Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; SP1: 1522-1526

Dharmendra Kumar
S.M.S., (Animal Science), Krishi Vigyan Kendra, Banka, Bihar, India

Kumari Sharda
Senior Scientist & Head, Krishi Vigyan Kendra, Banka, Bihar, India

Sanjiv Kumar
ABM Division, ICAR-NAARM, Rajendranagar, Hyderabad, India

Maya Kumari
Scientist (Home Science), Krishi Vigyan Kendra, Sahibganj, Jharkhand, India

Correspondence
Dharmendra Kumar
S.M.S., (Animal Science), Krishi Vigyan Kendra, Banka, Bihar, India

Enhancement of Farmers' income through agriculture and dairy technology in changing climate scenario in Banka district

Dharmendra Kumar, Kumari Sharda, Sanjiv Kumar and Maya Kumari

Abstract
The present study was conducted to know the role of agriculture and dairy farming on enhancement of farmer's income. The 55 dairy farmers from 11 blocks of Banka district were interviewed personally using standard procedure with pre-module questionnaires. The data were comparing with 10 years back. In paddy seed rate and fertilizer application was decreased by 20 and 52%. But in wheat seed rate increased by 2% and fertilizer application decreased by 11%. The irrigation cost decreased by 36% and 33% but total input increased by 7% and 23% in paddy and wheat, respectively. The production, grain price and straw price were increased by 9 and 6; 45 and 33; 39 and 16.76%, respectively. Income through selling of straw was 67 and 13% of total input in paddy and wheat. The gross and net income in wheat and paddy were increased by 44; 32 and 69; 49%, respectively which was statistically significant ($P<0.01$). The area of paddy production was increased by 1.0 acre. Application of compost was 2.4 trolley /acre, but area of wheat production was almost same. The net income through agriculture was 14307 and 23530 Rs/acre hence increased by 64% in last ten years which was statistically significant ($P<0.01$). Income through dairy was 48875Rs/animal/year which contributed 67.50% of total annual income of farmers. Urea treated straw feeding was 6.8± 0.2 kg/ day/animal with Concentrate and roughage ratio was 41: 59. Urea treatment of straw (UTS) costing average 0.84 Rs/kg and feeding of UST decreased the concentrate requirement by 20% saving average 10,187Rs/Inter calving period/cow. UTS also prevent the decrease in milk yield by 10% when green fodder was not available. Costing of Silage making was 0.72Rs/kg and feeding of silage increased the milk yield (%) and Fat% by 10 and 0.52, respectively. Water feeding on the average 5 litre/kg milk production increased milk yield by 1.2 - 1.5 kg and decreased the effect of heat stress on animals. They regularly applied spray of potassium permagnet solution after milking to prevent from mastitis. Hence dairy farming and technology application increase the agriculture income of dairy farmers as well as double the income.

Keywords: agriculture income, straw cost, urea treated straw, cost of cultivation

Introduction
Banka district came under Agro-climatic zone IIIA (South East) having sandy loam, clay loam, loam, clay, soil with pH-6.8-8.0. The total rainfall was 990-1240, Temperature 37.1-7.8 and cropping pattern was mostly Rice – Wheat and in some part Rice – Gram, Rice – Lentil, Rice – Rai etc. The only 55% of the land was plain, irrigated and rest 45% undulating Rain fed, majority of area covered with scrubs having shallow soils with hills & hill rocks. The productivity (q/ha) of Rice and wheat was 14.50 and 15.40 which is lesser than state productivity 25.23 and 27.97 q/ha.(2012-13) (Report of task force on agriculture 2015.). State productivity remains low because of the slow adoption of modern technologies by the farmers; more than 91 percent of all holdings fall in the category of marginal holdings with farm size less than 1 hectare. The low productivity has consequential effects on low income and high poverty of its population. The productivity of Banka was lower than Bihar productivity due to sandy loamy and hilly area.

In India, milk production offers great opportunities for increasing farm income, employment and provides subsidiary occupation in semi-urban areas and people living in hilly, tribal and drought prone areas (Rao *et al.,* 2004). The dairy sector is important for various reasons. Among these, complementarily with agriculture and a capacity to enrich the protein diet of the vegetarian population is well documented. A contribution which is not well recognized is its role in balancing the rural inequity. In India, small and marginal farmers accounting for 77 percent of total holdings cultivates only 33 percent of operated area; they, however, accounts for around 60 percent of female cattle and 56 percent of female buffaloes in the country (Jha, 2003). In recent decades, the dairy sector has emerged as an important source of rural employment and income in the country. Income from dairying contributes nearly a third of the

rural households' gross income and in the case of landless wage earning households, nearly a half (Pankaj, *et al*., 2005). The present study was undertaken to know the role of agriculture and dairy farming on enhancement of farmer's income of Banka district.

Methodology

The study area had mixed farming, comprised of crop and livestock. Banka district is located in between latitude 24.7757° N and longitude 86.8220° E at an altitude of 85 - 247 meters above Sea level having annual average rainfall of 1200 mm and area 3,019 km². The randomly selected 55 dairy farmers from 11 blocks of Banka district were interviewed personally using standard procedure with pre-module questionnaires. The farmers were having minimum 2 acre cultivable land and 2 cross bred cows. The data were comparing with 10 years back status of agriculture and dairy. Economics of milk production was calculated on single year data pertaining to animals completing lactation period during April 2016 to March 2017. Total variable cost per animal per day comprised sum of feed cost, labour charges, veterinary expenditure and miscellaneous cost. Calf was also an additional source of income from a cow but in this study this aspect was not considered as it was assumed that their price would be more or less equal to the expenditure incurred on their raising up during lactation period of milch animal. The cost of 1 litre of milk produced by an animal has been taken as the ratio of average daily net cost of maintenance for that animal and average daily milk produced during corresponding inter calving period.

The data generated were analysed by paired sample t- test using SPSS-24.

Results and Discussion

The paddy grown area was almost similar. In paddy seed rate was decreased but non-significant, however fertilizer application was decreased significantly (P<0.05) by 2.67 and 146 kg/acre, in percentage it was decreased by 20 and 52%, respectively. Seed rate was 10.74 kg/acre which is lesser than reported by (Jayapal reddy and Shenoy, 2013) that traditional cultivation needed 30kg of seed per acre for nursery management. Decrease in seed rate was due to less (2-3) seedling used in respect of traditional (6-7) seedling. It is the effect of System of root intensification technology by which farmers changed to less seedling and early transplantation. In paddy fertilizer application was decreased by 52%, which was 146 kg/acre. Decrease in fertilizer application was due to application of compost 2.4 trolley/ acre. Sarwar *et al.* (2007) was found benefit cost ratio maximum (4.21) with the combined use of recommended dose of fertilizer along with compost 12 t.ha-^{1}. Hence, in Banka still compost application was very low to achieve maximum productivity. Fertilizer cost decreased by 33%, which was 871 Rs/acre. It is not in proportion of decrease in fertilizer quantity because of increase in price of DAP and Potash two and three times after removal of subsidy by Government from these fertilizers. Irrigation cost was decreased by 174Rs/acre that is 36% of previous cost. Decrease in irrigation cost was due to electrification in agriculture in last ten years, which decrease the irrigation cost/ hour and frequency of irrigation also decreased resulting of application of compost which increase the water holding capacity of soil. Total input cost (Rs/acre) was increased significantly (P<0.05) from 7377 to 7883, hence increased by 506 Rs or 7% of input cost. There was marginal increase in input cost after increase in unit price of every input because of less seedling used decrease seed rate which also reduce the labour requirement in transplantation and also use of own farm compost. Similar input cost 7208Rs/acre in SRI paddy reported by Jayapalreddy and Shenoy (2013)

Productivity of paddy was almost same that was 12 and 13 q/acre in 2007 and 2016, respectively, because hybrid variety introduced in this area earlier than 2007. Productivity was more than national level rice productivity 9.6q/acre in 2015-16 (Annual report 2016-17, Department of Agriculture cooperation and Farmers welfare, GOI). Gross income through sold grains and Straw was increased significantly (P<0.01) by 45 and 39%, which was higher by 6585 and 1485 Rs/acre. Income through straw was 67% of total input; hence straw preservation is necessary for economical agriculture and also animal husbandry. There was increase in grain price mainly due to marketing facility of paddy in cooperative. Gross and net income (Rs./acre) was increased significantly (P<0.01) by 8069 and 7563 hence, income increased by 44 and 69% in last ten years.

The wheat grown area and seed rate was similar in last ten years. The fertilizer application in wheat significantly decreased (P<0.05). Because there was still line sowing of wheat was not popularize and farmers used compost only in month of April- may due to unavailability of labour during the time of sowing of wheat. Fertilizer cost increased significantly (P<0.01) by 69%, which was 715 Rs/acre. It is because of increase in unit price of fertilizer especially increase in price of DAP and Potash, two and three times after removal of subsidy by Government from these fertilizers. Irrigation cost was decreased significantly (P<0.05) by 561 Rs/acre that is 33% less than previous cost. Decrease in irrigation cost was due to electrification in agriculture in last ten years, which decrease the irrigation cost/ hour and frequency of irrigation also decreased resulting of application of compost which increase the water holding capacity of soil. Total input cost (Rs/acre) was increased significantly (P<0.01) from 6403 to 7861, hence increased by 1458 Rs or 23% of input cost. There was increase in input cost after increase in unit price of seed, fertilizer and labour.

Production of wheat was almost same that was 8 and 8.5 quintal/acre in 2007 and 2016, respectively. Productivity was less than national level wheat productivity 12.37q/acre in 2015-16 (Annual report 2016-17, Department of Agriculture cooperation and Farmers welfare, GOI). Gross income through sold grains and Straw was increased significantly (P<0.01) by 33 and 17%, which was higher by 2973 and 146 Rs/acre. Income through straw was only 13% of total input. There was increase in grain price mainly due to increase in market price. Gross and net income (Rs. /acre) was increased significantly (P<0.01) by 3119 and 1660 hence, income increased by 32 and 49% in last ten years.

The net income through agriculture was 14307 and 23530 Rs/acre hence increased significantly (P<0.01) by 64% in last ten years. It is more than, Singh and Joshi (2008) reported per-hectare gross income from crop production was Rs 23926 for marginal farmer. Income through dairy was 48875Rs/animal/year which contributed 67.50% of total annual income of farmers. Hence, Income from one cross bred cow was double than agriculture income from one acre land.

Production and productivity of animals

Farm having Av. 4.09 lactating cross-bred H.F cow yielding (Table 1) average 4178±158 kg/lactation and 11.72 ± 0.51 kg/day. Singh *et al*., 2012 reported av. 11.07 litre from

crossbred cows. Milk production was decreased when cow came in heat at 3rd or 4th month either they became pregnant or not.In contrast to this result Lopez *et al*., (2004; 2005) reported that milk yield shows a tendency to increase during post estrus period when compared by estrus period. The reason for the decreased milk yield during estrus could be the increase in estrogen levels both in milk and blood and this reduction might be caused also by a decrease in feed intake. Similar to present finding Geetha and Lavanya (2013) reported that per day per animal milk production on an average of cross-bred cows was ranging from 10.24 to 19.63 litres per day in all farm groups. The lactation period and calving interval (month) was 12.19±0.20 and 15.14±0.32, respectively. Calf became mature and start producing milk in 27 month. It was due to regular deworming and mineral mixture feeding. Geetha and Lavanya (2013) reported that lactation period of cross bred cow were 292 days for medium farmers. An average Holstein Friesian (HF) cow gives 10,000-12,000 litres of milk in a 10-month lactation cycle, whereas the yields from a desi cow are only 3,000-3,600 litres. Also, an HF calf takes just two years to mature and start producing milk.

Table 1: Cost-benefit of agricultural crops

	Paddy			Sig.(2-tailed)	Wheat			Sig.(2-tailed)
Year	**2016**	**2007**	**% Change**		**2016**	**2007**	**% Change**	
Av. Land (Acre)	5	4	25	0.167	1.65	1.56	6	0.162
Seed (Kg/acre)	10.74	13.41	-20	0.082	48	47	2	0.060
Seed cost(Rs/Acre)	1465	996	47	0.110	2686 [b]	2169 [a]	24	0.000
Fertilizer (Kg/Acre)	137	283	-52	0.070	93 [a]	104 [b]	-11	0.043
Compost (Trollley/Acre)	2.4 [b]	0.4 [a]	471	0.000				
Fertilizer Cost(Rs/Acre)	1738	2609	-33	0.160	1759 [b]	1044 [a]	69	0.000
Irrigation cost (Rs/Acre)	306	480	-36	0.298	1114 [a]	1675 [b]	-33	0.032
Total Input (Rs)/Acre	7883 [b]	7377 [a]	7	0.028	7861 [b]	6403 [a]	23	0.000
Production (q/Acre)	13	12	9	0.110	8.5	8.0	6	0.112
Grain Price (Rs/Acre)	21108 [b]	14523 [a]	45	0.000	11862 [b]	8889 [a]	33	0.000
Straw price(Rs/Acre)	5287 [b]	3802 [a]	39	0.000	1017 [b]	871 [a]	17	0.000
Straw price (% of Input)			67				13	
Gross income (Rs/Acre)	26,395 [b]	18,326 [a]	44	0.000	12880 [b]	9761 [a]	32	0.000
Net Income (Rs/Acre)	18,512 [b]	10,949 [a]	69	0.001	5018 [b]	3358 [a]	49	0.001
Agri. Income (Rs/Acre/Yr)	23,530 [b]	14,307 [a]	64	0.001				
Income from dairy (Rs/animal//year)	48875							
Dairy income (% of total income)	67.50							

[a,.b] Values with different superscripts in arrow differ significantly.

Feeding of animals

Average concentrate feeding was 0.4 kg/kg milk yield, 4.62± 0.24 kg/day/animal and 30.94 % of total feed intake. Farmers were fed 2.34±0.19 kg concentrate during dry period. They were feeding Green fodder 14.6 kg/ day/animal which was available for the period of January to August month only. This implies that there was a need to create awareness among dairy farmers about benefits of green fodder in milk production. It is also suggested to include promotion of green fodder production as an important component of strategies in future milk production policies of the state. Urea treated straw feeding was 6.8± 0.2 kg/ day/animal with Concentrate and roughage ratio was 41: 59. Total feed intake was 13kg/day/animal. Similarly, Khanal *et al*., (1999) reported that Urea treated straw feeding were 7.80kg and total dry matter intake 13.42 kg in Buffalo. Dairy cow yielding average daily milk yield 11.65±1.86kg milk significantly increased the milk production on 50:50 concentrate roughage than 40:60 and 30:70 (Beyero, 2015). But in present study better performance on 41:59 concentrate: roughage ratio due to UTS feeding. Study revealed that cost of milk production can be considerably reduced, by feeding urea treated straw. Average mineral mixture feeding was 75g /day /animal for 300 days/year. Some farmers were fed 100g and 200g /day /animal mineral mixture for animal giving less than 20kg and more than 20kg milk/day. There was feeding of 100g/day/animal calcium supplement calsagar for 10days each month. The quantity (kg) of concentrate, UTS, mineral mixture fed to calf and heifer up to calving was 780, 1260 and 22.5kg, respectively.

Economics of farming

Per litre milk production is one of the components for farm level decision making, so cost of milk production per kg milk was calculated and found that the cost of production per kg milk during Lactation period and Inter-calving period were 13.76±0.40 and 15.38±0.42Rs ranged from 11.36-24.58. Which was included the cost (Rs) of dry fodder, green fodder, concentrate, mineral mixture and medicines 3.1, 1.96, 7.58, 0.65 and 0.44, respectively. Feed and fodder formed the major component (91.86 %) of gross costs in which concentrate 55% and dry fodder 22.53% then green fodder 14.24%. It was higher than reported by, Singh *et al*. (2012) 10.74-14.46 Rs/liter milk production in which for herd of 1-3 to 10-12 cows in Bihar. In which feed and fodder formed the major component (68.62–69.33%) of gross costs followed by fixed expenses (14.91–16.03%), labour (10.50–10.90%), miscellaneous recurring expenditure (2.83–3.96%). It may be due to increase in price of ingredients in 5 years period and in present study labour cost and fixed prices very less because not extra labour hiring for 4-5 animals. Study revealed that cost of milk production can be considerably reduced, if producers are supplied with relatively cheap balanced ration. It is quite possible by replacing some of the costlier ingredients by relatively cheaper feed like maize, barley, oat, linseed, mustard cakes and molasses also advised for meeting requirements of feed by providing desired nutrients through feeding of green fodder which not only reduces intake of concentrates but also helps in reducing cost of production.

Daily feeding cost of dry period was 82.59 ± 6.96 Rs. Average milk price (Rs) was 26.09± 0.16 and income from

one kg milk was 10.58± 0.59 Rs. Net profit / inter-calving period were 46,051Rs/cow from cow yielding 4178kg milk/ lactation. In Mathura a Sahiwal cow can earn Rs 85/day but an unproductive cattle can loss of Rs 60/day (Jitendra, 2017). Cost of rearing calf and heifer up to parturition was 25295Rs in which Rs. 24030 was expend on feeding and only 1265 Rs. on treatments and medicine.

Feeding urea treated straw

Urea treatment of straw (UTS) costing average 0.84 Rs/kg and feeding of UST 6.8kg/day/ animal decreased the concentrate requirement by 20% and saved concentrate and cost of feeding 492± 0.2 kg, Rs.8503±428/inter calving period/cow. Similarly, Mallik,*et al*., (2013) reported cost of urea treatment was 0.96Rs/ kg and animal fed 8kg UTS/day/animal. This may be due to increased crude protein through added non-protein nitrogen (NPN) digestibility of treated straw. Urea treatment increases microbial protein synthetic activity (Garg, 1998) in the rumen making more microbial protein yield available in the lower gut for higher milk production. UTS also prevent the decrease in milk yield by 10% when green fodder was not available. Similarly, Khanan *et al*. (1999) reported significant ($p<0.05$) increase in milk yield of lactating buffaloes fed UTS. Calf of this farm started feeding dry fodder with UTS. Milk production increased by 10.3-11.9% and milk fat content increased by 3-5%, therefore, profit for farmers increased by US $0.55-0.73 per cow per dayVu *et al*., (1999).

Silage feeding

Costing of Silage making was 0.72Rs/kg and feeding of silage increased the milk yield and net income by 10% and 10,516Rs/Animal/ ICP, respectively. Halden *et al.* (1995) reported not any effect on milk production or milk composition on grazing cows yielding 32 kg of milk received 2.3 kg/d of corn silage DM.

Water feeding on the average 5 litre/kg milk production increased milk yield by 1.2 -1.5 kg and decreased the effect of heat stress on animals. Farmers used different system like 100g salt or 250g molasses and besan daily for optimum intake of water to dairy animals.

They regularly applied spray of potassium permagnet solution after milking to prevent from mastitis. Hence dairy farming and technology application increase the agriculture income of dairy farmers as well as double the income

Conclusion

From this study it can be concluded that the net income through agriculture was increased by 64% in last ten years due to application of new technology which decrease the fertilizer application, irrigation cost and seed rate. Income through dairy was contributed 67.50% of total annual income of farmers. Dairy farming with technology application like urea treatment of straw and silage feeding could be a profitable entrepreneurship and it also increase the net profit of farmers in agriculture by decreasing the input cost and increase the area of crop production.

Acknowledgements

Authors are also grateful to Director ATARI, Patna and Director Extension Education, BAU, Sabour for their valuable support towards the execution and completion of this study.

References

1. Anju Agnihotrichaba. Punjab Dairy farmers see no economic benefits in switching from Holsteins to Sahiwal. http://indianexpress.com/article/india/india-others/punjab-dairy-farmers-see-no-economic-benefits-in-switching-from-holsteins-to-sahiwal/
2. Beyero Netsanet, Kapoor V, Tewatia BS. Effect of different Roughage: Concentrate Ratio on Milk Yield and Its Fatty Acid Profile in Dairy Cows. Journal of Biology, Agriculture and Healthcare. Online, 2015, 5(13).
3. Donna Amaral-Phillips. Water intake determines a dairy cow's feed intake and milk production.http://www.progressivedairy.com/topics/feed-nutrition/water-intake-determines-a-dairy-cows-feed-intake-and-milk-production, 2010.
4. Geetha KT, Lavanya VL. Economics analysis of dairy farming in vellalore village in coimbatore district. Journal of Economic & Social Development, 2013; IX(1):25-37.
5. Holden LA, Muller LD, Lykos T, Cassidy TW. Effect of corn silage supplementation on intake and milk production in cows grazing grass pasture. Journal of Dairy Science. 1995; 78(1):154-60
6. Jayapalreddy R, Sandhya Shenoy N. A comparative economic analysis of Traditional and System of Rice Intensification (SRI) rice cultivation practices in Mahabubnagar district of Andhra Pradesh. International Journal of Scientific and Research, 2013, 3(10).
7. Jha B. 'India's Dairying in the Emerging Trade Order, Un Unpublished report submitted to Indian Institute of Economic Growth, Delhi-7, 2003.
8. Jitendra. Down to earth fortnightly on politics of development, environment and health, 2017. http://www.downtoearth.org.in/news/how-expensive-is-it-to-maintain-unproductive-cattle--57410
9. Khanal RC, Gurung DB, Kadariya RK. Effect of feeding Urea treated rice and wheat straw on intake and milk yield of lactating buffaloes under farmer's. Conditions. Asian-Australian. Journal of Animal Science. 1999; 8:1200-1204.
10. Kvapilik J, Hanu OS, Syrucek J, Vyletelova M, Klimesov, Roubal P. The economic importance of the losses of cow milk due to mastitis: a meta-analysis**,** Bulgarian Journal of Agricultural Science. 2014; 20(6):1483-1497.
11. Loepez H, Caraviello DZ, Satter LD, Fricke PM, Wiltbank MC. Relantionship between level of milk production and multiple ovulations in lactating dairy cows. Journal of Dairy Science. 2005; 88:2783-2793.
12. Loepez H, Satter LD, Wiltbank MC. Relationship between level of milk production and estrous behavior of lactating dairy cows. Animal Reproduction Science 2004; 81:209-223.
13. Malik PK, Anandan S, Rajendran D. Urea treatment of straw and stover for quality improvement folder No. 28. National Institute of Animal Nutrition and Physiology Adugodi, Bangalore-560030, 2013.
14. Kumar PP, Singh A, Roy B. 'Animal Husbandry and Dairying', '*Kurukshetra'*, December, 2005, 30-35.
15. Rao N, Kumar P, Pal G, Sen C. Economics of milk production in district Kanpur (Dehat), Uttar Pradesh. Indian Journal of Agricultural Economics. 2004; 59:534-35.
16. Sarwar G, Hussain N, Schmeisky H, Muhammad S. Use of compost an environment friendly technology for enhancing rice-wheat production in pakistan. Pak. J Bot. 2007; 39(5):1553-1558.
17. Singh KM, Meena MS, Bharati RC, Kumar A. An economic analysis of milk production in Bihar. Indian

Journal of Animal Sciences**.** 2012; 82(10):1233-1237.
18. Singh Mandeep, Joshi AS. Economic Analysis of Crop Production and Dairy Farming on Marginal and Small Farms in Punjab. Agricultural Economics Research Review. 2008; 21:251-257
19. Vu DD, Cuong LX, Dung CA, Hai PH. Use of urea-molasses-multinutrient block and urea-treated rice straw for improving dairy cattle productivity in Vietnam. Preventive Veterinary Medicine. 1999; 27; 38(2-3):187-93.