

Health Management and Factors Affecting Small Scale Intensive Pig Production in East Shewa of Central Ethiopia

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Abstract: The objective of this study was to investigate the health management practices and factors limiting small scale intensive pig production in East Shewa of Central Ethiopia. The study used structured questionnaire administered to 105 household pig farmers, randomly selected from three towns (Addis Ababa, Bishoftu and Adama) of East-Shewa. Focus group discussions were also performed to check the reliability of the information obtained through questionnaire interview. Data generated included production proposes, health practices, bio-security measures, quarantine practices, major pig diseases and constraints. Data were analyzed using ANOVA, chi-square, index ranking and descriptive statistics. The main reasons for rearing pigs across the towns were to generate secondary income. The percentages of households practiced feet bath and wheel bath were significantly higher ($P < 0.05$) in Bishoftu town (85 and 22.5%) than in Addis Ababa (20 and 2.9%) and Adama (20 and 3.3%) towns. While, the percentages of households that did not allow entry of new pigs; quarantined new pigs; and do not quarantined new pigs were significantly higher ($P < 0.05$) in Bishoftu (70, 25 and 75%) compared to Addis Ababa (14.3, 5.7 and 94.3%) and Adama (13.3, 6.7 and 93.3%). The prevalence of diseases and constraints to pig production were dependent on the context of the towns i.e. mastitis was ranked 2nd in Addis Ababa while 6th in Bishoftu and 3rd in Adama. Land scarcity had the highest rank value (4th) in Addis Ababa while the lowest rank value in Adama (7th) and Bishoftu (8th). Thus, development interventions should be designed and implemented accordingly to improve the benefit of small scale intensive pig keepers.

Key words: Small Scale • Intensive Pig Production • Diseases • Constraints • Districts

INTRODUCTION

Pig production is becoming increasingly important economic activity because of better production efficiency per unit area of land [1]. Pigs have higher turnover rate due to large litter sizes, shorter gestation period (114 days) and lower feed conversion ratio (1kg pork from 3kg feed), as compared to most livestock species [2].

Raising pigs plays an important role in many tropical countries [3]. Small scale pig production was a very recently introduced economic activity in Ethiopia [4]. The population was estimated to be 33,000

heads representing 0.1% of African pig population and they are concentrated in central part of the country [5, 6].

There is limited information in relation to production objective, health management practices and limiting factors of intensive pig production in East Shewa of Central Ethiopia. However, before deciding on any planned use for pigs, assessment of management practices and constraints of pig production are required in order to make more efficient and sustainable pig rearing activity [3]. The present study was planned to examine the health management practices and factors affecting small scale intensive pig production in three locations of

Central Oromia, Ethiopia, representing different agro ecologies. The data gathered will be used by policy makers in better addressing the needs of the pig farmers.

MATERIALS AND METHODS

Description of the Study Area: The study was undertaken in three major cities in East Shewa of central Ethiopia, namely: Addis Ababa, Bishoftu and Adama representing highland, midland and lowland agro-ecologies, respectively. The selection of towns was based on their proximity, pig population, pig fattening, feed production and marketing. Addis Ababa is located at 9°N latitude 38°E longitude and average altitude of 2355 meters above sea level. The area receives a bimodal rainfall with a long rainy season occurring from June to September and annual rainfall of 1184 millimeter and average temperature of 12.2°C [7].

Bishoftu town is located at 9°N latitude and 40°E longitude and at an altitude of 1850 meters above sea level. It is located in Oromia region, East Shewa Zone about 48 kilometers southeast of Addis Ababa, the capital city of Ethiopia with a bimodal rainfall pattern, having a main rainy season from June to September. The annual average rainfall and temperature are 866 millimeter and 20 c° respectively [8]. Bishoftu is also a town, where College of Veterinary Medicine and Agriculture, the National Veterinary Institute, the Pan-Africa Veterinary Vaccine Centre and an Ethiopian Institute of Agricultural Research are located [9]. Hence, this area has greater potential for access to veterinary and production expertise and materials to support production than anywhere else in the country.

Adama is located at 8° N latitude and 39° E longitude about 99 km Southeast of Addis Ababa. It is situated at an altitude ranging from 1300 to 1500 meters above sea level. The area receives an average annual rainfall ranging from about 600 to 1150 mm which is erratic in nature. There is a significant seasonal variation in the amount of rainfall. More than 67% of the mean annual rainfall occurs in the four rainy months: June, July, August and September. Some additional rains (about 23%) occur in the remaining dry months with mean monthly values of rainfall as low as zero millimeters. The minimum and maximum daily temperatures of the area are 12 and 33°C, respectively [10].

Data Collection Procedures: Questionnaire was developed and data were collected on small scale intensive pig rearing. The pretested structured questionnaire was administered to a total of 105 randomly

selected respondents by recruited enumerators trained for this purpose and involvement of the researcher. The data for the study were collected between January 2014 and April 2015. Data were collected on health management practices and limiting factors.

Focus Group Discussions: To substantiate the information collected through questionnaire survey focus group discussions were held in three districts, namely: Addis Ababa, Bishoftu and Adama. Nomination of discussants was made together with the urban agricultural staff. On average six people (ranging from 4 to 11) participated in the discussion.

Analytical Techniques: Data collected through questionnaire were analyzed by ANOVA, Chi-square and descriptive statistics of statistical package for social sciences [11]. Index method of ranking was used for ranking types of diseases and limiting factors in the study areas as described by Assen and Aklilu [12].

$$\text{Index} = R_n * C_1 + R_{n-1} * C_2 \dots + R_1 * C_n / \sum R_n * C_1 + R_{n-1} * C_2 \dots + R_1 * C_n;$$

where

R_n = Value given for the least ranked level (example if the least rank is 8th, then $R_n = 8$, $R_{n-1} = 7$, $R_{n-2} = 6$, $R_{n-3} = 5$, $R_{n-4} = 4$, $R_{n-5} = 3$, $R_{n-6} = 2$, $R_{n-7} = 1$), C_n = Counts of the least ranked level (in the above example, the count of the 8th rank = C_n and the count of the 1st rank = C_1).

RESULTS AND DISCUSSION

Purposes of Rearing Small Scale Intensive Pig Production in East Shewa: The overall results indicated that the major reasons for keeping pigs across the towns were to generate secondary income followed by primary income (Figure 1). In the surveyed towns, the majority of farmers were involved in pig production used it as a source of additional income, probably due to its high rate of profitability. The results were in conformity with reports of Dennis *et al.*, Florence *et al.* and Nth *et al.* [13- 15], who stated that the majority of farmers involved in pig production as a source of secondary income. The focus group discussions in all towns put in plain words that pig owners were against the slaughtering of pigs for home consumption. This may indicate that religion, culture and traditions played an important role in the pig sector of Ethiopia [16]. The results were in contrast to the situation in Namibia, Uganda and Kenya where pig keeping is for income and pork consumption [17, 18].

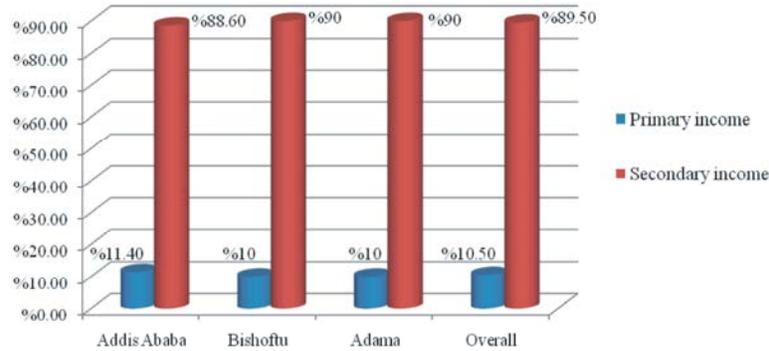


Fig. 1: Purposes of rearing small scale intensive pig production in East Shewa.

Table 1: Health practices of small scale intensive pig production in East Shewa

Health practices	Towns			Total	Chi-square Test	
	Addis Ababa	Bishoftu	Adama		<i>X</i> ² -value	<i>p</i> -value
	N (%)	N (%)	N (%)	N (%)		
Maintain herd health records	24(68.6) ^a	27(67.5) ^a	21(70) ^a	72(68.6)	0.05	0.975
Contact veterinarian in the past 12 months	34(97.5) ^a	39(97.5) ^a	29(96.7) ^a	102(97.1)	0.043	0.979
Use of vaccine	1(2.8) ^a	7(17.5) ^b	1(3.3) ^a	8(8.6)	6.578	0.037
Purpose of veterinary contact						
To get antibiotics	11(31.4) ^a	13(32.5) ^a	10(33.3) ^a	34(32.4)	0.027	0.986
To get disease advice	14(40) ^a	16(40) ^a	12(40) ^a	42(40)	0.00	1.00
For general pig information	10(28.6) ^a	11(27.5) ^a	8(26.7) ^a	39(37.1)	0.03	0.985
Disposal of dead pigs						
Bury	16(45.7) ^a	19(47.5) ^a	14(46.7) ^a	49(46.7)	1.58	0.454
Burn	12(34.3) ^a	14(32.5) ^a	10(33.3) ^a	36(34.3)	0.021	0.989
Feed to dogs	7(20) ^a	8(20) ^a	6(20) ^a	21(20)	0.00	1.00

N (%) depicts number or percent of respondents; numbers connected by different letters are statistically significant

Health Practices for Small Scale Intensive Pig Production in East Shewa: Health practices for small scale intensive pig production are presented in Table 1. Location had no effect ($P < 0.05$) on health practices (maintain health records, contact veterinarian in the last 12 months, purpose of veterinary contact and disposal of dead pigs). The focus group discussions among the three sites noticed that all farmers did not market pigs at public locations (abattoirs or sale yards); failure to monitor health status on-farm may result in a disease invasion going undetected. Farmers in the three towns contacted veterinary professionals to get: advice on pig disease (40%), general pig information (37.1%) and antibiotics (32.4%). Almost all (97.1%) farmers across the study sites cited the last time veterinarian visited the pigs were in the last 12 months. Important practices for disposal of dead pigs revealed by respondents were burying (46.7%), burning (34.3%) and feeding to dogs (20%). The current results were inconsonance with the findings of Schembri *et al.* [19]. The use of vaccine depended ($p < 0.05$) on the investigated site. Significantly higher percentages of

respondents in Bishoftu vaccinated their pigs than respondents in Addis Ababa and Adama towns. The current variation in use of vaccine for pig production might be due to difference in awareness, access to veterinary service and paying ability of the farmers in the three towns.

Prevalent Diseases of Small Scale Intensive Pig Production in East Shewa: The prevalent diseases of small scale intensive pig production in the study towns are described in Table 2. The study revealed that diarrhea had the highest incidence among the three towns. The focus group discussions emphasized that it was more common in piglets. The results of the present study agreed with report of Halpin [20], who pointed out that the age of the animal has a great effect on its ability to withstand attack by both physical and biological agents. In addition, it was observed to be probably responsible for their mortalities. The death of piglets can affect the ability of future breeding practices to respond to changing consumer needs [21]. The occurrence of diarrhea may be related to

Table 2: Prevalent diseases of small scale intensive pig production in East Shewa

Diseases	Towns																	
	Addis Ababa						Bishoftu						Adama					
	1 st	2 nd	3 rd	4 th	Index	Rank	1 st	2 nd	3 rd	4 th	Index	Rank	1 st	2 nd	3 rd	4 th	Index	Rank
Diarrhea	20	15	0	0	0.24	1	25	15	0	0	0.25	1	25	5	0	0	0.21	1
Mastitis	20	0	15	0	0.2	2	0	0	12	28	0.09	6	10	10	10	0	0.16	3
Coughing	0	30	0	5	0.17	3	0	5	30	5	0.14	4	10	20	0	0	0.18	2
FMD	10	5	10	5	0.14	4	0	30	10	0	0.19	2	5	10	15	0	0.14	4
Lice	0	0	30	5	0.12	5	0	0	24	16	0.11	5	10	0	10	10	0.13	5
Swine fever	0	8	0	27	0.9	6	20	10	10	0	0.15	3	5	5	5	15	0.11	6
Sun burn	0	0	1	34	0.06	7	0	0	2	38	0.07	7	0	0	15	15	0.09	7

Table 3: Bio-security practices of small scale intensive pig production in East Shewa

Practices	Towns								
	Addis Ababa		Bishoftu		Adama		Total	Chi-square Test	
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)		X ² -value	p-value
On farm bio- security practices									
Have controlled entry	29(82.9) ^a		33(82.5) ^a		25(83.3) ^a		87(82.9)	0.008	0.996
No overalls/boots provided to visitors	35(100)		40(100)		30(100)		105(100)	-	-
Perimeter fence around the farm	35(100)		40(100)		30(100)		105(100)	-	-
Use of feet bath	7(20) ^a		34(85) ^b		6(20) ^a		47(44.8)	42.3	0.000
Use of wheel bath	1(2.9) ^a		9(22.5) ^b		1(3.3) ^a		11(10.5)	9.96	0.007
No Clean and disinfect trucks	35(100)		40(100)		30(100)		105(100)	-	-
Quarantine practices									
No new pigs introduced	5(14.3) ^a		28(70) ^b		4(13.3) ^a		35(33.3)	34.22	0.00
New pigs quarantined	2(5.7) ^a		10(25) ^b		2(6.7) ^a		14(13.3)	7.6	0.022
No quarantine practices	33(94.3) ^a		30(75) ^b		28(93.3) ^a		91(86.7)	7.6	0.022
ANOVA Test									
	Mean ±SD		Mean ±SD		Mean ±SD		Mean ±SD	F-value	p-value
Number of days quarantined	26.3±0.95 ^a		26.9±2 ^a		26.6±2 ^a		26.6±2	1.67	0.193
Distance from the main herd (m)	210±0.00 ^a		210±0.00 ^a		210.3±1.8 ^a		210.3±1.8	1.26	0.289

N (%) depicts number or percent of respondents; SD refers to Standard Deviation; numbers connected by different letters are statistically significant

the observed poor hygiene and lack of disease preventive measures as well as poor nutrition of sow during gestation and lactation [22]. Furthermore, this finding agreed with observations by Hong *et al.* [23] who reported that the poor quality of feed and nutrient supply may be a contributory factor to the high incidence of diarrhea in piglets. The problem of diarrhea in piglets might cause considerable economic loss to pig farmers which was in harmony with study of Tuyen *et al.* [24]. It is suggested that improving the quality of pig feed could play an important role in reducing diarrhea in piglets, particularly in the pre-weaning period. FMD was leveled as the 2nd most important disease in Bishoftu town compared in Addis Ababa (4th) and Adama (4th) towns. Swine fever was perceived as the 3rd important disease in Bishoftu while supposed as the 6th important disease in both (Addis Ababa and Adama) towns. Lice and swine

fever were perceived as the 5th and 6th important diseases in Addis Ababa and Adama towns while the corresponding levels in Bishoftu town were 5th and 3th. Sun burn was perceived as the least important disease by respondents in all the three towns. The noted diseases were identified by farmers or by a veterinarian according to the symptoms, seldom by sample analysis in a laboratory. This implied that pig diseases were diverse for different districts.

On-farm Bio-security Practices of Small Scale Intensive Pig Production in East Shewa: Table 3 presents bio-security practices of the interviewed small scale intensive pig farmers in the study towns. In this survey, all farms in the three towns had perimeter fences. A fence around a farm could be important because many large farms were surrounded by livestock herds which might be

Table 4: Limiting factors of small scale intensive pig production in East Shewa

Factors	Towns																	
	Addis Ababa						Bishoftu						Adama					
	1 st	2 nd	3 rd	4 th	Index	Rank	1 st	2 nd	3 rd	4 th	Index	Rank	1 st	2 nd	3 rd	4 th	Index	Rank
Market	35	0	0	0	0.2	1	40	0	0	0	0.23	1	10	0	20	0	0.2	1
Disease	20	15	0	0	0.19	2	10	20	10	0	0.17	2	21	3	4	4	0.18	2
Feed	0	35	0	0	0.16	3	10	10	15	5	0.15	3	20	0	0	10	0.15	3
Land scarcity	10	0	20	5	0.13	4	0	0	0	40	0.06	8	0	0	0	14	0.08	7
Inbreeding	0	0	35	0	0.11	5	0	0	20	20	0.09	6	5	10	0	0	0.11	5
Slaughtering facilities	0	0	20	15	0.08	6	5	0	35	0	0.13	4	30	0	0	0	0.14	4
Social tradition	0	0	10	25	0.07	7	0	0	30	10	0.1	5	5	0	10	15	0.09	6
Technical know -how	0	0	0	0	0.05	8	0	0	10	30	0.06	7	0	0	0	30	0.05	8

a source of disease. About 82.9% of the pig keepers in the three towns practiced entry control to visitors. While none of the farmers in all the three towns provided overalls/boots to guests and carried out wheel bath, cleaning and disinfecting for trucks. The number of respondents declared to have no stock introductions was significantly higher ($p < 0.05$) in Bishoftu than Addis Ababa and Adama towns. The study highlighted that the number of farmer's quarantined new pigs were significantly higher ($p < 0.05$) in Bishoftu than that of Addis Ababa and Adam towns. These variations of bio-security implied that measures must be improved in districts with low practices in order to minimize chances of infection by diseases [25]. The pigs were quarantined at average distance of 210 ± 10 m from the main herd for average days of 26 ± 8 considering the total population. However the results disagreed with reports of Okello *et al.* [26], who stated that replacement stock often came from a variety of sources of unknown health status with no quarantine before entry. The number of days quarantined was less than the recommended 30 days outlined by APL [27]. None of the pig producers found in all the three study sites met the recommendations for pig quarantine sketched by [27]. Inadequate quarantine procedures can increase the potential for disease introduction and spread into a naive herd.

Factors Affecting Small Scale Intensive Pig Production in East Shewa: Table 4 presents households' ranking of constraints to small scale intensive pig production in the study towns. Respondents in the three districts ranked market, disease and feed consecutively, as the most limiting factors to increasing pig production. Farmers cited inadequate market access (Rank=1) as the most pressing challenge to pig production which concurred with report of Theodoros *et al.* [4]. This might be related to lack of organized market channel, limited market information and

lack of guaranteed prices [28]. The focus group discussions said "apig worth of Birr 3,500 could be sold at Birr 1,000, after being managed by the farmers for a year or even more". According to Ayele *et al.* [29], alleviating constraints to marketing, improving marketing and market information and upgrading marketing infrastructures could potentially increase the welfare of producers, urban consumers and improve the national balance of payments. The pig farms surveyed in all districts indicated that disease was the 2nd most important constraining factor for increased productivity. The prevalence of pig diseases might be related to high cost of drugs and veterinary services. The focus group discussions explained that losses due to disease in all the study sites ranged from 40 to 80%. Most farmers in the three districts had no explanation for these outbreaks, but 5% of interviewed households identified bringing pigs from other areas as a main cause of outbreak of disease. Feed was perceived as the 3rd most important constraint among all sites. Pig keepers initially concerned on the ability to provide enough feed sooner than quality feed for pigs to consume. While farmers in all locations contended that many feed materials were available nonetheless, they were unable to utilize in their feeding program. This might be due to the high prices of feed ingredients.

Scarcity of land was ranked 4th in Addis Ababa district while 7th and 8th in Adama and Bishoftu towns, respectively in terms of constraining productivity of the pig farms. This may hamper pig farm expansion, own feed/forage production and development. Furthermore, the absence of municipal abattoir in Bishoftu and Adama was leveled as the 4th threat which has resulted in small-scale producers slaughtering their pigs either on farms under unhygienic conditions or in Addis Ababa, about 40 to 60 km away. The slaughtering of pigs in Addis Ababa contributed to farmers incurring high transportation costs which can render pig farming unprofitable.

The inadequacy of slaughter facilities might contribute to low off take in the study towns. The focus group discussions clarified that lack of local pork processing plant was thought to be one of the leading causes of the poor marketing. In Addition, they indicated that the leading pig processing plant (Bishoftu pig processing P.L.C.) failed to buy pigs from farmers due to less demand of pork in the local market.

Social tradition was perceived as the 5th, 6th and 7th constraint in Bishoftu, Adama and Addis Ababa towns, respectively. This may demonstrate the cultural belief of the community i.e. pigs were considered unclean animals and have demons. This could in turn affect the selling price of pork in the market centers. Respondents said there was less pork served in the local hotels because customers were not likely to enter hotels where pork was served. Inbreeding was cited as the 6th constraint to improving pig production in Bishoftu district while rated as 5th both in Addis Ababa and Adama towns. This might be related to the use of same source of pig stock in Addis Ababa and Adama towns while rare use of pig breeds imported from Holland in Bishoftu. The focus group discussions highlighted that some of the breeders visited the neighboring provinces to procure quality breeding stock. In addition, pig keepers were unable to use artificial insemination to improve the quality of their pig herd. Inbreeding might cause a loss in heterozygosity and increases homozygosity which can result in increased lethal genes that increase embryonic death, mummified fetuses and stillbirths. Furthermore, inbreeding might cause a decrease in production/reproductive performance and fitness (inbreeding depression), low birth weights, increased mortality and poor fertility [30]. Lack of know-how on pig production management was distinguished as 8th constraint in Addis Ababa and Adama towns while 7th in Bishoftu towns. The majority of respondents explained that feeding, healthcare and housing were issues weakly experienced. The focus group discussions revealed that town pig category were provided with uniform feed supply and dose of drug. Similarly, the pigsty constructed hardly according to the space requirement of different pig class. This condition might lead to fighting, stress and decreased productivity. The pig shelters were generally poorly constructed from local materials.

The constraints to pig production as perceived by the farmers in the current study sites were largely in accordance with the findings in other pig production systems of Ethiopia [4, 31]. The production constraints

might hinder improvement to productivity of pigs [32]. The focus group discussions indicated that if limitations to pig production in East Shewa were reduced, the enterprise could be source of employment and livelihood to many dwellers of central Ethiopia. In general, the rank values for many limiting factors of small scale intensive pig production were unlike to towns. This implied that pig production constraints were different for Addis Ababa, Bishoftu and Adama towns.

CONCLUSIONS AND RECOMMENDATIONS

The small scale pig production system in the three towns can be characterized as intensive pig production for income generation. Health management and challenges of pig husbandry depended on the towns as differences were observed among sites, particularly in terms of use of vaccine, disease types, bio safety (use of feet and wheel bath) and quarantine practices (no new pigs introduced, new pigs quarantined and no quarantine practices). Furthermore, a number of limiting factors of pig production influenced by town for example; land scarcity was ranked as the 4th constraint in Addis Ababa town while the corresponding rank values in Bishoftu and Adama towns were 8th and 7th. Any further actions to improve pig production in East Shewa of Central Ethiopia should consider differences in health management practices and challenges of the towns. Such actions were articulated in six major pillars that were identified in this survey as the most critical.

- Creating awareness on bio-security and quarantine measures should be conducted to advance the pig herd performance and profitability.
- Animal disease control strategies associated with the background of the current towns should be intensified to improve the health status and performance of pigs.
- The government should consider establishing pig breeding center, pork processing units and creating market linkage which can motivate pig producers. It could be more promising to support innovative community-based systems and encouraging other private-sector investment to better meet the unsatisfied demand.
- Future research and development endeavors should focus on estimating body weights of pigs using linear body measurements that could be extremely beneficial for purposes of treating animals with the appropriate doses of drugs and vaccine.

- Allocation of land to the community for pig rearing would be a key intervention for supporting their livelihoods.
- The government should work on cultural and behavioral change of the people and formulate an appropriate policy regarding swine production and incorporate in the national livestock development program.

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