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Husbandry practices followed by backyard poultry in Sindhudurg district of Konkan region

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Abstract
The study was conducted in Sindhudurg district of Konkan region to determine the socio economic and management practices of backyard poultry keepers. The objective of the study was to assess status of chicken management practices following introduction of the improved strains and the perceptions of farmers on the influence of management on overall productivity of the chickens. A total of 156 household representing 44 per cent (352) of the intervened households were interviewed using semi-structured questionnaire at 48 weeks following introduction of the improved breeds. Data for management practices (Housing, feeding and healthcare practices) were assessed using scoring method. For every management aspect, management index was calculated as the proportion of the total score obtained by individual farmer to that of the possible maximum score. The overall result in the present study indicated that most farmers fall under medium status of chicken production practices. Farmers from Sindhudurg district had however, better management indices with respect to housing and feeding. For the improved strains to perform optimally under rural environment a holistic approach focusing on management elements should be emphasized.

Keywords: management practices**,** improved breed, rural chicken production

1. Introduction
In recent years, rural poultry genetic improvement programs in tropical countries has often been directed towards adoption of improved chicken breeds that are better in terms of productivity, adaptability and disease resistance (Wondmeneh *et al.,* 2014; Reta *et al.,* 2012 Habte *et al.,* 2013) [21, 15, 8]. Basically, such improved breed were developed following low productivity of local chicken and considerable reduced liveability of exotic and or cross breeds under extensive management system. The main objective of this project among many others was to improve the livelihood of poor rural farmers, women in particular through introduction of more productive and agro-ecologically adaptable chicken strains. However, experience from previous studies has showed that single intervention to end users had low impact (Wondmeneh *et al.,* 2014; Reta *et al.,* 2012) [21, 15]. Thus, suggesting that multiple interventions through combined inputs and breed have great likelihood of attaining better impact and sustainability of the interventions. However, even where interventions were made some farmers who are expected to be the end users do not effectively utilize them meanwhile expecting better performance (Lyimo, 2013) [11]. As a result, majority of farmers often hardly realize full production potential of their flock and thus may lead to negative perception towards the potential of the improved strains. Furthermore, existing studies that investigate the adoption of new agricultural technology in developing countries have failed to consider how farmers' subjective perceptions and subsequent preference of technology affect their adoption decisions (Adesina and Baidu-Forson, 1995) [1].
This study was therefore undertaken to characterize poultry management practices of the KVK beneficiary households, to assess farmers perception towards improved management practices and to identify constrains faced by farmers in the intervened areas of Sindhudurg district of Konkan Region. The results are expected to help the project and other developmental agencies to identify critical entry points that need immediate attention and to select the most appropriate innovation for village chicken production improvement.

2. Materials and methods
2.1 Description of study area, experimental layout and design
The study was conducted among the 25 villages of Malvan and Kudal taluka's of Sindhudurg district of Konkan Region. Sindhudurg district receives rainfall of between 3500-4500 mm per annum. Rainy season commences in June to October. The temperature ranges between is 15 to 30^0C.

2.2 Sampling and sample size
The study involved intervened districts in ecological zone. 25 villages from each both taluka's were randomly selected for detailed household management study. Quantitatively, a total of 156 out of 176 targeted beneficiary households in the eight selected villages (22 households per village) were successfully interviewed. The household selected represented 44% of the total intervened household (352) in the study zones who had previously received pre-vaccinated 42 days old chicks of either of two the two improved breeds namely; Giriraja and Kadaknath. Selected households were those with experience of at least 2 years in keeping chicken and had less than 50

local chickens before the new strains were introduced.

2.3 Data collection

Data on poultry management practices from beneficiary households were assessed when the allocated strains had reached 48 weeks of age. Basically, the management aspects assessed were those hypothesized to have direct positive effect on chicken productivity i.e. improved housing, general bio-security status, supplementation level, disease control measures and perception of farmers towards the impact of management practices on overall chicken productivity. Farmers were interviewed using pretested questionnaire and on-site observation to assess the extent of use of the recommended poultry management practices. Farmer's levels of awareness on the effect of management practice on chicken performance were also assessed. Furthermore, constrains that farmer's faces during the study period were also inquired. From the list of the challenges captured, only the first five challenges that had highest frequency were considered.

2.4 Determination of management practices level of the respondents

2.4.1 Diseases and health care control measures

The following healthcare elements were used to assess participating households: (i) vaccination against Newcastle diseases, (ii) vaccination against Fowl pox, (iii) provision of prophylactic measures, (iv) poultry house disinfection, (v) separation of sick birds from healthy ones and (vi) treating of sick birds. For every healthcare element studied a score of 1 or 0 was assigned to users or non-users respectively. Thus, with respect to all healthcare elements studied the minimum and maximum theoretical score individual farmer could score was 0 and 6 marks respectively.

2.4.2 Supplementation level

The following elements of feeding were studied; (i) amount supplemented per bird per day; (ii) quality of supplements and (iii) frequency of supplementation. With regards to amount of feed supplemented per bird per day, individual farmer were further ranked in five levels considering i.e. (i) nil(ii) poor (20g and below); (iii) inadequate (between 20 to 30g); (iv) adequate (anything above 40g) and (v) *ad libitum* feeding.

Regarding to quality of supplementing material individual farmers were further ranked into five levels considering that the complete diet has to contain ingredients having carbohydrates, fat, protein, minerals or vitamins as follows: The levels were (i) nil/ kitchen left over's (ii) supplemented grains and or their by-products only (iii) supplemented grains plus oils seeds cakes or legumes (iv) supplemented number (i) and (ii) above plus commercial feed ingredients (v) commercial diet. Lastly, individual farmers were further ranked into five levels with regards to regularity of feeding i.e. (i) occasional feeding; (ii) at least once in a week, (iii) 2-3 times in a week (iv) once per day and (v) 2-3 times a day. For all feeding elements studied, Likert scales of 0 to 5 points were allocated to the respective levels according to Parveen (2008) [14] and Elkashef *et al.* (2016) [6]. Finally, the overall score per respondent with regards to supplementation practice was obtained by summing up the score obtained from all the three feeding practices. Thus, in reference to the sub-elements of feeding the lowest and highest possible score individual farmer could score was 0 and 15 points respectively.

2.4.3 Poultry housing condition

The following elements of improved poultry housing were used to assess housing structure of participating households: (i) ventilation status and orientation; (ii) spacing requirement of chicken; (iii) floor status; (vi) roof status (spillage); (v) presence of feeder and drinkers; (vi) presence and quality of litter/bedding material (vii) general hygiene status. The housing structure in this context was not necessary built using expensive materials to be ranked high but rather if it meets the basic requirements regardless of construction materials used. From the developed scale, poultry housing elements were ranked into four levels i.e. (i) poor; (ii) moderate; (iii) good and (iv) very good. A Liker scale of 0 to 4 points was assigned to the respective levels as per Parveen (2008) [14] and Elkashef *et al*. (2016) [6]. Similarly, the overall score per respondent with regards to housing practice was obtained by summing points obtained from each poultry housing element. Thus, with respect to seven studied housing elements the minimum and maximum possible score individual farmer could score was 0 and 28 points respectively.

2.4.4 Determination of farmer's perception towards poultry management intervention

Likert scale was used to measure farmer's perception on the effect of the use of improved management intervention on production performance of their chicken. A total of five attitudinal statements describing different management elements were used. After data transformation a Likert scale was categorized into negative, neutral and positive into which a score of 1, 2 and 3 points were allocated into respective categories. The total score for individual respondent was obtained by summing up the score obtained from all five attitudinal statements. Thus, the highest, middle and lowest possible points were 15, 10 and 3 points respectively. With that regards, farmers who scored 1 to 9 points were considered as negative attitude while those who scored 11 to 15 stood for positive attitude. Those farmers who score 10 was considered neutral attitude.

2.5 Data analysis

All descriptive data collected were coded and analysed for each variable investigated using SPSS version 20.0 (SPSS, 2016).With regards to management data, the total score for individual farmer were used to calculate Management Index (MI) in respect of the three intervention categories. In all cases management index was calculated as the proportion of the total score obtained by individual farmer to that of the total scores i.e.

Management Index (MI) =Respondent total score/Sum of the total score for a given technology

Based on computed management index values, participating households were categorized in four management levels; (i) low level (MI 0 to 0.40); (ii) medium level (MI 0.41 to 0.60); (ii) high level (MI 0.61 to 0.80); (iii) very high level (MI 0.8 and above). Cross tabulation analysis was thereafter used to compare management levels to particular technology elements between the two ecological zones. Descriptive statistics such like frequency distribution, percentages and mean were used

for categorization of description of the variables. T-test and chi-squire were used to identify whether the differences between zones means were statistically different. Furthermore, multiple linear regression analysis was used to measure association between management indices of the respondents as dependent variable against respondent's socio-demographic and related factors as independent variables.

3. Results

3.1 Respondent's characteristics

Table1 shows that female constituted the majority of respondent (82.3%). The mean age of the respondent in both zones was 37 years with the mean chicken farming experience of 17 years. Only 20.5 per cent of the respondents had attended secondary education level and beyond. The remaining proportions (78.5%) had primary education or were semi illiterate. Southern highland zone had more households rearing their chicken under partial confinement (84.6%) while the predominant system (76.9%) for the central zone was free range.

3.2 Management level categories of the respondents

Management level categories of respondents for the three management aspects are presented in Table 2. Malvan Taluka had about 50 per cent of the households who had fairly good housing for their chicken with better feeding (56.4%). On overall 41% of the households had better management followed by 35.5% of the households who scored medium.

Table 1: Socio-demographic information the respondent (N=156), for the two agro-ecological zones

Variables		Taluka's		Overall means
		Malvan	Kudal	
Gender	Variables	60 (76.9)	70(89.1)	130(82.3)
	Male	18(23.1)	8(11.4)	26(17.7)
Education level	Secondary education and above	18(23.1)	14(17.9)	32(20.5)
	Primary education and below	60(76.9)	64(82.1)	124(78.5)
Management system	Partial confinement	60(76.9)	12(15.4)	72(46.2)
	Free range	12(15.4)	66(84.6)	78(50.0)
Age of farmer (years)		35.96	37.98	36.9
Chicken farming experience (years)		15.36	18.64	17.0

Numbers outside and inside parenthesis represents respondent number and percentage respectively

In the Kudal Taluka most of the visited households kept their chicken in poor housing structure (48%) and only 16 per cent scored higher. Similarly, feeding was poor for almost two third of the households. On overall, 56.4 per cent of the household fell under medium level of management. With regards to healthcare there was nearly equal distribution of respondent in the three categories.

Table 2: Proportion of household within agro ecology by management level categories

Recommended practice	Taluka's							
	Malvan				Kudal			
	Poor	Medium	High	Very igh	Poor	Medium	High	Very high
Housing structure	18(23.1)	22(28.2)	38(48.7)	0(0.0)	38(48.7)	32(41.0)	8(10.3)	0(0.0)
Feed and feeding	26(33.3)	44(56.4)	8(10.3)	0(0.0)	52(66.6)	26(33.3)	0(0.00)	0(0.0)
Health care	12(15.3)	30(38.5)	32(41.0)	4(5.1)	30(38.5)	16(20.5)	28(35.9)	2(2.6)
Overall	18(23.1)	28(35.5)	32(41.0)	0(0.0)	30(38.5)	44(56.4)	4(5.10)	0(0.0)

Poor = 0.0 to 0.41, Medium= 0.41 to 0.6, High= 0.61 to 0.8, =Very high= 0.81 to 1; Numbers outside and inside parenthesis represents respondent number and percentage respectively.

3.3 Management index score between zones

Management index score for the two zones are presented in Fig1. There was significant difference in management level indices with respect to housing (P>0.05) and feeding practices (P>0.05) for the two zones in favour of Southern highland zone. Healthcare practices were almost similar in the two zones. Overall management index further revealed significant difference between the two zones.

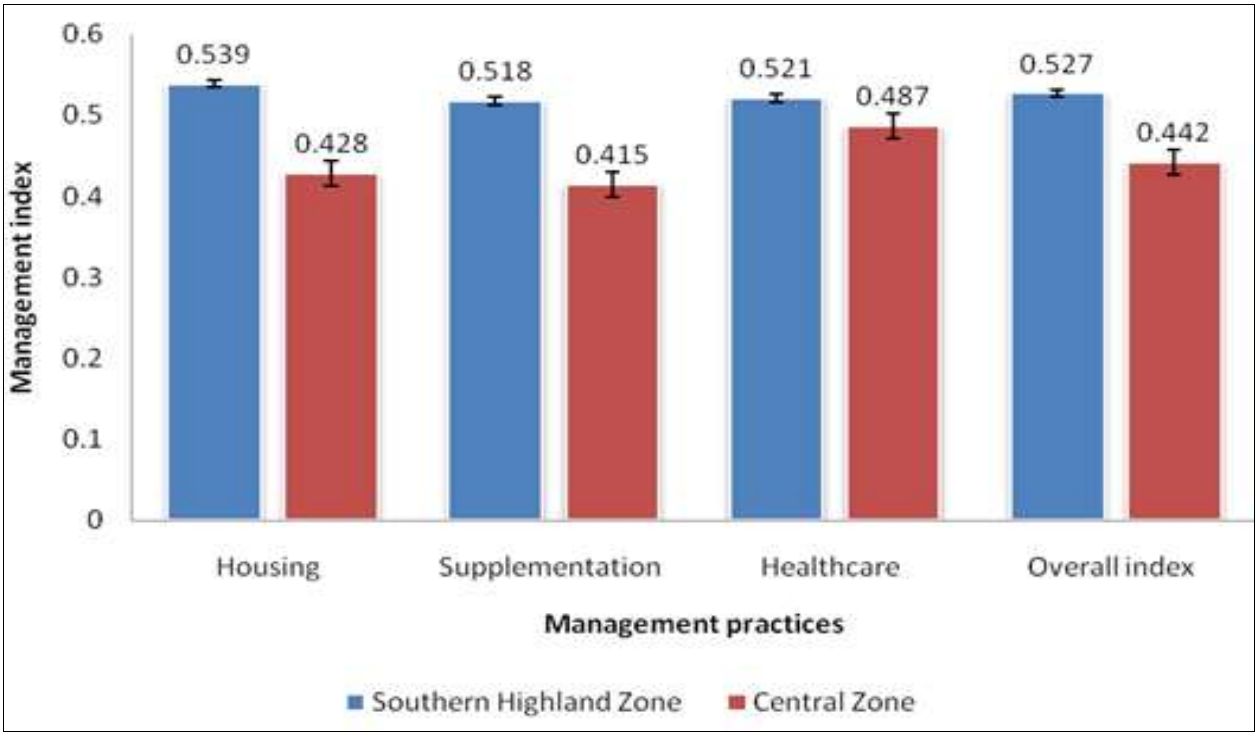

Fig 1: Management index score for the three management aspects by zone

3.4 Relationships between management indices and some characteristics of the respondents

Out of the five elements used to characterize the respondents only two i.e. awareness level and management system adopted (P>0.05) positively affected the overall chicken management indices of participating households (Table 3).However, sex of the farmer, education level and poultry keeping experience had no influence on level of management.

3.5 Farmer's perception of the interventions

The results for farmer's perception on the importance of poultry management practices on overall productivity are presented in Table 4. There was no significant difference in farmer's perception between agro-ecological zones. Majority of the respondent in both zones (74.4%) had positive attitude towards effects of management interventions on overall flock performance while 10.3% and 15.4% had neutral and negative perception respectively.

Table 3: Influence of socio-demographic and related factor on overall management index

Attributes	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constants)	0.136	0.72		1.898	0.060
Sex of the farmer	0.005	0.026	0.014	0.204	0.838
Age of the farmer	-0.002	0.002	-0.115	-0.973	0.332
Level of education of the farmer	0.039	0.023	0.115	1.188	0.093
Management system of the farmer	0.092	0.020	0.341	4.698	0.000
Farming experience of rearing chicken	0.005	0.002	0.265	2.213	0.078
Awareness of the farmer	0.336	0.071	0.337	4.730	0.000

Multiple R=0.565[a], R^2=0.319; Adjusted R^2=0.262; Std. Error of the Estimate = 0.11706; F-statistics=5.552, F significance=0.000[b]; Dependent variable: Overall management index

Table 4: Overall perception index categories of respondents in the two agro-ecological zones

Categories	Taluka		Total	$\chi 2$	df	P-value
	Malvan	Kudal				
Negative	8(10.1)	16(20.5)	24 (15.4)	4.908[a]	2	0.086
Neutral	6(7.70)	10(12.8)	16 (10.3)			
Positive	64(82.0)	52(66.6)	116 (74.4)			

Numbers outside and inside parenthesis represents respondent number and percentage respectively

3.6 Constraints encountered by farmers during study period

The predominant constrains as perceived by farmers are Presented in Table 5. Low price of eggs, high feed cost, diseases, predation and retained eggs in that order, were the first five frequently mentioned constraints.

Table 5: List of challenges encountered by farmer in their order of their importance

Constrains	Responses		
	N	Percentage	Percentage cases
Low eggs prices	118	34.1	76.6
Feeding cost	100	28.9	64.9
Diseases	72	20.8	46.8
Predators	42	12.1	27.3
Retained eggs	14	4.0	9.1

4. Discussion

High proportion of women in the current study (82.3%) justifies the findings that poultry keeping activity in rural areas is fully in the domain of women (M uchadeyi *et al.*, 2007; Ali, 2012) [13, 4]. However, the finding was expected since more women were recruited in the project using chicken keeping as potential opportunity for their empowerment. Nevertheless, gender of person, education level and age did not significantly influence overall management level. The difference in management systems observed in the two Taluka may thus be explained by other socio-economic factors including the relative size of land available for livestock and crop production. The intervened villages in Malvan are located in peri-urban areas where land is limiting but with better access to inputs and markets. While, the villages in Kudal were spatially populated with ample scavenging area but with limitations in market access. Cooler and abundant rain in Malvan may imply intense agriculture activities compared to Kudal which in away could have instilled positive influence on entrepreneurship tendencies. The results conform to what was reported by T sadik et al. (2015) [18] in Ethiopia where higher adoption rate (48.3%) of poultry technologies was found in the highlands compared to 33.3% in the lowland agro-ecologies.

Despite the observation that education level did not influence level of management significantly, UNESCO (2012) contended that education is a key socio-economic factor that can enhance the ability of farmers to adopt new agricultural innovations. Likewise, the observed mean age of household heads of approximate 37 years falls within the economic active age group which is comparable to the mean age of 36 years reported for rural poultry farmers in coastal region of Tanzania (Lyimo, 2013) [11].

Availability of feeds and feeding practices are critical in ensuring that farmers optimise the genetic capacity of the flock. Moreover, the difference in management practices in respect of supplementation seem to be rather influenced by the agro-ecologies whereby availability of feeds throughout the year can dictate whether the farmer adopt semi-intensive or scavenging mode of production. For example, Alem (2014) [2] and Habte *et al.* (2013) [8] reported slightly better performance of both local and exotic breeds in mid-highland than was in the lowland ecologies of Ethiopia due to availability of feeds and favourable environment. Likewise, proximity of households as was the case in Southern highland also meant that there was limitation in terms of scavenging feed resource, thus further explain why semi-intensive system was common in this zone. However, despite the difference in feeding management, almost all farmers (96.2%) from both ecological zones provided one form or another of supplementary feeds. These results are in agreement with the findings of Lyimo (2012) [11] in Tanzania, Tadesse *et al.* (2013) [17] in Ethiopia and Elkashef *et al.* (2016) [6] in India who reported that over 95% of chicken owners in respective study areas were supplementing their birds.

Regarding quality of supplementing material, grains and their by-products (maize, sorghum, and rice) and sunflower seed cake appears to be the most important feed resource commonly used by farmers in the two zones. Nonetheless, availability of these feed resources was influenced by season and competition between human and livestock. Farmers reported increased used of supplement during harvesting period and much less during wet season. Previous study by Goromela *et al.* (2007) [7] in central region Tanzania observed similar pattern with seasonal availability of feed. Again, the need for cash under small holder condition during the dry season compel the farmer to sell stock of crops that could have been used to smoothening supplementation of birds during lean periods. These finding suggest the necessity of developing a practical feed supplementation strategy and feed conservation techniques for rural farmers based on estimated scavenging feed resource in the study area.

Furthermore, commercial feed was not important feed resource in both regions due to prohibitive costs and accessibility. Few farmers especially from Southern highland zone used home-made formulations and in some cases vitamins and bone meals were added. The findings are in agreement with the observation made by Lyimo (2013) [11] and Goromela *et al.* (2007) [7], in Tanzania, Tadesse *et al.* (2013) [17] in Ethiopia and, Ali (2012) [4] n Sudan who noted that commercial feeds and use of premixes is rare in rural areas. Thus, depending on the season, birds are liable to under nutrition and may explain the often poor performance reported for both local and improved strains (Reta *et al.,* 2012; Wondmeneh *et al.,* 2016) [15, 20].

It was observed that most of the farmers provided some form of housing for their chickens. However, there was a huge variation in the quality of housing structure across the zones; those from Malvan at least met the minimum standards compared to those of central zone. Thus, the quality of houses and overall management could be influenced by the level of agriculture productivity which implies better income. Under such circumstance, farmer may perceive the development projects differently hence their willingness to invest. This observation conforms to what was reported by Dorji and Gyeltshen, (2012) [5], Tadesse (2013) [17] and Elkashef *et al.* (2016) [6]. As such most primitive poultry houses and inadequate feeders and drinkers were found in households practicing free range system suggesting the influence of socio-economic background on level of technology adoption.

On biosecurity, it was anticipated that the levels of biosecurity under rural environment cannot match with prescribed standards for commercial poultry production. However, majority of farmers adopted ectoparasite control practices as well as vaccination for major diseases such as New castle, Fowl pox and Infectious bronchitis. Vaccination was done to both introduced and the local strains, following project interventions as part of the management packages. Lyimo (2013) [11] in Tanzania and Khandait *et al.* (2011) [10] in India found that de-worming was uncommon practice in rural

setting of developing countries probably due to insufficient knowledge. Nevertheless, all farmers vaccinated their chicken against new castle disease and fowl pox. Newcastle disease (ND) has been ranked the most killer disease of free-ranging local chickens in Tanzania (Swai *et al.*, 2007; Minga *et al.*, 1989) [16, 12] and thus its control is very critical in any program seeking to improve rural poultry production. Other diseases which were commonly reported included Coccidiosis, Fowl Coryza, Fowl typhoid and vitamin A deficiency.

Despites the differences in management levels between the two ecological zones, the overall results indicated that most of the households were responsive in adopting recommended management practices. Lyimo (2012) [11] in Tanzania, Tsadik *et al.* (2015) [18] and Tadasee *et al.* (2013) in Ethiopia had similar observation in areas where there were external interventions. Such observations auger well with the fact that majority of farmers had positive perception on influence of best practices in management (74.4%). This could be contributed by the level of awareness created before introduction of the improved breed and extension support consistently provided by the project. Likewise, the project provided pre-vaccinated brooded chicks when they were 42 days. This reduced the higher incidences of chick mortality commonly observed in scavenging mode of production and likely to have raised the farmers' confidence. Minga *et al.* (1989) [12] and Alexander *et al.* (2004) [3] showed that vaccination against Newcastle alone can significantly reduce chicken mortalities in rural areas. Apparently, adoption of innovation is a process that can be influenced by the nature of the project and other externalities. For example, Tsadik *et al.* (2015) [18] in Ethiopia observed that on introducing new technologies initially some farmers tended to have either negative or positive perception about the technology. However, after farmers were engaged in the technology, most developed positive perception and only a few had still negative or neutral perception. Wondmeneh *et al.* (2016) [20] contends that purposive selection of participating households based on prior experience in chicken production had influence on the overall perception. In the current study recruited farmers were also required to have at least chicken keeping experience of two years.

Even though, majority of respondent had positive attitude the overall level of management observed in this study was at medium level index suggesting that other factors more than awareness level might have contributed to the status. For instance, majority of respondents who did not use the recommended management practices claimed to be aware on their importance however, their major challenges were their low financial status and a number of other constrains such as low egg prices, high cost of inputs, diseases and predations. These constraints can therefore partly explain why farmers were reluctant to full adopt the management practices, especially if they are not guaranteed with market. Wondmeneh et al. (2016) [20] reported that as long as farmers are assured of getting profit he/she is also likely to invest in technologies. In general, small family poultry producer have poor levels of knowledge on how to raise their birds profitably. And therefore, productivity and the rate of output/rate of input will likely be affected by various socioeconomic factors such as motives for keeping poultry, flock size and economic cost (of stock, feed and health maintenance).

5. Conclusions and recommendation

On the basis of the important findings of the study the following conclusions are drawn and presented.

1. Overall management level of farmers in the study areas were medium being influenced by agro-ecology and level of awareness created
2. Majority of the farmers had positive perception that improved management will have positive impact on overall performance of their birds.
3. In order to optimize productivity of introduced improved strains of chicken in rural areas a holistic approach that addresses critical management elements is recommended.

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