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RESEARCH ARTICLE.....

Poultry farming : Suitable intervention for livelihood support and nutritional security of marginal/small farmers of N-E Karnataka

S.N. VINODAKUMAR AND B. K. DESAI

ABSTRACT..... Backyard poultry farming is a social phenomenon rather than an economic proposition. It is popular among the communities who have no inhibition against keeping birds, eating eggs produced and the meat. Keeping the importance of backyard poultry system in rural areas the present study was undertaken to compare free range/ backyard poultry rearing practices with battery cage rearing in Main Agricultural Research Station (MARS), Raichur of N-E Karnataka during 2012-13 and 2013-14 to examine productivity, economic structure, employment generation, nutritional value addition and resource recycling.

KEY WORDS..... Backyard (free range) poultry rearing, Battery cage rearing, Marginal/ small farmers, Productivity, Economics, Employment, Livelihood/ nutritional security

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INTRODUCTION.....

Nearly three-fourth of the farming community is categorized as marginal, small and landless laborers who constitute the bulk of the population living below poverty line. The vicious circle of poverty could not be broken even more than six decades of planned effort for bringing improvement in the living standard of the masses earning their livelihood through traditional pursuits. Livestock has been a built in component of the farming system throughout the world but its potentials have not been fully recognized and realized by majority of the farming communities. An average traditional farmer remains idle for four to six months per year following the tradition bound farming. Lack of gainful employment leads to loss of income and deep rooted poverty. Nutritional deficiencies problem is common among the poor's. Protein deficient diet based on cereals and pulses need to be supplemented by animal based protein sources for which poultry and poultry products are well known. Backyard poultry keeping is a social phenomenon which has more of family touch and very little or no business motives. The flock size is very small and managed as a supplementary enterprise without any worthwhile separate infrastructure and competitiveness in resource allocation and managerial efforts. There is a dire need to investigate the need oriented success which may be convincing to the local farmers. The problems of generating know how and its dissemination is universally recognized which is a great challenge to the researchers, policy makers and the prospective beneficiaries (Awasthi

Table A : Different improved breed of backyard chicken

Name of breed	Feather pattern	Purpose	Organization
Gramapriya	Multicolour	Dual	PDP, Hyderabad
CARI- Nirbhic	Multicolour	Dual	CARI, Izatnagar
CARI- Shyama	Mixed colour	Dual	CARI, Izatnagar
Vanaraja	Multicolour	Dual	PDP, Hyderabad
Giriraja	Multicolour	Dual	KVAFSU, Bangaluru
Gramalaxmi	Mixed brown	Egg	KAU, Mannuthy
Nicobari	Black and white	Egg	CARI, Portblair

et al., 2015).

Rural poultry farming involves rearing of improved chicken varieties under free range, semi intensive or intensive conditions (Buragohain *et al*., 2007). Rearing method largely depends on the type of the bird reared, availability of resources and the preference of the local population for meat or eggs. Specific varieties of birds are available for rearing for meat or eggs and few varieties for both (dual purpose. Having realized the importance of backyard rural poultry farming in India, several research organizations developed different backyard chicken varieties which are presented in Table A (Pathak and Nath, 2013). Marginal and small farmers rear poultry birds mainly with 3 methods *viz*., free range farming/ backyard rearing method, yarding method and battery cage method. The objectives of the study is to compare the backyard poultry system with battery cage in terms of its productivity, economics, employment generation, nutritive value addition and livelihood security.

RESEARCH METHODS.....

Profile of experimental location :

The present study was conducted at Agricultural Research Station (MARS), Raichur of N-E Karnataka. Raichur district lies between 15^0 09' and 16^0 34' North latitude and between 75^0 46' and 77^0 35' Eastern longitude. It is surrounded by Yadgir, Bijapur, Baglkot, Koppal and Bellary districts and in eastern side surrounded by Mahboobnagar district of Andhra Pradesh. The two rivers Krishna and Tungabhadra flows through northern and southern boundaries of the district. Raichur district consists of 37 hoblis which falling in 5 talukas (Raichur, Manvi, Lingasugur, Devadurga and Sindhnur) of the district. Total geographical area of the district is 8383 sq kms consisting of 883 villages. About 88 per cent of the farmers are small and marginal farmers. Raichur district consist of 9 veterinary hospitals, 21 dispensaries, 19 primary veterinary centers, 6 artificial insemination centers to take care of livestock. The district has potential irrigation source (canal, tank, wells, tube wells and lift irrigation). Various types of farming systems are being adopted by the farmers of North-East Karnataka. Integration of livestock component as a farm enterprise is most common. Major crops grown are cotton, paddy, tur, groundnut, sunflower, *Rabi* jawar, maize etc. Among these, cotton and paddy occupy major area of the cultivable land in the district. With respect to livestock, dairy and sheep/ goat rearing occupies major subsidiary enterprise with cropping. Majority of the farmers rear desi/local poultry birds for family consumption purpose mainly through free range/ backyard rearing method.

Giriraj poultry birds were selected for study due to its high general immune competence (withstand pest and disease attack), resistance to adverse climatic conditions, better performance even with poor quality diets and faster growth rate. Taste of the meat is superior than normal broiler and less tender than broiler birds gives desi/local chicken taste. The price of the meat is also higher than broiler and the meat is having very good marketability. Free range/Backyard (Fig. A) and battery cage (Fig. B) rearing systems were followed to rear 25 poultry birds each.

A day old chicks of giriraj breed were used for study. Maize residues, kitchen leftovers and other crop residues were the main food for poultry birds. Lighting and other operations were followed as per recommendations. Periodical live weight of poultry birds, per day live weight increase in live weight, dressing weight, feed consumption rate, feed conversion rate (FCR) were observed for a period of nine weeks during 2012-13 and 2013-14. Other parameters *viz.*, economics, employment generation, residue addition, nutrition were calculated.

Fig. A : Free range/backyard poultry rearing

Fig. B : Battery cage system poultry rearing

RESEARCH FINDINGS AND ANALYSIS.....

The results obtained from the present investigation as well as relevant discussion have been summarized under the following heads :

Productivity of poultry birds :

The observations pertaining to the live weight of giriraj birds indicated that, the live weight increased from 50 to 1980 g and 50 to 2460 g between day old chick to 9th week in free range rearing and battery cage rearing (Table 1), respectively during the first year of study (2012-13). The similar trend was observed in second year study (2013-14) with 2037 and 2565 increase in live weight of poultry birds in free range rearing and battery cage rearing, respectively. Highest dressing weight was recorded for poultry birds in battery cage rearing system (1747 and 1821 g, respectively during 2012-13 and 2013-14). Whereas, free range rearing recorded lower dressing weight (1436 and 1477 g, respectively during 2012-13 and 2013-14). Among these two rearing methods, battery cage rearing recorded highest live weight (24.24 and 25.92%) and dressing weight per bird (21.65 and 23.29%) over free range rearing during 2012-13 and 2013-14, respectively. This might be due to higher assimilation capacity of birds with reduced physical movement. Considerable difference recorded between rearing methods with respect to live weight and growth rate. The weight increase upto 9 weeks was higher and

Table 1 : Live weight (g), growth rate (g) and dressing weight (g) of poultry (Giriraj broiler) birds (mean of 25 birds)

Age (Weeks)	Live weight bird^{-1} (g)		Weekly weight gain of bird^{-1} (g)		Daily weight gain of bird^{-1} (g)		Live weight bird^{-1} (g)		Weekly weight gain of bird^{-1} (g)		Daily gain bird^{-1} (g)	
	First year (2012-13)						Second year (2013-14)					
	FRS	BCS	FRS	BCS	FRS	BCS	FRS	BCS	FRS	BCS	FRS	BCS
Initial	50	50	-	-	-	-	50	50	-	-	-	-
1	79	116	30	66	4.2	9.4	75	131	26	81	3.6	11.6
2	117	276	38	161	5.4	22.9	105	296	30	165	4.3	23.6
3	240	495	123	219	17.6	31.3	222	531	117	236	16.7	33.6
4	450	840	210	345	30.0	49.3	414	873	192	342	27.4	48.9
5	690	1185	240	345	34.3	49.3	720	1305	306	432	43.7	61.7
6	960	1473	270	288	38.6	41.1	990	1518	270	213	38.6	30.4
7	1305	1821	345	348	49.3	49.7	1368	1926	378	408	54.0	58.3
8	1680	2205	375	384	53.6	54.9	1755	2265	387	339	55.3	48.4
9	1980	2460	300	255	42.9	36.4	2037	2565	282	300	40.3	42.9
Dressing weight (g)	1436	1747	-	-	-	-	1477	1821	-	-	-	-

Not statistically analyzed FRS: Free range poultry rearing system/ backyard rearing system BCS: Battery cage poultry rearing system

considered as economical for broiler poultry rearing. Highest weekly live weight gain and per day live weight was observed during 8th week with 375, 53.6, 384 and 54.9 g in free range rearing and battery cage rearing, respectively during first year study (2012-13). Similar trend was observed in case of second year study (387, 55.3, 339 and 48.4 g in free range rearing and battery cage rearing, respectively) with respect to weekly live weight gain and per day live weight.

Between two poultry rearing systems, battery system has lowest wastage of feed and higher feed conversion rate (FCR) compare to the free range during 2012-13 and 2013-14 and depicted In Table 1 and 2. Much variation in consumption was also observed in both the rearing methods due to assimilating capacity of the individual birds. The results are with conformity of Jayanthi (1995) and Paraminder Singh (2000).

Organic manure and nutrient addition :

The results clearly indicated that, both rearing systems markedly influenced the organic residue addition in both the years. The organic residues added by the

Table 2 : Feed consumption rates (kg) and feed conversion rate (FCR) of poultry (Giriraj broiler) birds (mean of 25 birds)

Age (Weeks)	Food consumption (kg)											
	First year (2012-13)						Second year (2013-14)					
	FRS			BCS			FRS			BCS		
	Per week	Cumulative	FCR	Per week	Cumulative	FCR	Per week	Cumulative	FCR	Per week	Cumulative	FCR
1.	0.15	0.15	1.88	0.14	0.14	1.25	0.15	0.15	2.00	0.15	0.15	1.13
2.	0.24	0.39	2.08	0.24	0.38	0.86	0.25	0.40	2.34	0.24	0.39	0.82
3.	0.43	0.82	1.80	0.42	0.80	0.85	0.44	0.83	1.97	0.43	0.82	0.81
4.	0.58	1.40	1.29	0.57	1.37	0.67	0.59	1.42	1.42	0.58	1.39	0.66
5.	0.68	2.08	0.98	0.66	2.03	0.55	0.68	2.10	0.95	0.67	2.06	0.51
6.	0.81	2.90	0.84	0.79	2.83	0.54	0.82	2.93	0.83	0.80	2.88	0.53
7.	0.95	3.85	0.72	0.92	3.75	0.51	0.96	3.89	0.70	0.94	3.82	0.49
8.	1.05	4.90	0.63	1.03	4.77	0.47	1.06	4.95	0.61	1.05	4.86	0.46
9.	1.24	6.14	0.63	1.21	5.98	0.49	1.26	6.21	0.62	1.23	6.10	0.48

Not statistically analyzed FRS: Free range poultry rearing system/ backyard rearing system BCS: Battery cage poultry rearing system

Table 3: Nutrient management, nutrition value, economic and employment parameters of poultry (Giriraj broiler) birds reared under free range / backyard poultry rearing system and battery cage poultry rearing system

Parameters		First year (2012-13)						Second year (2013-14)					
		FRS			BCS			FRS			BCS		
Nutrient management	Residue addition (kg ha^{-1})	265			290			270			299		
	NPK addition (kg ha^{1})	N	P	K	N	P	K	N	P	K	N	P	K
		85.6	46.9	78.0	251.5	94.3	130.8	96.7	51.0	92.1	262.1	99.3	144.7
Nutritional parameters	Meat yield (kg ha^{-1})	198			246			203			256		
	Carbohydrate yield (kg ha^{-1})	10.6			13.2			10.9			13.7		
	Protein yield (kg ha^{-1})	17.2			21.4			17.7			22.3		
	Fat yield (kg ha^{-1})	7.9			9.8			8.1			10.2		
	Energy output (K cal ha^{-1})	18254			22679			18733			23601		
Economic and employment	Production cost (Rs.)	3891			3912			4012			4198		
	Gross income (Rs.)	26850			29510			29510			30750		
	Net return (Rs.)	22959			25598			25498			26552		
	B: C	5.90			6.54			6.30			6.32		
	Return per day (Rs.)	1640			1707			1821			1770		
	Employment generation (man days ha^{-1} year^{-1})	14			15			14			15		

Not statistically analyzed FRS: Free range poultry rearing system/ backyard rearing system BCS: Battery cage poultry rearing system

poultry birds in the second year were higher than the first year. Poultry birds reared in battery cage system recorded higher residues addition of 290 and 299 kg ha^{-1} in the first and second year, respectively over conventional free range rearing (265 and 270 kg ha^{-1} in the first and second year, respectively). The NPK addition followed the same trend of crop residues addition during both the years. The NPK addition was, more in the second year than the first year and the battery cage system recorded higher amount of NPK (251.5, 94.3, 130.8, 262.1, 99.3 and 144.7 kg ha^{-1} in the first and second year, respectively) addition than the conventional free range rearing (85.6, 46.9, 78.0, 96.7, 51.0 and 92.1 kg ha^{-1} in the first and second year, respectively). The reason is due to, higher quantity of residue added by the system. As physical movement was restricted in battery system collection was litter and other residues is convenient compare to conventional backyard rearing. Similar findings were earlier reported by Rao (1993); Rao *et al*. (1999) and Ikpe and Powell (2002).

Nutritional value :

In general, both the systems resulted in higher nutritional value during the second year than the first year. This is due to, higher yield obtained in the second year. Higher meat yield, carbohydrate, protein, fat and energy output was recorded in battery cage system (246 kg ha^{-1}, 13.2 kg ha^{-1}, 21.4 kg ha^{-1}, 9.8 kg ha^{-1}, 22679 K cal ha^{-1}, 256 kg ha^{-1}, 13.7 kg ha^{-1}, 22.3 kg ha^{-1}, 10.2 kg ha^{-1} and 23601 K cal ha^{-1} respectively in first, second year over free range conventional rearing system. Results are in accordance with the findings of Parthasarathy Rao and Hall (2003); Devendra and Pezo (2004); Funes-Monzote *et al*. (2009) and Channabasavanna *et al*. (2009).

Economics and employment generation:

The economics in respect of gross returns, net returns, B: C and returns per day was higher in the second year than the first year. This is due to higher yield obtained in the second year. Among the two different poultry rearing systems, battery cage system recorded highest gross returns of Rs. 29510 and 30750 in the first and second year, respectively over conventional free range rearing Rs. 26850 and 29510, respectively. Similar trend was followed with net returns, B: C and return per day. This is due to higher meat yield in the cage rearing system. The result is in accordance with the findings of Nhan *et al*. (2007).

The employment generation in terms of man days not varied considerably with poultry rearing methods during both the years of study. The employment generation through battery cage system (15 man days ha^{-1} $year^{-1}$) over conventional backyard rearing (14 man days ha^{-1} $year^{-1}$). Conventional backyard rearing requires constant watch and battery cage system requires cage feeding, cleaning, shifting of birds on regular basis. Moll (2005); Singh *et al*. (1996); Ramrao *et al*. (2005); Deoghare (1997); Tiwari *et al*. (1999); Ramrao *et al*. (2006); Shabanali Fami (2006) and Suresh and Singh (2008) also obtained similar findings.

Conclusion :

Results on evolution of different poultry rearing methods depending upon their suitability and preferences were found encouraging. Hence, it can be concluded that to enhance the productivity, economic returns, nutritional values battery cage rearing system can be adopted successfully in NE Karnataka instead of conventional backyard rearing. Recycling of organic residues in form of poultry litter and other wastes could be beneficial in improving the soil health and productivity over a longer period of time with lesser environmental hazards. Livelihood of small and marginal farmers could be upgraded by adopting improved rearing technologies on a larger scale.

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