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An Explorative Study on the Development of Dairy Based Integrated Farming System Model

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Abstract Two acre of land was brought under integrated farming 40% land was earmarked for cereal crop i.e. paddy, wheat and vegetable crop in different season, 20% land for fishery, 20% land for horticultural crop, 10% land for dairy, duckery and 10% land for fodder production. Three crossbred (Holstein Friesian × Indigenous Local) high yielding lactating cows were maintained in semi open housing system and management. They were fed with the fodders produced in the system mostly. Concentrate feed was supplied in measured quantity. Overall mean value of av daily morning milk (kg), av daily evening milk yield (kg) and av daily total milk yield (kg) was recorded to be 4.661, 3.143 and 7.804 respectively. Overall mean value of average daily dry fodder intake, average daily green fodder intake and average daily concentrate intake were 4.923, 8.062 and 6.621 kg respectively. Av daily yield of dung was 13.627 kg Multiple regression analysis of data indicated that daily total milk yield of cow increases by 31 g (p<0.01) and 681 g (p<0.01) per kg increase of green roughage intake and concentrate intake.

Keywords Dairy cattle, Integrated Farming System, India, Performance.

Introduction

The Integrated Farming System (IFS) has revolutionized Conventional Farming of Livestock, Agriculture, Aquaculture, Horticulture and Allied activities in some countries, especially in tropical and subtropical regions that are not arid. Farming all over the world is not very performing unless relatively big inputs are added to sustain yields and very often compromise the economic viability as well as the ecological sustainability.

Evidently, the situation can worsen if high duties are paid on imported materials and energy. The IFS can remove all these constraints by not only solving economic and even ecological problems, but also provide the needed means of production such as feed, fertilizer, fuel, besides increasing productivity manyfold. It can turn all those existing disastrous farming systems, especially in the poorest countries, into economically viable and ecologically balanced systems that will not only alleviate poverty, but can even eradicate this scourge completely.

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Livestock keeping in India and similar other countries has multiple objectives and dimensions. They play multiple roles in rural systems and economy and have a strong human dimension, as manifested through socio-cultural link and involvement of women [1]. Besides their well-established role in agriculture livestock have crucial role in food security and as risk aversion mechanism for sustaining family, whenever there is crop failure. Role of livestock in generating employment and income in rural areas is well established and livestock development has become an important component of rural development programes. Manure-compost is ranked by farmers as one of the most important outputs from livestock production. Therefore an effort was made to develop dairy based integrated farming system for the sustainable production in the lower gangetic part of India i.e. at Patna of Bihar.

(Authors are thankful to the Director of the institute for providing necessary facilities for conducting the experiment).

Materials and Methods

Two acre of land was brought under integrated farming at institute farm located at Patna of Bihar. 40% land was earmarked for cereal crop i. e. paddy, wheat and vegetable crop in different season, 20% land for fishery, 20% land for horticultural crop, 10% land for dairy, duckery and 10% land for fodder production. Three crossbred (Holstein Friesian × Indigenous Local) high yielding milch cows were maintained in semi open housing system and management. They were fed with the feed and fodders produced in the system mostly. 40% dry matter of cow was received from different green fodders. 30% dry matter was received from crop residue i.e. paddy straw and wheat straw and rest 30 % dry matter was from concentrate mixture prepared from rice bran, rice polish, pulse chuni, wheat bran, common salt and cake. Common salt and cake were added from external source. Therefore, Barseem, Oat, Mustard in *rabi* season; Maize, Cowpea in Summer; Jowar and Napier in *kharif* season were produced for maintenance and production of three crossbred cows. Cow dung received from the cows was used to fertilize the land for producing cereal crops and fodder crops besides putting in the pond for fish production. Restricted grazing on natural pasture was practiced for three hours daily. Manual milking was practiced twice daily i.e. morning at 8 am and evening at 4 pm .Artificial insemination was practiced by liquid semen. Regular deworming and vaccination was done. Regular data were recorded on feed and fodder intake , milk yield of cow, meteorological parameters . Feed and fodder were analyzed as per AOAC [2]. Daily meteorological parameters were recorded as per standard method [3]. Data were analyzed as per Snedecor and Cochran [4].

Results and Discussion

Three crossbred high yielding lactating cows were maintained in the system and their performances were shown in the Table 1. Cows were maintained in semi open system of housing and management. It was observed that there was highly significant (p<0.01) difference of daily morning milk and daily total milk yield between the cows. However, no significant difference was observed in daily evening milk yield between the cows. Overall mean value of av daily

Table 1. Performance of cow under the system. ** => p <0.01, * = p < 0.05. Figures having different superscripts in a column differ significantly (p <0.05).

Sl. No.	Cow No.	Av daily morning milk yield (kg)	Av daily evening milk yield (kg)	Av daily total milk yield (kg)	Av daily intake of dry fodder (kg)	Av daily intake of green fodder (kg)	Av daily intake of concentrate (kg)
1	26	4.802^{a} ±0.038 (334)	3.170^{a} ±0.077 (334)	7.972^{a} ±0.037 (334)	5.142^{a} ±0.037 (334)	8.130^{a} ± 0.214 (334)	6.697^{a} ±0.090 (334)
2	27	4.705^{a} ±0.052 (334)	3.238^{a} ±0.069 (334)	7.943^{a} ±0.104 (334)	4.876^{b} ±0.035 (334)	8.044^{a} ±0.206 (334)	6.654^{a} ±0.081 (334)
3	28	4.476^{b} ±0.055 (334)	3.020^{b} ± 0.068 (334)	7.496^{b} ± 0.105 (334)	4.752^{b} ±0.045 (334)	8.012^{a} ± 0.203 (334)	6.512^{a} ±0.086 (334)
3	Overa II	4.661 ±0.033 (1002)	3.143 ± 0.042 (1002)	7.804 ±0.067 (1002)	4.923 ±0.022 (1002)	8.062 ± 0.189 (1002)	6.621 ± 0.050(1002)
	F Value	8.203**	2.333 NS	4.991**	27.933 **	0.034 NS	1.217 NS

morning milk yield (kg), av daily evening milk yield (kg) and av daily total milk yield (kg) was recorded to be 4.661, 3.143 and 7.804 respectively. Average lactation yield per cow was 2,475 kg in a lactation period of 295 days. Total milk yield from three cows were 7, 425 kg approximately in a year. The low yield of milk was might be due to the limited use of cake i.e. GNC or MOC. Other reasons might be high ambient temperature along with relative humidity as well as poor genetic make up as the cows were crossbred of Holstein Friesian and Local.

Individual cow had significant effect on the average daily dry fodder intake but not on average daily green fodder intake and average daily concentrate intake. Overall mean value of average daily dry fodder intake, average daily green fodder intake and average daily concentrate intake were 4.923, 8.062 and 6.621 kg respectively. Av daily yield of dung was 13.627kg/day/cow. Total yield of dung in a year was approximately14.5 Mt from three cows in a year. In one study at ICAR, Barapani in micro watershed based IFS incorporating dairy, horticulture, crop, agro forestry three cows produced around 5,600 lit milk and 25 Mt manure annually with cost benefit ratio of 1 : 2.08 [5].

Month wise analysis of data revealed that there was highly significant (p <0.01) difference of morning milk yield, evening milk yield, total milk yield, dry roughage intake, green roughage intake and concentrate intake between the months. This was due to significant change of ambient temperature and relative humidity in different months which affected feed and fodder intake of cows which ultimately reflected in milk production of cows. Highest morning milk (5.766 kg), highest evening milk (5.433 kg) and highest total milk (11.200 kg) were recorded in the month April. This was due to availability of green succulent fodder in sufficient quantity as well as congenial micro environmental condition of cattle shed. Multiple regression analysis of data indicated that daily total milk yield of cow increases by 31 g (p<0.01) and 681 g (p<0.01) per kg increase of green roughage intake and concentrate intake.

The proximate composition of fodder was delineated in Table 2. It was observed that barseem contained highest amount of protein and total ash i.e. mineral whereas mustard contained highest % of dry matter and EE i.e. crude fat and hybrid napier contained highest amount of crude fiber.

However, in this study no major health problem was recorded. In our present study few incidence of parasitic diarrhoea problem occurred which was controlled by anathelmentic few incidence of mastitis occurred during the period of study which was cured by treatment. Reproductive performances of the cows were good in respect of occurrence of heat, age of conception, service per conception, calving interval in case of two cows but one cow suffered from repeat breeding problem which was cured by mineral supplementation.

Average value of air temperature and average value of relative humidity were 28.75 ± 0.28 ^{o}C and 67.69 ± 1.03% respectively during the period of study. Peak maximum temperature (42.82 ^{o}C) was recorded in the month May and lowest minimum temperature was recorded in the month January (11.48^{o}C).

So, it can be inferred that dairy based integrated

Table 2. Proximate composition of different feed and fodder on DM basis.

Name of fodder crop	DM	CP	CF	EE	NFE	TA
Barseem	28.25	17.26	21.92	4.80	52.15	3.87
Oat	31.08	15.81	26.18	4.25	50.26	3.50
Mustard	34.55	10.34	38.17	5.67	43.07	2.75
Cowpea	24.29	16.97	24.87	3.95	50.60	3.61
Jowar	30.47	11.24	40.18	2.87	43.23	2.48
Hybrid Napier	33.27	10.57	43.17	2.50	41.04	2.72
Maize	26.11	9.88	42.72	3.57	41.75	2.08

farming is a good venture for optimum utilization of all available resources for maximum economic benefit. However, it needs lot of research, strategic management, proper planning , implementation and monitoring to get maximum benefit suitable to this agro climatic condition of India.

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