4 \times FM - 88.7 \times CC - 40.8 \times CA$, (in kcal/kg DM)
 141 With:
 142 FM = fat (in p.100)
 143 CC = crude cellulose (in p.100)
 144 CA = crude ash (in p.100)
 145 DM = Dry mater
 146

147 2.3. Statistical analysis of data

148
 149 All the parameters collected were entered into a Microsoft Excel spreadsheet to constitute a
 150 database. Frequencies were generated using Excel's pivot table method. Means and standard
 151 deviations of the parameters studied were obtained using the descriptive method of SPSS
 152 version 21 software.

154 3. Results

156 3.1. Characteristics of the producers involved in poultry feed production and their 157 production's units

158
 159 Almost all the feed mill owners surveyed were men. They had all benefited from formal
 160 education. Indeed, 87.5% had higher education and 12.5% had secondary education. Thirty-
 161 eight percent (38%) were aged between 20 and 40, and 62% between 40 and 60. Most of the
 162 poultry feed mills surveyed were located in the Ouagadougou communal area. Indeed, 94% of
 163 these industrial units were located in the commune of Ouagadougou, compared with just 6%
 164 in the commune of KOUBRI, 25 km from the city of OUAGADOUGOU. Seventy-five
 165 percent (75%) of the mills surveyed had the status of « Limited Liability Company (LLC) »,
 166 while the remaining 25% were « Anonymous Societies (AS) ».

167
 168 Most of the feed mills surveyed indicated that they used software to formulate their feeds, and
 169 that they also relied on the expertise of third persons. They declared that they had carried out
 170 quality controls on their feeds by having them analyzed by certain local laboratories. Only one

factory in the survey had its own analysis laboratory, but with very limited functionality in terms of quality control, particularly with regard to the diversity of nutrients to be determined. Most of the feed produced (62.5%) was in pellet form, with the remainder (37.5%) in powder form. These feeds were packaged in 25-50 kg bags for sale. Storage time for these feeds was estimated at between 7 and 10 days maximum.

All the factories visited were operating below their production capacity, which, according to the information gathered, ranged from 3,000 to 35,000 tons a year. Maximum annual production actually achieved at the time of the investigation and reported was 5,000 tons on average per Mill.

3.2. Broiler feeds from surveyed feed mills and their nutritional qualities

Three (3) types of broiler feed were identified from the feed mills surveyed. These were starter feed, grower feed and finishing feed. Six (6) of the eight (8) feed mills surveyed produced their broiler feed according to the three (3) physiological stages: start-up, growth and finishing. The other two (2) mills only produced feed corresponding to two phases, i.e. start-up and growth-finish.

All the three (3) feed types surveyed and analyzed had DM contents above 90%. The average of CP rates measured were 21.13 ± 3.63 , 17.61 ± 5.64 and $20.43 \pm 4.41\%$ respectively for the start-up, growth and finishing phases (Table 1). Mean ME values were 3,745.67, 3,704.92 and 3,704.92 kcal/kg DM for starter, grower and finisher feed respectively. The fat contents evaluated were 7 ± 4 ; 8.08 ± 4 ; $7 \pm 2\%$. Mean CC values obtained were 3.42 ± 1.71 ; 3.53 ± 2.47 ; $4.14 \pm 2.47\%$ for the starter, grower and finisher phases respectively.

In terms of the mineral content of the meat feeds analyzed (Table 2), phosphorus levels were 4.78 ± 2.16 (approx. 0.5%); 5.35 ± 1.97 (0.54%) and 4.63 ± 1.79 g/kg DM (0.5%) for the start-up, growth and definition phases respectively. Calcium ratios were 11.38 ± 2.29 (1.4%); 8.15 ± 3.75 (0.82%) and 8.94 ± 3.25 g/kg DM (0.9%) for the start-up, growth and definition phases respectively. Phospho-calcium (Ca/P) ratios were 2.31 ± 0.90 ; 1.64 ± 1.14 and 1.89 ± 0.71 for the start-up, growth, and finishing phases, respectively.

Average zinc levels for starter, grower and finisher feed were 85.25, 113.54 and 250.57 ppm respectively. Copper rates were 13.61, 11.72 and 9.65 ppm respectively.

204
205 **Table 1.**Organic composition of broiler chicken feed from the feed mills surveyed (Means,
206 maximum, minimum)
207

Feeding Phases		DM (%)	CA (%)	CP (%)	CC (%)	FM (%)	ME (kcal/kg)
Startup	means	91.73	8.35	21.13	3.42	7	3745.6
		N (37)	N (37)	N (37)	N (37)	N (37)	N (37)
	maximum	93.17	11.68	24.76	5.13	11	4026.5
	minimum	90.29	5.02	17.5	1.71	3	3464.8
Growth	means	90.57	11.22	17.61	3.53	8.04	3704.9
		N (26)	N (26)	N (26)	N (26)	N (26)	N (26)
	maximum	98.55	16.2	23.25	6	12.04	3986.5
	minimum	82.59	6.24	11.97	1.06	4.04	3423.3
Finish	means	91.9	10.1	20.43	4.14	7	3692.1
		N (20)	N (20)	N (20)	N (20)	N (20)	N (20)
	maximum	94.3	13.2	24.84	6.61	9	4002.4
	minimum	89.5	7	16.02	1.67	5	3381.8

13 08 **DM:dry matter, CA:crude Ash, CP:crude protein, CC:crude cellulose, FM: fat matter,**
209 **ME:metabolizable energy, N:number of Samples**

210
211
212 **Table2.** Mineral composition of broiler chicken feed from the feed mills surveyed (Means and
213 SDs)

Feeding Phases	P (g/kg)	Ca (g/kg)	Cu (mg/kg)	Zn (mg/kg)	Fe (mg/kg)	Ca/P
Startup	4.78±2.16	11.38±2.29	13.61±2.24	85.25±6.54	463±158	2.31±0.90
	N(37)	N(37)	N(37)	N(37)	N(37)	N(37)
Growth	5.35±1.97	8.15±3.75	11.72±1.83	113.54±29.41	205.03±126.06	1.64±1.14
	N(26)	N(26)	N(26)	N(26)	N(26)	N(26)
Finish	4.63±179	8.94±3.25	9.65±1.51	250.57±96.14	1077±207	1.89±0.71
	N(20)	N(20)	N(20)	N(20)	N(20)	N(20)

214 **P:Phosphorus; Ca:calcium;Cu:copper;Fe:iron;N: numberof Samples, Ca/P: ratio**
 215 **calcium/phosphorus**

216
 217
 218
 219

4. Discussion

4 20 The results of the study show that almost all the feed mill managers surveyed were men. This
 221 situation highlights the particular nature of this sector of economic activity in Burkina Faso,
 222 linked to the importance of the working time to be devoted to it and the financial capacity to
 223 be satisfied. Indeed, setting up an industrial unit such as a feed mill requires a significant
 224 investment of time and funds, which are not always affordable for women[21]. The food
 225 industry also requires a certain maturity in age and a good level of education. In fact, feed mill
 226 management must be carried out by people who are qualified in feed and in the nutritional and
 227 sanitary quality of feed, and therefore those who have benefited from training or appropriate
 228 technical skills in the field [22].

230 The 75% of factories surveyed were Limited Liability Companies (LLCs), compared with
 231 25% that were Anonymous Societies (ASs). In Burkina Faso, the status of a Limited Liability
 232 Company (LLCs) requires a minimum social capital of one hundred thousand (100,000) CFA
 233 francs[23], while the status of an Anonymous Societies (ASs) requires the owner to have a
 24 share capital of one hundred million(100,000,000) CFA francs in the case of a public offering,
 235 or ten million (10,000,000) CFA francs otherwise[24] . The fact that it is relatively easier to
 236 raise share capital for the creation of limited liability companies (LLCs) could partly explain
 237 their predominance compared with Anonymous Societies (ASs).

239 The results show a degree of professionalism among the feed mill operators surveyed, through
 240 the use of ration/feed formulation software and the expertise of animal nutrition and feed
 241 technology specialists. The actors surveyed are well aware of the importance of a quality feed
 25 42 supply. To this end, they determine and control the chemical composition of their feeds in the
 243 laboratory. Some of them have even set up "pseudo laboratories" to control the quality of their
 244 products. Such is the case of the "Société de Fabrique d'Aliments pour Bétail
 245 (SOFAB)" company.

In addition, most of these feed mills try to produce feed to the best possible satisfaction of their customers (breeders), taking into account the three critical phases of broiler physiological needs: start-up, growth and finishing. The feeds produced also have a good level of dry matter content, making them easy to store for healthy poultry feeding.

The CP levels obtained from the present study are slightly close to the recommended standards for starter feed, which range from 21 to 23.7%, and finishing feed, which vary from 16 to 20% [19,25]. On the other hand, the values of this parameter for the growth phase (17.61% on average) remain slightly below those recommended in the literature, which vary from 18 to 21%. It is recognized that the reduction in protein content in broiler chicken feed is a major issue affecting the performance of the birds and the sustainability of poultry farming[26–28].

The metabolizable energy (ME) values obtained from the present study are higher than those usually recommended, which average 2,750 to 3,200 kcal/kg DM for starter feed, 2,900 to 3,200 kcal/kg DM for grower feed and 2,700 to 3,200 kcal/kg DM for finisher feed[19,25,29]. However, in tropical zones where temperatures are high, poultry still have lower energy requirements than those living in temperate environments [30]. To achieve this, they limit their feed and energy intake, in order to maintain their body temperature at a normal 42°C[31]. In addition, a high-energy diet can induce greater fat deposition and limit the quality of chicken carcasses produced for consumers. In the tropics, 3000 kcal/kg would appear to be the ideal energy level for good growth performance [32]

The results of chemical analyses show that, overall, the phosphorus and calcium content of the feed studied is inappropriate. However, an excessive or insufficient intake of either of these two minerals generally inhibits the effective use of the other, which can cause nutritional problems in chickens [33]. Calcium and phosphorus are the most important minerals in poultry nutrition, especially for broilers (rapid growth) where good skeletal mineralization is important to avoid problems of lameness or joint deformities [34]. They are involved in humoral balance and bone formation during growth. For this reason, it is recommended to have a calcium-phosphorus ratio that is favorable to good bone retention, which should be between 2 and 3[19,35,36]. However, the results obtained from our study also show

unattractive calcium-phosphorus ratios, especially those for the growth and finishing phases, which are 1.64 and 1.89 respectively.

The levels of trace elements measured in this study (Zn, Cu and Fe) exceeded the recommended values, i.e. they were in excess of these values. These results could be the consequence of excessive or abusive use of mineral supplements by feed mills, particularly iron sulfate and premixes, as the results showed. Trace elements play an important role in the life and metabolism of birds, and their deficiencies or excesses are the cause of many diseases and abnormalities[37,38]. It should also be noted that most of the trace elements ingested, in quantities generally in excess of the animal's requirements, are excreted and may pose a risk to the environment [12].

5. Conclusion

The results of the study show that the factories that produce feed for poultry in Burkina Faso are almost exclusively run by men who are trying to professionalize in their own way in order to best satisfy their customers, who are mainly poultry farms. In fact, they produce and take into account the physiological phases of broiler poultries.

Apart from crude protein (CP) content, most of the feed from the factories studied had chemical compositions that were either deficient or excessive in relation to the required standards. This requires paying particular attention to the actors involved in order to help them adjust their diets and make them more balanced and high-performance. To achieve this, research could contribute its expertise by studying and optimizing the effectiveness of these feeds from the feed mills studied. In the meantime, the results obtained from this study could serve as a reference for the animal feed industry and for Burkinabe Government officials responsible for monitoring and inspecting feed quality at the national scale.

Acknowledgements

We thank also the FONRID (Fonds National de la recherche et de l'Innovation pour le développement) for the technical support.

309 Data Availability

310 The datasets used and/or analyzed during the current study are available from the
311 corresponding author upon reasonable request.

2 12 Authors' Contributions

313 Conceptualization, data curation, methodology, writing-original draft, writing-review and
314 editing: ZAMPOU Yasmine Jessica Irène, GNANDA Bila Isidore. For the formal analysis
315 ZARE Yacouba, KY Inoussawere responsible. For the investigation, supervision, validation
316 and visualization TRAORE Boureima, ZONGO Moussa were responsible.

10 17 Conflicts of Interest

318 The authors declare no conflicts of interest regarding the publication of this paper.

319 320 References

- 321
- 322 1. FAO. Le devenir de l'élevage au Burkina Faso. Défis et opportunités face aux
323 incertitudes. (2019) 56 p. ISBN 987-92-5-131541-5
 - 324 2. Addass, P.A., David, D.L., Edward, A., Zira, K.E. and Midau, A. (2012)Effect of Age,
325 Sex and Management System on Some Haematological Parameters of Intensively and
326 Semi-Intensively Kept Chicken in Mubi, Adamawa State. Nigeria. *Iranian Journal of Applied*
327 *Animal Science*. **2** (3), 277-282. ISSN : 2251-631X
328 <http://ijas.ir/main/modules/content/index.php?id=318>
329
 - 330 3. Mweugang, N., Nkana, K. G., Miégoué, E., Efiriya, C., Njintang, Y. and Fonteh, A. F.
331 (2021) Effect of meal from the leaves of Manihot esulenta and Tithonia diversifolia as a
332 protein substitute to soybean cake in the diet on growth and laying performances, egg
333 quality of local hen (Gallus gallus) in the Sudano-guinean zone. *International Journal of*
334 *Agronomy and Agricultural Research*,**18**, (5) 1-12, ISSN: 2223-7054 (Print) 2225-3610
335 (Online) <http://www.innspub.net>.

- 336 4. Zongo, R.T., Kiema A. and Zongo, A. (2024) Effets des techniques de stockage et de
337 conservation du maïs (Zeamays) sur les performances zootechniques et économiques des
338 poulets de chair au Burkina Faso. *Journal of Animal and Plant Sciences*, **62**(1),
339 11487-11499. <https://doi.org/10.35759/JAnmPlSci.v62-1.8>
- 340 5. Pinde, S., Tapsoba, A.S.R., Traoré F., Ouédraogo, R., Ba, S. and Sanou, M.(2020)
341 Caractérisation et typologie des systèmes d'élevage de la poule locale du Burkina Faso.
342 *Journal of Animal and Plant Sciences*, **46**(2), 8226-8239.
343 <https://doi.org/10.35759/JAnmPlSci.v46-2.6>
- 344 6. Guisso Taffa, A., Moula, N., Issa, S., Mahamadou, C. and Detilleux, J. (2022)
345 Phenotypic Characterization of Local Chickens in West Africa: Systematic Review. *Poultry*,
346 **1**(4), 207-219. <https://doi.org/10.3390/poultry1040018>
- 347

348 7. Logtene, Y.M. and Awa, D.N. (2009) Systèmes avicoles en zone de savanes
349 d'Afriquecentrale: performances zootechniques et importance socio-économique. In:
350 Savanes africaines en développement: innover pour durer. Cirad. 11-p.
351 <https://hal.science/cirad-00472067/>
- 352 8. Oladokun, V.O. and Johnson, A. (2012)Feed formulation problem in Nigerian poultry
353 farms: a mathematical programming approach. *American journal of scientific and industrial
354 research*, **3**(1), 14-20. <http://www.scihub.org/AJSIR> ISSN: 2153-649X
355 doi:10.5251/ajsir.2012.3.1.14
- 356

357 9. Saxena, P., Pathak, V. and Kumar V., (2013) Algorithm for Animal Diet Formulation. *Anim
358 NutrFeedTechnol. Nutrition animale et technologie de l'alimentation animale*
359 **13**(1):139-46.ISSN 0974-181X
- 360 10. Hu, J. (2013) Effects of housing and calcium-deficient diet on health and egg production
361 in Bovans Brown hens. Ph.D. Thesis,*Purdue University*; Access Theses. 38.
362 https://docs.lib.purdue.edu/open_access_theses/38

- 11. Beattie, J.H. and Avenell, A. (1992) Trace Element Nutrition and Bone Metabolism. *Nutrition Research Reviews*, **5**(1):167-88

DOI : 10.1079/NRR19920013

- 12. Nys, Y. (2001) Oligo-éléments, croissance et santé du poulet de chair. **14**(3):171-180. *INRA Productions. Animales.*, 14 (3), 171-180. DOI : <https://doi.org/10.20870/productions-animales.2001.14.3.3737>

- 13. Belem, A. (2018) Etude des paramètres technico-économiques des élevages intensifs de poulets de c'haïr de race exotique dans la Commune de Bobo-Dioulasso. Diplôme d'ingénieur de développement rural, Institut du Développement Rural, Université Nazi BONI, Bobo-Dioulasso, Burkina Faso.

- 14. Kjeldahl, J. (1883) A new method for the determination of nitrogen in organic matter. *Z. Analytical Chemistry Journal***22**: 366.

- 15. Soxhlet, F. (1879) Die gewichtsanalytische Bestimmung des Milchfettes. *Dinglers Polytechnisches Journal*; 461-465 p.

- 16. ISO-659.(1998) Graines oléagineuses-Détermination de la teneur en huile (Méthode de référence). <https://cdn.standards.iteh.ai/samples/23297/7fef29aa441a4e97a6e6358464c9a6f8/ISO-659-1998.pdf>

- 17. AOAC. (1984) Basic and Applied Research in the Analytical Sciences Related to Agriculture and the Public Health. [Internet]. 2^e éd. Vol. 67. Washington, DC, Etats-Unis.: Journal of the Association of the Official Analytical Chemists; 482 p. Disponible sur: <https://www.google.com>

- 18. Clément, A. (1971) Principes et méthodes d'analyse des macroéléments et microéléments dans les échantillons foliaires. 32 p.

- 389 19. INRA. (1989) L'Alimentation des animaux monogastriques Porc, lapin, volailles
390 [Internet]. 2^e éd. Quae; 282 p.
391 <https://www.scirp.org/reference/referencespapers?referenceid=1654586>
- 392 20. Schiemann, R., Nehring, K., Hoffmann, L., Jentsch, W. and Chudy, A. (1971)
393 Energetische Futterbewertung und Energienormen. Deutscher Landwirtschaftsverlag.,
394 344 p.
- 395 21. Agbédé G.B., Tegua A., Manjeli Y., (1995) Enquête sur l'élevage traditionnel des
396 volailles au Cameroun. *Tropicultura*, **13**(1):22-4. ISSN 2295-8010
- 397 22. FAO, IFIF. (2013) Bonnes pratiques pour l'industrie de l'alimentation animale – Mise en
398 œuvre du Code d'usages pour une bonne alimentation animale du Codex Alimentarius.
399 Rome, Italie.
- 400 23. Burkina Faso. (2016) Décret N°2016-314/PRES/PM/MJDHPC/MINEFID/MCIA portant
401 modification du décret N°2014-462/PRSE/PM/MJ/MICA du 26 mai 2014 portant
402 fixation des dispositions nationales applicables à la forme des statuts et au capital social
403 pour les sociétés à responsabilité limitée au Burkina Faso. 2 p.
- 404 24. OHADA.(1993) OHADA (Organisation pour Harmonisation en Afrique du Droit des
405 Affaires), Création des sociétés au Burkina Faso.
406 <https://rccm.ohada.org/staticPage/index?alias=dfj>
- 407 25. Larbier M., Leclercq B., (1992) Nutrition et alimentation des volailles. Quae; 355p.
408 <https://www.google.com>
- 409 26. Bouvarel, I., Lessire, M., Narcy A., Duval E., Grasteau S., Quinsac A.(2014) Des
410 sources de protéines locales pour l'alimentation des volailles: quelles voies de
411 progrès *Oilseeds and fats, Crops and Lipids*, **21**(4):D405. DOI : [10.1051/ocl/2014014](https://doi.org/10.1051/ocl/2014014)
- 412 27. Fraysse, P., Lessire, M., van Milgen, J.J., Schmidely, P., Corrent E. and Tesseraud
413 S.(2015) Effet de la réduction de la teneur en protéines des aliments de poulets de
414 chair:approche par méta-analyse. In: 11 Journées de la Recherche Avicole et Palmipèdes
415 à Foie Gras. ITAVI; <https://hal.science/hal-01173679/>

- 416 28. Sauvant, D., Perez, J.M., Tran, G. (2004) Tables de composition et de valeur nutritive
417 des matières premières destinées aux animaux d'élevage (Porcs, volailles, ovins, caprins,
418 lapins, chevaux, poissons). INRA editions; <https://hal.science/hal-02834238/>
- 419 29. Anselme B. (1987) L'alimentation composée pour volaille au Sénégal: Situation actuelle,
420 contribution à son amélioration par une meilleure valorisation des ressources
421 nutritionnelles locales [PhD Thesis]. Thèse pour l'obtention du grade de Docteur
422 vétérinaire, Toulouse, 87p.
- 423 30. Ndoye N.(1996) Etude de la qualité nutritionnelle des aliments de volaille vendus au
424 Sénégal et l'effet de leur supplémentation en lysine, en méthionine et en lipides sur les
425 performances zootechniques du poulet de chair, Université Cheikh Anta Diop de Dakar.
426 Thèse pour le grade de Docteur en médecine vétérinaire, 106p.
- 427 31. Borne, P.M. (1994) Les carences vitaminiques en production avicole. African
428 Agriculture. 212, éd. 33-4.
- 429 32. AndelaAbessolo, C.M. (2008) Etude comparative des performances de croissance de
430 poulet de chair permises par trois aliments chair sur le marché de Dakar [PhD Thesis].
431 Thèse pour l'obtention du grade de Docteur vétérinaire, EISMV Dakar, 94p.
- 432 33. Van Eekeren, N., Maas, A., Staatskamp, H.W., Verschuur, M., (2006) L'élevage des
433 poulets à petite échelle. 4ème. édition révisée Digigraphi, Wageningen. Pays Bas.
434 (4ème).<https://hdl.handle.net/10568/64595>
- 435
- 436 34. Zongo, R. T., Kiema, A., et Zongo, A. (2024). Effets des techniques de stockage et de
437 conservation du maïs (Zeamays) sur les performances zootechniques et économiques des
438 poulets de chair au Burkina Faso. *Journal of Animal and Plant Sciences*, 62(1),
439 11487-11499. <https://doi.org/10.35759/JAnmPlSci.v62-1.8>
- 440
- 441 35. Mabalo, K. (1993) Influence de l'apport qualitatif de phosphore sur la consommation
442 alimentaire, le métabolisme phosphocalcique et les performances de croissance du poulet

443 de chair en milieu sahélien. Thèse pour l'obtention du grade de Docteur
444 vétérinaire, EISMV Dakar, 112p.

445 36. Magnin, M., Jean-Michel, P., Mahieu, A. (2009) Comparison of the stability of ten
446 tagetes extracts and seven paprika extracts, natural sources of yellow and red pigments
447 for poultry. In St Malo, p. 459-463.

448 37. Revy, P.S., Jondreville, C., Dourmad, J.Y., Nys, Y. (2003) Le zinc dans l'alimentation du
449 porc : oligo-élément essentiel et risque potentiel pour l'environnement. *INRAE*
450 *Productions Animales*, **16**(1):3-18. DOI : [https://doi.org/10.20870/productions-](https://doi.org/10.20870/productions-animales.2003.16.1.3639)
451 [animales.2003.16.1.3639](https://doi.org/10.20870/productions-animales.2003.16.1.3639)

452
453 38. Drinceanu D., Luca I., Julean C., Ștef L., Mihai A., Simiz E., (2010) Mineral Content of
454 the Main Feed Ingredients Used in Poultry Biological Farms. *Scientific Papers Animal*
455 *Science and Biotechnologies*. **43**(1). <https://www.researchgate.net/publication/268385507>

456
457
458
459