International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2017; 5(3): 805-808

Received: 19-03-2017
Accepted: 20-04-2017

Vinodakumar SN
Department of Agronomy, University of Agricultural Sciences, Raichur, Karnataka, India

Desai BK
Department of Agronomy, University of Agricultural Sciences, Raichur, Karnataka, India

Correspondence
Vinodakumar SN
Department of Agronomy, University of Agricultural Sciences, Raichur, Karnataka, India

Dairy based farming system models for livelihood security of small and marginal farmers of N-E Karnataka

Vinodakumar SN and Desai BK

Abstract
Farming system is an integrated set of activities that farmers perform in their farms under their resources and circumstances to maximize the productivity and net farm income on a sustainable basis. The present study has been taken up to assess the potentialities of dairy based farming systems models for increasing farm income, employment through reallocation of resources in farming system during 2012-14 (2 years) at Main Agricultural Research Station (MARS), Raichur of N-E Karnataka. The results proved that, dairy based farming system helped to increase in net farm income, employment, nutritional value and livelihood of small and marginal farm family.

Keywords: Dairy based farming systems, marginal/small farmers, productivity, economics, employment, livelihood and nutritional security.

1. Introduction
Nearly 85% of the farming community is categorized as marginal, small and landless laborers (Singh *et al*., 2010) [11] 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 dairy based products are well known.

Dairying plays a vital role in the country's agricultural economy, which being the second largest contributor to the gross agricultural produce and leading milk producer with 18.5% of world production (Anon, 2016) [1]. In the recent past, milk production has increased steadily due to the successful implementation of Operation Flood Programmes through combined efforts of research institutions, extension agencies, production and marketing networks, institutional credit policy and more important the enterprising, innovative nature of farmers practicing and operating dairy based farming systems. Dairy enterprise when combined with other enterprises on scientific lines offers great opportunities for increasing farm income and employment, particularly to the weaker sections of the rural community. Hence, the study of dairy based farming systems are helpful to the farmers in rational economic decisions by selecting the appropriate combination of enterprises by reallocating their scarce resources efficiently (Komala, 2002) [5]. Considering these, the study was undertaken to compare the two dairy based farming systems in terms of its productivity, economics, employment generation, nutritive value addition and livelihood security.

2. Material and Methods
Profile of experimental location
The present study was conducted at Main Agricultural Research Station (MARS), Raichur of N-E Karnataka. Raichur district lies between 15º 09' and 16º 34' North latitude and between 75º 46' and 77º 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 cows for daily dairy products requirement. Whereas, some farmers rear HF and jersey cows as they are known for outstanding milk production.

HF cows

Holstein Friesian cows have distinctive markings and known for outstanding milk production. They are large, generally black-and-white marked animals or they can also be red and white. Crop residues, straw, fodder cowpea, Hy. Napier grass, pillipesara and agati were used in the study as per the diet need (Table 1& 2). Dung and refuge of cow were collected and composted separately. The compost was recycled in the respective treatments. Milk yield during morning and evening were recorded. Other attributes namely residues added, employment generated, income etc were calculated during the study period (2012-14). During study period, various crops (commercial, fodder and horticulture) taken along with dairy component to evaluate compatibility and synergetic effect on dairy farming (Fig. 1& 2).

Table 1: Details of the experimental treatments

Treatments		Livestock components	Crops on bunds
F_1	Cotton + Cowpea (F) 1:1 Maize + Cowpea (F) 1:1 - Bengal gram Pillipesara	HF Cow (1)	Agati and Hy. Napier Grass (CO-4)
F_2	Cotton + Onion 1:2 Maize + Cowpea (F) 1:1 - Bengal gram	HF Cow (1)	Banana, Agati, Drum stick and Curry leaf

Table 2: Details of varieties and hybrids used

Crop	Variety	Crop	Variety
Bt Cotton	Jaadoo	Curry leaf	Suvasini (Dharwad-1)
Maize	Hero-555	Banana	Grand nine(G-9)
Bengal gram	Annigeri-1	Hybrid napier grass	Sampoorna (DHN-6)
Onion	Nasik Red	Agati (*Sesbania grandiflora*)	Local
Fodder cowpea	Swad (DFC-1)	Pillipesara (*Phaseolus trilobus*)	Local
Drum stick	Dhanraj		

3. Results and Discussion

Productivity of milch animals (Table. 3)

The result on total milk yield indicated that, different crops residues, fodder crops in the farming systems adopted has markedly influenced the total milk yield of cow integrated in F_1 and F_2 farming systems. Both the systems supplied with sufficient quantity of green fodder and dry hay to meet the diet needs of the cows. Twenty months milk yield was recorder from the cows taken in both farming system models and HF cow of F_1 system gives higher milk yield and consistent milk yield per day compared to F_2 with 3671.7 liters, 6.04 liters day^{-1}, 3442.5 liters and 5.68 liters day^{-1}, respectively. Cow component of F_1 system, produced 6.24 per cent of higher total milk yield over F_2 system. It might be due to supply of balanced nutrition by pillipesara, agati and Hy. Napier grass incorporated in F_1 system. Diary animal supports farmer with daily returns by sale of milk produce. This agrees with the findings of Menale Kassie *et al*. (2008) [7].

Fig 1: F_1 model of dairy rearing

Fig 2: F_2 model of dairy rearing

Total dung and urine yield of HF cows are taken for study and found that, milk yield was directly proportional to the total dung and urine yield. Dung and urine yield of HF cow was, collected and composted to recycle nutrients to the soil of respective systems in both the years. Between two farming systems, cow belonging to F_2 system yielded higher total dung and urine yield of 24,114 kg and 17,026 liters, respectively compared to F_1 with 22,511 kg and 16,865 liters, respectively during 20 months study period.

Organic manure and nutrient addition (Table. 4)

The results clearly indicated that, both the farming systems markedly influenced the organic residue addition in both the years. Total residue added by the F_1 & F_2 systems were 11303, 12027, 11208 & 12088 kg ha^{-1}, respectively for first and second year of study. The NPK addition followed the same trend of organic waste addition during both the years (237.5, 86.4, 123.8, 251.5, 94.3, 130.8, 247.4, 90.3, 137.7, 262.1, 99.3 & 144.7 kg ha^{-1} in the first and second year, respectively). Similar observations are noticed by, Tilman *et al*. (2002) [14], Sanchez *et al*. (2004) [10], Bationo *et al*. (2004) [2] and Makinde *et al*. (2007) [6].

Nutritional value (Table. 4)

In general, both the systems resulted in higher nutritional value during the second year than the first year. This is due to, higher milk yield obtained in the second year. Higher milk yield was recorded in F_1 system (3671.7 lit during 2012-14) over F_2 system (3442.5 lit during 2012-14). Carbohydrate, protein, fat and energy output were recorded the similar trend of milk yield during both the study years. Results are in accordance with the findings of Devendra and Pezo (2004) [3].

Economics and employment generation (Table. 4)

The economics in respect of gross returns, net returns, B: C and returns per day was higher in the first year in F_1 system whereas, in second year F_2 system is more remunerative. This is due to milk yield obtained in the particular year. Among the two different dairy rearing systems, F_2 system recorded highest gross returns of Rs. 1,00,204 in the 2012-14 over F_1 system Rs. 96,827 during 2012-14. Similar trend was followed with net returns, B: C and return per day. This is due to higher milk yield in the F_2 system. The result is in accordance with the findings of Thelma Paris (2002) [13], Subhadra *et al*. (2009) [12] & Khondker and Diemuth (2011) [4].

The employment generation in terms of man days not varied considerably in dairy based farming systems during both the years. The employment generation is ranges from 50-52 during 2012-14 in both the systems. Integration of dairy component will generate extra man days by which increase the employment opportunity per year, uniform employment round the year and to make use of the family laborers of small and marginal category farmers effectively. Moll (2005) & Ram Suresh and Hubba Lal Singh (2008) [9] also obtained similar findings.

Table 3: Total milk yield, daily average milk yield, total dung yield and total urine yield of HF cows studied during 2012-14

Treatments/ Month		Total milk yield (liters)		Average milk yield (liters day^{-1})		Total dung yield (kg)		Total urine yield (litres)	
		F_1	F_2	F_1	F_2	F_1	F_2	F_1	F_2
2012	Aug	201.5	129.0	6.50	4.16	1087	1163	868	887
	Sept	192.5	144.5	6.42	4.82	1109	1218	846	855
	Oct	192.0	131.5	6.19	4.24	1173	1311	856	865
	Nov	210.5	118.0	7.02	3.93	1154	1194	816	823
	Dec	223.5	111.5	7.21	3.60	1195	1194	893	898
2013	Jan	203.0	110.5	6.77	3.56	1177	1352	918	918
	Feb	216.5	109.0	6.98	3.89	1057	1126	784	794
	Mar	163.0	79.0	5.82	2.55	1124	1166	781	790
	Apr	0	36.5	0	1.22	1112	1122	780	785
	May	0	0	0	0.00	1115	1181	818	797
	Jun	0	0	0	0.00	1088	1185	732	787
	Jul	217.5	0	7.02	0.00	1102	1212	880	885
	Aug	239.5	198.0	7.73	6.39	1164	1197	868	854
	Sept	243.5	215.0	8.12	7.17	1145	1101	876	856
	Oct	249.0	229.0	8.03	7.39	1136	1150	856	883
	Nov	264.0	345.0	8.80	11.50	1088	1149	838	874
	Dec	237.0	369.0	7.65	11.90	1152	1246	887	916
2014	Jan	227.2	374.5	7.33	12.08	1180	1342	893	888
	Feb	209.5	376.0	7.48	13.43	1020	1201	772	781
	Mar	182.0	366.5	5.87	11.82	1133	1305	905	892
Total		3671.7	3442.5	-	-	22511	24114	16865	17026

Not statistically analysed

Table 4: Nutrient management, nutrition value, economic and employment generated by dairy enterprises during 2012-14

Parameters		First year (2012-13)						Second year (2013-14)					
		F_1			F_2			F_1			F_2		
Nutrient Management	Residue addition (kg ha^{-1})	11303			12027			11208			12088		
	NPK addition (kg ha^1)	N	P	K	N	P	K	N	P	K	N	P	K
		237.5	86.4	123.8	251.5	94.3	130.8	247.4	90.3	137.7	262.1	99.3	144.7
Nutritional parameters	Milk yield (kg ha^{-1})	1603			969			2069			2473		
	Carbohydrate yield (kg ha^{-1})	7.1			4.3			9.1			10.9		
	Protein yield (kg ha^{-1})	5.1			3.1			6.6			7.9		
	Fat yield (kg ha^{-1})	6.6			4.0			8.5			10.1		
	Energy output (K cal ha^{-1})	10785			6521			13924			16643		
Economic & Employment	Production cost (Rs.)	7832			8531			7192			8476		
	Gross income (Rs.)	44427			42314			52400			57890		
	Net return (Rs.)	36595			33783			45208			49414		
	B: C	4.67			3.96			6.29			5.83		
	Return per day (Rs.)	100			93			124			135		
	Employment generation (man days ha^{-1} $year^{-1}$)	50			50			52			52		

Not statistically analyzed

4. Conclusion

Results on evolution of different dairy based farming system depending upon their suitability and preferences were found encouraging. Hence, it can be concluded that, to enhance the productivity, economic returns, nutritional values and employment, - integration of dairy component is advisable for NE Karnataka instead of conventional cropping alone. Recycling of organic residues in form of dung, uring 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 dairy based farming system on a larger scale.

5. Acknowledgement

Author acknowledge the contribution of multi-disciplinary research team of RKVY-IFS group of Department of Agronomy, University of Agricultural Sciences, Raichur (India) during the course of studies conducted for evaluation of various integrated farming system models.

6. References

1. Anon. Economic survey: India ranks first in milk production, accounting for 18.5 % of world production, 2015-16.http://www.news18.com/news/business/economic-survey-2015-16-india-ranks-first-in-milk-production-accounting-for-18-5-per-cent-of-world-production-1208209 .html. 2016
2. Bationo A, Nandwa SM, Kimetu JM, Kinyangi JM, Bado BV, Lompo F, *et al*. Sustainable interaction of crop-livestock systems through manure management in Eastern and Western Africa: Lessons learned and emerging research opportunities in Williams (eds.), Sustainable crop-livestock production for improved livelihoods and natural resource management in West Africa. Int. Livestock Res. Inst. Nairobi. 2004; 173-198.
3. Devendra C, Pezo D. Crop-animal systems in Asia and Latin America: Characteristics, trends and emerging challenges. Comparison with West Africa. In: Williams. TO, Tarawali SA, Hiernaux P, Fernandez-Rivera S. (Eds.), Proc. Int. Conf. Sust. Crop-Livestock. Prod. Improved Livelihoods. Nat. Resour. Manage. 19-22 Nov. 2002. Int. Livestock Res. Inst, Nairobi (Kenya). 2004; 123-159.
4. Khondker Murshed-E-Jahan, Diemuth E Pemsl. The impact of integrated aquaculture-agriculture (IAA) on small-scale farm sustainability and farmers livelihoods: Experience from Bangladesh. Agric. Syst. 2011; 104:392-402.
5. Komala CN. Risk efficient farming system for sustainable agriculture – models for Kolar district of Karnataka. M.Sc. Thesis (unpublished) submitted to the University of Agricultural Sciences, Bangalore, India. 2002; 161.
6. Makinde EA, Saka JO, Makinde JO. Economic evaluation of soil fertility management options on cassava-based cropping systems in the rain forest ecological zone of South Western Nigeria. Afr. J. Agric. Res. 2007; 2(1):7-13.
7. Menale Kassie, Mohammad A, Jabbar, Belay Kassa, Mohamed Saleem MA. Benefits of integration of cereals and forage legumes with and without crossbred cows in mixed farms: An ex ante analysis for highland Ethiopia. J. Sust. Agric. 2008; 14(1):31-48.
8. Moll HAJ. Costs and benefits of livestock systems and the role of market and nonmarket relationships. Agric. Econ. 2005; 32:181-193.
9. Ram Suresh, Hubba Lal Singh. Income and employment generation in mixed farming systems in Gonda district of UP. Agric. Sci. Digest. 2008; 28(2):121-123.
10. Sanchez JE, Harwood RR, Willson TC, Kizilkaya K, Smeenk J, Parker E, Paul EA, Knezek BD, Robertson GP. Managing carbon and nitrogen for productivity and environmental quality. Agron. J. 2004; 96:769-775.
11. Singh SP, Gangwar B, Singh SP. Characterisation and evaluation of existing farming systems of Uttar Pradesh. Bull., PDFSR, Modipuram. 2010; 1-6.
12. Subhadra MR, Suresh KA, Reeja George P. Optimum activity mix of dairy with crops in mixed farming system in Kerala. J. Dairying. Foods. Husbandry. Sci. 2009; 28(2):101-106.
13. Thelma Paris R. Crop-animal systems in Asia: Socio-economic benefits and impacts on rural livelihoods. Agric. Syst. 2002; 71:147-168.
14. Tilman D, Cassman KG, Matson P, Naylor R, Polasky S. Agricultural sustainability and intensive production practices. Nat. 2002; 418:671-677.