



Feed Management in Pig Production and an Attempt for Improvement: A Case Study of Babadjou Locality in the Western Region of Cameroon

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Authors' contributions

This work was carried out in collaboration between both authors. Author FED designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author DPTT managed the analyses of the study and the literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

A survey was conducted to evaluate feed management in pig production and an attempt for improvement in the locality of Babadjou, western region of Cameroon. The study used well structured questionnaires to address the socio-demographic profile of respondents, the production characteristics, feeding methods, and farm management in relation to feed quality from 120 households. Descriptive statistics were used for all the variables studied in SPSS v.11. Results show that there was significant association between feed quality and all socio-demographic parameters of the respondents at $P < 0.001$ except for the spoken language ($P < 0.01$). Likewise there was significant association between feed quality and all production characteristics at $P < 0.001$ except for the production systems ($P = 0.193$). Many respondents didn't undergo any quality training before embarking on pig farming (95.83%) even though some of them had at least 10 years of rearing experience (39.16%). In like manner, there was significant association between all the feeding parameters and feed quality at $P < 0.001$ except for the measuring utensils ($P = 0.193$) feeding frequency of harvest residues ($P = 0.238$) Use of harvest residues as sole feed ($P = 0.026$)

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and water source ($P=0.003$). Majority of farmers used any complete feed types available (96.66%) rather than the specific animal feed based on growth stage. They suffered the high cost of complete feed (73.33%) and resolved to top up pigs daily ration with kitchen residues (76.66%) and harvest farm residues (60%). The farmers used well water preferentially (85.83%). Very few farmers understood the benefits of flushing practices (17.5%) and therefore could not achieve large litters at farrowing (82.5%). In the same vein, there was significant association between all the farm management parameters and feed quality at $P<0.001$ except for common initiative group (CIG) member ($P=0.018$), and reasons for no farm extension ($P=0.002$). In conclusion, pigs farmers in Babadjou locality need regular workshops for training in pig husbandry and to come together as CIGs so as to benefit from government subsidies and Non Governmental Organisations assistance for better production and productivity.

Keywords: Farm management; feed quality; feeding methods; production characteristics; socio-demographic profile.

1. INTRODUCTION

The western region in Cameroon is the largest pig producer with a herd estimated at 3 500 000 heads; it provides 4/5 of pigs marketed in the country. This production is therefore of considerable importance both for producers who derive substantial income and for urban consumers [1] Babadjou is located in this western highlands with nearly 55,624 inhabitants in 2016 and an area of approximately 161 km². Pig breeding there is the second income generating activity after maize cultivation for the rural population. In the locality, pigs are sold in markets at any stage of growth when the farmer needs money. Government statistics estimated the pigs population at about 600 000 heads in that area [2]. In the Strategic Document for Growth and Employment in Cameroon, the livestock sub-sector is expected to increase in supply of animal products to meet the domestic need in animal protein requirements [3] and give surplus for exports. To achieve this goal, the Government planned in the short term to develop the breeding of short cycle species, to professionalize the training and structuring of producers. Despite the government good will, farmers are still faced with many constraints in animal husbandry such as health, nutrition, and management techniques. The most important being the cost of the food which is a serious obstacle to the achievement of these objectives, as it represents 70% of total investments [4,5]. So far, pig farming in Cameroon has reached a peak of 30,000 tons of meat per year with a projected 40,000 tons in 2016 and 45,000 tons by the year 2020. In order to meet the increasing demand of pork, there is still recourse to massive import of pigs, mainly from Chad (42 billion CFA francs/ year) [1]. This study was therefore conducted to evaluate the feed management in

pig production in the locality of Babadjou and an attempt for improvement.

2. MATERIALS AND METHODS

2.1 Selection and Presentation of the Study Area

Babadjou village is a large pig producing area and there is a multitude of usable agricultural residues for pigs. Pig farming in this locality is a culture passed down from generations to generations. The extensive production system is mostly practiced with agricultural products and household waste based diets associated with scarcity or inadequate veterinary care. Babadjou is located at about 7 km from Mbouda in the Department of Bamboutos, West Region of Cameroon on the National road No. 6 connecting Bafoussam to Bamenda. The geographic coordinates of Babadjou taken by the Global Positioning System (GPS) extend from 05° 37' to 05° 40' north latitude and 10° 04' to 10° 10' east longitude. It is characterized by a long rainy season from mid-March to mid-November and a short dry season from mid-November to mid-March. The average annual rainfall is between 1500 and 1830 mm while average temperatures range between 24 and 35°C. [6].

2.2 Sampling of Farmers and Conduct of Investigations

The village was divided into three (3) areas namely Toumaka, Djinso and Kombou. The population size of pigs farmers in these three (3) zones was about 5316 households [7] out of which forty (40) were randomly selected per zone for the survey. The only requirement being to have a herd of at least 2 (two) adult pigs. The

survey was conducted in two phases. The first phase consisted of a 7 days investigation period during which questionnaires were tested on the field for adjustments followed by interviews schedule and contacts exchange to keep in touch with the various stakeholders. As for the second phase, interviews were conducted from April 10 to May 5, 2016 in homes and consisted of a session of questions and answers between the respondents and the research team to complete the survey form. The questionnaires addressed the socio-demographic profile of respondents, the production characteristics, feeding methods, and farm management in relation to feed quality.

2.3 Data Collection and Statistical Analysis

Descriptive statistics were used for all the variables studied. Pearson Chi-square at 95% Confidence Interval was used to test the association between feed quality and the

variables studied in the Statistical Package for Social Sciences software (SPSS) version 11.0 as described by [8].

3. RESULTS AND DISCUSSION

Table 1 shows the association between the feed quality and socio-demographic profile of the respondents. There was significant association between feed quality and all socio-demographic parameters of the respondents at $P < 0.001$ except for the spoken language ($P < 0.01$). Majority of the respondents were aged between 36 to 50 years old (57.5%). Christians constituted the largest group of respondents (54.16%). Most of the respondents had attended at least a primary school (88.34%) and could fluently speak French and Ngombale (85%). This implies that the pig farmers can easily keep records of their activities and know areas of improvement. Majority of the respondents were married (80%) and men were more involved in pig husbandry than the women (71.66% > 28.34%).

Table 1. Association of socio-demographic profile of respondents with feed quality

| Socio-demographic parameters | Poor quality | Inferior quality | Standard quality | Superior quality | Total | P value |
|------------------------------|--------------|------------------|------------------|------------------|------------|--------------|
| Religion | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Christians | 41 | 6 | 12 | 6 | 65 | |
| Muslim | 0 | 7 | 0 | 0 | 7 | |
| Pagans | 15 | 29 | 4 | 0 | 48 | |
| Age | 56 | 42 | 16 | 6 | 120 | 0.001 |
| ≤ 20 year old | 0 | 6 | 0 | 6 | 12 | |
| 21-35 | 6 | 0 | 0 | 0 | 6 | |
| 36-50 | 22 | 31 | 16 | 0 | 69 | |
| >50 year old | 28 | 5 | 0 | 0 | 33 | |
| Marital status | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Married | 51 | 36 | 9 | 0 | 96 | |
| Single | 0 | 6 | 0 | 6 | 12 | |
| Widower | 5 | 0 | 7 | 0 | 12 | |
| Educational level | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Illiterate | 14 | 0 | 0 | 0 | 14 | |
| Primary level | 21 | 15 | 0 | 0 | 36 | |
| Secondary level | 12 | 5 | 7 | 0 | 24 | |
| High school level | 9 | 6 | 0 | 6 | 21 | |
| University level | 0 | 16 | 9 | 0 | 21 | |
| Spoken language | 56 | 42 | 16 | 6 | 120 | 0.004 |
| French | 4 | 0 | 0 | 0 | 4 | |
| Fulfulde | 9 | 0 | 0 | 0 | 9 | |
| French + Ngombale | 38 | 42 | 16 | 6 | 102 | |
| French + English + Ngombale | 5 | 0 | 0 | 0 | 5 | |
| Gender | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Male | 29 | 42 | 9 | 6 | 86 | |
| Female | 27 | 0 | 7 | 0 | 34 | |

These results tally with the finding of [9] who reported that majority of the farmers (44.3%) fall within the age group of 36 – 55 years indicating that pig production and marketing is mostly carried out by adults who have the physical stamina. Their results also showed that men (67.1%) were more involved in pig farming than females (32.9%).

Table 2 shows the association between the feed quality and the production characteristics. There was significant association between feed quality and all production characteristics at $P < 0.001$ except for the production systems ($P = 0.193$). Farm management was more of the husbands' responsibility (57.5%) in homes. Most of the farmers reared pigs and chickens at the same

time (53.33%). Many respondents didn't undergo any quality training before embarking on pig farming (95.83%) even though some of them had at least 10 years of rearing experience (39.16%). The pigs reared by farmers were all hybrids (100%) and mostly purchased (87.5%). This practice of pigs purchase mostly hybrids at the creation of farms was also reported by [10] who worked on the appraisal of indigenous pig production and management practices in Rivers State, Nigeria. Pigs were separated in pens (75.03%) especially based on age (35.03%). The age of animals appears as the predominant reason for their separation indicating that farmers buy or sell pigs either as piglets, fatteners or breeders irrespective of their sex.

Table 2. Production characteristics in relation to feed quality

| Production characteristics | Poor quality | Inferior quality | Standard quality | Superior quality | Total | P value |
|-----------------------------------|---------------------|-------------------------|-------------------------|-------------------------|--------------|----------------|
| Quality training | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Yes | 0 | 0 | 5 | 0 | 5 | |
| No | 56 | 42 | 11 | 6 | 115 | |
| Training period | | | | | | 0.001 |
| One week | 0 | 0 | 1 | 0 | 1 | |
| Two weeks | 0 | 0 | 2 | 0 | 2 | |
| Three weeks | 0 | 0 | 2 | 0 | 2 | |
| Farm management | | | | | | 0.001 |
| Husband | 29 | 31 | 9 | 0 | 69 | |
| Wife | 27 | 5 | 7 | 6 | 45 | |
| Children | 0 | 6 | 0 | 0 | 6 | |
| Rearing experience | 56 | 42 | 16 | 6 | 120 | 0.001 |
| < 3 years | 23 | 6 | 0 | 0 | 29 | |
| 3-10 years | 15 | 16 | 7 | 6 | 44 | |
| >10 years | 18 | 20 | 9 | 0 | 47 | |
| Animals reared | | | | | | 0.001 |
| Swine alone | 11 | 18 | 0 | 0 | 29 | |
| Chickens alone | 0 | 0 | 0 | 0 | 0 | |
| Goats alone | 0 | 0 | 0 | 0 | 0 | |
| Rabbits alone | 0 | 0 | 0 | 0 | 0 | |
| Swine + chickens | 32 | 17 | 9 | 6 | 64 | |
| Swine + chickens + rabbits | 5 | 0 | 0 | 0 | 5 | |
| Swine + chickens + goats | 8 | 7 | 7 | 0 | 22 | |
| Breed of animals | | | | | | -- |
| Local breed | 0 | 0 | 0 | 0 | 0 | |
| Exotic breed | 0 | 0 | 0 | 0 | 0 | |
| Hybrid | 56 | 42 | 16 | 6 | 120 | |
| Acquisition method | | | | | | 0.001 |
| Purchased | 47 | 36 | 16 | 6 | 105 | |
| Entrusted | 0 | 6 | 0 | 0 | 6 | |
| Gift | 9 | 0 | 0 | 0 | 9 | |
| Flock size | | | | | | 0.001 |
| 0 week old | 14 | 7 | 0 | 6 | 27 | |
| 1 week old | 0 | 0 | 7 | 0 | 7 | |
| 2 weeks old | 19 | 0 | 0 | 0 | 19 | |

| Production characteristics | Poor quality | Inferior quality | Standard quality | Superior quality | Total | P value |
|-----------------------------------|---------------------|-------------------------|-------------------------|-------------------------|--------------|----------------|
| 3 | 4 | 0 | 0 | 0 | 4 | |
| 4 | 0 | 6 | 0 | 0 | 6 | |
| 5 | 5 | 0 | 0 | 0 | 5 | |
| 6 | 14 | 5 | 0 | 0 | 19 | |
| 9 | 0 | 7 | 0 | 0 | 7 | |
| 10 | 0 | 5 | 0 | 0 | 5 | |
| 12 | 0 | 0 | 4 | 0 | 4 | |
| 13 | 0 | 4 | 0 | 0 | 4 | |
| 16 weeks old | 0 | 8 | 5 | 0 | 13 | |
| Production systems | 56 | 42 | 16 | 6 | 120 | 0.193 |
| Intensive | 0 | 0 | 0 | 0 | 0 | |
| Semi-intensive | 52 | 42 | 16 | 6 | 116 | |
| Extensive | 4 | 0 | 0 | 0 | 4 | |
| Rearing techniques | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Piglets | 0 | 12 | 0 | 0 | 12 | |
| Fatteners | 27 | 4 | 7 | 0 | 38 | |
| Breeders | 29 | 26 | 9 | 6 | 70 | |
| Pigs separation | | | | | | 0.001 |
| Yes | 34 | 42 | 9 | 6 | 91 | |
| No | 22 | 0 | 7 | 0 | 29 | |
| Reasons for no-separation | | | | | | 0.001 |
| No importance | 14 | 0 | 0 | 0 | 14 | |
| Lack of means | 8 | 0 | 7 | 0 | 15 | |
| Others | 34 | 42 | 9 | 6 | 91 | |
| Reasons for separation | | | | | | 0.001 |
| Sexe | 5 | 0 | 0 | 0 | 5 | |
| Age | 11 | 17 | 9 | 6 | 43 | |
| Physiological stage | 4 | 13 | 0 | 0 | 17 | |
| Sexe + age + physiological stage | 9 | 12 | 0 | 0 | 21 | |
| Age + physiological stage | 5 | 0 | 0 | 0 | 5 | |

Table 3 shows the association between feeding and the feed quality. There was significant association between all feeding parameters and feed quality at $P < 0.001$ except for the measuring utensils ($P = 0.193$), feeding frequency of harvest residues ($P = 0.238$), Use of harvest residues as sole feed ($P = 0.026$) and water source ($P = 0.003$). Majority of farmers used any complete feed types available (96.66%) rather than the specific animal feed based on growth stage. Feed distribution periods were predominant in morning and evening (43.33%) and plates were mostly used (96.66%) as measuring utensils. These results tally with the findings of [11] who study the production practices and constraints of pig farms in N'Djamena area, Chad and observed that the highest food distribution frequency was twice daily (67%). Many respondents were challenged by the high cost of complete feed (73.33%) and resolved to top up the daily ration with kitchen residues given in less than 24 h after collection (76.66%) and harvest farm residues

given preferentially twice a day (60%). The use of unconventional feed resources in traditional pig farming was also reported by [12] who worked on seasonal changes in body condition scores of pigs and chemical composition of pig feed resources in a semi-arid smallholder farming area of Zimbabwe. The farmers used well water preferentially (85.83%) and distributed to pigs mostly twice a day (55.83%). This result tallies with the finding of [13] who reported that rural farmers provide pigs with water separately from the feeds in Busia district of Kenya. Very few farmers understood the benefits of flushing practices (17.5%) and therefore could not achieve large litters at farrowing (85%). This explains the fact that many respondents had not received any quality training before embarking on pig farming (95.83%) despite their many years of rearing experience. Unfortunately, [14] already deplored this situation in their study on constraints to development of pig production in Cameroon.

Table 3. Association of feeding parameters with feed quality

| Feeding parameters | Poor quality | Inferior quality | Standard quality | Superior quality | Total | P value |
|--|--------------|------------------|------------------|------------------|-------|---------|
| Use pigs quality feed | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Yes | 25 | 28 | 16 | 6 | 75 | |
| No | 4 | 0 | 0 | 0 | 4 | |
| Anyone available | 27 | 14 | 0 | 0 | 41 | |
| Measuring utensils | 56 | 42 | 16 | 6 | 120 | 0.193 |
| Plate | 52 | 42 | 16 | 6 | 116 | |
| Soup tureen | 0 | 0 | 0 | 0 | 0 | |
| Buckets | 4 | 0 | 0 | 0 | 4 | |
| Feed types | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Piglet feed | 0 | 0 | 4 | 0 | 4 | |
| Growers feed | 0 | 0 | 0 | 0 | 0 | |
| Anyone available | 56 | 42 | 12 | 6 | 116 | |
| Feed distribution periods | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Morning | 22 | 6 | 0 | 0 | 28 | |
| Noon | 0 | 0 | 0 | 0 | 0 | |
| Evening | 0 | 24 | 12 | 0 | 36 | |
| Morning & Evening | 30 | 12 | 4 | 6 | 52 | |
| Morning, noon & evening | 4 | 0 | 0 | 0 | 4 | |
| Challenges in Feed production | | | | | | 0.001 |
| High feed cost | 38 | 34 | 16 | 0 | 88 | |
| Raw feed ingredients unavailable | 0 | 0 | 0 | 0 | 0 | |
| High feed cost & feed formulation problem | 18 | 8 | 0 | 0 | 26 | |
| Feed formulation problem | 0 | 0 | 0 | 6 | 6 | |
| Feeding frequency of harvest residues | 56 | 42 | 16 | 6 | 120 | 0.238 |
| Once a day | 5 | 4 | 0 | 0 | 9 | |
| Twice a day | 28 | 26 | 12 | 6 | 72 | |
| Thrice a day | 12 | 7 | 4 | 0 | 23 | |
| Use harvest residues as sole feed | 56 | 42 | 16 | 6 | 120 | 0.026 |
| Yes | 23 | 21 | 11 | 0 | 55 | |
| No | 33 | 21 | 5 | 6 | 65 | |
| Water source | | | | | | 0.003 |
| rain water | 0 | 8 | 0 | 0 | 8 | |
| well water | 52 | 29 | 16 | 6 | 103 | |
| stream water | 4 | 5 | 0 | 0 | 9 | |
| Frequency of water distribution | | | | | | 0.001 |
| Once a day | 37 | 11 | 0 | 0 | 48 | |
| Twice a day | 19 | 31 | 11 | 6 | 67 | |
| Ad libitum | 0 | 0 | 5 | 0 | 5 | |
| Flushing practice | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Yes | 4 | 8 | 9 | 0 | 21 | |
| No | 52 | 34 | 7 | 6 | 99 | |

| | | | | | | |
|--|----|----|----|---|-----|-------|
| Reasons for flushing | | | | | | 0.001 |
| Increase of flock | 4 | 8 | 9 | 0 | 21 | |
| No understanding | 52 | 34 | 7 | 6 | 99 | |
| Reasons for not flushing | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Ignorance | 52 | 34 | 7 | 6 | 99 | |
| Do not see its need | 0 | 0 | 0 | 0 | 0 | |
| Lack of quality food | 4 | 8 | 9 | 0 | 21 | |
| Kitchen residues distribution time after collection | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Immediately | 5 | 7 | 0 | 0 | 12 | |
| In less than 24 h | 35 | 35 | 16 | 6 | 92 | |
| Between 24 & 48 h | 16 | 0 | 0 | 0 | 16 | |

Table 4. Farm management in relation to feed quality

| Farm organization | Poor quality | Inferior quality | Standard quality | Superior quality | Total | P value |
|--------------------------------------|--------------|------------------|------------------|------------------|-------|---------|
| CIG member | 56 | 42 | 16 | 6 | 120 | 0.018 |
| Yes | 4 | 5 | 0 | 0 | 9 | |
| No | 52 | 31 | 16 | 6 | 105 | |
| No answer | 0 | 6 | 0 | 0 | 6 | |
| Farm records | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Yes | 24 | 29 | 9 | 6 | 68 | |
| No | 32 | 7 | 7 | 0 | 46 | |
| No answer | 0 | 6 | 0 | 0 | 6 | |
| Security around pig farms | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Yes | 22 | 0 | 4 | 0 | 26 | |
| No | 19 | 24 | 12 | 6 | 61 | |
| No answer | 15 | 18 | 0 | 0 | 33 | |
| Government subsidies to CIG | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Yes | 46 | 24 | 16 | 6 | 92 | |
| No | 10 | 18 | 0 | 0 | 28 | |
| Farm extension project | 56 | 42 | 16 | 6 | 120 | 0.001 |
| Yes | 32 | 28 | 16 | 6 | 82 | |
| No | 24 | 8 | 0 | 0 | 32 | |
| No answer | 0 | 6 | 0 | 0 | 6 | |
| Reasons for no farm extension | 56 | 42 | 16 | 6 | 120 | 0.002 |
| Maintenance | 4 | 0 | 0 | 0 | 4 | |
| Space | 5 | 8 | 0 | 0 | 13 | |
| African Swine Pest | 10 | 0 | 0 | 0 | 10 | |
| Security issues | 5 | 0 | 0 | 0 | 5 | |
| No answer | 32 | 34 | 16 | 6 | 88 | |

Table 4 shows the association between farm management and feed quality. There was significant association between all farm management parameters and feed quality at $P < 0.001$ except for (common initiative group)

CIG member ($P=0.018$), and reasons for no farm extension ($P=0.002$). Most of the farmers failed to come together as (CIG) common initiative group (87.5%) despite all the sensitisation campaigns whereas that's the avenue through

which they could easily receive government subsidies (76.66%). In the same vein, [9] worked on Pig Production and Marketing in North West Region Cameroon: An Economic Assessment and reported that there were remarkable differences between those receiving assistance from an NGO and those without assistance. If pigs farming were their only income generating activity, then this result is an indicator that these farmers living conditions are deplorable. It really shows the need for the majority to be educated on the benefits of coming together to be known officially as groups and also to be taught on how to apply for financial support and follow-up trainings in order to be given attention by government and private organisations. Farm records were kept mostly in well organised structures like common initiative groups where stakeholders properly share dividends (56.66%). This means that the pig farmers can better monitor and evaluate their activities. [9] in their study also observed that 52.9% of the respondents kept records of their farm activities but only 10.0% of them were consistent with their records. Some of the farmers failed to secure their farms (50.83%) due to limited resources while others particularly CIG members secured and even extended theirs (68.33%). These results corroborate with the finding of [14] who reported a lack of adequate structures or poorly constructed facilities in their study on constraints to development of pig production in Cameroon.

4. CONCLUSION

The results of this study found that feed quality was significantly associated with many variables of the socio-demographic profile of respondents, the production characteristics, feeding methods, and farm management in Babadjou locality. Therefore, recommendations as an attempt for improvement include: A need for Government or Non-Governmental Organisation (NGOs) to organise seasonal workshops to train farmers in pig husbandry, a need for the farmers to group themselves in common initiative groups (CIG) so as to benefit from government subsidies or NGOs assistance and finally a need for a scrupulous implementation of the knowledge acquired for better pig production and productivity.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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