A STUDY ON STATUS ASSESSMENT OF PRIVATE DAIRY FARMS IN MUZAFFARNAGAR DISTRICT OF UTTAR PRADESH

THESIS

Submitted in partial fulfilment of the requirements for the degree

of

Master of Veterinary Science

in

LIVESTOCK PRODUCTION AND MANAGEMENT

By

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To

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INDIAN VETERINARY RESEARCH INSTITUTE

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Certificate

Certified that the research work embodied in this thesis entitled "A study on status assessment of private dairy farms in Muzaffarnagar district of Uttar Pradesh" submitted by ***Dr. Praveen Bharti, Roll No. 4910,*** *for the award of* ***Master of Veterinary Science*** *degree in* ***Livestock Production and Management*** *at Indian Veterinary Research Institute, Izatnagar, is the original work carried out by the candidate himself under my supervision and guidance.*

It is further certified that ***Dr. Praveen Bharti, Roll No. 4910,*** *has worked for more than 21 months in this Institute and has put in more than 150 days attendance under me from the date of registration for the degree of Master of Veterinary Science of the Deemed University, as required under the relevant ordinance.*

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*Certified that the thesis entitled, "**A study on status assessment of private dairy farms in Muzaffarnagar district of Uttar Pradesh**" submitted by **Dr. Praveen Bharti,** Roll No. 4910, in partial fulfilment of the requirement of **Master of Veterinary Science** degree in **Livestock Production and Management**, Deemed University, **Indian Veterinary Research Institute,** Izatnagar, embodies the original work done by the candidate. The candidate has carried out his work sincerely and methodically.*

We have carefully gone through the contents of the thesis and are fully satisfied with the work carried out by the candidate, which is being presented by him for the award of Master of Veterinary Science of this Institute.

*It is further certified that the candidate has completed all the prescribed requirements governing the award of **Master of Veterinary Science** of Indian Veterinary Research Institute.*

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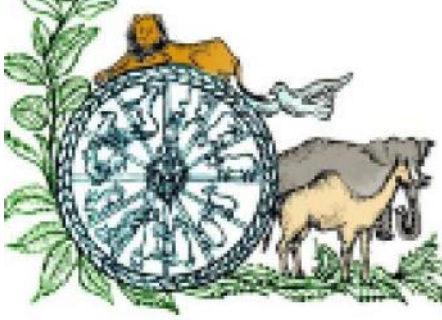

Introduction

Dairy farming in India is not a true commercial activity rather it is the typical rural Indian lifestyle, wherein, a farmer, in most of the smallholder households, keeps 1-2 milch animals, primarily fed on crop residues and agricultural by-products, for fulfilling the domestic requirement of milk, in addition to, production of bullocks for agricultural operations, dung for manure and dung cakes for fuel.

The activity is characterized by milk production by masses rather than mass production of milk. The *Gober* gas is also produced for fulfilling the domestic fuel requirements and for running engines to draw water from wells. Almost, all draught power for agricultural farm operations and rural transportation is provided by bullocks.

Dairying is an important source of subsidiary income to small and marginal farmers, agricultural / land less labourers, rural housewives and rural unemployed youth. There is a possibility of generating round the year employment through dairy farming. Thus, dairying also provides considerable employment.

Depending upon the breed of animal, managerial skills and marketing potential, varying amount of profit can be earned. It is worth noting that now a days dairying is becoming more commercialized in metropolitan, urban and semi-urban areas.

The economic production of milk is also directly related to marketing and distribution facilities available, particularly in unorganized sector. The cost of milk production is one of the most important economic indicators which can help

the dairy farmers in taking important management decisions. Larger milk production does not necessarily mean larger marketed surplus and better income to the producers. Due to scanty literature available on status of private dairies of unorganized sector, the milk production and returns through sale of milk needs to be analyzed in private dairies too.

The cost and return structure of dairying is an important aspect for producers and consumers so that producers get better remunerative prices for milk and consumers get milk and milk products at reasonable and cheaper rates. There is huge scope as well as deficiency of literature regarding economical aspect, management practices followed along with herd structure of private dairy farms under unorganized sector in India.

Global food demand is ever increasing and expected to be doubled by the year 2050 due to exponential increase in human population as indicated by recently achieved *Seven Billion* mark (Haub and Gribble, 2011). This along with shrinking of resources, particularly cultivable land mounts pressure on livestock sector to fulfill growing demands by ensuring nutritional security and employment generation (IVRI, 2011). This belief is further strengthened as the contribution of agriculture as a whole to GDP has halved from about 35 (1980-81) to about 16% (2007-08). The share of livestock sector within agriculture had almost doubled i.e. from 14 to 26%, during the same period, despite the fact, that investment to this sector was not substantial (Sharma and Arya, 2011).

Distribution of livestock wealth in India is more egalitarian, compared to land. Here, from equity and livelihood perspective, it is considered as an important component in poverty alleviation programmes. The increased demand of livestock products can be met by enhancing the number of animals and improving feed utilization efficiency (IVRI, 2011).

India is the largest milk producing country in the world since 1998. India has one of the largest livestock populations in the world (529.00 million). World

total bovine population is 1557.70 million and India contributes 280 million (about 18.00%). India's share is 56.70% (105.00 million) to the total buffalo population of world (185.30 million heads). However, India contributed 12.70% (175.00 million) to the total cattle population of world (1372.4 million heads, BAHS, 2010).

In the year 2009, India produced 15.80% (110 MT) of total world milk production (696.60 MT). Indian buffaloes contributed 68.21% (60.9 MT) to the total milk production by buffaloes in world (89.28 MT). However, Indian cows contributed 7.60% (44.10 MT) to the total milk production by cows in the world (BAHS, 2010). It indicated towards comparatively better performance by Indian buffaloes when compared to cows in International arena.

In 2009-10, Uttar Pradesh was the leading milk producing state in the country. UP's share in total milk production of India was about 18.00% (20.20 MT). This state is equipped with vast network of infrastructure and large number of organizations existing in the dairy sector (BAHS, 2010).

Out of total milk production from cattle in India, 10.75% (5.14 MT) is contributed by UP. Of the total buffalo milk production in India, 23.48% is shared from UP. Uttar Pradesh possesses 18.80 million cattle and 23.80 million buffaloes (BAHS, 2010). Although, UP produces 18.00% of the national milk production, only 0.82 million tons of milk is processed through organized cooperative dairy sector in the state (Planning Commission, GOI, 2009).

Out of the total milk production of UP, 46.69% of the total milk is produced in the Western region alone. In certain parts of Western UP, Murrah buffaloes are more popular than cattle. It was heartening to know that there are home-grown Murrah buffaloes which are presently producing up to 18 litres of milk per day (Planning Commission, GOI, 2009).

In UP, the Saharanpur *Mandal*, which consists of Muzaffarnagar and Saharanpur districts, is considerably forward region due to highly fertile soil and good irrigation conditions. The socio-economic condition of the local population

is also good. Agriculture is highly productive and sugarcane is an important cash crop of the region. It has dominated the farming system in this region for a long time. Amongst various farming systems prevalent in this region, *sugarcane-livestock-cereals-fodder* has been found as the major system being followed by majority of farmers. It has been found that sugarcane farmers keep two dairy animals, in general, largely for household milk consumption. The major source of income of farmers in this area is sugarcane (58.00%), followed by livestock and cereal crops (Planning Commission, GOI, 2009).

In Saharanpur *Mandal* of Uttar Pradesh, Muzaffarnagar district, situated in the *Doab* of the Ganga (on the east) and Yamuna (on the west), is a frontline agricultural district and is endowed with suitable agro-climatic conditions for rearing of exotic as well as crossbred cattle (Kumar and Gupta, 1992). Progressive approach of dairy farmers is reflected by large number of dairy cooperative societies functioning in the district (556, http://muzaffarnagar.nic.in/dcdf.htm). At the same time, progressive approach is also reflected by maximum number of exotic cattle population in the district (18th Livestock census of UP, 2007). Besides government sector, in private sector also, there are good numbers of dairy farms in Muzaffarnagar district. Private dairy farms are located in urban, sub-urban and rural areas. Good demand for milk and milk products also exist due to nearness to national capital, New Delhi.

Muzaffarnagar district is very rich in agricultural and livestock wealth and is predominated by sugarcane production and dairy buffaloes. The district produces comparatively higher sugarcane yield per acre (Murti, 2010). Therefore, abundant green tops of sugarcane (*Agola*) are generally used as unconventional green fodder for livestock, in addition to, considerable availability of good green fodder in the district. Muzaffarnagar District of Uttar Pradesh has the biggest Jaggery market in Asia (http://en.wikipedia.org/wiki/Muzaffarnagar). Buffaloes are the prevailing livestock type and 80-85% of the households own buffaloes. The ownership of *desi* cow is not widespread and is now being replaced

by crossbred cattle and buffaloes. About 70% of the total milk produced in the region is sent to the market for selling. Farmers in this region have also adopted crossbreeding with preference for HF crosses (Planning Commission, GOI, 2009).

Total livestock population of Muzaffarnagar district is 1169650 heads which consists of 70.50% buffaloes (824260 heads) and 13.50% of cattle (229872 heads). Total cattle population structure of district is made up of 735 exotics, 90374 crossbreds and 138763 heads of indigenous cattle. Among crossbred cattle population, Jersey crosses are predominantly present in the district as it contributes 74.18% (67044 heads) of total crossbred cattle population of this district. It is followed by Holstein Friesian (8.40%) and other crosses (17.42%, 18th Livestock census of UP, 2007).

Muzaffarnagar district of U.P. is endowed with suitable agro-climatic conditions for rearing of exotic as well as crossbred cattle due to its vicinity to Himalayan belt (foothills). It is due to good irrigation network and availability of sufficient water for irrigation added with humus rich soils. Muzaffarnagar district, among districts of UP, possesses rare distinction of having highest exotic cattle population (735) followed by Bulandshahar (544) and G.B. Nagar districts (449). At the same time, exotic female cattle population is also highest which comprised of 432 Jersey and 127 Holstein Friesian females. Total exotic breedable females in Muzaffarnagar district were maximum (356) followed by Bulandshahar (261) and G.B. Nagar districts (213). Muzaffarnagar was leading district in crossbred cattle population which were in milk and it possessed largest number of young crossbred female cattle under 1 – 2½ years age category. This indicated that the dairy farmers of Muzaffarnagar district are very keen in rearing high yielding exotic as well as crossbred cattle and also have progressive approach. Muzaffarnagar possessed appreciable number of total crossbred population (90374) and was only after Gorakhpur (99718) and Allahabad districts (91793). However, in total crossbred breedable cattle, Muzaffarnagar (39879) was only after Gorakhpur district (40522). Among indigenous cattle population also, Muzaffarnagar district was superior to any other district of UP. Among the districts

of UP, Muzaffarnagar possessed maximum heads of Tharparkar (2811) and Sahiwal (8243) females too. The population structure of indigenous cattle in Muzaffarnagar district was made up of *Hariana* (34.50%) followed by *Sahiwal* (8.80%), *Tharparkar* (3.36%), *Gangatiri* (1.27%) and other graded breeds of cattle (51.05%). In Muzaffarnagar district, there were good number of descript breeds of buffaloes like Murrah and Bhadawari. This district ranked 2nd in Murrah population just after Bulandshahar and 3rd in Bhadawari population among other districts of UP. Muzaffarnagar district possessed 824260 heads of buffaloes, out of which 404645 heads were breedable (18th Livestock Census of UP, 2007).

Household structure of Muzaffarnagar district consisted of 66.87% marginal holdings (<1 hac.) followed by 17.63% small holdings (1-2 hac.), 11.13% semi medium holdings (2-4 hac.), 4.2% medium holdings (4-10 hac.) and 0.16% large holdings (10 < hac.). At the same time, gross cropped area in Muzaffarnagar district was 471038 hac., of which 99.60% area was irrigated and which was highest among all the districts of Saharanpur, Moradabad and Bareilly Divisions (Statistical Abstract, 2009).

Several studies have been carried out in Uttar Pradesh on economics of milk production by cattle and buffaloes. Although, Kumar and Gupta (1992) have made some attempts at farmer's level, scanty information is available on economics of private dairy farms. It was concluded by Kumar and Gupta (1992) that buffalo milk production is not lucrative enterprise in the Muzaffarnagar district because of low or negative returns from buffalo milk production. However, Singh *et al.* (2001) reported that dairy farming with improved breeds in large herd size is a highly remunerative enterprise based on a study done in Etah district of Uttar Pradesh. A study conducted on dairy farmers of Uttarakhand revealed that lack of business development services related to dairy industry is the leading reason responsible for disassociation of farmers from state cooperative dairy federation (Sharma *et al.,* 2007). Further, it is essential to study the prevalent management practices and economic performance, at field level, in order to find out constraints and to decide measures for improvement in our future policies and to suggest remedies.

Therefore, the present study has been planned to assess and evaluate status of private dairy farms in Muzaffarnagar district of Uttar Pradesh with the following objectives:

- **To study the management practices adopted by private dairy farms in Muzaffarnagar district of Uttar Pradesh**
- **To study and evaluate herd structure maintained by private dairy farms**
- **To analyze economic viability of these private dairy farms.**

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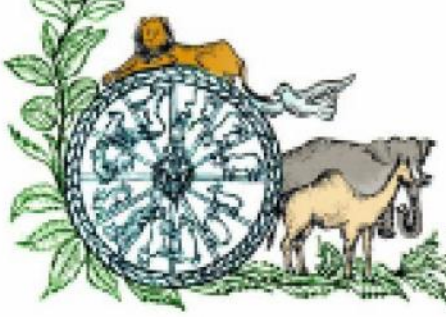
Review of Literature



Review of Literature

Dairy development in India has been acknowledged throughout the world as one of the modern India's most successful developmental programme. Today, India is the largest milk producing country in the world. Milk and milk products are rated as one of the most promising sectors which deserve appreciation in a big way.

Dairy farmers are business managers, irrespective of the size of their milking herd. The scale of operation is generally limited by personal asset worth, but even smallholder farmers can make good financial returns on their dairy enterprise. Therefore, it is essential to study the economic performance of dairy farmers at their door-step and to find out their constraints and suggest the way ahead.

It is estimated that some 12-14 per cent of the world population (750-900 million people) live on dairy farms or within dairy farming households. According to a report (Chen and Ravallion, 2008), in 2005, about 2.6 billion people in the developing world (48 per cent of the total population) were surviving on less than US $2 per day and about 149 million farm households, mostly smallholders, kept livestock for the purpose of producing milk for self-consumption or sale.

Global milk demand is growing by 15 million tons per year, mostly in developing countries. Once this increased volume of milk is being produced by small-scale dairy farmers, approximately 3 million jobs per year may be created in primary production. This presents a unique opportunity for building up a sustainable dairy chain that sources milk from smallholder dairy farmers to meet not only the demands of local consumers but also those of the world market. While capitalizing on this opportunity which could generate significant wealth in

rural areas and provide benefits to all stakeholders involved in the dairy value chain, it calls for a sound dairy development strategy (Hemme and Otte, 2010).

2.1 MANAGEMENT PRACTICES ADOPTED BY PRIVATE DAIRY FARMS

Private dairy farms in India follow different management practices according to locality/agro-climatic zones, availability of resources, marketing infrastructure available, educational status and technological knowledge, purchasing capacity of farmers, effect of surroundings etc. In Indian rural conditions, only small percent of area is covered by A.I., rest is dependent on natural breeding. At the same time, performance of A.I. is also not up to the mark. Availability, quality and cost of feed is also an issue. India's per capita availability of milk is one of the lowest in the world due to the fact that farmers do not adopt improved dairy management practices at the desired level (Patil *et al.,* 2009). Therefore, it is important to find out prevalent management practices at field level, in order to find out measures for improvement in our future policies.

2.1.1 Type of dairy animals

Reddy and Jayashankar (1973) studied the cooperative cost of milk production for crossbred and purebred animals. They found that the average maintenance cost per day per animal was higher in crossbred than purebred. Moreover, it was found that the cost of production per kg of milk was lesser in crossbreds than purebred animals. It is indicative of higher milk yield from crossbred animals.

Chauhan (1992) reported the profitability and economic viability was more in buffaloes compared to crossbred cows in Moradabad district of Uttar Pradesh (India).

Badal (1994) in a study on economics of milk production and its disposal pattern in Gopalganj district of Bihar, reported that per litre cost of milk production was Rs.5.67, Rs.7.18 and Rs.5.88, for crossbred cow, local cow and buffaloes, respectively. The net return from milk production was highest in buffalo (Rs.3.40) followed by crossbred cow (Rs.2.33) and local cow (Rs.1.28).

2.1.2 Educational status of dairy farmers

Akino and Hayani (1974) while studying sources of agricultural growth in Japan observed that an increase in education resulted in the increase in agricultural output to the extent of 25 per cent.

Saini *et al.* (1981) revealed that fairly education had positive and significant effect on dairy farm income.

Sagar *et al.* (1986) found a positive and significant relationship between educational status of family with productivity of milch animals. Later on Sawarkar *et al.* (2001) observed that there was significant relationship between education level and extent of adoption of A.I. practice.

Patel (2000) indicated that majority of the beneficiaries (74.19%) had primary to secondary level of education.

Singh and Singh (2002) observed that the decision-making on dairying depends on education and general awareness level of the family in Haryana.

Shah *et al.* (2002) found that educational status of majority of male respondents (29.17%) was up to high school level while majority of female respondents (26.67 %) showed up to primary level in Uttaranchal state.

Wadear *et al.* (2003) revealed that 25.83 per cent of dairy farmers had primary education followed by 25.00 per cent illiterate, whereas 13.33 per cent of dairy farmers had SSLC/matriculation followed by secondary (12.50%), PUC (10.83%) and higher secondary (9.16%). Only 3.33 per cent of dairy farmers were educated up to graduate level. Chauhan *et al.* (2004) found that 30.00 per cent of dairy farmers were educated up to high school level followed by primary level (27.50%), middle school level (19%) and college level (13.50%), whereas 10.00 per cent of dairy farmers were illiterate.

Bordoloi *et al.* (2005) found that improvement in educational level lead to better management practices adopted by the farmers. Education tends to expose

the farmer to modern techniques of dairying practices which helped for commercial orientation resulting in increased income from the enterprise.

Harrison (2006) suggested that financial management education for farmers is beneficial, especially education related to appraising long-term investments and analyzing the financial effects of environmental activities.

Knowledge, educational level and experience of farmers help in developing future teaching methods and materials for increasing the level of record keeping and their use to improve production, reproduction, genetics, health and economic practices of dairy farms (Rhone *et al.,* 2008).

2.1.3 Feed type and cost

Past studies on cost and returns from milk production revealed that feed cost alone accounted for the largest cost component, which ranged between 60-70 per cent of the total cost of production.

Patel (1987) observed that almost 50 percent or more of the recurring expenditure was on feeding and was the major cost item in maintenance of milch animals. Deoghare and Bhattacharya (1994) carried out a survey to study the economics of buffalo milk production. They found out that the share of concentrate (cotton seed cake, mustard cake, barley husk and wheat flour) in the total feed cost was around 62%.

Kundu and Basu (1991) suggested that milk production in Murrah buffalo herds could be increased by feeding more concentrates along with forage.

Grover *et al.* (1992) analyzed the economics of milk production in Bhatinda district of Punjab and reported average net annual maintenance costs of Rs.5271 and Rs.4681 for buffaloes and cows, respectively. The feed and fodder cost accounted for 68.42 and 73.00 percent of the total expenditure on a buffalo and cow, respectively. The study comes out with the fact that on an average the sample farms incurred an annual loss of Rs.1016 per buffalo and Rs.1902 per cow. The losses showed a tendency to increase with an increase in farm size.

Ram *et al.* (1993) conducted a study on economic analysis of milk production on weaker section households in sugarcane tract of western Uttar Pradesh which included rural areas only and reported that average maintenance cost and milk yield per day was Rs. 15.81 and 4.41 litres, respectively. The free availability of sugarcane tops contributed 9-10 percent of total maintenance cost. The per litre cost of milk production worked out to be as Rs. 3.07. It was also observed that both the costs i.e. fixed and variable were lower in case of land less cattle owners and marginal farmers as compared to small farmers.

Shirsat *et al.* (1994) in their study on *Adoption of improved dairy management practices by cattle owners* conducted in Parbhani district of Maharashtra state revealed that 90.83 per cent of the respondents were feeding concentrates at the time of milking and 95 per cent of the respondents were feeding cotton cake to milking animals, 68.33 per cent respondents supplied green fodder in proportion to milk production, 53.33 per cent were mixing common salt in *Kadba kuti* and 46.66 per cent of respondents were providing vitamins and minerals through feeds for high milk production.

Prasad *et al.* (1997) in their study on *Nutrient utilization in crossbred heifers* conducted at National Dairy Research Institute (Bangalore) to optimize the level and source of supplement (groundnut cake and cotton seed cake) utilization of finger millet straw when fed with different proportions of wheat bran. They suggested that supplementing groundnut cake at 15 g RDN (Rumen Digestible Nitrogen)/kg of DOM (Digestible Organic Matter) to a diet of straw: bran at a ratio of 75:25 improved nutrient utilization and was economical as compared to supplementing equivalent quantity through cotton seed cake or supplementing groundnut cake to 60:40 straw : bran fed groups.

Singh and Singh (1999) studied the economics and performance of buffalo calves fed on wheat straw based diets having different modes of urea supplementation. The dry matter intake (kg/day) was maximum in group receiving urea ammoniated wheat straw. The supplementation of urea or feeding of

ammoniated wheat straw in the study did not improve the dry matter consumption. The DCP (Digestible Crude Protein) and TDN (Total Digestible Nutrients) intake in different groups were comparable among the groups. The feed conversion efficiency (FCE) was found to be 12.97, 14.48 and 10.36 in buffalo calves fed on chaffed paddy straw along with 2 kg concentrate mixture (CM) or 4 per cent urea treated paddy straw fresh or stored plus 1.5 kg CM in groups, 1, 2 and 3, respectively.

Sudheer *et al.* (1999) found that higher investment on concentrates in organized sector was due to the better economic position of the farmers and also because they possessed better milch animals. But expenditure on fodder was higher in the unorganized sector. This was because the farmers were feeding more of roughages than concentrates as roughages were cheaper than concentrates.

Toppo *et al.* (1999) in their study on *Effect of feeding groundnut cake and urea molasses mineral block to adult cattle* conducted in IVRI (Izatnagar) for determining the effect of untreated and formaldehyde treated groundnut cake on intake of urea molasses mineral block revealed that there was no beneficial effect of supplementing untreated groundnut cake. The catalytic effect of formaldehyde treated groundnut cake could not be achieved by adding 100 grams groundnut cake in the rations of adult cattle supplemented with urea molasses mineral block.

Chandra and Agarwal (2000) revealed that feed cost was about two third of total gross cost and was the major cost component based on their study in Uttar Pradesh. According to a study done by Singh *et al.* (2001) in Uttar Pradesh, feed cost remained the major component of milk production and accounted for nearly 55-60 per cent for all the herds of milch buffaloes among members and non-members of Brooke Bond Lipton India Ltd. The expenditure on human labour used was nearly 14 per cent in member class and 24 per cent in non-member class.

Biradar *et al.* (2003) conducted a PRA based study in three different agro-climatic regions of Karnataka to know the influence of cropping pattern on the fodder availability and utilization. Regarding feeding pattern, researchers observed

that most important fodder for large ruminants is a crop residue in different forms such as local concentrate mixed with powdered paddy husk/hull, hay, sorghum stover and purchased feed. Local concentrate was composed of broken and poor quality grains of sorghum, horse-gram, red-gram and green-gram. All these grains were powdered and fed to animals after soaking it for 6-8 hours. Some farmers mixed the paddy husk/hull with local concentrate and together soaked in water for 6-8 hrs.

Bardhan *et al.* (2004) found that the feed cost constituted the major part of total cost in dairy farming in Terai area in erstwhile Uttaranchal (present Uttarakhand). On an average, farmers incurred 66.50% on feed and labor cost was 16.76% of total maintenance cost. Besides these items, costs of veterinary expenditure, depreciation and interest on fixed capital contributed 3.69%, 5.59% and 7.49% to the total maintenance costs, respectively. Moreover, it was mentioned that milk production from indigenous cattle is highly unprofitable and unviable proposition in Terai region of erstwhile Uttaranchal.

Aitawade *et al.* (2005) concluded that the feed cost was the major cost in dairying and the share of variable and fixed cost to the total cost was 90.35 and 9.65 percent, respectively.

Kumar *et al.* (2005) analysed the feeding pattern of livestock at different stages. The study revealed that among the three feed components namely dry fodder, green fodder and concentrates, the dry fodder had the highest share (50 to 73%) in the animals' diet followed by green fodder (22 to 30%) and concentrates (4 to 25%). The crossbred cows were normally taken out for grazing, but were invariably stall-fed, with a feeding pattern of 19 q of dry fodder, 5.6 q of green fodder and 9.4 q of concentrates. It can be inferred from the above studies that various types of feeding patterns were followed in different regions of the country.

2.1.4 Labour type

Pant and Karanjkar (1965) analysed the commercial dairy farms of Jabalpur (Madhya Pradesh). The study revealed that the proportion of hired labour

increased with the scale of the business, whereas in case of small farms, most of the labour is contributed by the operator himself.

Grewal and Rangi (1980) in a study on employment and economics of dairying in Punjab reported that although the relative share of labour input in dairying in the total cost was less, the absolute magnitude of labour employment turned out to be much higher. On an average per animal labour input was worked out as 619 man-hours per year which means an input of 1.7 hours per animal per day. The operation wise labour input revealed that harvesting, transportation and chaffing of fodder accounted for as much as 58% of total labour input while feeding accounted for 19% of the total labour input. The other important operations of milking, watering, cleaning of animal shed and animals accounted for 7-8 per cent of labour use each.

Varadarajan and Srinivasan (1980) in a study on livestock and rural development in rural areas of Tiruchirapalli district of Tamil Nadu indicated that livestock production uses, on an average, 280 man days of labour per farm per year. On per animal, family labour contributes about 80% of the total labour used.

Legha and Mehla (1992) conducted a study in Karnal to identify the labour utilization pattern at three different dairy farms i.e. Demonstration Unit NDRI (Farm 1), dairy farm in Karnal city (Farm 2) and dairy farm located in rural areas (Farm 3). The study revealed that daily time spent per adult unit was 68.44, 138.76 and 68.61 minutes at farms 1, 2 and 3, respectively. They found that one man can look after 6 milch animals or 17 dry animals when processing and marketing was not involved. If processing and marketing is involved, this figure reduces to 3 milch animals or 10 dry animals. The study showed that milking operation was the most labour intensive activity.

Within dairy operations, 47% of labour is utilized for bringing fodder, 12% for grazing, 10% for chaffing, 15% for feeding, 7% for cleaning and 10% for milking (Singh and Kairon, 1996).

Sudheer *et al.* (1999) conducted a study in Ernakulam district in Kerala state to study the comparative economics of milk production in organized and unorganized sectors. They found that labour charges were higher in the unorganized sector because the dairy men had to spend more labour for the purchase of feed, health care and breeding of the animals.

Dosanjh and Gill (2000) while studying the labour utilization for sanitation and miscellaneous farm operations at dairy enterprise in rural areas of Ludhiana district (Punjab) revealed that the efficiency of labour depend on the adult milch and livestock units of the farm.

Christy and Thirunavukkarasu (2002) observed that most of the tasks related to livestock keeping were performed by farm women in Tamil Nadu. Further, on an average, farm women spent about 294 minutes/day/household on the care of large ruminants.

Shah *et al.* (2002) revealed that majority of the selected men (61.66%) and women (83.33%) engaged in dairying belonged to middle age group of 27 to 53 years.

Kumar *et al.* (2005) in their study *Pattern of feeding milch animals in different size categories of farmers in northern Karnataka* conducted in Bagalkot and Belgaum districts revealed that labour utilization was nearly same in both stall feeding and grazing + stall feeding, for indigenous cows. In case of buffaloes, labour use was slightly more in grazing + stalls feeding with about 109 man days than in stall feeding (107 man days). But in case of crossbred cows, labour utilization was same with 102 man days in both stall feeding type and grazing and stall feeding.

2.1.5 Miscellaneous factors

Baruah *et al.* (1996) studied the economics of milk production in Assam. In that study they reported that the cost of milking animals accounted for a major share of cost followed by cattle sheds and equipments irrespective of herd size. The fixed costs varied from 10.75 - 13.71 percent of total cost.

Schaik *et al.* (1996) suggested that feeding concentrate is an important indicator of high farm performance. The influence of health-services costs on farm performance was not significant. Off-farm income also influenced overall farm performance; farms heavily dependent on off-farm income were often inefficient in their dairy enterprise.

Overton (2005) using stochastic simulation showed that A.I. is less expensive than using natural service.

Cain *et al.* (2007) reported significant effect of using better, well managed dairy livestock in increasing the uptake of simple technological improvements and for widening access to credit on performance of dairy farms.

Gangasagare and Karanjkar (2009) based on their study on milk production and economic profile of dairy farmers in Marathwada region of Maharashtra concluded that the members of single family maintained the dairy animals more carefully than those of joint families.

Nishi *et al.* (2011) based on a study conducted in Uttar Pradesh concluded that organizational participation, market potential and economic motivation were found to have strong influence on the satisfaction level of dairy farmers.

2.2 HERD STRUCTURE AT PRIVATE DAIRY FARMS

Pant and Karanjkar (1965) studied the commercial dairy farms of Jabalpur. They defined dairy unit as a *business venture if it had a minimum of five milk buffaloes, on an average, during the year of survey*. Smaller farms than this were considered as self sustaining business units and were considered too small to qualify for the study. A total of 7 cases qualified for the study and were finally selected for the study. The number of buffaloes in the herd ranged from 6-60. The authors reported that feed cost accounted for 84.7 percent of the total expenses (excluding unpaid labour). There were a large inter farm-group variations regarding cost of milk production and earnings. The operators labour earning per litre of milk was highest in the largest size group (23 and above) whose cost of

milk production was also lowest. The most efficient group had the largest herd and made best use of labour and capital and was feeding most economically. The authors concluded that returns tend to increase with increase in herd size and income differences were attributable to differences in management.

Jamal (1989) found that herd size was negatively and significantly associated with the productivity of milk which indicated that productivity of milk increased with decrease in herd strength.

Kundu and Basu (1991) investigated on small and large herds to determine the effect of various management factors on herd average milk production and found that herd size was significantly related to milk production. Dixit and Laharia (1996) in their study on farmers constraints in buffalo husbandry in Haryana revealed that herd size had positive and significant relationship with the total constraints score for both the less developed and developed villages.

Kumar *et al.* (1998) have done a study on herd size productivity relationship and returns of sale through milk production. It was concluded that yield per milch animal can be increased substantially and significantly with the increase in the herd size.

Reddy *et al.* (2000) also reported that milk production is in positive relation with increase in herd size.

Keshava and Mandape (2001) analysed the potentials and problems of dairy farming in North Bihar and found that herd size was largest (3.82 cattle equivalents) on small farms and lowest (2.18 cattle equivalents) on medium-large farms. Gour (2002) revealed that two fifth (40.76 %) of the dairy farmers had low level herd size, followed by 32.50 with high and 26.74 with medium herd size.

Shah *et al.* (2002) in their study in *Uttaranchal* state observed that 55% of the sample households were from marginal land holding category with land holding up to 2.50 acres. Dairying was observed to be an important secondary

enterprise among 47.50% of sample households and the herd size maintained in half of the selected households was medium sized (5-6 dairy animals).

Kumar (2004) based on a study on optimal farm plans in Haryana suggested that increase in number of milch animals in the rain fed dairy farming systems could further increase farm income. So, in previous studies on relationship in milk productivity and herd size both positive and negative association has been reported. This difference could be attributed mainly to differences in management practices and their efficient use in different farms. However, most of the studies concluded that cost of milk production per litre of milk was lesser in large farms. According to Baruah *et al.* (1996), in Assam, the cost of production per litre of milk was observed to be Rs. 8.47, 8.23, 8.28, 8.38 and 8.08 in <4, 4-6, 7-9, 10-12 and > 12 animal unit sizes, respectively.

The large farms in India and Pakistan produce milk at a cost of US $9–12/ 100 kg ECM, which have an advantage of 48% lower costs than large size farms in Brazil and New Zealand. The average size farms with 1–2 milk animals in India and Pakistan are not competitive in the longer run as compared to average size farms in Brazil and New Zealand due to higher opportunity cost of family labour (Mahmood *et al.,* 2004).

Veeranna and Singh (2004) studied attitude and adoption of improved dairy production practices by *Lambani* tribe in Bidar district. Study reported that herd size had positive and significant correlation with the extent of adoption of improved dairy production practices. Gangil and Dabas (2005) found that farmers possessing large herd have more knowledge in animal husbandry than the farmers possessing smaller herd.

Savitha *et al.* (2005) conducted a study on the role of rural women in dairy enterprise in Dharwad and found that herd size was positively and significantly associated with the time spending pattern of the respondents. As the herd size increased, the amount of time spent on washing the animals, milking

and various activities of dairy enterprise also increased. Reviews on herd size indicated that the smaller farms had large herd size and vice versa. The herd size showed positive and significant relationship with adoption of dairy Innovations.

Shah (2005) reported that the average family size was 5-6 persons among the dairy keepers in Maharashtra. Further, the operational land holding increased with the increase in herd size thus revealing positive relationship between herd size and land holding.

Tauer and Mishra (2006) reported that the higher cost of production on many smaller farms in United States is caused by inefficiency rather than failure in adoption of technologies.

Kumar *et al.* (2006) conducted a micro level study in Andaman and Nicobar Islands. The study revealed that for all the farm size categories, the total investment on local cow and crossbred cow was Rs. 9034.45 and 22304.13, respectively. Of which, 77.36 and 75.89 percent was on milch animals, 20.69 and 22.49 percent on dairy buildings and 1.95 and 1.61 percent on dairy equipments and machineries, respectively. It was also reported that there is a positive relationship between investment on milch animals and size of the farm. While there is a negative relationship between investment on dairy buildings and size of the farm in crossbred cows.

Ranaweera (2007) in his study on small holder dairy farmers in Sri Lanka found that majority reaction among farmers was to increase the herd size. However, due to the shortage of grazing land (3/9) and difficulty in obtaining good animals (5/9) farmers are not in favour of it.

The herd structure of dairy farms in Uttar Pradesh based on field study revealed that out of total sample, only 22.22 percent of the dairy owners had cattle calves while 33.33 percent had buffalo calves. The calf health care practices in the commercial dairy farms are very poor. In fact these dairy owners find the calf rearing uneconomical. The poor care of calves in the commercial dairies is reflected by the fact that the mortality rate in buffalo calves in these dairies was 81.09 % (Tiwari *et al.,* 2007).

Gangasagare and Karanjkar (2009) based on their study on milk production and economic profile of dairy farmers in Marathwada region of Maharashtra concluded that increase in the herd size decreased the productivity.

Uddin *et al.* (2010) reported in a study conducted in Bangladesh that milk yield increased and the cost of milk production decreased with increasing farm size. The large-scale intensive production system had the lowest milk production costs (30.88 US $/100 kg Energy Corrected Milk – ECM - compared to 43.46 US $/100 kg ECM for the small-scale traditional system). The highest milk yield was observed in the large-scale intensive dairy farming system (1600 kg ECM/year). Small-scale farmers of extensive and traditional farming system had a negative entrepreneur's profit (-0.93 and -0.27 US $/100 kg ECM, respectively) and were not able to cover their full economic costs from dairying. Sharma *et al.* (1999) investigated on labour input of selected herds in Rajasthan found that the labour input decreased significantly with increase in herd size, with herd sizes of 23, 23-42, 43-68 and above 68 SAU, the labour required was 2.71, 2.55, 2.09 and 1.83 man hours/SAU/day.

2.3 ECONOMIC VIABILITY OF PRIVATE DAIRY FARMS

Examining the cost of production is an indispensable component of any concern in analyzing the economic aspects. Low productivity of Indian dairy animals is due to large number of unproductive animals, lower genetic potential, poor nutrition and lack of good infrastructure and services etc. The high opportunity cost for own factors of production (land, family labour and capital), the differences in economies of scale and institutional support (infrastructure, provision of support services such as artificial insemination and veterinary services etc.) are the key drivers for differences in costs of production in different systems and low profitability. High potential for enhancing farmer incomes from dairy enterprise requires identifying approaches to enable farmers to capitalize on available opportunities.

Acharya and Pawar (1980) found that the average daily milk production per day and total milk production per lactation of crossbred cows was higher as

compared to buffaloes and local cows. It was reported that an average crossbred cow gave a profit of Rs.1538 per lactation and 59 paisa per litre of milk produced against Rs. 400 and 29 paisa per litre of milk of a buffalo.

Increased profitability and lower costs or higher returns were the primary motivators of milk producers in Texas, USA. Veterinarians were the most frequent source of information, followed by farm magazines (Jordan and Fourdraine, 1993). In India source and extent of availability of information regarding dairy farm management for farmers may be entirely different.

Deoghare and Bhattacharya (1994) reported that the net and the overall income per buffalo per year and input-output ratio were highest on large sized farms.

Chandra and Agarwal (2000) observed that keeping milch buffaloes was more economical with large farmers than milch cows with medium farmers in Uttar Pradesh. The net cost per litre of milk from crossbred cows was Rs.6.83 and that of buffalo was Rs. 7.58.

Singh *et al.* (2001) did a study on economics of milk production in different herd size groups of buffaloes in Etah district of Uttar Pradesh. The study revealed that the net income derived from different herd size of buffaloes was much higher among members than non-members of Brooke Bond Lipton India Ltd. Similarly, Verma and Sharma (2006) during a study in Rajasthan reported that the contribution of dairying to total income was 30.57 and 23.73 percent, respectively, in member and non-member groups of co-operative society.

Chand *et al.* (2002) did an economic analysis of commercial dairy herd in arid region of Rajasthan. The study revealed that the feed cost alone accounted for more than 70 per cent per animal per day. The overall net cost per animal per day was Rs. 53, 51 and 50, respectively, on small, medium and large herds. The net return per milch animal in a day was Rs.18, 13 and 12, respectively, on small, medium and large herds. The break-even level of output estimated was 30, 37 and 38 per cent of the total output on small, medium and large herds, respectively.

Sharma *et al.* (2002) carried out a study on dairying as an income generative activity in Himachal Pradesh. They found that the cost of milk production was Rs.10.43 and 9.59 in Kangra and Panchrukhi blocks, respectively. Net profit per litre of milk production was Rs. 0.57 and 1.41 for the respective blocks. Input output ratio for dairying was found to be 1: 2.98 in the study area.

Hemalatha *et al.* (2003) reported that the average profit per animal was highest in Jersey crossbred cows (99.55%) compared to Holstein Friesian crossbreds (98.47%) in Ahmednagar of Maharashtra.

Kumar and Pandian (2003) in Tamil Nadu calculated the cost of milk per litre for crossbred cows, indigenous cows and buffaloes as Rs. 9.71, 11.96 and 11.44, respectively. Moreover, it was revealed that total cost of dairying decreased with increase in farm size. The major constituents of variable cost, the feed cost accounted for Rs. 61.22 and labour cost was 34.36 percent of total cost. Further, veterinary expenses and miscellaneous expenses were 0.39 and 0.21 percent, respectively.

Misra and Pal (2003) concluded that 25% of the total earnings come from dairying as a subsidiary activity of crop-livestock integration in rural West Bengal.

Bardhan *et al.* (2005) in their study on economics of milk production from crossbred cattle in Udham Singh Nagar district of Uttarakhand reported that average annual cost of maintenance of crossbred cattle was Rs. 21863 with no significant differences among different categories of farmers. Feed and fodder costs constituted major part of total costs for all categories of farmers (59.71 per cent). Labour charges constituted about 20.82 per cent of total costs. Veterinary expenditures constituted 3.80 per cent of total maintenance cost. Per litre cost of milk production was found out to be Rs. 9.78, but it showed declining trend with increase in size of land holding. For land less labourers it was Rs.10 and for large farmers it was Rs.9.22. The average annual returns including returns from dung were found out to be Rs. 20054 which means that these could not cover the cost of maintenance for all categories of farmers.

Chinnappa (2005) in a study done in Karnataka reported that the contribution from dairy farming to the rural smallholder household income was 16.79 and 18% in irrigated and un-irrigated areas, respectively.

Desai (2005) in a study on economic analysis of milk production and disposal pattern of milk in rural areas of Bidar district (Karnataka) observed that feed cost was the major cost followed by labour cost in all the species. The study also revealed that the net return per day was highest (Rs.3.72) from the local cows followed by buffalo, while in crossbred cow it was negative.

The economic feasibility of the perennial-cow dairy farm was very sensitive to the milk production maintained by the perennial herd and market prices for milk and perennial replacement animals (Rotz *et al.,* 2005).

Bhardwaj *et al.* (2006) conducted a study in four adopted villages of Central Institute for Research on Buffaloes, Hisar (Haryana). Feed cost was found to be a major component accounting as high as 71-76 per cent of the total maintenance cost of milch buffaloes. The net maintenance cost per day per buffalo for small, medium and large farms was worked out to be Rs.57, Rs. 63.80, and Rs.64.30, respectively. The corresponding figures for net gross returns per day per buffalo were Rs. 65.80, Rs. 71.02 and Rs. 73.16 and net profit per day per buffalo were Rs11.50, Rs.7.22 and Rs. 8.86, respectively.

Shergill (2006) in his study on the commercial dairy farms of Punjab comes out with an interesting fact that commercial dairy farming in rural Punjab is not a profitable economic activity in strict business sense. The overall picture showed that the price of milk received does not cover even the cost of milk production. The per litre cost of milk production worked out to be Rs. 11.13 and the price received by farmers was Rs. 9.98. On every litre of milk sold, the commercial dairy farmer suffered a loss of Rs.1.15. The farmers suffered loss even when the cost of family labour is not taken into consideration. Across herd size categories the picture remains largely the same, the situation of commercial dairy farms is so grim that when the fixed costs and wages to family labour are completely

ignored and only operational expenses are considered, the middle herd size group (4-6 milch animals) fails to cover even the operational expenses. However, small herds (1-3 milch animals) and big herds (7 or more milch animals) were able to generate some cash surplus from the sale of milk.

Bidwe *et al.* (2009) reported that the level of management influenced the production in buffaloes based on their study in Maharashtra. The production under satisfactory management status was 3 to 4, 4 to 5 and 5 to 7 kg/animal under satisfactory, fair and good management index while it was 10 to 14 kg/animal under very good management index.

Cabrera *et al.* (2010) based on their study in dairy farms of Spain reported that production exhibits constant returns to scale and that farm efficiency is positively related to farm intensification, the level of contribution of family labour in the farm activities, the use of a total mixed ration feeding system and milking frequency.

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Materials and Methods

3 Materials and Methods

3.1 DEMOGRAPHIC DETAILS OF MUZAFFARNAGAR DISTRICT

Muzaffarnagar district of Uttar Pradesh lies between latitude 29° 11' N and 29° 43' N and longitude 77° 04' E and 78° 07' E. It was carved out of Saharanpur district and is part of Saharanpur *Mandal*. It is situated in the *doab* of the Ganga and Yamuna between districts of Saharanpur on the north and Meerut on the south (Fig. 1). On the west, the Yamuna separates it from Karnal district of Haryana and on the east the Ganga forms the boundary between this district and the district of Bijnor. Its extreme length from east to west is about 98 km. while extreme width from north to south is 58 km.

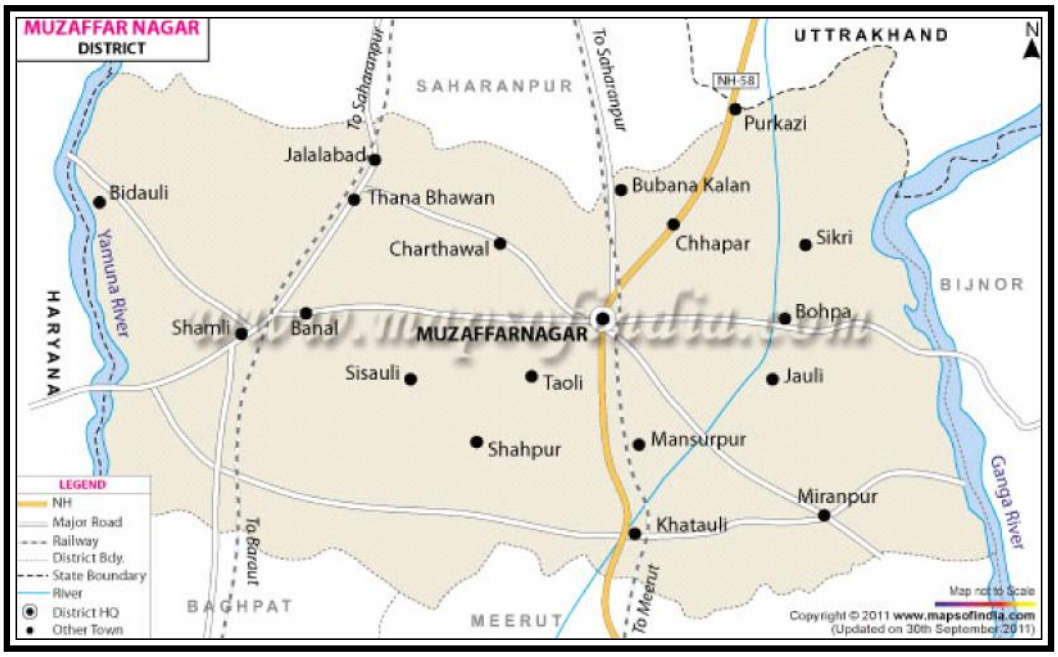

Fig.1. Demographic details of Muzaffarnagar district (UP)

(Source: http://www.mapsofindia.com/maps/uttarpradesh/districts/muzaffarnagar-district-map.jpg)

The district covers an area of 4008 sq. km. which is dominated by rural population 26,39,480 (78.94%) while urban population is 9,03,882 (21.06%). Level of literacy is also comparatively low (60.07%) so this area is predominately occupied by farmers dependent on agriculture and dairying for livelihood. Net area sown is 0.09 hectare/capita and cropping intensity is 144.08 hectare (Statistical Abstract of Uttar Pradesh, 2009).

3.2 ADMINISTRATIVE SET-UP OF MUZAFFARNAGAR

The district is divided into 5 *tehsils* and 14 blocks. There are 112 *nyaya panchayata* and 687 *gram panchayats*. Total number of villages is 1025 in which 893 are inhabited and 132 are un-inhabited. Climatic condition is variable. Maximum temperature was 43.1^0 C and minimum temperature is 3.4^0 C. Normal rainfall recorded was 753 mm while maximum rainfall recorded was 1159 mm (http://shodhganga.inflibnet.ac.in).

About 1336 Km. of canal is being used for irrigation of agricultural land. Besides this, there are government and private tube-wells numbering 452 and 94022, respectively. Livestock population of Muzaffarnagar district is 11,30,375 heads. There is a good Veterinary infrastructure with Veterinary Hospitals (45), Livestock Service Centres (59) and Artificial Insemination Centres (44, Sankhyakiya Patrika, 2006).

3.3 SURVEY METHODOLOGY

Data was collected from private dairy farms functioning in different parts of the Muzaffarnagar district. Five dairy farms from each block were selected randomly for collection of data so as to cover all length and breadth of the district. Only those dairy farms were taken in to consideration which were keeping at least 15 adult animals (cattle or buffaloes or both). In this way a total of 70 private dairy farms of this district were surveyed.

Data regarding introductory part, economic profile of dairy farm owner, management practices followed at farm, herd structure and indicative economic

performance i.e. input-output details were collected. Efforts were made to collect this information within stipulated time frame. Proforma used for collection of data has been presented below:

3.3.1 General introductory information

- **Name of dairy farm:** It was the name of dairy farm.
- **Name and age of the owner of dairy farm:** The name and age of private dairy farm owner was enquired and recorded. The ages were classified in to following groups:

Classes	Age in years
Middle aged	= 40 years
Grown ups	>40 years

- **Ownership type (Individual/partnership):** Type of ownership has been affirmed and was individual ownership only.
- **Education of the dairy farmer:** The dairy farmers were classified in to two major groups with respect to their formal education i.e. literate and Illiterate. Under literate group following sub-groups were created:

Groups	Educational status
Group 1	Middle (VIIIth)
Group 2	High School (Xth)
Group 3	Intermediate (XIIth)
Group 4	Graduate and above

- **Experience in dairy farming:** The experience of the dairy owner has been ascertained from him in number of years. The experience of these dairy farmers extended from 7 to 18 years and hence to analyze its effect on other variables, classes of experience years were formed as follows:

Classes	Experience in dairy farming (years)
Fair	< 5
Good	5-10
Very good	>10

- **Financial soundness:** The financial soundness of these dairy farmers were classified in to two major groups i.e. fair and good. This

classification was based on the total area of plot and its present value, type and brand of car/tractor owned, no. of motorcycles owned, shed structure and construction materials used, house and other facilities available etc. which ultimately reflects the overall socio-economic status of the dairy farmer.

- **Technical/other special qualifications:** The possession of any technical diploma/degree in agriculture/animal science or allied sciences was confirmed and recorded, if any.

- **Deployed manpower / staff:** The deployment of manpower / staff, if available, was recorded. All the dairy farmers were themselves managing their dairy farms and no manager was employed. All dairy farms were having unskilled type of workers to facilitate the day to day activities of the dairy farm management. All the unskilled manpower were men only, no women workers were employed on these dairy farms. The number of unskilled manpower employed as well as salary per month was also recorded.

3.3.2 Geographic and technical information

3.3.2.1 Location of dairy, plot size – use – cost, availability of ancillary structures, equipments and machines

- **Location details:** The location of the dairy farm i.e. place, village, town name etc. was recorded.

- **Total area of plot and its cost:** The plot area under possession of the dairy was enquired/ascertained before recording. At the same time, the cost of the plot was also recorded based on the prevailing rates in that area.

- **Type of fence:** Fencing type of animal shed was recorded as per the availability.

- **Animal sheds:** Availability of animal sheds, its size and construction material were observed/enquired and recorded. The shed type which included (partially) RCC – (partially) tin shed (RCCTS), (partially) RCC – (partially) thatched (RCCTH), complete RCC (RCC) and sheds made up of RCC – thatched – tin shed (THRCCT) and thatched – tin shed each (THTS) were recorded.

- **Store room:** Availability and size of store room, if any, for storing different articles and items was observed/enquired and recorded.
- **Milk storage room:** Availability of milk storage room, if any, was observed/enquired and recorded.
- **Servant quarters:** Availability and number of servant quarters, if any, were observed/enquired and recorded.
- **Silo-pit:** Availability of silo-pits, if any, was observed/enquired and recorded.
- **Biogas plant:** The farmers were asked regarding availability of bio gas plant, if any, and the same was recorded.
- **Chaff-cutter machine:** The type of chaff-cutter available along with its per hour capacity in quintals was observed/enquired and recorded.
- **Milking machine:** Availability of milking machine, if any, was recorded.
- **Feed grinder and mixer:** Availability of feed grinder and mixer, if any, was enquired and recorded.
- **Milking pails/milk canes:** Availability of milking pails/canes and its cost were enquired and recorded.
- **Tractor and trailer:** Availability of tractor along with trailer, if any, and its cost was recorded.

3.3.2.2 Livestock shed, electricity and water

- **Orientation of longer axis of shed:** The orientation of longer axis of shed, which were in East – West (EW) and North – South (NS) directions, was recorded.
- **Floor space:** The floor space was adjudged as adequate if the animals were comfortable while standing and sitting otherwise it was evaluated as inadequate.
- **Ventilation:** The ventilation inside the shed was adjudged as adequate if inside the shed no suffocation due to smell of urine and other off-odors were there otherwise it was evaluated as inadequate.
- **Light:** The adequacy of natural sun light was adjudged on the basis of visibility inside the shed during day hours and was adjudged as

adequate if the premises were comfortable and visible during day hours otherwise it was termed as inadequate.

- **Drainage and cleanliness:** The drainage was evaluated by constructed drains as well as cleanliness status of the animal shed. In case, drains were present and floor were sufficiently clean it was termed as adequate otherwise inadequate drainage and cleaning was recorded.

- **Electricity**: The source of electricity supply was observed/enquired for fulfilling daily requirements (government supply/diesel generator) of the dairy farm and the same was recorded.

- **Water supply:** The source of sufficient quantity of water supply for drinking, cleaning, fodder production, other purposes was observed/ enquired from the dairy farmers. In most of the cases, the dairy farm was having a submersible pump along with hand pumps for supply of water which was operated through electric supply, when available, or through diesel generator, if available.

- Age group wise herd strength and other related information on cattle and buffaloes

3.3.3.1 Species, breed, information on animal purchase and age group wise herd strength

- **Species:** The species were entered as cattle or buffaloes.

- **Breed:** The breeds/genetic groups of cattle/buffaloes were observed/ enquired from the owner and were entered as follows:

HF	Holstein Friesian
J	Jersey
S	Sahiwal
HF x S / J x S	Holstein Friesian x Sahiwal/Jersey x Sahiwal crosses
Mu	Murrah buffalo
Mug	Graded Murrah

- The herd were mixed type having no clearcut demarkation for different breed/grades and hence no. of mention of breed/grades is there in result and discussion. The genetic groups were either equired or assessed based on typical phenotypic characters of different breeds.

- **Source, place and cost of cattle/buffalo purchase:** The farmers were asked regarding occurrence of Farmers' Fairs / Animal Hats / Local Animal Markets in the vicinity from where they prefer to purchase cattle and buffaloes. At the same time, they were asked regarding the place of purchase of cattle and buffaloes to which they answered as Haryana and local market Budhana. The actual/expected cost of purchasing cattle and buffaloes (Rs.) was also enquired/verified and all these parameters were recorded.
- **Age group wise herd strength (number of cattle and buffaloes):** The farmers were asked regarding available numbers of milch, dry, heifers (>1 year) and male and female calves below 1 year of age and the number told was verified and after verification it was recorded. The total number of adult animals was reached after summing up the milch, dry and heifers of breedable age.
- Production parameters of cattle and buffaloes reared

The order of lactation of milch animals, per day milk yields (litre), lactation lengths expressed (minimum and maximum in days), dry days expressed (minimum and maximum in days), conception rates (%) and the mortality rate expressed (%) in case of adult and young stock were enquired from these dairy farmers and were recorded.

- Management practices adopted

3.3.4.1 Total plot size and other details

The total plot size used, plot size used by dairy, plot size used for household purposes and total cost of plot was observed/assessed/enquired and recorded. To assess the effect of plot size, it was classified into small (<500 yards^2), medium (501-750 yards^2), big (751-1000 yards^2) and very big (>1000 yards^2), though only one farmer of Baghra block belonged to very big category.

3.3.4.2 Feeding management

- **Source of feeds and fodder along with round the year green fodder availability:** The farmers were asked regarding the source of purchase

in case of green and dry fodder along with concentrate mixture. Most of the farmers indicated towards local purchase of green and dry fodder along with feed ingredients used for making concentrate mixture and the same was recorded.

- **Fodder crop rotations:** All the farmers indicated that they are purchasing green fodder from the market and hence there was no further question of followed fodder crop rotations, fodder cultivation expenses etc.

- **Concentrate mixture composition/ingredients:** The major concentrate ingredients included wheat bran (*Brassica juncea*), mustard oil cake (*Triticum vulgare*), black gram *chunni* (*Vigna mungo*) and black gram *chhilka* (*Vigna mungo*), which were purchased from the open market. The farmers were using these basic ingredients in different combinations as follows:

    - WB+ MOC + BGC
    - WB + MOC + BGC + BGCH
    - WB + MOC
    - WB + MOC + BGCH

- **Quantity and unit rate of green and dry fodder along with concentrate (ingredients) used:** The farmers were asked regarding quantity used (per day) and unit rate (per quintal) of green and dry fodder along with concentrate (ingredients) to estimate monthly requirements and monthly expenditure in the above said heads. Regarding per animal consumption, the total consumption was divided by total strength of milch and dry animals along with heifers to assess the per animal consumption.

3.3.4.3 Breeding management

- **Source/type, location, distance (Km.) of breeding facility:** The source (government/private) as well as type of breeding (natural/AI), the location and distance (Km.) of breeding facilities were observed/ enquired/verified from these dairy farmers before recording it.

- **Availability of semen, AI staff and expenditure per AI:** The availability of semen, AI staff and expenditure per AI observed/enquired/verified and recorded.

Health management

- **Source, location and distance (km.) of veterinary aid:** The source (government/private), location/place and distance of veterinary aid available to the dairy farmers were observed/enquired/verified before recording.
- **Availability of veterinary doctor/stockman/consultant, periodicity of veterinary visit, amount paid/visit (Rs.):** The availability of veterinary doctor/stockman/consultant, periodicity of their visits and expenditure incurred per visit was recorded after asking from the farmers.

3.3.4.5 Milking management and marketing of milk

- **Adoption of machine/hand milking:** All the dairy farmers surveyed were adopting hand milking and no milking machines could be traced and the same was recorded.
- **Proper prewashing of udders, utensils and hands before milking:** The farmers were asked regarding proper prewashing of udders, utensils and hands before milking and the answers were recorded in Yes/No.
- **Use of oxytocin for letting down of milk:** The dairy farmers were keenly observed for use of oxytocin for letting down of milk and no apparent use could be traced down. The farmers were also asked enquired regarding use of oxytocin to which they are all denied.
- **Agency, place, distance (km.) of milk sale and per litre price realized (Rs.):** These private dairy farmers were enquired regarding agencies to which they usually sell milk (cooperative society, milkmen and clients in open market), place of selling milk (doorstep) and per litre price obtained in case of cattle and buffalo milk separately and was recorded.
- **Basis and periodicity of milk payment:** The basis for selling milk to above agencies was also enquired and the periodicity of payment received (daily/monthly) was also enquired and recorded.

3.3.4.6 Marketing of other products

- **Sale of manure and gunny bags:** The dairy farmers were asked to tell regarding sale of manure (q) and gunny bags on per month basis and the same was recorded.

- **Sale of culled cattle and buffaloes:** The farmers were asked regarding age wise sale of culled cattle and buffaloes and the price realized or expected price was recorded.

- **Financial aspect and indicative economics**

3.3.5.1 Fixed expenses

The fixed expenses on costs of plot, shed, machines/tractors and trailers, animals (cattle and buffaloes), utensils and one time animal transportation costs (from Haryana or Budhana) were observed/enquired/verified/assessed and recorded.

3.3.5.2 Daily/monthly recurring expenses

The daily/monthly recurring expenditure on purchase of green and dry fodder along with concentrate mixture ingredients, chaffing of green fodder, salary of workers, costs of veterinary aid and AI services along with per deworming cost, electricity and water charges were observed/enquired/verified/assessed and recorded. In case the costs were told on per day basis, these were multiplied by 30.4 to arrive at monthly costs.

3.3.5.3 Financial liabilities

They were asked regarding any financial liability in the shape of either bank/private finance, though all of them denied for that and the same was recorded.

3.3.5.4 Livestock insurance

Dairy farmers were asked regarding insurance of their cattle and buffaloes however all of them denied for that and the same was recorded.

3.3.5.5 Net economic gain per month (Rs. /m) based on monthly recurring expenses

The economic viability of the private dairy farms was estimated based on the net economic gain per month in following manner:

Net economic gain (Rs./m) = Total output (receipts generated through sale of milk, manure and gunny bags/m)/Total monthly recurring input (expenditures on

costs of green and dry fodder along with concentrate mixture ingredients, chaffing charges of green fodder, salary of workers, costs of veterinary aid and AI services along with one deworming cost, electricity and water charges etc.).

The study was conducted on spot at a particular point of time to know the current status only and hence depreciation on fixed was not induced and it was estimated based on recurring expenses ony.

In case of veterinary visits, it has been assumed during estimation of net economic gain that these dairy farmers enjoyed/afforded 5 visits per month through private veterinary doctor and their cost was estimated. Similarly, in case of breeding, it has been assumed that 8% of the total adult cattle or buffaloes (milch + dry + breedable heifers) were artificially inseminated per month through private inseminators on per AI payment basis and the same cost was used for estimation of net economic gain/m (Rs.). Regarding deworming expenditure, it was assumed that in the month of estimation, one deworming (out of 4 quarterly dewormings) were done for all the available cattle and buffaloes at the surveyed rates.

3.4 TECHNICAL SUPPORT

Dairy farmers were asked regarding any technical assistance from VO/ other bodies at an hour of need. Technical guidance/Training facilities/Govt. support /extension support etc., if any, was recorded.

3.5 ANALYSIS OF DATA

The analysis of the data collected was done as per standard procedures (Snedecor and Cochran, 1987) using SAS (9.2 version) and SPSS 17.0 softwares.

The univariate analysis of variance (ANOVA) was conducted to ascertain the effect of factors on considered traits. At the same time, Chi-square analysis was done for socio-economic traits to the expected frequencies i.e., each group has equal share in a particular trait. Also, Chi-square test for testing indepence of groups was applied.

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Results and Discussion

4 Results and Discussion

The present survey work was conducted in all the fourteen blocks of Muzaffarnagar district of Uttar Pradesh. These blocks were namely Baghra, Budhana, Charthawal, Jaansath, Kandhla, Kairana, Khatauli, Morna, Muzaffarnagar Sadar, Purkaji, Sahapur, Shamli and Thana Bhawan. From each block, five private dairy farms were chosen, having at least 15 adult livestock units i.e. cattle or buffaloes or both. In all 70 private dairy farms were studied.

4.1 GENERAL INFORMATION OF PRIVATE DAIRY FARMS

4.1.1 Location and ownership type of private dairy farms

Block wise location of these 70 private dairy farms have been shown in Table 1. In all these 70 private dairy farms were located in 29 different locations within these 14 blocks. All the dairy farms were managed by these private dairy farmers in individual capacity.

4.1.2 Religion and castes of private dairy farmers

Of all the 70 private dairy farms surveyed, 77.14% (54) were owned by Hindus followed by 20% Muslims (14) and 2.86% by Sikhs (2). Among Hindus, maximum dairy farmers belonged to the caste Jats (74.07%, 40 out of 54) followed by Tyagis (11.11%, 6), Pals (5.55%, 3), Gujars (3.70%, 2) and one each by Jains, Kashyaps and Rajputs (1.85%). Among Muslims, the majority of the surveyed private dairy farms were owned by Shias (78.57%, 11) followed by 21.43% Sunnis. All the private dairy farmers belonging to religion Sikh were Jatt Sikhs (Table 2). The chi square test indicated that block has significant affect on caste of dairy farmers ($P \leq 0.05$) whereas its effect on religion was highly significant (Table 2a).

Table 1. Block wise location/number of private dairy farms under study in Muzaffarnagar district of Uttar Pradesh

Sl. No.	Location of dairy farm	Blocks														Total
		Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan	
1.	Banjaron Ka Teela	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
2.	Basada	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
3.	Beralsi	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
4.	Bijopura	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
5.	Budhana	-	4	-	-	-	-	-	-	-	-	-	-	-	-	4
6.	Charthawal	-	-	3	-	-	-	-	-	-	-	-	-	-	-	3
7.	Gandhi Colony	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
8.	Jaansath	-	-	-	4	-	-	-	-	-	-	-	-	-	-	4
9.	Jalalabad	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
10.	Kandhla	-	-	-	-	5	-	-	-	-	-	-	-	-	-	5
11.	Kandaki	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
12.	Kairana	-	-	-	-	-	5	-	-	-	-	-	-	-	-	5
13.	Khatauli	-	-	-	-	-	-	5	-	-	-	-	-	-	-	5
14.	Kithoda	-	-	-	1	-	-	-	-	-	-	-	-	-	-	1
15.	Medpur	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
16.	Malpura	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
17.	Mandi	5	-	-	-	-	-	-	-	-	-	-	-	-	-	5
18.	Morna	-	-	-	-	-	-	-	4	-	-	-	-	-	-	4
19.	Mallupura	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
20.	New Mandi	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1

Table 1. Contd...

Sl. No.	Location of dairy farm	Blocks														Total
		Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan	
21.	Oon	-	-	-	-	-	-	-	-	-	5	-	-	-	-	5
22.	Rohna	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1
23.	Sahapur	-	-	-	-	-	-	-	-	-	-	-	5	-	-	5
24.	Saket	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
25.	Shahdabber	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1
26.	Shamli	-	-	-	-	-	-	-	-	-	-	-	-	5	-	5
27.	Thana Bhawan	-	-	-	-	-	-	-	-	-	-	-	-	-	2	2
28.	Raseedgarh	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
29.	Verma Park	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
	Total	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**70**

Table 2. Block wise distribution of religion and caste of private dairy farmers under study in Muzaffarnagar district of Uttar Pradesh

Religion	Caste	Blocks														Total
		Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan	
Hindu	Gujars	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2
	Jains	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
	Jats	5	5	1	1	5	1	1	2	3	4	2	4	5	1	40
	Kashyaps	-	-	-	-	-	-	-	1	-	-	-	-	-	-	1
	Pals	-	-	1	-	-	-	1	1	-	-	-	-	-	-	3
	Rajputs	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
	Tyagis	-	-	3	-	-	-	-	-	1	-	2	-	-	-	6
Muslim	Shias	-	-	-	2	-	4	2	-	1	-	-	-	-	2	11
	Sunni	-	-	-	-	-	-	-	-	-	-	1	1	-	1	3
Sikh	Jatt	-	-	-	-	-	-	-	1	-	1	-	-	-	-	2

Table 2a. Block wise distribution of religion and caste of private dairy farmers under study in Muzaffarnagar district of Uttar Pradesh

Blocks	Religion			Caste									
	Hindu	Muslim	Sikh	Gujars	Jains	Jats	Kashyaps	Pals	Jatt	Rajputs	Siyas	Sunnis	Tyagis
Shamli	5	-	-	-	-	5	-	-	-	-	-	-	-
Con	4	-	1	-	-	4	-	-	1	-	-	-	-
Thana Bhawan	2	3	-	-	-	1	-	-	-	1	2	1	-
Morna	4	-	1	-	-	2	1	1	1	-	-	-	-
Jaansath	3	2	-	2	-	1	-	-	-	-	2	-	-
Charthawal	5	-	-	-	-	1	-	1	-	-	-	-	3
Purkaji	4	1	-	-	-	2	-	-	-	-	-	1	2
Khatauli	3	2	-	-	1	1	-	1	-	-	2	-	-
Sahapur	4	1	-	-	-	4	-	-	-	-	-	1	-
Baghra	5	-	-	-	-	5	-	-	-	-	-	-	-
Muzaffarnagar Sadar	4	1	-	-	-	3	-	-	-	-	1	-	1
Kairana	1	4	-	-	-	1	-	-	-	-	4	-	-
Kandhla	5	-	-	-	-	5	-	-	-	-	-	-	-
Budhana	5	-	-	-	-	5	-	-	-	-	-	-	-
Total	**54**	**14**	**2**	**2**	**1**	**40**	**1**	**3**	**2**	**1**	**11**	**3**	**6**
Chi^2 Values	**39.111***	**165.476****											

Singh and Tyagi (1985) revealed that adoption of dairy innovations of the village was positively and significantly correlated with caste. In the present study, Jats was predominant caste involved in dairying as agriculture is considered main occupation of this community in most of the parts of country.

4.1.3 Age of private dairy farmers

The private dairy farmers surveyed were aged in between 32-50 years. It has been observed that the profession of dairy farming is most popular among people aged 40 years (22.86%) followed by people aged 38 years (14.29%) and aged 42 years (12.86%) or we can say that 60% of the total private dairy farmers (42 out of 70) belonged to the age group of 40.00±2.00 years (Table 3).

The block effect was non-significant on age of dairy farmers in different blocks of Muzaffarnagar district of Uttar Pradesh (Table 5). The overall mean for average age of dairy farmers was 41.27±0.44 years which varied from 38.80±1.02 (Thana Bhawan) to 44.60±1.99 years (Charthawal) indicating that the youngest dairy farmers were in Thana Bhawan whereas eldest were in Charthawal block of Muzaffarnagar district (Table 4).

Rajanna *et al.* (2003) found that 43.30 per cent of dairy farmers were under the age group up to 25 years, followed by 26 – 40 years of age (33.40 %) and above 41 years of age 23.30%). Similar to the present findings, Gour (2002) reported that majority of the dairy farmers (76.74 %) belonged to middle age group. Chauhan *et al.* (2004) observed that 28.00 per cent of dairy farmers were under the age group of 36 – 45 years, followed by 46 – 55 years (27%), above 55 years (25 %) and 26– 35 years (16 %), while only 4.00 per cent of them were under the age group of below 25 years. Gangil and Dabas (2005) in their study in Uttaranchal state revealed that the majority of livestock farmers belonged to middle age group followed by old age group and young age groups.

4.1.4 Educational status of private dairy farmers

Among all the dairy farmers, illiterate were 8 (11.43%) whereas 62 (88.57%) were literate (Table 6). Maximum illiterates were in Kairana block (4

Table 3. Block wise distribution of age of dairy owners (frequency) in private dairy farms under study in Muzaffarnagar district of Uttar Pradesh

Age of dairy owners (years)	Blocks														Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan	
32	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1
36	-	-	-	-	-	1	1	-	1	-	-	1	-	1	5
37	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
38	1	2	-	-	2	-	-	-	1	1	1	-	-	2	10
39	-	-	1	1	-	1	-	1	-	-	-	-	-	-	4
40	2	1	-	1	1	2	1	1	1	1	1	1	2	1	16
41	-	-	-	1	-	-	-	1	-	-	1	-	-	-	3
42	1	1	1	-	-	-	1	1	1	-	1	-	1	1	9
43	-	-	-	-	1	-	-	-	-	1	-	-	-	-	2
44	-	-	1	-	-	1	-	1	-	-	-	1	1	-	5
45	1	-	-	1	1	-	-	-	-	1	1	-	-	-	5
46	-	-	-	-	-	-	-	-	-	1	-	1	-	-	2
48	-	1	1	1	-	-	1	-	1	-	-	-	-	-	5
50	-	-	1	-	-	-	-	-	-	-	-	1	-	-	2
Total	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**70**

Table 4. **Block wise age of dairy farmers (years), total plot size (Yd^2), distance from market and railway station (Km.) and total children of dairy farmers (along with sons and daughters)**

Particulars	No. of Obs. (N)	Age of dairy farmers (years)	Distance (Km.) from		Children (no.)				
			Market	Railway Station	Total	N	Sons	N	Daughters
Overall mean (μ)	70	41.27±0.44 (32-50)	3.37±0.20 (1.0-7.0)	19.01±1.47 (1-49)	4.07±0.14 (2-7)	69	2.28±0.09 (1-4)	68 68	1.88±0.10 (1-4)
Blocks									
Shamli	5	40.60±1.17 (37-44)	2.80±0.37 (2.0-4.0)	5.40±0.40 (4-6)	3.60±0.24 (3-4)	5	2.00±0.32 (1-3)	5	1.60±0.40 (1-3)
Oon	5	42.40±1.50 (38-46)	3.20±0.86 (1.0-6.0)	19.20±0.58 (18-21)	4.80±0.37 (4-6)	5	2.80±0.20 (2-3)	5	2.00±0.32 (1-3)
Thana Bhawan	5	38.80±1.02 (36-42)	2.50±0.63 (1.5-5.0)	5.40±0.40 (4-6)	4.20±0.73 (2-60)	5	2.40±0.40 (1-3)	4	2.25±0.25 (2-3)
Morna	5	41.20±0.86 (39-44)	3.60±0.98 (1.0-7.0)	22.60±1.17 (20-26)	3.80±0.2 (3-4)	5	2.00±0.32 (1-3)	5	1.80±0.37 (1-3)
Jaansath	5	42.60±1.69 (39-48)	3.80±0.86 (2.0-7.0)	20.80±1.39 (18-26)	4.20±0.37 (3-5)	5	2.40±0.24 (2-3)	5	1.80±0.37 (1-3)
Charthawal	5	44.60±1.99 (39-50)	3.10±0.78 (1.5-5.0)	17.60±1.63 (13-23)	4.20±0.37 (3-5)	5	2.60±0.24 (2-3)	5	1.60±0.24 (1-2)
Purkaji	5	41.20±1.16 (38-48)	4.20±0.86 (2.0-7.0)	14.20±1.36 (10-18)	3.60±0.93 (2-7)	5	2.00±0.45 (1-3)	4	2.00±0.71 (1-4)
Khatauli	5	39.60±2.71 (32-48)	2.40±0.75 (1.0-5.0)	3.20±0.86 (1-6)	3.40±0.68 (2-5)	4	1.75±0.48 (1-3)	5	2.00±0.55 (1-4)

Table 4. Contd....

Particulars	No. of Obs. (N)	Age of dairy farmers (years)	Distance (Km.) from		Children (no.)				
			Market	Railway Station	Total	N	Sons	N	Daughters
Sahapur	5	43.20±2.42 (36-50)	3.20±1.20 (1.0-7.0)	28.00±1.30 (25-32)	3.80±0.37 (3-5)	5	2.00±0.32 (1-3)	5	1.80±0.20 (1-2)
Baghra	5	41.00±1.18 (38-45)	2.80±0.20 (2.0-3.0)	17.00±0.45 (16-18)	4.40±0.51 (3-6)	5	2.40±0.24 (2-3)	5	2.00±0.32 (1-3)
Muzaffarnagar Sadar	5	40.80±2.06 (36-48)	5.20±0.66 (3.0-7.0)	7.40±0.68 (5-9)	4.20±0.73 (3-7)	5	2.40±0.24 (2-3)	5	1.80±0.58 (1-4)
Kairana	5	39.80±1.28 (36-44)	3.80±0.37 (3.0-5.0)	20.00±0.77 (17-21)	5.40±0.40 (4-6)	5	2.80±0.37 (2-4)	5	2.60±0.24 (1-3)
Kandhla	5	40.80±1.39 (38-45)	3.60±0.68 (2.0-6.0)	46.60±0.81 (45-49)	4.40±0.40 (3-5)	5	2.40±0.40 (1-3)	5	2.00±0.32 (1-3)
Budhana	5	41.20±1.85 (38-48)	3.00±0.89 (1.0-6.0)	38.80±1.24 (36-43)	3.00±0.32 (2-4)	5	1.80±0.37 (1-3)	5	1.20±0.20 (1-2)

Table 5. Block wise analysis of variance (ANOVA) for age of dairy farmers (years), distance from market and railway station (Km.) and total children of dairy farmers (along with sons and daughters)

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Age of dairy farmer	Between Groups	149.44	13	11.50	0.820	0.640
	Within Groups	788.40	56	14.08		
	Total	937.84	69			
Distance from market	Between Groups	35.64	13	2.74	0.940	0.520
	Within Groups	164.20	56	2.93		
	Total	199.84	69			
Distance from railway station	Between Groups	10175.79	13	782.75	152.620	0.000
Total children	Between Groups	23.84	13	1.83	1.370	0.200
	Within Groups	74.80	56	1.34		
	Total	98.64	69			
	Within Groups	287.20	56	5.13		
	Total	10462.99	69			
No. of sons	Between Groups	7.42	13	0.57	1.030	0.430
	Within Groups	30.35	55	0.55		
	Total	37.77	68			
No. of daughters	Between Groups	6.71	13	0.52	0.730	0.730
	Within Groups	38.35	54	0.71		
	Total	45.06	67			

Table 6. Block wise distribution of literacy among private dairy farmers under study in Muzaffarnagar district of Uttar Pradesh

Literacy among dairy farmers	Blocks														Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffamagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan	
Illiterate	-	-	-	1	-	4	-	-	1	-	1	-	-	1	8 (11.43)
Literate	5	5	5	4	5	1	5	5	4	5	4	5	5	4	62 (88.57)

Table 7. Block wise level of literacy among private dairy farmers under study in Muzaffarnagar district of Uttar Pradesh

Education of owner	Blocks														Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffamagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan	
Illiterate	-	-	-	1	-	4	-	-	1	-	1	-	-	1	8(11.43)
Literate															
Middle (Viii th)	-	-	-	-	-	-	1	-	-	-	-	-	-	2	3(4.00)
High School (X th)	1	1	2	2	4	1	1	2	-	2	2	2	2	-	22(31.00)
Intermediate (Xii th)	3	3	3	2	1	-	1	2	2	3	1	3	2	1	27(39.00)
Graduate and above	1	1	-	-	-	-	2	1	2	-	1	-	1	1	10(14.00)

out of 5) whereas all the selected 5 dairy farmers were literate in Baghra, Budhana, Charthawal, Kandhla, Khatauli, Morna, Oon, Shahpur and Shamli block. It has also been observed that the maximum number of dairy farmers were Intermediate (27, 39.00%) followed by High School (22, 31.00%), Graduation or above (10, 14.00%), Illiterate (8, 11.43%) and educated up to Middle standard (3, 4.00%, Table 7 and Fig. 2). it has also been observed that one of these dairy farmers among graduate or above category was qualified engineer (B.E.) in Mechanical Engineering (Baghra block). The block expressed its significant effect ($P \leq 0.01$) on literacy as well as educational status of dairy farmers ($P \leq 0.05$) as tested by chi-square analysis (Table 3a).

At the same time, none of these private dairy owners were having technical qualifications (Diploma/ Degree) in agriculture, animal husbandry and dairying or allied sciences.

Patel (2000) indicated that majority of the beneficiaries (74.19%) had primary to secondary level of education. Shah *et al.* (2002) found that educational status of majority of male respondents (29.17%) was up to high school level while majority of female respondents (26.67 %) showed up to primary level in Uttaranchal state. Wadear *et al.* (2003) revealed that 25.83 per cent of dairy farmers had primary education followed by 25.00 per cent illiterate, whereas 13.33 per cent of dairy farmers had SSLC/matriculation followed by secondary (12.50%), PUC (10.83%) and higher secondary (9.16%). Only 3.33 per cent of dairy farmers were educated up to graduate level. Chauhan *et al.* (2004) found that 30.00 per cent of dairy farmers were educated up to high school level followed by primary level (27.50%), middle school level (19%) and college level (13.50%), whereas 10.00 per cent of dairy farmers were illiterate. However, in our study literacy level of dairy farmers is better than their study.

4.1.5 Experience of dairy farmers in dairy farming

It has been observed among the surveyed dairy farms of all the fourteen blocks of Muzaffarnagar district that the experience span extended from 7 years

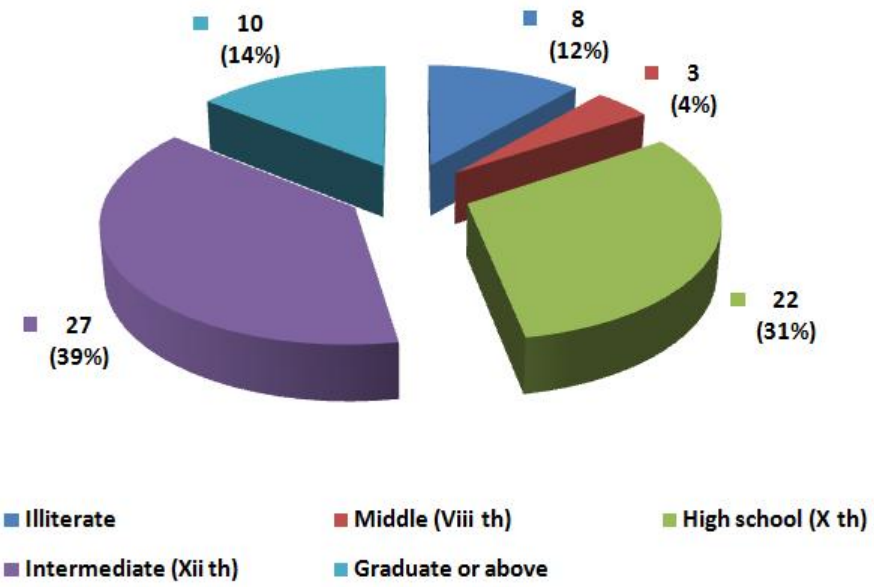

Fig. 2 : Education of private dairy owners

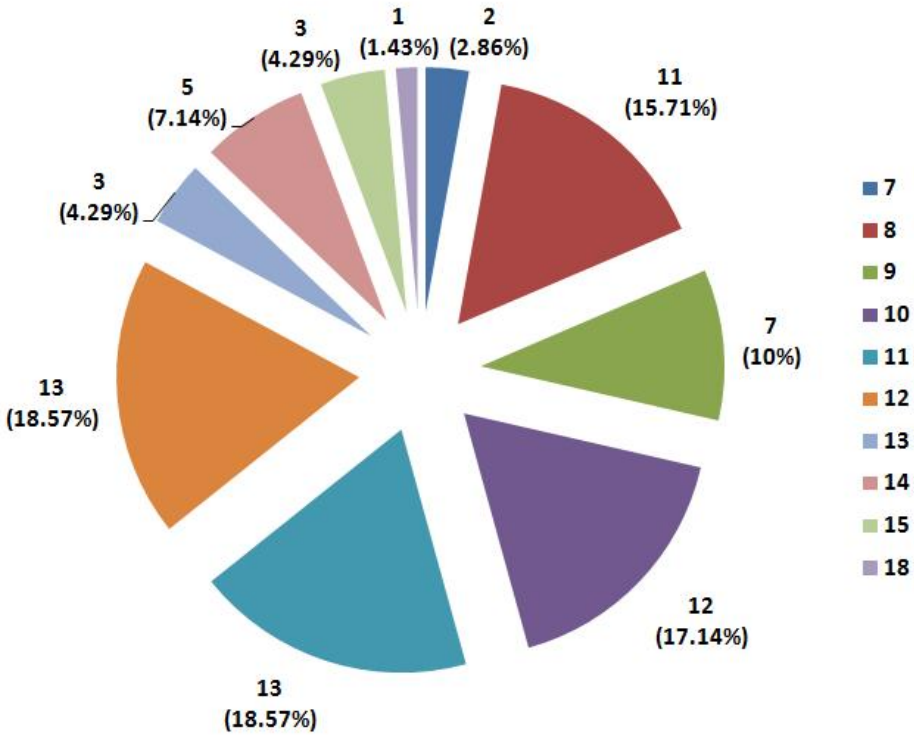

Fig. 3 : Frequency distribution of for different experience spans (years)

(10%) to 18 years (1.43%, Fig. 3 and Table 8) though block effects were non-significant (Table 3a).

Most of the dairy farmers were having good (5-10 years) and very good (>10 years) experience in practical dairy farming. No one of the surveyed dairy farmers was found to possess an experience of < 5 years (Fair). A total of 32 farmers (45.71%) were having good as well as 38 farmers (54.28%) were having very good experience in dairy farming (Table 9).

The effects of experience class on age of dairy farmers was significant ($P \leq 0.05$, Table 10). The dairy farmers having good experience of dairy farming were 40.31±0.70 years old, whereas the older dairy farmers (42.08±0.54 years) were having very good experience of dairy farming (Table 9).

At the same time, the block effects was non-significant on experience of dairy farmers (Table 12). The overall mean for experience of dairy farmers was 10.80±0.26 years which ranged from 9.40±0.75 (Budhana) to 12.80±1.11 years (Oon, Table 11). The block wise means for experience of dairy farmers are presented in Table 11.

The reviewed literature indicated that the knowledge, educational level and experiences of farmers help in developing future teaching methods and materials for increasing the level of record keeping and their use to improve reproduction, production, genetics, health, and economic practices of dairy farms (Rhone *et al.,* 2008).

Mundhwa and Pandheria (1998) reported that more than half of the dairy women had low experience in dairy farming i.e. up to 10 years followed by medium i.e. 11 to 20 years (40.44%) and only 5.78 per cent of dairy women had high i.e. above 20 years of experience. Khin Mar Oo (2005) found that majority of the diary women (74.16%) had low dairying experience i.e. up to 10 years. However, 15.00 per cent of the dairy women had medium experience i.e. 10 to 20 years followed by 10.83 per cent dairy women, who had high dairying experience i.e.

Table 3a. Block wise Chi-Square analysis for different traits

Traits	Pearson Chi-Square Value	df	Asymp. Sig. (2-sided)
Age of dairy farmer	139.65	169	0.952
Literacy among dairy farmers	30.48	13	0.004
Education of dairy farmer	72.18	52	0.033
Experience in dairying	108.83	117	0.692
Experience code	10.36	13	0.664
Financial status of dairy farmer	19.23	13	0.116
Orientation of longer axis of shed	7.54	13	0.872
Shed type	52.92	52	0.438
Shed ventilation	15.72	13	0.264
Natural lighting in shed	22.39	13	0.050
Drainage and shed cleaning	21.65	13	0.061
Availability of floor space	37.36	13	0.000
Availability of bio-gas plant	13.19	13	0.433
Availability of tractor & trailer	19.04	13	0.122
Availability of motorcycle	43.12	26	0.019
Availability of cars	116.20	117	0.504
Round the year green fodder availability	11.49	13	0.570
Type of green fodder	53.07	26	0.001
Milk sale source	84.61	26	0.000
Technical support	66.45	13	0.000

Table 8. Block wise distribution of no. of years of experience in dairy farming among private dairy farmers under study in Muzaffarnagar district of Uttar Pradesh

No. of years of experience dairy farming (years)	Blocks														Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhavan	
7	-	-	-	-	-	-	-	1	-	-	-	-	-	1	2
8	1	2	2	-	1	-	1	1	1	-	-	1	1	-	11
9	1	1	-	1	-	-	-	-	1	1	-	-	1	1	7
10	1	1	-	1	3	1	1	-	1	-	1	2	-	-	12
11	2	-	2	1	-	2	-	1	1	-	-	1	2	1	13
12	-	1	1	1	1	2	2	1	-	1	2	-	1	-	13
13	-	-	-	-	-	-	1	-	-	1	-	-	-	1	3
14	-	-	-	1	-	-	-	1	1	-	1	-	-	1	5
15	-	-	-	-	-	-	-	-	-	2	1	-	-	-	3
18	-	-	-	-	-	-	-	-	-	-	-	1	-	-	1

Table 9. Experience class wise means for age of dairy owners

Particulars	Age of dairy farmer (years)
Overall mean (μ)	41.27±0.44 (70)
Experience in dairy farming class	
Good (5-10 years)	40.31±0.70 (32)
Very good (>10 years)	42.08±0.54 (38)

Table 10. Experience wise analysis of variance (ANOVA) for age of dairy farmers

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Age of dairy farmers	Between Groups	54.20	1	54.20	4.171	0.045
	Within Groups	883.64	68	12.99		
	Total	**937.84**	**69**			

Table 11. Block wise distribution of no. of years of experience in dairy farming among private dairy farmers under study in Muzaffarnagar district of Uttar Pradesh

Particulars	Experience of dairy farmer (years)
Overall mean (μ)	**10.80±0.26 (70)**
Blocks	
Shamli	10.20±0.74 (5)
Oon	12.80±1.11 (5)
Thana Bhawan	10.80±1.28 (5)
Morna	10.40±1.29 (5)
Jaansath	11.20±0.86 (5)
Charthawal	10.00±0.84 (5)
Purkaji	12.60±0.87 (5)
Khatauli	11.00±0.89 (5)
Sahapur	11.40±1.72 (5)
Baghra	9.80±0.58 (5)
Muzaffarnagar Sadar	10.40±1.03 (5)
Kairana	11.20±0.37 (5)
Kandhla	10.00±0.63 (5)
Budhana	9.40±0.75 (5)

Table 12. Block wise analysis of variance (ANOVA) for experience of dairy farmers

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Experience of dairy farmer	Between Groups	64.40	13	4.95	1.024	0.442
	Within Groups	270.80	56	4.84		
	Total	**335.20**	**69**			

Table 14. Block wise means for number of motorcycles available with the dairy farmers

Particulars	No. of motorcycles available
Overall mean (μ)	**1.39±0.06 (70)**
Blocks	
Shamli	2.20±0.20 (5)
Oon	1.60±0.25 (5)
Thana Bhawan	1.20±0.20 (5)
Morna	1.40±0.25 (5)
Jaansath	1.40±0.25 (5)
Charthawal	1.00±0.00 (5)
Purkaji	1.00±0.00 (5)
Khatauli	1.00±0.00 (5)
Sahapur	1.20±0.20 (5)
Baghra	1.60±0.25 (5)
Muzaffarnagar Sadar	1.80±0.20 (5)
Kairana	1.80±0.20 (5)
Kandhla	1.20±0.20 (5)
Budhana	1.00±0.00 (5)

Table 15. Block wise analysis of variance (ANOVA) for number of motorcycles available with the dairy farmers

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
No. of motorcycles available	Between Groups	8.99	13.00	0.69	4.03	0.00
	Within Groups	9.60	56.00	0.17		
	Total	**18.59**	**69.00**			

above 20 years. In our study more than half of the dairy farmers had more than 10 years of experience as also reported in a study by Bhagyalaxmi *et al.* (2003).

4.1.6 Distance of private dairies from market and railway station

It has been observed that the distance of market from all the surveyed dairy farms varied in-significantly among the blocks (Table 5) with an overall mean of 3.37±0.20 Km. It's range varied from 1.00 Km. (Oon, Morna, Khatauli, Sahapur and Budhana) to 7.00 Km. (Morna, Jaansath, Purkaji, Sahapur and Muzaffarnagar Sadar, Table 4).

At the same time, the effects of block were highly significant ($P \leq 0.01$, Table 5) on distance from railway station with an overall mean of 19.01±1.47 Km. (Table 4). It ranged from 3.20±0.86 Km. (Khatauli) to 46.60±0.81 Km. (Kandhla, Table 4).

The importance of nearness to market was also highlighted by several studies in various ways. Gour (2002) indicated that more than half (53.49%) of dairy farmers had high level of market orientation followed by 27.32 per cent with low and 19.19 per cent with medium level of market orientation. At the same time, Chauhan and Patel (2003) observed that more than half of respondents (60.00%) had medium market orientation whereas 21.25 per cent of respondents had high market orientation followed by low market orientation (18.75%). Tiwari and Singh (2005) stated the importance of market oriented approach in livestock development through educating farmers about market availability for selling their produce, mode of entering the market, price fluctuations and estimating demand and supply of the produce.

4.1.7 Cooperation of spouses in various activities of dairy farms

It has been accepted by all the private dairy farmers that their spouses extended all help and cooperation to them in various activities of dairy farm management. The involvement of women in dairy farming was also highlighted by Singh and Singh (1999), who reported in a study of Haryana that 55, 89, 67 per cent females belonging to scheduled, backward, agriculturists in study area

were engaged in milking. However, present study indicated towards very high level of involvement of women/spouses in dairying.

4.1.8 Children of these dairy farmers

The number of total children along with number of sons and daughters varied in significantly among fourteen blocks of Muzaffarnagar district (Table 5). The overall mean for total children along with number of sons and daughters were 4.07±0.14, 2.28±0.09 and 1.88±0.10, respectively (Table 4).

Shukla *et al.* (2007) observed that majority of the families of farmers in Pithoragath district of Uttaranchal were nuclear with family size ranging from 4.67 to 5.80. In present study also family size ranges in these limits after inclusion of parents with children of families.

4.1.9 Financial status of dairy farmers

The financial status of dairy farmers was adjudged by the comparative possessions/holdings indicating towards their relative financial soundness and based on that the dairy farmers were classified in to two major groups i.e. fair and good. This classification was based on the total area of plot and its present value, type and brand of car/tractor owned, no. of motorcycles owned, shed structure and construction materials used, house and other facilities available, type of electricity and water supply arrangements, etc. which ultimately reflects overall socio-economic status of the dairy farmer.

It was observed that 23 dairy farmers (32.85%) had comparatively lower financial status (fair) as compared to rest of the 47 dairy farmers (67.14%, Fig. 4 and Table 13). Block effect on financial status of dairy farmers was non-significant as tested by chi square analysis (Table 3a).

4.1.9.1 Number of motorcycles available

The block expressed its significant effect ($P \leq 0.05$) on availability of motorcycles in the private dairy farms as tested by chi-square analysis (Table

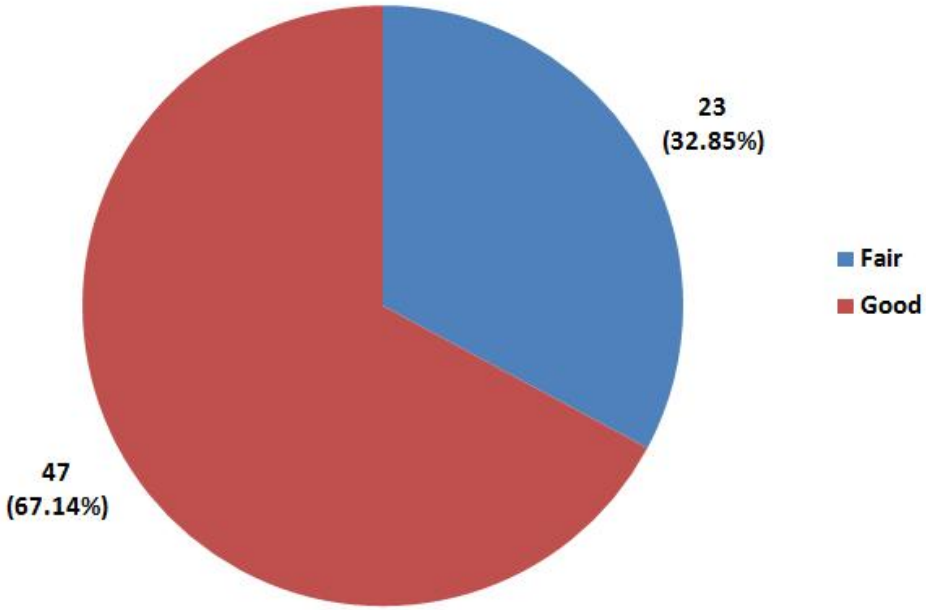

Fig. 4 : Financial status of dairy farmers

Table 13. Distribution of financial status of dairy owners of private dairy farms

Financial status of dairy owners	Blocks														Total (%)
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan	
Fair	-	-	1	2	1	4	3	3	1	1	2	2	-	3	23(32.85)
Good	5	5	4	3	4	1	2	2	4	4	3	3	5	2	47(67.14)

3a). At the same time, the block effect was highly significant ($P \leq 0.01$, Table 15) on number of motorcycles available with these private dairy farms which averaged 1.39±0.06 and varied from 1.00 (Charthawal, Purkaji, Khatauli and Budhana) to 2.20 motorcycles (Shamli, Table 14).

4.1.9.2 Availability of tractors (along with trailers) and cars

The block expressed its non-significant effect on availability of tractors and trailers as was tested by chi-square analysis (Table 3a). A total of 20 out of these 70 dairy farms (29.00%) were having tractors and tailors for transportation of material like feeds and fodder and garbage, etc. (Fig. 5 and Table 16). It has also been observed that 34.29% of dairy farms were not having a private car while rest of the dairy owners were having different brands of cars for their personal use (Fig. 6 and Table 16).

4.1.9.3 Electric supply and its expenditure per month

All of these private dairy farms possessed authorized electric connection taken from electricity department of the government. In case of electricity failure, the diesel generators were used by few of these dairy farmers to fulfill the water and fodder chaffing requirements of the farm.

The effect of block was highly significant ($P \leq 0.01$, Table 18) on cost of electric supply per month with an overall mean of Rs. 762.86±19.77 and it varied from Rs. 490.00±33.17 (Morna) to Rs. 1080.00±131.91 (Muzaffarnagar Sadar, Table 17).

4.1.9.4 Water supply

All the dairy farms were using submersible pumps along with hand pump for fulfilling the daily water requirement of the dairy farm. In case of electric failure, diesel generators were used by few of these dairy farmers to fulfill the requirements for water and fodder chaffing.

4.1.9.5 Availability of technical support to dairy farmers

Regarding technical support of dairy farmers, it has been observed that majority (65.71%) of the dairy farmers had access to veterinary officers for getting

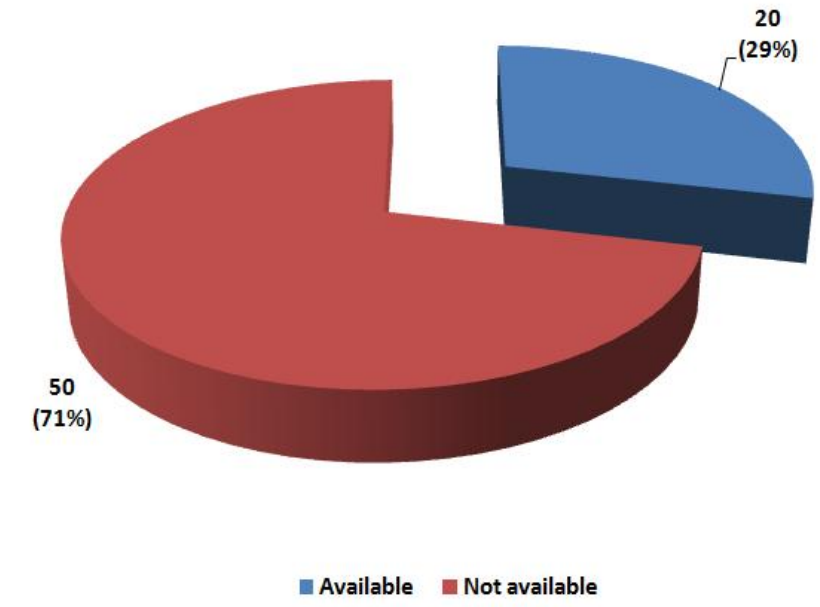

Fig. 5 : Availability of tractor & trailers with private dairy farms

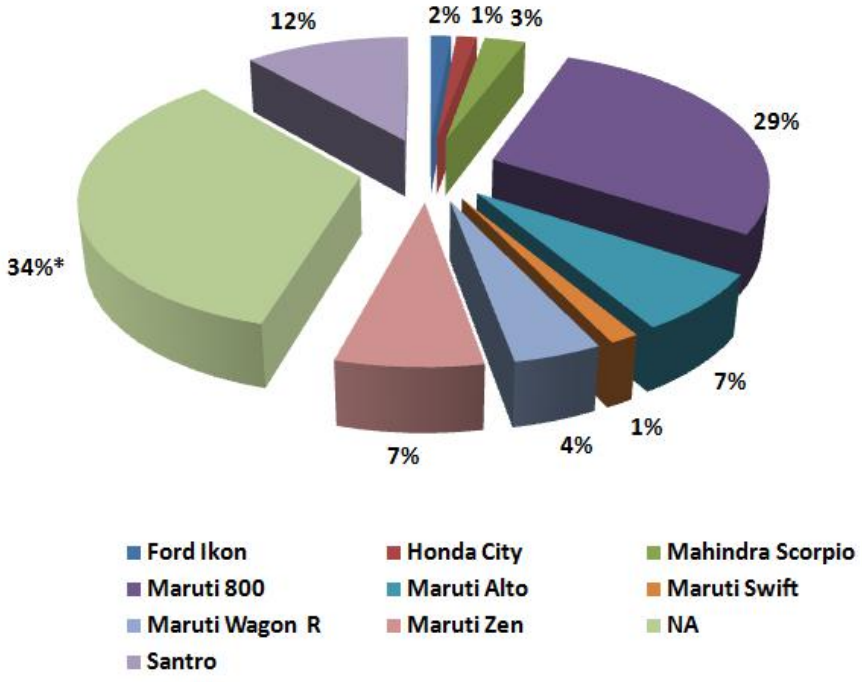

Fig. 6 : Availability of cars with private dairy farm owners

Table 16. Availability of tractor and trailer and type/brand of cars owned by the dairy farmers

Particulars	Blocks														Total	% of Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan		
Availability of tractor and trailer																
Yes	2	4	1	3	0	2	2	1	2	2	0	0	1	0	20	28.57
No	3	1	4	2	5	3	3	4	3	3	5	5	4	5	50	71.43
Availability, type and brand of cars owned																
Ford Ikon	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1.43
Honda City	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1.43
Mahindra Scorpio	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2	2.86
Maruti 800	2	1	1	1	2	1	1	0	2	2	0	0	3	4	20	28.57
Maruti Alto	0	0	0	0	0	0	0	1	1	1	0	1	1	0	5	7.14
Maruti Swift	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1.43
Maruti Wagon R	1	1	0	0	0	1	0	0	0	0	0	0	0	0	3	4.29
Maruti Zen	1	1	0	0	0	1	1	0	0	0	0	0	0	1	5	7.14
Santro	1	1	1	0	1	1	1	0	0	1	0	0	1	0	8	11.43
Cars not available	0	1	3	4	2	1	2	4	2	0	1	4	0	0	24	34.29

Table 17. Block wise means for store area, wheat straw store area , chaff cutter capacity, total plot size, plot used by dairy, plot size used for household purposes total cost of plot, cost of shed and electricity supply cost per month

Particulars	Store area (ft^2)	Wheat straw store area (ft^2)	Chaff cutter capacity (q/h)	Total plot size (ft^2)	Plot used by dairy (ft^2)	Plot size used for household purposes (Yd^2)	Total cost of plot (Rs. In lakhs)	Cost of shed (lakhs)	Electric supply cost per month (Rs.)
Overall mean (µ)	171.91±5.77 (70)	260.01±8.30 (70)	19.71±0.38 (70)	687.86±21.40 (70)	565.00±24.28 (70)	232.43±17.35 (37)	29.87±1.60 (70)	2.97±0.09 (70)	762.86±19.77 (70)
Blocks									
Shamli	195.20±16.27 (5)	228.60±17.22 (5)	22.90±1.12 (5)	840.00±50.99 (5)	600.00±31.62 (5)	240.00±40.00 (5)	25.00±1.58 (5)	3.40±0.25 (5)	860.00±40.00 (5)
Oon	154.40±24.25 (5)	250.80±66.17 (5)	21.40±0.49 (5)	780.00±66.33 (5)	470.00±37.42 (5)	310.00±40.00 (5)	23.40±1.99 (5)	3.10±0.25 (5)	800.00±31.62 (5)
Thana Bhawan	174.00±28.21 (5)	282.60±26.71 (5)	19.00±0.63 (5)	600.00±31.62 (5)	380.00±12.25 (5)	220.00±25.50 (5)	20.00±2.59 (5)	2.70±0.37 (5)	780.00±48.99 (5)
Morna	176.40±18.14 (5)	333.00±33.43 (5)	17.50±0.39 (5)	610.00±64.03 (5)	410.00±24.50 (5)	200.00±44.72 (5)	22.00±2.19 (5)	2.80±0.37 (5)	490.00±33.17 (5)
Jaansath	124.00±4.00 (5)	201.00±28.30 (5)	22.50±0.79 (5)	580.00±37.42 (5)	400.00±15.81 (5)	180.00±25.50 (5)	17.40±1.12 (5)	2.80±0.37 (5)	720.00±37.42 (5)
Charthawal	145.00±21.10 (5)	275.60±45.83 (5)	17.20±0.97 (5)	520.00±40.62 (5)	360.00±18.71 (5)	160.00±29.16 (5)	18.60±1.40 (5)	2.80±0.37 (5)	680.00±20.00 (5)
Purkaji	163.60±20.24 (5)	267.20±29.16 (5)	19.50±2.00 (5)	670.00±101.98 (5)	420.00±37.42 (5)	250.00±70.71 (5)	23.20±4.50 (5)	3.20±0.37 (5)	820.00±66.33 (5)
Khatauli	160.00±36.74 (5)	252.60±29.19 (5)	16.20±0.74 (5)	620.00±101.98 (5)	460.00±50.99 (5)	400.00±100.00 (2)	31.00±5.10 (5)	2.80±0.20 (5)	740.00±60.00 (5)

Table 17. Contd...

Particulars	Store area (ft^2)	Wheat straw store area (ft^2)	Chaff cutter capacity (q/h)	Total plot size (ft^2)	Plot used by dairy (ft^2)	Plot size used for household purposes (Yd^2)	Total cost of plot (Rs. In lakhs)	Cost of shed (lakhs)	Electric supply cost per month (Rs.)
Sahapur	134.00±14.00 (5)	237.80±31.87 (5)	16.20±0.74 (5)	690.00±110.00 (5)	690.00±110.00 (5)	-	34.40±5.56 (5)	3.60±0.51 (5)	770.00±37.42 (5)
Baghra	184.00±6.57 (5)	246.00±19.88 (5)	22.40±0.80 (5)	940.00±87.18 (5)	940.00±87.18 (5)	-	37.60±3.49 (5)	3.20±0.20 (5)	780.00±20.00 (5)
Muzaffarnagar Sadar	231.20±12.04 (5)	295.20±20.99 (5)	22.00±1.38 (5)	660.00±40.00 (5)	660.00±40.00 (5)	-	61.20±7.31 (5)	3.20±0.37 (5)	1080.00±131.91 (5)
Kairana	185.00±16.21 (5)	255.40±13.04 (5)	21.60±0.93 (5)	720.00±58.31 (5)	720.00±58.31 (5)	-	36.00±2.92 (5)	2.40±0.19 (5)	700.00±44.72 (5)
Kandhla	212.60±14.68 (5)	249.60±12.64 (5)	20.40±0.51 (5)	780.00±66.33 (5)	780.00±66.33 (5)	-	39.00±3.32 (5)	2.80±0.37 (5)	800.00±54.77 (5)
Budhana	167.40±14.27 (5)	264.80±11.04 (5)	17.20±1.66 (5)	620.00±58.31 (5)	620.00±58.31 (5)	-	29.40±1.97 (5)	2.80±0.37 (5)	660.00±24.50 (5)

Table 18. Block wise analysis of variance (ANOVA) for store area, wheat straw store area, chaff cutter capacity, total plot size, plot used by dairy, total cost of plot, cost of shed and electric supply cost per month

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Store area	Between Groups	55249.88	13	4249.99	2.260	0.018
	Within Groups	105291.60	56	1880.20		
	Total	160541.48	69			
Wheat straw store area	Between Groups	64107.78	13	4931.36	1.030	0.437
	Within Groups	268235.20	56	4789.91		
	Total	332342.98	69			
Chaff cutter capacity	Between Groups	400.08	13	30.77	5.712	0.000
Total plot size	Between Groups	843178.57	13	64859.89	2.653	0.006
	Within Groups	1369000.00	56	24446.42		
	Total	2212178.57	69			
Plot used by dairy	Between Groups	2041750.00	13	157057.69	210.926	0.000
	Within Groups	805000.00	56	14375.000		
	Total	2846750.00	69			
Plot size used for household purposes	Between Groups	134081.08	7	19154.44	2.080	0.078
	Within Groups	267000.00	29	9206.90		
	Total	401081.08	36			
Total plot cost	Between Groups	8681.04	13	667.77	9.986	0.000
	Within Groups	3744.80	56	66.87		
	Total	12425.84	69			
Cost of shed	Between Groups	6.64	13	.51	0.886	0.572
	Within Groups	32.30	56	.57		
	Total	38.94	69			
Electric supply cost per month	Between Groups	1074428.57	13	82648.35	5.686	0.000
	Within Groups	814000.00	56	14535.71		
	Total	1888428.57	69			

technical assistance at an hour of need. While 34.29% of the farmers had no technical support regarding dairy farming (Kairana, Khatauli, Morna, Muzaffarnagar Sadar and Thana Bhawan blocks, Table 18a and Fig. 7-8).

The block expressed its highly significant effect (P=0.01) on availability of technical support to these private dairy farmers as tested by chi-square analysis (Table 3a).

4.2 MANAGEMENT PRACTICES ADOPTED

4.2.1 Infrastructural facilities available

4.2.1.1 Civil structures

Floor type

It has been observed that all the dairy farms had paved brick floors in livestock sheds.

Fencing of shed

Cement brick walls were used as the fencing style to retain cattle and buffaloes within the shed.

Store and its area

All the private dairies were maintaining a store for keeping various utensils and items as per their requirements.

The effect of block was significant ($P \leq 0.05$, Table 18) on the area of store with an overall mean of 171.91±5.77 ft^2 which ranged from 124.00±4.00 (Jaansath) to 231.20±12.04 ft^2 (Muzaffarnagar Sadar, Table 17).

Wheat straw store and its area

Wheat straw store was also available on all the dairy farms.

The effect of blocks on wheat straw store area was non-significant with an overall mean of 260.01±8.30 ft^2 (Table 17).

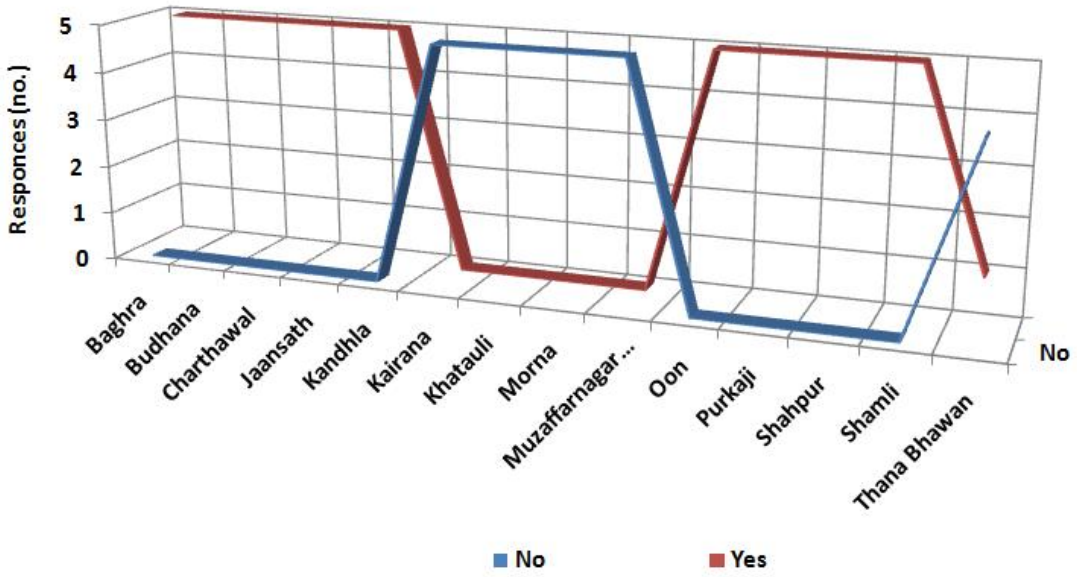

Fig. 7 : Technical support to these private dairies

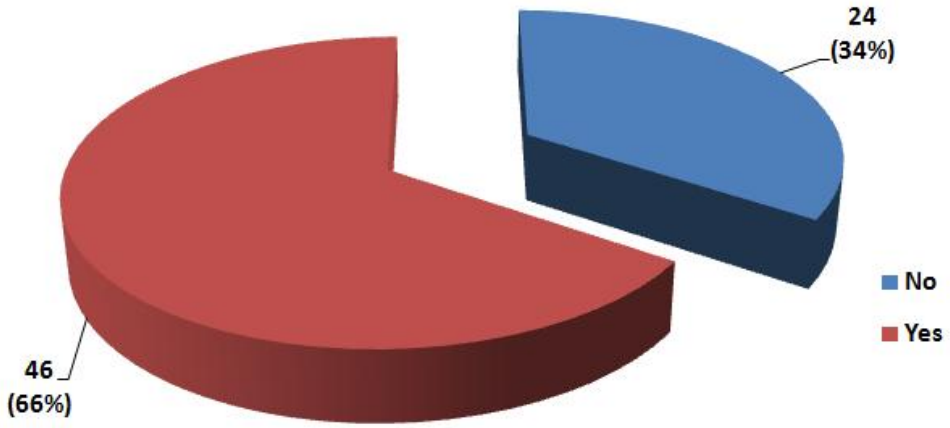

Fig. 8 : Technical support to these private dairies

Table 18a. Block wise availability of technical support to dairy farmers

Availability of technical support	Blocks														Total	% of Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan		
Veterinary Officer (VO)	5	5	5	5	5	0	0	0	0	5	5	5	5	1	46	65.71
Not Available	0	0	0	0	0	5	5	5	5	0	0	0	0	4	24	34.29

Availability of milk keeping store

No private dairy farm has constructed milk keeping store separately.

Chaff cutter, type and its capacity

All the dairy farms were having electrical/diesel engine driven chuff-cutters with an average capacity of 19.71±0.38 q/h. The per hour chaff cutter capacity expressed highly significant effect of blocks ($P \leq 0.01$, Table 18) which ranged from 16.20 (Khatauli and Sahapur) to 22.90±1.12 q/h (Shamli, Table 17).

Availability of Silo pits

No private dairy farm constructed the silo pits.

Availability of milking machines

Milking machines were not available at any of the private dairy farms surveyed under this study. Rather, all the private dairy farms were practicing hand milking.

Availability of milking canes and pails

All these dairy farms had milking pails and cans as per their requirements. Usually for milking purpose, narrow bottomed metal buckets made up of steel or iron were used for milking of animals.

Availability of feed grinders and mixers

Feed grinders and mixtures were not available on any of these dairy farms to grind and mix concentrate ingredients procured, rather these were mixed manually.

Bio gas plant

Almost all the dairy farms did not possess biogas plant, except one, located in dairy farm of block Purkaji.

Total plot size, plot size used by dairy, plot size used for household purposes, total cost of plot

Around 28.57% of the total private dairy farmers of the different blocks had an average plot size of 600 yards^2 followed by 17.14% with plot of

800 yard^2 and 14.28% having 700 yard^2. At the same time, 12.86% of the dairy owners had a plot size of 500 yard^2, whereas 11.43% were having 1000 yard^2. Very small and very large plot sizes were owned by 1.50 – 3.00% of the dairy owners. Rests of the dairy owners were having plots sizes with area in between these figures (Table 19). Frequencies for various plot sizes are presented in Fig. 9.

The block effects were highly significant ($P \leq 0.01$) on total plot size, plot size used for dairy and total cost of plot (Table 18).

The overall means for average total plot size, plot size used by dairy, plot size used for household purposes, total plot cost were 687.86±21.40 yards^2, 565.00±24.28 yards^2, 232.43±17.35 yards^2 and Rs. 29.87±1.60 lakhs, respectively (Table 17). It has also been observed that the total plot size ranged from 520.00±40.62 (Charthawal) to 940.00±87.18 yards^2 (Baghra). The range for plots size used for dairy varied from 360.00±18.71 (Charthawal) to 940.00±87.18 yards^2 (Baghra). It is essential to mention here that few dairy farmers were living at the dairy itself or somewhere else. There were a few numbers of dairy farmers who were using same plot for dairy as well as for household purposes with clear cut demarcation. The farmers of eight blocks (Shamli, Oon, Thana Bhawan, Morna, Jaansath, Charthawal, Purkaji and Khatauli) were having clear cut demarcation of the same plot in to dairy as well as household purposes. Rests of the blocks were using the piece of land extensively for dairy purpose only. The piece of plot used for household purpose ranged from 160.00±29.16 (Charthawal) to 400.00±100.00 yards^2 (Khatauli). The means for total plot cost ranged from Rs. 17.40±1.12 (Jaansath) to 61.20±7.31 lakhs (Muzaffarnagar Sadar, Table 17).

The plot size used for dairy were classified in to small (<500 yards^2), medium (501-750 yards^2), big (751-1000 yards^2) and very big (>1000 yards^2), though only one farmer of Baghra block belonged to very big category (Table 20). At the same time, the effect of age class was found to be non-significant on

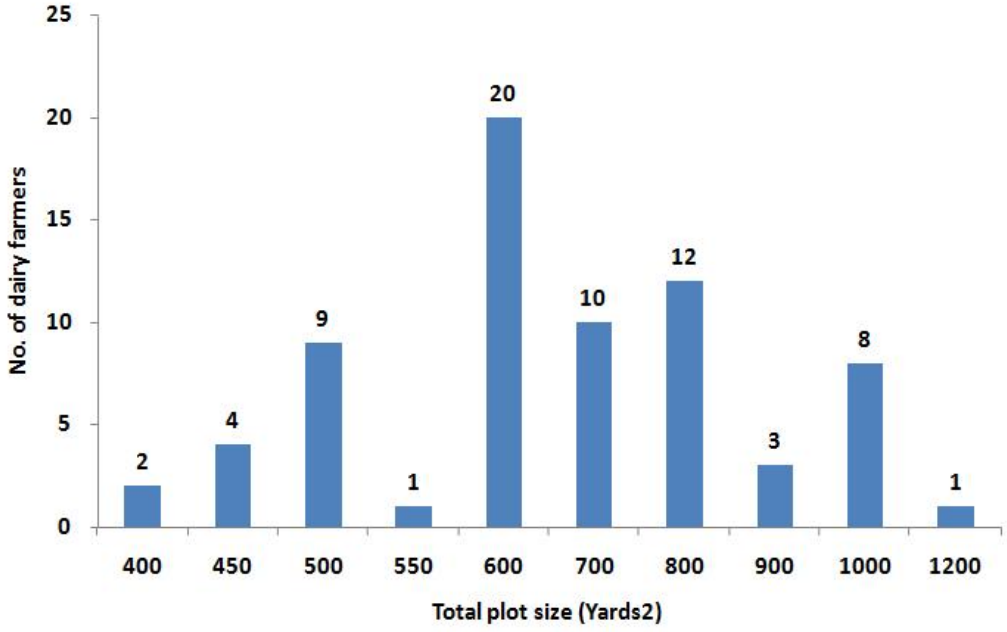

Fig. 9 : Total plot size wise frequency of dairy farmers

Table 19. Block wise distribution of total plot size occupied by private dairy farmers under study in Muzaffarnagar district of Uttar Pradesh

Total plot size (Yd^2)	Blocks														Total	% of Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan		
400	-	-	1	-	-	-	1	-	-	-	-	-	-	-	2	2.86
450	-	-	1	-	-	-	-	1	-	-	1	1	-	-	4	5.71
500	-	2	-	2	-	-	1	1	-	-	1	1	-	1	9	12.86
550	-	-	1	-	-	-	-	-	-	-	-	-	-	-	1	1.43
600	-	1	2	2	1	2	2	1	3	1	1	1	-	3	20	28.57
700	1	1	-	1	1	1	-	1	1	1	-	-	1	1	10	14.29
800	1	1	-	-	2	1	-	1	1	2	1	-	2	-	12	17.14
900	-	-	-	-	-	1	-	-	-	-	-	1	1	-	3	4.29
1000	2	-	-	-	1	-	1	-	-	1	1	1	1	-	8	11.43
1200	1	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1.43
Total	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**70**	**100.00**

Table 20. Means for total plot size, plot size used by dairy, plot size used for household purposes, total plot cost and experience of dairy farmers

Particulars	Total plot size (Yd^2)	Plot size used by dairy (Yd^2)	Plot size used for household purposes (Yd^2)	Total cost of plot (Rs. In lakhs)
Overall mean (μ)	687.86±21.40 (70)	565.00±24.28 (70)	232.43±17.35 (37)	29.87±1.60 (70)
Age groups				
Middle Aged (= 40 years)	699.18±22.71 (61)	572.13±26.07 (61)	234.85±17.88 (33)	30.02±1.71 (61)
Grown Ups (>40 years)	611.11±60.54 (9)	516.67±68.21 (9)	212.50±71.81 (4)	28.89±4.89 (9)
Plot size used (by dairy) classes				
Small (< 500 yd^2)	603.95±23.73 (38)	414.47±10.14 (38)	225.00±18.51 (32)	22.00±0.13 (38)
Medium (501-750 yd^2)	705.26±31.04 (19)	631.58±10.96 (19)	280.00±48.99 (5)	35.42±2.99 (19)
Big (751-1000 yd^2)	883.33±27.06 (12)	883.33±27.06 (12)	-	44.50±3.63 (12)
Very big (> 1000 yd^2)	1200.00 (1)	1200.00 (1)	-	48.00 (1)
Dairying experience classes				
Good (5-10 years)	40.31±0.70 (32)	704.69±30.81 (32)	603.12±35.14 (32)	33.78±2.72 (32)
Very Good (>10 years)	42.08±0.54 (38)	673.68±29.86 (38)	532.89±33.06 (38)	26.58±1.72 (38)

total plot size, plot used by dairy and household purposes and total plot cost (Table 21). The age class wise means for these traits are presented in Table 20.

The plot size used by dairy classes expressed highly significant effects ($P \leq 0.01$) on total plot size, plot used by dairy and total plot cost (Table 22). The ranges for these traits varied from 603.95±23.73 (small) to 1200.00 ft^2 (very big), 414.47±10.14 (small) to 1200.00 ft^2 (very big) and Rs. 22.00±0.13 (small) to 48.00 lakhs (very big, Table 20).

The class of working experience of dairy owners expressed it significant effect ($P \leq 0.05$) on total plot cost (Table 23). The dairy farmers having good experience of dairy farmers possessed a plot costing to Rs. 33.78±2.72 lakhs whereas the farmers with very good experience were having a plot cost of Rs. 26.58±1.72 lakhs (Table 20) indicating towards managing the enterprise on cheaper pieces of land based on their huge past experiences.

Mundhwa and Padheriab (1998) found that 37.33 per cent of the dairy entrepreneurs had marginal land holding followed by small (28.89%), medium (25.33 %) and big (8.45 %) land holding. Shinde *et al.* (1998) stated that 26.67 per cent of dairy farmers possessed more than 2 hac. of land followed by less land (25.83%) i.e. up to 1 hac. (25%) and 1.1 hac. to 2 hac. (22.50%), respectively. Kadian and Kumar (1999) while studying the factors associated with knowledge level of dairy farmers reported that level of knowledge increased as the size of land holding increased. Mahindra and Kalra (2001) observed that 40.00 per cent of dairy farmers possessed more than 4 hac. of land followed by up to 2 hac. (28%) and 2.1-4.0 hac. (13.33%), whereas 18.67 per cent of dairy farmers were land less. Patange *et al.* (2001) found that the dairy farmers with large size of land holding tended to increase the milk production as compared to dairy farmers who had small land size. Prasad *et al.* (2001) revealed that out of the total milk producers, 61 per cent possessed land and 39 per cent possessed no land. The average wet land holding was 4.82 acres among milk producers who possessed wet land while the dry land average was 6.29 acres among the

Table 21. Age group class wise analysis of variance (ANOVA) for total plot size, plot size used by dairy, plot used for household purposes and total plot cost

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total plot size	Between Groups	60830.67	1	60830.67	1.923	0.170
	Within Groups	2151347.91	68	31637.47		
	Total	2212178.57	69			
Plot size used by dairy	Between Groups	24127.05	1	24127.05	0.581	0.448
	Within Groups	2822622.95	68	41509.16		
	Total	2846750.00	69			
Plot size used for household purposes	Between Groups	9.97	1	9.97	0.055	0.816
	Within Groups	12415.87	68	182.59		
	Total	12425.84	69			
Total plot cost	Between Groups	1781.84	1	1781.84	0.156	0.695
	Within Groups	399299.24	35	11408.55		
	Total	401081.08	36			

Table 22. Geographical sizes of dairy farm class wise analysis of variance (ANOVA) for total plot size, plot size used by dairy, plot size used for household purposes and total plot cost

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total plot size	Between Groups	994130.33	3	331376.78	17.956	0.000
	Within Groups	1218048.25	66	18455.28		
	Total	2212178.57	69			
Plot size used by dairy	Between Groups	2564491.23	3	854830.41	199.883	0.000
	Within Groups	282258.77	66	4276.65		
	Total	2846750.00	69			
Plot size used for household purposes	Between Groups	13081.08	1	13081.08	1.180	0.285
	Within Groups	388000.00	35	11085.71		
	Total	401081.08	36			
Total plot cost	Between Groups	5836.21	3	1945.40	19.485	0.000
	Within Groups	6589.63	66	99.84		
	Total	12425.84	69			

Table 23. Experience of dairy farmers class wise analysis of variance (ANOVA) for total plot size, plot size used by dairy, plot size used for household purposes and total plot cost

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total plot size	Between Groups	16697.49	1	16697.490	0.517	0.475
	Within Groups	2195481.09	68	32286.49		
	Total	2212178.57	69			
Plot size used by dairy	Between Groups	85680.92	1	85680.922	2.110	0.151
	Within Groups	2761069.08	68	40603.96		
	Total	2846750.00	69			
Plot size used for household purposes	Between Groups	6185.25	1	6185.25	0.548	0.464
	Within Groups	394895.83	35	11282.74		
	Total	401081.08	36			
Total plot cost	Between Groups	901.11	1	901.11	5.317	0.024
	Within Groups	11524.73	68	169.48		
	Total	12425.84	69			

Table 24. Shed type and orientation of longer axis of shed wise means for cost of animal sheds

Particulars	Cost of shed (Rs. In lakhs)
Overall mean (µ)	2.97±0.09 (70)
Orientation of longer axis of shed	
EW	3.06±0.15 (27)
NS	2.92±0.11 (43)
Shed type	
RCC	4.25±0.25 (4)
RCCTH	2.18±0.09 (19)
RCCTS	3.23±0.08 (45)
THRCCT	2.00 (1)
THTS	2.00 (1)

milk producers who possessed dry land. Shah *et al.* (2002) in their study in *Uttaranchal* state observed that 55% of the sample households were from marginal land holding category with land holding up to 2.5 acres. Dairying was observed to be an important secondary enterprise among 47.50% of sample households and the herd size maintained in half of the selected households was medium sized (5-6 dairy animals). Umarani (2002) in their study named *Technological needs of women in dairying* conducted in three different mandals in Ranga Reddy district of Andhra Pradesh found that land holding has not shown any significant relationship with technological needs of farmers. Wadear *et al.* (2003) reported the average land holding possessed by the different categories of dairy farmers such as small dairy farmers had 1.74 hac. of land, medium dairy farmers had 5.17 hac. and large dairy farmers had 9.04 hac. of land. Khin Mar Oo (2005) reported that equal percent of dairywomen (33.33%) possessed marginal and small size of land followed by medium size land (29.17%), whereas only 4.16 per cent dairywomen possessed big size of land. Patel (2005) revealed that slightly more than half of the respondents (52%) were found to have small size of land holding (1.1 to 2.0 hac. of land) followed by marginal (40%) size of land holding (up to 1.0 hac. of land). Only 8.00 per cent of the respondents fell in the category of medium size of land holding (2.0 hac. of land). Our study involves comparatively large dairy farms i.e. with more than 15 animals, so farmers had sufficiently large land holding.

Shed type and structure

Orientation of longer axis of livestock shed

The longer axis of the surveyed private dairy farms was mainly in N-S direction (61%), whereas 39% of these dairy farms were having their longer axis of shed in E-W direction (Fig. 10 and Table 26). The block effect was non-significant on longer axis of shed as tested by chi square analysis (Table 3a). It may be due to fact that usually winds are flowing in east to west or west to east directions and a shed perpendicular to this will have good air flow inside the shed, as and when needed.

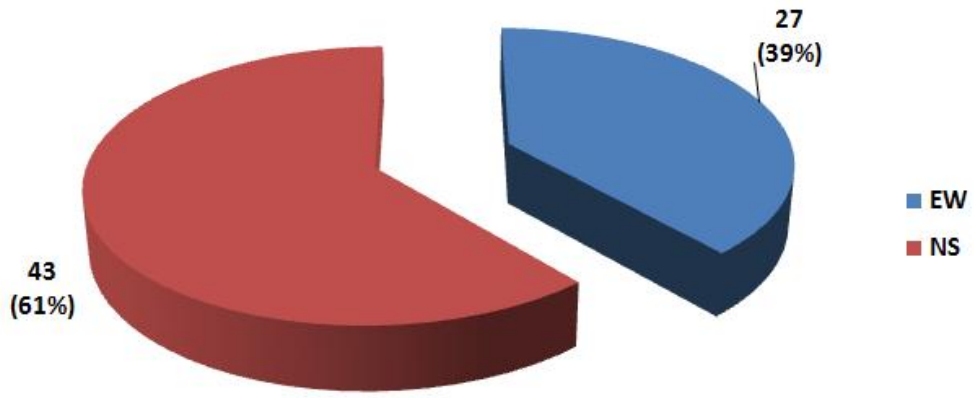

Fig. 10 : The orientation of longer axis of the livestock shed

Table 25. Orientation of longer axis of shed wise analysis of variance (ANOVA) for cost of animal sheds

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Orientation of longer axis of shed	Between Groups	0.31	1.00	0.31	0.550	0.462
	Within Groups	38.63	68.00	0.57		
	Total	38.94	69.00			
Shed Type	Between Groups	23.29	4.00	5.82	24.170	0.000
	Within Groups	15.66	65.00	0.24		
	Total	38.94	69.00			

Table 26. Orientation of longer axis of animal shed in different blocks of Muzaffarnagar district of UP

Directions	Blocks														Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan	
E-W	3	2	3	1	1	1	3	2	2	2	1	3	1	2	**27**
N-S	2	3	2	4	4	4	2	3	3	3	4	2	4	3	**43**

Table 27. Availability of floor space, shed ventilation, natural shed lighting and drainage cleaning system in private dairy farms of Muzaffarnagar district of UP

Availability of adequacy/ inadequacy	Blocks														Total	% of Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan		
Floor space																
Adequate	5	5	3	5	5	0	3	1	2	5	5	1	4	3	47	67.14
Inadequate	0	0	2	0	0	5	2	4	3	0	0	4	1	2	23	32.86
Shed ventilation																
Adequate	3	5	4	5	4	5	5	5	5	4	5	5	5	5	65	92.86
Inadequate	2	0	1	0	1	0	0	0	0	1	0	0	0	0	5	7.14
Natural shed lighting																
Adequate	1	4	3	4	5	5	3	5	4	4	5	5	4	5	57	81.43
Inadequate	4	1	2	1	0	0	2	0	1	1	0	0	1	0	13	18.57
Drainage and cleaning in shed																
Adequate	5	5	2	1	3	2	1	1	2	3	3	2	2	0	32	45.71
Inadequate	0	0	3	4	2	3	4	4	3	2	2	3	3	5	38	54.29

It has also been observed that the orientation of longer axis of shed has no bearing on cost of animal shed whether in E-W or N-S directions (Table 25). The overall mean for shed cost was Rs. 2.97±0.09 lakhs (Table 24).

Type of livestock shed and construction material used

The shed type which included (partially) RCC – (partially) tin shed (45, 64.00%), (partially) RCC – (partially) thatched (19, 27.00%), complete RCC (4, 6.00%) and 1.00 each (1.5%) made up of RCC – thatched – tin shed and thatched – tin shed (Fig. 11 and Table 24). The block effect was non-significant on shed type as tested by chi square analysis (Table 3a).

The effect of shed type on cost of shed was highly significant ($P \leq 0.01$, Table 25) with its range varying from Rs. 2.00 lakhs (each in case of THRCC and TS) to Rs. 4.25±0.25 lakhs (RCC, Table 24).

Shreeshilaja (2000) reported that among several practices, large majority of farm women adopted the practices like maintenance of separate cattle shed, location of the cattle shed, type of floor for cattle shed, feeding colostrum to calf within six hours, artificial insemination, drying period of the pregnant animal, frequency of milking the animal, green grasses grown, keeping the sick animal separately, method of controlling diarrhoea, method of controlling ticks and lice and burying the dead animals.

Availability of floor space

It has been observed that the availability of floor space was adequate in 67.14% (47) and inadequate in 32.86% (23) of the total surveyed private dairy farms in Muzaffarnagar District (Fig. 12 and Table 27). The block expressed its highly significant effect ($P \leq 0.01$) on availability of floor space in livestock shed as tested by chi-square analysis (Table 3a).

Shed ventilation

As far as the shed ventilation is concerned, 92.86% (65) of the total surveyed private dairy farms were having adequate shed ventilation whereas

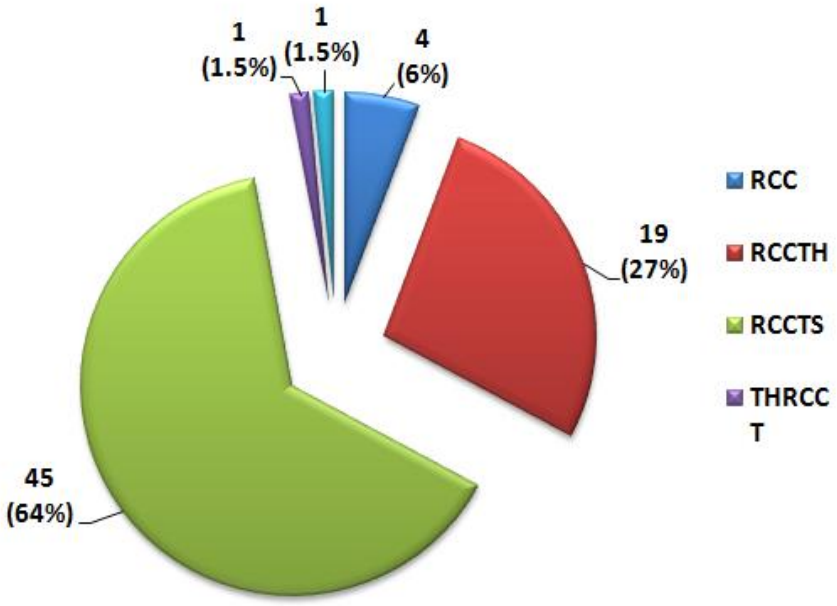

Fig. 11 : Type of sheds in private dairy farms of Muzaffarnagar

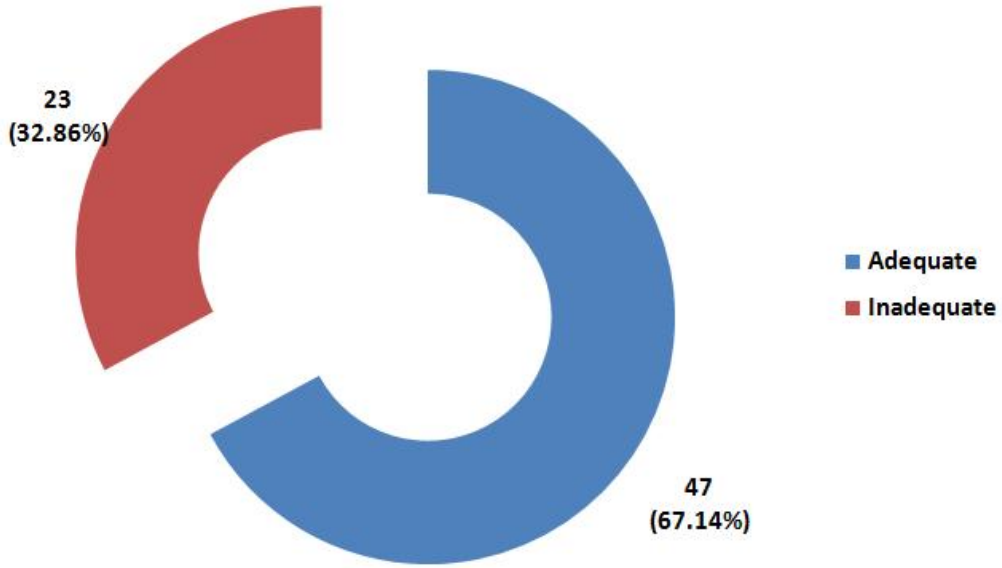

Fig. 12 : Availability of floor space in private dairy farms

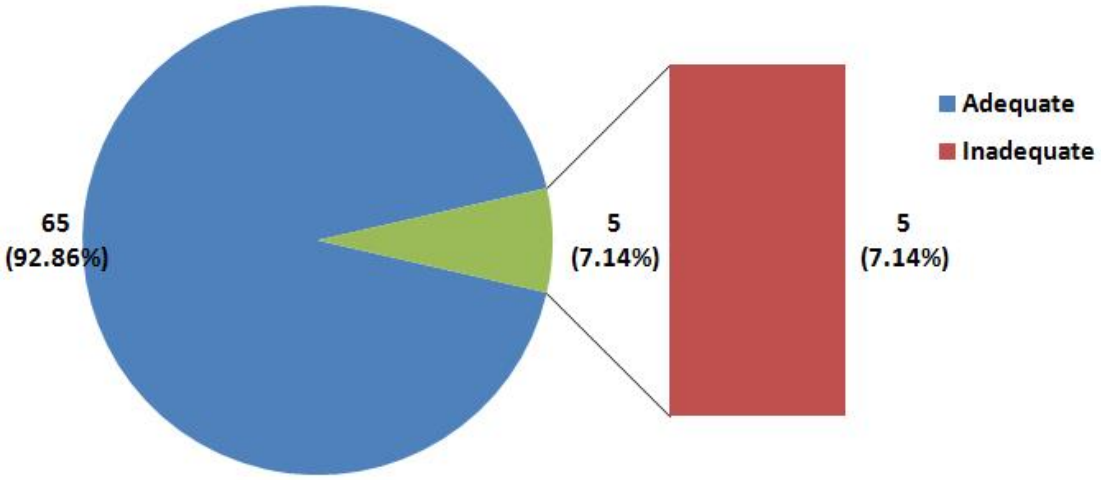

Fig. 13 : Shed ventillation in private dairy farms

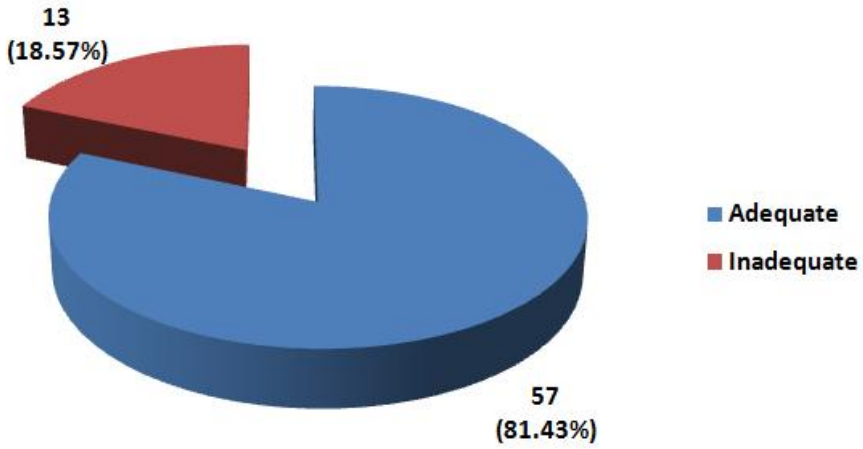

Fig. 14 : Natural lighting in animal sheds

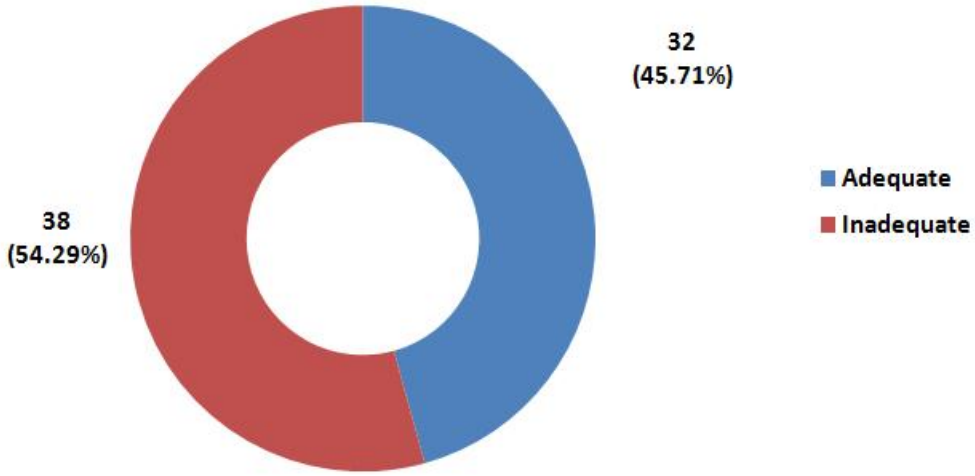

Fig. 15 : Drains and cleaning of private dairy farms

7.14% (5) could be classified in to a category which possessed inadequate shed ventilation (Fig. 13 and Table 27). The block effect was non-significant on shed ventilation as tested by chi-square analysis (Table 3a).

Natural lighting in livestock shed

At the same time, 81.43% (57) of these private dairy farms were having such an orientation and construction so that natural lighting was facilitated, though rest of the 18.57% (13) could be classified as having inadequate natural lighting (Fig. 14 and Table 27). The block expressed its significant effect ($P \leq 0.05$) on natural lighting in livestock sheds as tested by chi-square analysis (Table 3a).

The drain and cleaning arrangements in the livestock shed

The drain and cleaning arrangements made by these private dairy farms of Muzaffarnagar district were inadequate to the tune of 54.29% (38) whereas 45.71% (32) of these private dairy farms were having adequate arrangements for shed cleaning and drainage (Fig. 15 and Table 27). The block expressed its non-significant effect on drainage and shed cleaning as tested by chi-square analysis (Table 3a).

Manpower availability on private dairy farms

All the dairy farms were having unskilled type of workers to facilitate the day to day activities of the dairy farm management. No manager was employed by the dairy farmers. The owners themselves were handling the farms as manager. All the unskilled manpower was men only, no women worker were employed on these dairy farms. Most of the workers were local inhabitants and were coming on duty at around 5.00 AM and leaving the dairy farm after completion of the day to day management tasks. In few cases, persons from distant places were also employed, who were living on the dairy farm itself on 24 hour basis. However, no specific arrangements were made for them; rather they were living along with their family members (in some cases) within the already available premises/infrastructural facilities. It has also been observed that the manpower engaged were extended several facilities like occasional provision for cloths (for

workers as well as their family members), provision of food and shelter in addition to fulfill few more of their occasional demands, etc. in addition to the fixed monthly salary on which he had agreed upon.

Pant and Karanjkar (1965) analysed the commercial dairy farms of Jabalpur (Madhya Pradesh). The study revealed that the proportion of hired labour increased with the scale of the business, whereas in case of small farms most of the labour is contributed by the operator himself. Legha and Mehla (1992) conducted a study in Karnal to identify the labour utilization pattern at three different dairy farms i.e. Demonstration Unit NDRI (Farm 1), dairy farm in Karnal city (Farm 2) and dairy farm located in rural areas (Farm 3). The study revealed that daily time spent per adult unit was 68.44, 138.76 and 68.61 minutes at farms 1, 2, and 3, respectively. They found that one man can look after 6 milch animals or 17 dry animals when processing and marketing was not involved. If processing and marketing is involved this figure reduces to 3 milch animals or 10 dry animals. The study showed that milking operation was the most labour intensive activity. Sudheer *et al.* (1999) conducted a study in Ernakulam district in Kerala state to study the comparative economics of milk production in organized and unorganized sectors. They found that labour charges were higher in the unorganized sector because the dairy men had to spend more labour for the purchase of feed, health care and breeding of the animals. Dosanjh and Gill (2000) while studying the labour utilization for sanitation and miscellaneous farm operations at dairy enterprise in rural areas, in Ludhiana district (Punjab) revealed that the efficiency of labour depend on the adult milch and livestock units of the farm.

4.2.2.2 Education of dairy farmer and labour welfare

The educational level of private dairy farmer had non-significant effects on number of unskilled manpower engaged and their monthly salary (Table 29). The overall means for these traits were 1.99±0.04 no. and Rs. 3904.29±72.16 per month (Table 28).

Table 28. Educational as well as financial status wise means for no. of unskilled manpower engaged and monthly salary of these workers

Particulars	No. of unskilled manpower engaged (no.)	Monthly salary of manpower engaged (Rs./m)
Overall mean (μ)	**1.99±0.04 (70)**	**3904.29±72.16 (70)**
Education of dairy farmer		
Illiterate	1.75±0.16 (8)	4062.50±175.19 (8)
Literate		
Middle (VIII th)	2.00±0.00 (3)	3333.33±166.67 (3)
High School (X th)	2.00±0.07 (22)	3863.64±114.82 (22)
Intermediate (XII th)	2.00±0.05 (27)	3881.48±126.09 (27)
Graduation or above	2.10±0.10 (10)	4100.00±221.11 (10)
Financial status of dairy farmer		
Fair	1.87±0.07 (23)	3804.35±128.61 (23)
Good	2.04±0.04 (47)	3953.19±87.19 (47)

Table 29. Based on educational status analysis of variance (ANOVA) for no. of unskilled manpower engaged and monthly salary drawn by them

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
No. of unskilled manpower engaged	Between Groups	0.59	4.00	0.15	1.490	0.220
	Within Groups	6.40	65.00	0.10		
	Total	6.99	69.00			
Monthly salary of manpower engaged	Between Groups	1611647.79	4.00	402911.95	1.110	0.360
	Within Groups	23540000.00	65.00	362108.72		
	Total	25150000.00	69.00			

4.2.2.3 Financial status of dairy farmer and labour welfare

Depending upon the economic status of the private dairy farmers, they were divided into two categories i.e. fair and good.

The financial status of dairy farmer significantly affected ($P \leq 0.05$, Table 30) the number of unskilled manpower engaged with its range varying from 1.87±0.07 (fair financial status) to 2.04±0.04 persons (good financial status, Table 28) indicating that good cash flow promotes better management of private dairy farms by employing appropriate number of unskilled manpower to accomplish day to day tasks well within the specified time.

Feeding management

All the dairy farms were procuring/purchasing green and dry fodders along with various feed ingredients used to prepare concentrate mixture (wheat bran, mustard oil cake, black gram *chunni* and black gram *chhilka*) separately from the open market as per their requirements on daily basis (either in cash or credit). Regarding salt and mineral mixture, no reliable information could be extracted out from these dairy owners in spite of the fact that few of these dairy owners were using these ingredients in vague manner.

The block expressed its highly significant effects ($P \leq 0.01$) on type of green fodder in these private dairy farms as tested by chi-square analysis, though round the year green fodder availability expressed its non-significant effect (Table 3a).

Green fodder and its chaffing cost

It has been observed in the present study that per quintal cost of green fodder had the highly significant effect ($P \leq 0.01$, Table 32) of type of green fodder purchased during the study period by these private dairy farms which included Barseem, Oats and sugarcane tops.

The overall means for minimum and maximum per day chaffing expenses for green fodder, per quintal cost of green fodder and total green fodder purchased

Table 30. Based on financial status analysis of variance (ANOVA) for no. of unskilled manpower engaged and monthly salary drawn by them

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
No. of unskilled manpower engaged	Between Groups	0.46	1.00	0.46	4.820	0.030
	Within Groups	6.52	68.00	0.10		
	Total	6.99	69.00			
Monthly salary of manpower engaged	Between Groups	342127.79	1.00	342127.79	0.940	0.340
	Within Groups	24810000.00	68.00	364802.74		
	Total	25150000.00	69.00			

Table 31. Type of green fodder wise means for minimum and maximum chaffing expenses/d, per quintal cost of green fodder and per day consumption of green fodder/d

Particulars	Chaffing expenses per d (Rs./d)		Per quintal cost of green fodder (Rs.)	Green fodder consumption/d (q)
	Minimum	Maximum		
Overall mean (µ)	144.00±4.43 (70)	204.29±4.41 (70)	113.43±1.82 (70)	2.32±0.06 (70)
Type of green fodder				
Barseem	148.53±6.84 (34)	213.24±6.78 (34)	113.24±1.45 (34)	2.37±0.09 (34)
Oats	146.15±8.88 (13)	200.00±8.01 (13)	136.15±2.67 (13)	2.15±0.09 (13)
Sugarcane tops	136.09±7.43 (23)	193.48±7.24 (23)	100.87±2.08 (23)	2.35±0.12 (23)

Table 32. Type of green fodder wise analysis of variance (ANOVA) for minimum and maximum per d chaffing expenses, per quintal cost of green fodder and green fodder consumption/d

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Chaffing expenses per d (minimum)	Between Groups	2198.01	2	1099.01	0.794	0.456
	Within Groups	92681.99	67	1383.31		
	Total	94880.00	69			
Chaffing expenses per d (maximum)	Between Groups	5648.43	2	2824.21	2.149	0.125
	Within Groups	88065.86	67	1314.42		
	Total	93714.29	69			
Per quintal cost of green fodder	Between Groups	10342.72	2	5171.36	61.494	0.000
	Within Groups	5634.42	67	84.10		
	Total	15977.14	69			
Green fodder consumption/d	Between Groups	0.45	2	0.23	0.946	0.393
	Within Groups	16.06	67	0.24		
	Total	16.52	69			

Table 33. Block wise means for per quintal cost of dry fodder, total dry fodder consumed/d in surveyed private dairy farms

Particulars	Per quintal cost of dry fodder (Rs.)	Total dry fodder consumption/d (q)
Overall mean (µ)	**470.00±4.60 (70)**	**2.16±0.05 (70)**
Blocks		
Shamli	490.00±10.00 (5)	2.20±0.12 (5)
Oon	450.00±0.00 (5)	2.10±0.10 (5)
Thana Bhawan	450.00±0.00 (5)	1.90±0.19 (5)
Morna	450.00±0.00 (5)	2.00±0.27 (5)
Jaansath	460.00±10.00 (5)	2.20±0.20 (5)
Charthawal	420.00±40.62 (5)	2.00±0.00 (5)
Purkaji	500.00±0.00 (5)	2.30±0.20 (5)
Khatauli	510.00±10.00 (5)	2.00±0.00 (5)
Sahapur	500.00±0.00 (5)	2.00±0.00 (5)
Baghra	430.00±12.25 (5)	2.40±0.19 (5)
Muzaffarnagar Sadar	500.00±0.00 (5)	2.50±0.27 (5)
Kairana	470.00±12.25 (5)	2.40±0.19 (5)
Kandhla	450.00±0.00 (5)	2.30±0.20 (5)
Budhana	500.00±0.00 (5)	2.00±0.00 (5)

per day were Rs. 144.00±4.43, Rs. 204.29±4.41, Rs. 113.43±1.82 and 2.32±0.06 q, respectively. The values for per quintal cost of green fodder i.e. Barseem, Oats and sugarcane tops indicated that the sugarcane tops were cheapest (Rs. 100.87±2.08) and the Oats were costliest (Rs. 136.15±2.67, Table 31).

Dry fodder and its costs

Usually in all the surveyed private dairy farms in different blocks of Muzaffarnagar district, wheat straw was used as dry fodder. The overall means for total dry fodder consumed per day and per quintal cost of dry fodder were 2.16±0.05 q/d and Rs. 470.00±4.60/q, respectively (Table 33). The dry fodder cost is seemingly higher because of the fact that the study period extended from December, 2011 to March, 2012 (Winter season) where in usually dry fodder cost (wheat straw) is comparatively higher as compared to wheat harvesting season (March-April onwards).

It has also been observed that among different blocks, per quintal cost of dry fodder was deferring at highly significant level ($P \leq 0.01$, Table 34). The minimum being Rs.420.00±40.62 (in Charthawal block) whereas it was maximum in Khatauli block (Rs. 510.00±10.00, Table 33).

Concentrate ingredients

Per quintal cost of concentrate ingredients, per day consumption of concentrate ingredients, total concentrate consumed/d, total cost of concentrate/ d and per quintal cost of concentrate in different blocks. It has been observed that different dairy farmers were feeding concentrate ingredients in different combinations which are presented in Table 35. Blocks expressed its highly significantly affects ($P \leq 0.01$, Table 37) on per quintal cost for all the four constituents of concentrate mixture. The overall means for per quintal costs for WB, MOC, BGC and BGCH were Rs. 1290.36±7.50, Rs. 1469.86±10.50, Rs. 1982.31±10.01 and Rs. 1627.50±12.29, respectively. The respective ranges varied from Rs. 1200.00±31.62 (Purkaji) to Rs. 1400.00±15.81 (Muzaffarnagar Sadar), Rs. 1360.00±24.50 (Thana Bhawan and Purkaji) to Rs. 1600.00±0.00 (Budhana), Rs. 1800.00 (Charthawal) to Rs. 2080.00±20.00 (Oon) and Rs. 1500.00 (Charthawal) to Rs. 1700.00 (Muzaffarnagar Sadar and Oon, Table 36).

Table 34. Block wise analysis of variance (ANOVA) for per quintal cost of dry fodder and total dry fodder consumption/d

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Per quintal cost of dry fodder	Between Groups	57000.00	13	4384.61	5.456	0.000
	Within Groups	45000.00	56	803.57		
	Total	102000.00	69			
Total dry fodder consumption/d	Between Groups	2.36	13	0.18	1.271	0.258
	Within Groups	8.00	56	0.14		
	Total	10.36	69			

Table 35. Block wise consumption of different concentrate ingredient combinations

Blocks	WB	MOC	BGC		BGCH	
			Not used	Used	Not used	Used
Shamli	5	5	0	5	2	3
Oon	5	5	0	5	4	1
Thana Bhawan	5	5	2	3	1	4
Morna	5	5	2	3	3	2
Jaansath	5	5	0	5	4	1
Charthawal	5	5	0	5	4	1
Purkaji	5	5	0	5	5	0
Khatauli	5	5	0	5	5	0
Sahapur	5	5	0	5	5	0
Baghra	5	5	0	5	4	1
Muzaffarnagar	5	5	0	5	1	4
Kairana	5	5	0	5	4	1
Kandhla	5	5	0	5	3	2
Budhana	5	5	0	5	5	0

Table 36. Block wise means for cost per quintal of concentrate ingredients, per day consumption, total concentrate consumed/d, total cost of concentrate/d and per quintal cost of concentrate

Particulars	Cost per quintal (Rs.)				Per day consumption (q/d)				Total concentrate consumed/d (q)	Total cost of concentrate/d (Rs.)	Per quintal cost of concentrate (Rs.)
	WB	MOC	BGC	BGCH	WB	MOC	BGC	BGCH			
Overall mean (μ)	1290.36±7.50 (70)	1469.86±10.50 (70)	1982.31±10.01 (65)	1627.50±12.29 (20)	0.47±0.01 (70)	0.34±0.01 (70)	0.29±0.01 (66)	0.24±0.02 (20)	1.15±0.03 (70)	1742.61±48.69 (70)	1518.45±10.52 (70)
Blocks											
Shamli	1300.00±0.00 (5)	1460.00±10.00 (5)	2000.00±0.00 (4)	1600.00±0.00 (3)	0.46±0.02 (3)	0.42±0.02 (5)	0.28±0.02 (5)	0.30±0.03 (3)	1.34±0.11 (5)	1919.00±96.75 (5)	1452.89±78.99 (5)
Oon	1340.00±10.00 (5)	1450.00±0.00 (5)	2080.00±20.00 (5)	1700.00 (1)	0.42±0.02 (5)	0.36±0.02 (5)	0.26±0.02 (5)	0.20 (1)	1.08±0.07 (5)	1693.00±117.28 (5)	1564.81±12.91 (5)
Thana Bhawan	1255.00±5.00 (5)	1360.00±24.50 (5)	2000.00±0.00 (3)	1612.50±12.50 (4)	0.46±0.02 (5)	0.26±0.02 (5)	0.20±0.00 (3)	0.21±0.04 (4)	1.01±0.06 (5)	1445.50±95.93 (5)	1430.43±20.90 (5)
Morna	1270.00±20.00 (5)	1400.00±0.00 (5)	2000.00±0.00 (3)	1650.00±50.00 (2)	0.46±0.02 (5)	0.31±0.04 (5)	0.28±0.06 (3)	0.23±0.03 (2)	1.03±0.13 (5)	1506.00±228.86 (5)	1448.51±39.16 (5)
Jaansath	1250.00±15.81 (5)	1400.00±15.81 (5)	2000.00±0.00 (5)	1600.00± (1)	0.50±0.00 (5)	0.30±0.05 (5)	0.29±0.05 (5)	0.25± (1)	1.14±0.11 (5)	1707.50±188.98 (5)	1489.45±23.99 (5)
Charthawal	1250.00±0.00 (5)	1430.00±20.00 (5)	1800.00±0.00 (5)	1500.00 (1)	0.44±0.02 (5)	0.28±0.04 (5)	0.26±0.02 (5)	0.20 (1)	1.02±0.04 (5)	1476.00±57.37 (5)	1446.61±9.72 (5)
Purkaji	1200.00±31.62 (5)	1360.00±24.50 (5)	1850.00±22.36 (5)	-	0.46±0.05 (5)	0.37±0.06 (5)	0.37±0.03 (5)	-	1.20±0.13 (5)	1740.50±181.29 (5)	1453.98±14.73 (5)
Khatauli	1290.00±24.50 (5)	1428.00±19.60 (5)	1990.00±33.17 (5)	-	0.46±0.04 (5)	0.26±0.04 (5)	0.26±0.04 (5)	-	0.98±0.09 (5)	1481.10±137.44 (5)	1511.03±1.81 (5)

Table 36. Contd...

Particulars	Cost per quintal (Rs.)				Per day consumption (q/d)				Total concentrate consumed/d (q)	Total cost of concentrate/d (Rs.)	Per quintal cost of concentrate (Rs.)
	WB	MOC	BGC	BGCH	WB	MOC	BGC	BGCH			
Sahapur	1310.00±10.00 (5)	1500.00±15.81 (5)	1990.00±10.00 (5)	-	0.48±0.02 (5)	0.27±0.02 (5)	0.22±0.01 (5)	-	0.97±0.02 (5)	1472.00±32.85 (5)	1517.42±10.33 (5)
Baghra	1250.00±15.81 (5)	1540.00±36.74 (5)	2000.00±0.00 (5)	1600.00 (1)	0.52±0.05 (5)	0.37±0.04 (5)	0.34±0.05 (5)	0.20± (1)	1.27±0.11 (5)	1969.00±192.65 (5)	1546.19±18.72 (5)
Muzaffarnagar Sadar	1400.00±15.81 (5)	1580.00±20.00 (5)	2020.00±20.00 (5)	1700.00±0.00 (4)	0.50±0.03 (5)	0.42±0.02 (5)	0.36±0.04 (5)	0.30±0.04 (4)	1.52±0.13 (5)	2499.00±231.80 (5)	1641.10±22.03 (5)
Kairana	1300.00±0.00 (5)	1550.00±22.36 (5)	2020.00±20.00 (5)	1600.00 (1)	0.48±0.02 (5)	0.32±0.02 (5)	0.30±0.00 (5)	0.20 (1)	1.14±0.05 (5)	1790.00±69.50 (5)	1572.07±15.14 (5)
Kandhla	1260.00±18.71 (5)	1520.00±37.42 (5)	2000.00±0.00 (5)	1600.00±0.00 (2)	0.46±0.02 (5)	0.42±0.02 (5)	0.32±0.04 (5)	0.20±0.05 (2)	1.28±0.10 (5)	1985.00±156.40 (5)	1550.47±20.64 (5)
Budhana	1390.00±10.00 (5)	1600.00±0.00 (5)	2020.00±37.42 (5)	-	0.42±0.04 (5)	0.34±0.02 (5)	0.29±0.01 (5)	-	1.05±0.05 (5)	1713.00±81.94 (5)	1633.32±17.47 (5)
Concentrate compositions											
CC1 (WB+MOC+BGC)	1288.78±8.90 (49)	1477.35±12.73 (49)	1976.53±12.21) (49)	-	0.47±0.01 (49)	0.33±0.01 (49)	0.29±0.01 (49)	-	1.08±0.03 (49)	1655.52±43.18 (49)	1527.62±9.28 (49)
CC2 (WB+MOC+BGC+ BGCH)	1301.47±16.94 (17)	1464.71±21.76 (17)	2000.00±15.81 (16)	1626.47±13.64 (17)	0.47±0.01 (17)	0.37±0.02 (17)	0.29±0.02 (17)	0.24±0.02 (17)	1.38±0.06 (17)	2103.97±114.63 (17)	1525.20±30.02 (17)
CC3 (WB+MOC)	1300.00 (1)	1400.00 (1)	-	-	0.50 (1)	0.40 (1)	-	-	0.90 (1)	1210.00 (1)	1344.44 (1)
CC4 (WB+MOC+ BGCH)	1250.00±0.00 (3)	1400.00±0.00 (3)	-	1633.33±33.33 (3)	0.43±0.03 (3)	0.27±0.02 (3)	-	0.23±0.03 (3)	0.93±0.04 (3)	1295.00±53.46 (3)	1388.33±11.67 (3)

Table 37. Block wise analysis of variance (ANOVA) for cost per quintal, per day consumption, total concentrate consumed/d, total cost of concentrate/d and per quintal cost of concentrate for various concentrate ingredients

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Cost per quintal (WB)	Between Groups	203116.07	13	15624.31	12.773	0.000
	Within Groups	68500.00	56	1223.21		
	Total	271616.07	69			
Cost per quintal (MOC)	Between Groups	407818.57	13	31370.66	14.09	0.000
	Within Groups	124680.00	56	2226.43		
	Total	532498.57	69			
Cost per quintal (BGC)	Between Groups	331153.85	13	25473.37	15.106	0.000
	Within Groups	86000.00	51	1686.28		
	Total	417153.85	64			
Cost per quintal (BGCH)	Between Groups	50500.00	9	5611.11	8.162	0.001
	Within Groups	6875.00	10	687.50		
	Total	57375.00	19			
Per day consumption (WB)	Between Groups	0.05	13	0.00	0.893	0.565
	Within Groups	0.26	56	0.01		
	Total	0.31	69			
Per day consumption (MOC)	Between Groups	0.23	13	0.02	3.11	0.002
	Within Groups	0.31	56	0.01		
	Total	0.54	69			
Per day consumption (BGC)	Between Groups	0.14	13	0.01	1.972	0.043
	Within Groups	0.28	52	0.01		
	Total	0.42	65			

Table 37. Contd....

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Per day consumption (BGCH)	Between Groups	0.04	9	0.00	0.8	0.626
	Within Groups	0.05	10	0.01		
	Total	0.09	19			
Total concentrate consumed/d	Between Groups	1.67	13	0.13	2.974	0.002
	Within Groups	2.42	56	0.04		
	Total	4.09	69			
Total cost of concentrate/d	Between Groups	5385111.39	13	414239.34	3.823	0.000
	Within Groups	6067659.20	56	108351.06		
	Total	11450000.00	69			
Per quintal cost of concentrate	Between Groups	311041.77	13	23926.29	5.998	0.000
	Within Groups	223380.95	56	3988.95		
	Total	534422.71	69			

The block effect was highly significant (P≤0.01) on per day consumption of MOC, whereas its significant effect (P≤0.05) was observed on per day conception of BGC. It has also been observed that block had highly significant effects (P≤0.01) on total concentrate consumed/d, total cost of concentrate/d and per quintal cost of concentrate (Table 37). The respective overall means for per day consumption of these concentrate ingredients were 0.47±0.01, 0.34±0.01, 0.29±0.01 and 0.24±0.02 q/d (Table 36). The ranges for MOC and BGC were 0.26 q/d (Thana Bhawan and Khatauli) to 0.42±0.02 q/d (Shamli, Muzaffarnagar Sadar and Kandhla) and 0.20 q/d (Thana Bhawan) to 0.37±0.03 q/d (Purkaji, Table 36).

The overall means for total concentrate consumed/d were 1.15±0.03 q/d, Rs. 1742.61±48.69 and Rs. 1518.45±10.52 and the respective ranges varied from 0.97±0.02 kg (Sahapur) and 1.52±0.13 kg (Muzaffarnagar Sadar), Rs. 1445.50±95.93 (Thana Bhawan) and Rs. 2499.00±231.80 (Muzaffarnagar Sadar) and Rs. 1430.43±20.90 (Thana Bhawan) and Rs. 1641.10±22.03 (Muzaffarnagar Sadar, Table 36).

Concentrate composition wise per quintal cost, per day consumption, total concentrate consumed/d, total cost of concentrate/d and per quintal cost of concentrate

The different concentrate compositions expressed highly significant effects (P≤0.01) on total concentrate consumed/d, total cost of concentrate/d and per quintal cost of concentrate/d (Table 38) and the respective ranges varied from 0.90 (CC3) to 1.38±0.06 q/d (CC2), Rs. 1210.00 (CC3) to Rs. 2103.97±114.63 (CC2) and Rs. 1344.44 (CC3) to Rs. 1527.62±9.28 (CC1, Table 36).

Shirsat *et al.* (1994) in their study on *Adoption of improved dairy management practices by cattle owners* conducted in Parbhani district of Maharashtra state revealed that 90.83 per cent of the respondents were feeding concentrates at the time of milking and 95 per cent of the respondents were feeding cotton cake to milking animals. Prasad *et al.* (1997) in their study on

Table 38. Concentrate ingredient wise analysis of variance (ANOVA) for cost per quintal, per day consumption, total concentrate consumed/d, total cost of concentrate/d and per quintal cost of concentrate for various concentrate ingredients

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Cost per quintal (WB)	Between Groups	7201.31	3	2400.44	0.599	0.618
	Within Groups	264414.77	66	4006.28		
	Total	271616.07	69			
Cost per quintal (MOC)	Between Groups	22719.94	3	7573.31	0.981	0.407
	Within Groups	509778.63	66	7723.92		
	Total	532498.57	69			
Cost per quintal (BGC)	Between Groups	6643.64	1	6643.64	1.02	0.316
	Within Groups	410510.20	63	6516.04		
	Total	417153.85	64			
Cost per quintal (BGCH)	Between Groups	120.10	1	120.10	0.038	0.848
	Within Groups	57254.90	18	3180.83		
	Total	57375.00	19			
Per day consumption (WB)	Between Groups	0.00	3	0.00	0.319	0.812
	Within Groups	0.31	66	0.01		
	Total	0.31	69			
Per day consumption (MOC)	Between Groups	0.05	3	0.02	2.136	0.104
	Within Groups	0.49	66	0.01		
	Total	0.54	69			
Per day consumption (BGC)	Between Groups	0.00	1	0.00	0.036	0.849
	Within Groups	0.41	64	0.01		
	Total	0.42	65			

Table 38. Contd....

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Per day consumption (BGCH)	Between Groups	0.00	1	0.00	0.059	0.811
	Within Groups	0.09	18	0.01		
	Total	0.09	19			
Total concentrate consumed/d	Between Groups	1.30	3	0.43	10.217	0.000
	Within Groups	2.79	66	0.04		
	Total	4.09	69			
Total cost of concentrate/d	Between Groups	3476267.87	3	1158755.96	9.588	0.000
	Within Groups	7976502.72	66	120856.10		
	Total	11450000.00	69			
Per quintal cost of concentrate	Between Groups	85965.32	3	28655.11	4.217	0.009
	Within Groups	448457.39	66	6794.81		
	Total	534422.71	69			

Nutrient utilization in crossbred heifers conducted at National Dairy Research Institute (Bangalore) suggested that supplementing groundnut cake at 15 g RDN (Rumen Digestible Nitrogen)/kg of DOM (Digestible Organic Matter) to a diet of straw: bran at a ratio of 75:25 improved nutrient utilization and was economical as compared to supplementing equivalent quantity through cotton seed cake or supplementing groundnut cake to 60:40 straw: bran fed groups. Singh and Singh (1999) studied the economics and performance of buffalo calves fed on wheat straw based diets having different modes of urea supplementation. The Dry Matter Intake (kg/day) was maximum in group receiving urea ammoniated wheat straw. The supplementation of urea or feeding of ammoniated wheat straw in the study did not improve the dry matter consumption. The DCP (Digestible Crude Protein) and TDN (Total Digestible Nutrients) intake in different groups were comparable among the groups. The feed conversion efficiency (FCE) was found to be 12.97, 14.48 and 10.36 in buffalo calves fed on chaffed paddy straw along with 2 kg concentrate mixture (CM) or 4 per cent urea treated paddy straw fresh or stored plus 1.5 kg CM in groups, 1, 2 and 3, respectively. Sudheer *et al.* (1999) found that higher investment on concentrates in organized sector was due to the better economic position of the farmers and also because they possessed better milch animals. But expenditure on fodder was higher in the unorganized sector. This was because the farmers were feeding more of roughages than concentrates as roughages were cheaper than concentrates. Toppo *et al.* (1999) in their study on *Effect of feeding groundnut cake and urea molasses mineral block to adult cattle* conducted in IVRI (Izatnagar) for determining the effect of untreated and formaldehyde treated groundnut cake on intake of urea molasses mineral block revealed that there was no beneficial effect of supplementing untreated groundnut cake. The catalytic effect of formaldehyde treated groundnut cake could not be achieved by adding 100 grams groundnut cake in the rations of adult cattle supplemented with urea molasses mineral block.

Chandra and Agarwal (2000) revealed that feed cost was about two third of total gross cost and was the major cost component based on their study in

Uttar Pradesh. According to a study done by Singh *et al.* (2001) in Uttar Pradesh, feed cost remained the major component of milk production and accounted for nearly 55-60 per cent for all the herds of milch buffaloes among members and non-members of Brooke Bond Lipton India Ltd. The expenditure on human labour used was nearly 14 per cent in member class and 24 per cent in non-member class. Biradar *et al.* (2003) conducted a PRA based study in three different agro-climatic regions of Karnataka to know the influence of cropping pattern on the fodder availability and utilization. Regarding feeding pattern, researchers observed that most important fodder for large ruminants is a crop residue in different forms such as local concentrate mixed with powdered paddy husk/hull, hay, sorghum stover and purchased feed. Local concentrate was composed of broken and poor quality grains of sorghum, horse-gram, red-gram and green-gram. All these grains were powdered and fed to animals after soaking it for 6-8 hours. Some farmers mixed the paddy husk/hull with local concentrate and together soaked in water for 6-8 hrs. Bardhan *et al.* (2004) found that the feed cost constituted the major part of total cost in dairy farming in Terai area in erstwhile Uttaranchal (present Uttarakhand). On an average, farmers incurred 66.50% on feed and labour cost was 16.76% of total maintenance cost. Besides these items, costs of veterinary expenditure, depreciation and interest on fixed capital contributed 3.69%, 5.59% and 7.49% to the total maintenance costs, respectively. Moreover, it was mentioned that milk production from indigenous cattle is highly unprofitable and unviable proposition in Terai region of erstwhile Uttaranchal. Kumar *et al.* (2005) analysed the feeding pattern of livestock at different stages. The study revealed that among the three feed components namely dry fodder, green fodder and concentrates, the dry fodder had the highest share (50 to 73%) in the animals' diet followed by green fodder (22 to 30%) and concentrates (4 to 25%). The crossbred cows were normally taken out for grazing, but were invariably stall-fed, with a feeding pattern of 19 q of dry fodder, 5.6 q of green fodder and 9.4 q of concentrates. It can be inferred from the above studies that various types of feeding patterns were followed in different regions of the country. As in our study

also different types of locally available concentrate, green and dry fodder combinations were reported to be utilized by dairy farmers of Muzaffarnagar district. Aitawade *et al.* (2005) concluded that the feed cost was the major cost in dairying and the share of variable and fixed cost to the total cost was 90.35 and 9.65 percent, respectively.

4.2.3 Milking Management

All the private dairy farms were using fresh clean water for before wash of udders pre-milking. At the same time they were ensuring pre-milking cleaning of utensils which were supposed to be used for milking eg. milking buckets, canes, etc. The dairy farmers were ensuring the hand wash of milkers before milking in fresh clean water. As far as the use of oxytocin was concerned (for letting down of milk), most of the dairy farmers denied its use. Milking was performed through hands only and no milk machines were available. All the dairy farmers indicated towards the door step of their dairy farm as milk selling point. In the present study, it was found that main sources for sale of milk were cooperative societies, milkman and open market. The periodicity of milk payment was daily/monthly.

The block expressed its highly significant effect ($P \leq 0.01$) on milk sale point (cooperative societies, milkmen and open market) of these private dairy farms as tested by chi-square analysis (Table 3a).

Per liter price of cow and buffalo milk along with total daily milk sale

Milk sale source

The milk sale source had highly significant effects ($P \leq 0.01$) on per litre sale price of cow and buffalo milk along with total daily milk sale (Table 40).

The overall means for per litre sale price of cow and buffalo milk along with total daily milk sale were Rs. 27.03±0.42 and Rs. 32.01±0.55 per liter and Rs. 4713.91±136.23 per day. The ranges for these traits varied from Rs.

Table 39. Different sources of sale wise means for per liter price of cow and buffalo milk along with total daily milk sale

Particulars	Per litre sale price of milk (Rs.)		Total daily milk sale (Rs.)
	Cow	Buffalo	
Overall mean (μ)	**27.03±0.42 (59)**	**32.01±0.55 (67)**	**4713.91±136.23 (70)**
Milk sale source			
Cooperative societies	24.88±0.32 (17)	29.12±0.36 (17)	4281.58±185.25 (19)
Milkmen	22.83±0.31 (6)	25.83±0.54 (6)	3441.67±128.07 (6)
Open Market	28.75±0.46 (36)	33.98±0.63 (44)	5066.09±171.99 (45)
Periodicity of payment			
Daily	24.10±0.30 (20)	28.00±0.44 (20)	4095.45±181.83 (22)
Monthly	28.54±0.45 (39)	33.72±0.61 (47)	4997.37±165.90 (48)
Blocks			
Shamli	35.67±1.20 (3)	39.60±0.40 (5)	5204.80±259.89 (5)
Oon	27.75±0.25 (4)	31.80±0.20 (5)	4420.00±287.05 (5)
Thana Bhawan	24.40±0.51 (5)	28.60±0.60 (5)	3950.00±204.94 (5)
Morna	22.80±0.37 (5)	25.00±0.00 (4)	4060.00±676.46 (5)
Jaansath	28.00±0.00 (4)	29.20±0.80 (5)	4230.00±197.23 (5)
Charthawal	23.60±0.25 (5)	28.00±0.00 (5)	3840.00±215.87 (5)
Purkaji	26.00±0.00 (2)	28.60±0.40 (5)	5220.00±732.39 (5)
Khatauli	30.20±1.36 (5)	35.40±2.04 (5)	4980.00±453.21 (5)
Sahapur	25.67± 0.67 (3)	31.00±0.58 (4)	4220.00±245.76 (5)
Baghra	25.25± 0.48 (4)	28.80±0.80 (5)	4670.00±346.27 (5)
Muzaffarnagar Sadar	28.00±0.00 (4)	38.50±0.50 (4)	6960.00±754.72 (5)
Kairana	29.20±0.49 (5)	37.20±0.49 (5)	4860.00±213.54 (5)
Kandhla	27.80±0.20 (5)	35.00±0.00 (5)	5020.00±292.23 (5)
Budhana	26.60±0.68 (5)	31.20±0.49 (5)	4360.00±274.96 (5)

Table 40. Sources of milk sale wise analysis of variance (ANOVA) for per litre sale price of cow milk, per litre sale price of buffalo milk and total daily milk sale

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Per litre sale price of cow milk	Between Groups	290.58	2	145.29	27.180	0.000
	Within Groups	299.35	56	5.35		
	Total	589.93	58			
Per litre sale price of buffalo milk	Between Groups	541.41	2	270.71	22.110	0.000
	Within Groups	783.58	64	12.24		
	Total	1324.99	66			
Total daily milk sale	Between Groups	18800000.00	2	9422129.94	8.920	0.000
	Within Groups	70800000.00	67	1056636.77		
	Total	89600000.00	69			

Table 41. Periodicity of milk payment wise analysis of variance (ANOVA) for per litre sale price of cow milk, per litre sale price of buffalo milk and total daily milk sale

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Per litre sale price of cow milk	Between Groups	260.44	1.00	260.44	45.05	0.00
	Within Groups	329.49	57.00	5.78		
	Total	589.93	58.00			
Per litre sale price of buffalo milk	Between Groups	459.58	1.00	459.58	34.52	0.00
	Within Groups	865.40	65.00	13.31		
	Total	1324.99	66.00			
Total daily milk sale	Between Groups	12270000.00	1.00	12270000.00	10.79	0.00
	Within Groups	77370000.00	68.00	1137754.28		
	Total	89640000.00	69.00			

Table 42. Block wise analysis of variance (ANOVA) for per litre sale price of cow milk, per litre sale price of buffalo milk and total daily milk sale

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Per litre sale price of cow milk	Between Groups	514.30	13	39.56	23.54	0.00
	Within Groups	75.63	45	1.68		
	Total	589.93	58			
Per litre sale price of buffalo milk	Between Groups	1185.19	13	91.17	34.56	0.00
	Within Groups	139.80	53	2.64		
	Total	1324.99	66			
Total daily milk sale	Between Groups	40970000.00	13	3151697.13	3.63	0.00
	Within Groups	48670000.00	56	3151697.13		
	Total	89640000.00	69	869051.09		

Table 43. Block wise distance of AI centre, expenditure per AI in govt. hospital and expenditure per AI through private doctors/ Inseminators

Particulars	Distance of AI centre (Km.)	Expenditure per AI in Govt. Hospital (Rs.)	Expenditure per AI through private doctors/ Inseminators (Rs.)
Overall mean (μ)	3.78±0.21 (70)	39.86±0.14 (70)	106.36±1.64 (70)
Blocks			
Shamli	4.20±0.37 (5)	40.00±0.00 (5)	100.00±3.16 (5)
Oon	3.20±0.86 (5)	38.00±2.00 (5)	83.00±2.00 (5)
Thana Bhawan	4.60±0.87 (5)	40.00±0.00 (5)	92.00±3.74 (5)
Morna	2.90±1.08 (5)	40.00±0.00 (5)	100.00±0.00 (5)
Jaansath	3.80±0.86 (5)	40.00±0.00 (5)	96.00±6.00 (5)
Charthawal	2.40±0.40 (5)	40.00±0.00 (5)	94.00±2.45 (5)
Purkaji	3.40±0.93 (5)	40.00±0.00 (5)	116.00±4.00 (5)
Khatauli	2.80±0.37 (5)	40.00±0.00 (5)	112.00±4.90 (5)
Sahapur	3.40±1.12 (5)	40.00±0.00 (5)	120.00±0.00 (5)
Baghra	4.40±0.60 (5)	40.00±0.00 (5)	120.00±0.00 (5)
Muzaffarnagar Sadar	5.60±0.51 (5)	40.00±0.00 (5)	120.00±0.00 (5)
Kairana	4.80±0.37 (5)	40.00±0.00 (5)	108.00±4.90 (5)
Kandhla	4.80±0.37 (5)	40.00±0.00 (5)	120.00±0.00 (5)
Budhana	2.60±1.03 (5)	40.00±0.00 (5)	108.00±4.90 (5)

22.83±0.31 (milkmen) to Rs. 28.75±0.46 (open market), Rs. 25.83±0.54 (milkmen) to Rs. 33.98±0.63 (open market) and Rs. 3441.67±128.07 (milkmen) to Rs. 5066.09±171.99 (open market, Table 39). It indicated that milkmen were purchasing the milk at the cheapest rate whereas the open market sale to clients was at the best possible rates.

Periodicity of milk sale payment

The periodicity of payment of milk sale i.e. daily and monthly, had expressed its highly significant effects ($P \leq 0.01$) on per litre sale price of cow and buffalo milk as well as total daily milk sale (Table 41).

The periodicity of milk sale wise ranges for these traits varied from Rs. 24.10±0.30 (daily) to Rs. 28.45±0.44 (monthly), Rs. 28.00±0.44 (daily) to Rs. 33.72±0.61 (monthly) and Rs. 4095.45±181.83 (daily) to Rs. 4997.37±165.90 (monthly, Table 39). It indicated that the agencies doing the daily payment are paying cheaper rates of milk as compared to agencies paying at monthly intervals.

Blocks wise milk sale

The block had highly significant effects ($P \leq 0.01$) on per liter sale price of cow and buffalo milk and total daily milk sale (Table 42).

Block wise figures indicated that per litre sale price of cow and buffalo milk were lowest in Morna block (Rs. 22.80±0.37 and Rs. 25.00±0.00, respectively) whereas these were highest in Shamli block (Rs. 35.67±1.20 and Rs. 39.60±0.40, respectively, Table 39). At the same time, for total daily milk sale, the block wise range varied from Rs. 3840.00±215.87 (Charthawal) to Rs. 6960.00±754.72 (Muzaffarnagar Sadar, Table 39).

Tripathi (1999) conducted a study to examine the cost and return structure of buffalo milk production in Indian central Himalaya and found that the milk production and gross income were closely related with the quantity of fodder and concentrates fed to buffaloes. Kaur and Singla (2001) found that in marketing of

milk, low participation was found for selling of milk at home and through milk vendors, whereas marketing of milk through village co-operatives, a medium level of participation was seen among rural women dairy farmers.

Breeding facilities and management

The barring few of these private dairy farmers, most of the dairy farmers preferred artificial insemination (A.I.), either through government Veterinary Hospitals/A.I. Centres or through Private Veterinary Doctors/Inseminators, based on availability of breeding bulls either with the dairy farmer itself or in the vicinity. Some of these dairy farmers preferred natural service, though the number was very small. The natural service was, though costly (Rs. 120-200/natural service) was accepted by very few dairy farmers depending upon critical condition or in case of absence of A.I. facilities. Most of the cattle and buffalo rears accepted the availability of A.I. services either at their door-step or at A.I. Centre through government/private sources. All the dairy farmers have accepted the availability of A.I. staff at the point of need either through government or private sector.

Sathiadas *et al.* (2003) noted that under breeding practices, more than three fourth of dairy farmers owned crossbred cows (83.33%) and practicing artificial insemination in cows (76.67%), whereas under disease control practices, majority of dairy farmers (96.66%) were practicing regular cleaning/grooming followed by vaccination against contagious diseases (90%) and hygienic milking (83.33 %).

Expenditure per A.I. (Rs.)

The block effect was highly significant ($P \leq 0.01$) on expenditure per A.I. through private doctors or inseminator (Table 44).

The overall means for distance of A.I. Center, expenditure per A.I. through government and private Veterinary Doctor/Inseminator were 3.78±0.21 Km., Rs. 39.86±0.14 and Rs. 106.36±1.64, respectively (Table 43). The range for

Table 44. Block wise analysis of variance (ANOVA) for distance of AI centre, expenditure per AI in govt. hospital and expenditure per AI through private doctors/Inseminators

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Distance of AI centre	Between Groups	61.42	13	4.72	1.670	0.094
	Within Groups	158.40	56	2.83		
	Total	219.82	69			
Expenditure per AI in govt. hospital	Between Groups	18.57	13	1.43	1.000	0.464
	Within Groups	80.00	56	1.43		
	Total	98.57	69			
Expenditure per AI through private doctors/Inseminators	Between Groups	9836.07	13	756.62	13.408	0.000
	Within Groups	3160.00	56	56.43		
	Total	12996.07	69			

Table 45. Block wise expected disposal price of cows

Particulars	Expected disposal price for culled cows (Rs.)
Overall mean (µ)	**16033.33±267.83 (60)**
Blocks	
Shamli	15333.33±333.33 (3)
Oon	15000±0 (5)
Thana Bhawan	15000±0 (5)
Morna	17000.00±1224.75 (5)
Jaansath	15000±0 (4)
Charthawal	16000±1000 (5)
Purkaji	15000±0 (2)
Khatauli	16200.00±969.54 (5)
Sahapur	16666.67±1666.67 (3)
Baghra	18000.00±2345.21 (4)
Muzaffarnagar Sadar	17250.00±1108.68 (4)
Kairana	15400.00±244.95 (5)
Kandhla	15400.00±244.95 (5)
Budhana	17000.00±1224.75 (5)
Disposal age group of cows (years)	
6-7	18666.67±3179.80 (3)
7-8	15307.69±133.24 (13)
8-9	15923.08±415.43 (13)
9-10	16200.00±435.89 (25)
8-10	15833.33±833.33 (6)

expenditure per A.I. by private Veterinary Doctor/Inseminator varied from Rs. 83.00±2.00 (Oon) to Rs. 120.00 (Sahapur, Baghra, Muzaffarnagar Sadar and Kandhla, Table 43).

Disposal of culled animals

All the dairy farmers were of the opinion that their undesirable animals (cattle and buffaloes) were usually sold either from the dairy itself or in a time of emergent need these are sold at animal hats also.

Cows

Block expressed non-significant effect on expected price of culled cows (Table 46). The overall mean for expected price of culled cows was Rs. 16033.33±267.83 and it ranged between Rs. 15000.00±0 (Oon, Thana Bhawan, Jaansath and Purkaji) to Rs.18000.00±2345.21 (Baghra, Table 46).

Disposal age group (as told by farmers) had non-significant effect on expected disposal price for culled cows. Disposal age group wise range varied from Rs. 15307.69±133.24 (7-8 years) to Rs. 18666.67±3179.80 (6-7 years, Table 45).

Buffaloes

It has been observed that block had highly significant effect ($P \leq 0.01$) on expected minimum disposal price for culled buffaloes (Table 49). The overall mean for expected minimum disposal price for culled buffaloes was Rs. 20358.21±187.47 and it ranged between Rs. 18000.00±124.75 (Purkaji) block Rs. 22250.00±1030.78 (Muzaffarnagar Sadar, Table 48).

Conversely, block had non-significant effect on expected maximum disposal price for culled buffaloes with its overall mean being Rs. 23480.60±390.46 and which ranged from Rs. 19840.00±448.10 (Kandhla) to Rs. 26000.00±1000.00 (Baghra, Table 48).

4.2.4 Animal insurance and bank liabilities

The cattle and buffaloes maintained by all the dairy farmers were uninsured as was informed by these dairy farmers.

Table 46. Block wise analysis of variance (ANOVA) for expected disposal price of culled cows

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Expected	Between Groups	54650000.00	13.00	4203846.150	0.970	0.490
disposal price	Within Groups	199283333.33	46.00	4332246.380		
for culled cows	Total	253933333.33	59.00			

Table 47. Disposal age group wise analysis of variance (ANOVA) for expected disposal price of culled cows

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Disposal	Between Groups	28741025.64	4.00	7185256.41	1.76	0.15
expected	Within Groups	225192307.69	55.00	4094405.59		
Price cattle	Total	253933333.33	59.00			

Table 48. Block wise expected minimum and maximum disposal price for culled buffaloes

Particulars	Expected disposal price for culled buffaloes (min.)	Expected disposal price for culled buffaloes (max.)
Overall mean (μ)	**20358.21±187.47 (67)**	**23480.60±390.46 (67)**
Blocks		
Shamli	21200.00±489.90 (5)	25000.00±0.00 (5)
Oon	20000.00±0.00 (5)	24200.00±583.10 (5)
Thana Bhawan	19600.00±400.00 (5)	22200.00±800.00 (5)
Morna	20500.00±500.00 (4)	22750.00±750.00 (4)
Jaansath	20000.00±0.00 (5)	22000.00±0.00 (5)
Charthawal	20400.00±400.00 (5)	22600.00±600.00 (5)
Purkaji	18000.00±124.75 (5)	21800.00±916.52 (5)
Khatauli	19600.00±400.00 (5)	23800.00±734.85 (5)
Sahapur	20500.00±500.00 (4)	25000.00±0.00 (4)
Baghra	22200.00±800.00 (5)	26000.00±1000.00 (5)
Muzaffarnagar Sadar	22250.00±1030.78 (4)	24500.00±866.03 (4)
Kairana	20400.00±400.00 (5)	25000.00±0.00 (5)
Kandhla	20000.00±0.00 (5)	19840.00±448.10 (5)
Budhana	20800.00±489.90 (5)	24400.00±600.00 (5)

Table 49. Block wise analysis of variance (ANOVA) for expected minimum and maximum disposal price for culled buffaloes

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Expected disposal price for culled buffaloes (min.)	Between Groups	71452985.08	13.00	5496383.47	3.470	0.000
	Within Groups	83950000.00	53.00	1583962.26		
	Total	155402985.08	66.00			
Expected disposal price for culled buffaloes (max.)	Between Groups	181102776.12	13.00	13930982.78	1.500	0.150
	Within Groups	493062000.00	53.00	9303056.60		
	Total	674164776.12	66.00			

Table 50. Transportation cost of livestock from Haryana and Budhana in different blocks

Particulars	Transportation cost (Rs.)	
	Per animal from Haryana	Per animal from Budhana
Overall mean (μ)	**691.43±18.73 (70)**	**383.08±10.64 (65)**
Blocks		
Shamli	500.00±0.00 (5)	300.00±0.00 (5)
Oon	460.00±40.00 (5)	400.00±0.00 (5)
Thana Bhawan	460.00±24.50 (5)	220.00±20.00 (5)
Morna	980.00±20.00 (5)	520.00±20.00 (5)
Jaansath	780.00±37.42 (5)	460.00±24.49 (5)
Charthawal	640.00±24.50 (5)	380.00±20.00 (5)
Purkaji	720.00±37.42 (5)	460.00±24.49 (5)
Khatauli	720.00±80.00 (5)	400.00±0.00 (5)
Sahapur	680.00±20.00 (5)	300.00±0.00 (5)
Baghra	740.00±24.50 (5)	400.00±0.00 (5)
Muzaffarnagar Sadar	900.00±0.00 (5)	440.00±24.49 (5)
Kairana	700.00±0.00 (5)	400.00±0.00 (5)
Kandhla	700.00±0.00 (5)	300.00±0.00 (5)
Budhana	700.00±0.00 (5)	-

All the dairy farmers stated that they have no financial liabilities in the form of bank loans.

4.2.5 Transportation of livestock after purchase

All the dairy farmers were using mini trucks for transporting small numbers of animals either from Haryana or nearby Budhana. Blocks expressed highly significant effects ($P \leq 0.01$) on transportation costs of cattle and buffaloes from Haryana as well as from Budhana (Table 51). The overall means for transportation costs per animal from Haryana and Budhana were Rs. 691.43±18.73 and Rs. 383.08±10.64 per animal, respectively. The ranges for these traits varied from Rs. 460.00 (Thana Bhawan and Oon) to Rs. 980.00±20.00 (Morna) and Rs. 220.00±20.00 (Thana Bhawan) to Rs. 520.00±20.00 (Morna, Table 50). The per animal transportation cost were basically dependent upon time of transport, number of animals to be transported etc. and were sometimes not in accordance with the actual distance travelled based in their partial/complete engagement.

4.2.6 Livestock health management

The surveyed dairy farms indicated towards the most reliable source of veterinary aid as block hospital where there are qualified veterinarians and who were available at a point of need. They are using government as well as private source of veterinary aids. All the dairy farmers indicated towards arrangements of regular veterinary aid (visit) in addition to the visit depending upon the specific (emergent) requirement of dairies. All the dairy farmers indicated towards the vaccination of animal for HS and FMD through a government source arranged by local veterinary hospitals.

It has been observed that block expressed highly significant effects ($P \leq 0.01$) on cost per veterinary visit and minimum and maximum cost for deworming (Table 53). The overall means for distance of veterinary aid, cost per veterinary visit, deworming stage, minimum and maximum deworming costs were 3.82±0.21 Km., Rs. 125.00±2.16, 2.98±0.05, Rs. 93.10±1.81 and Rs. 117.59±2.45, respectively (Table 52).

4.3 HERD STRENGTH MAINTAINED AT PRIVATE DAIRY FARMS

The block effect was significant ($P \leq 0.05$) on total herd size, however it was highly significant ($P \leq 0.01$) on total number of buffaloes (Table 55).

Table 51. Block wise analysis of variance (ANOVA) for transportation cost of livestock from Haryana and Budhana

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Transportation cost from Haryana (per animal)	Between Groups	1426857.14	13.00	109758.240	22.940	0.000
	Within Groups	268000.00	56.00	4785.710		
	Total	1694857.14	69.00			
Transportation cost from Budhana (per animal)	Between Groups	411384.62	12.00	34282.050	29.710	0.000
	Within Groups	60000.00	52.00	1153.850		
	Total	471384.62	64.00			

Table 52. Block wise means for distance of veterinary aid, per visit veterinary aid cost, deworming stage (in months) and minimum and maximum deworming cost

Particulars	Veterinary aid distance (Km.)	Per visit veterinary aid cost (Rs.)	Deworming stage (in months)	Deworming cost (Rs.)	
				Minimum	Maximum
Overall mean (μ)	**3.82±0.21 (70)**	**125.00±2.16 (70)**	**2.98±0.05 (58)**	**93.10±1.81 (58)**	**117.59±2.45 (58)**
Blocks					
Shamli	4.20±0.37 (5)	120±0.00 (5)	3±0.00 (5)	100±0.00 (5)	134±6.00 (5)
Con	3.60±0.93 (5)	108±4.90 (5)	3±0.00 (5)	100±0.00 (5)	128±4.90 (5)
Thana Bhawan	5.00±0.63 (5)	116±4.00 (5)	2.8±0.20 (5)	88±4.90 (5)	106±6.00 (5)
Morna	2.90±1.08 (5)	120±0.00 (5)	3.5±0.50 (2)	90±10.00 (2)	120±20.00 (2)
Jaansath	3.80±0.86 (5)	128±9.70 (5)	2.75±0.25 (4)	100±0.00 (4)	120±0.00 (4)
Charthawal	2.40±0.40 (5)	108±4.90 (5)	3.5±0.29 (4)	82.5±2.50 (4)	95±2.89 (4)
Purkaji	3.40±0.93 (5)	150±15.81 (5)	3 (1)	80 (1)	100 (1)
Khatauli	2.80±0.37 (5)	134±10.30 (5)	2.67±0.33 (3)	73.33±3.33 (3)	86.67±6.67 (3)
Sahapur	3.40±1.12 (5)	132±7.35 (5)	2.8±0.20 (5)	80±12.25 (5)	122±10.20 (5)
Baghra	4.40±0.60 (5)	124±4.00 (5)	3±0.00 (5)	108±4.90 (5)	138±4.90 (5)
Muzaffarnagar Sadar	5.60±0.51 (5)	150±0.00 (5)	3±0.00 (5)	98±6.63 (5)	120±8.94 (5)
Kairana	4.80±0.37 (5)	120±0.00 (5)	3±0.00 (5)	90±4.47 (5)	108±4.90 (5)
Kandhla	4.6±0.51 (5)	120±0.00 (5)	3±0.00 (5)	96±4.00 (5)	116±4.00 (5)
Budhana	2.6±1.03 (5)	120±0.00 (5)	3±0.00 (4)	97.5±2.50 (4)	125±9.57 (4)

Table 53. Block wise analysis of variance (ANOVA) for veterinary aid distance, per visit veterinary aid cost, deworming stage and minimum and maximum deworming costs

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Veterinary aid distance	Between Groups	62.018	13	4.771	1.713	0.084
	Within Groups	156	56	2.786		
	Total	218.018	69			
Per visit veterinary aid cost	Between Groups	10870	13	836.154	4.009	0.000
	Within Groups	11680	56	208.571		
	Total	22550	69			
Deworming stage	Between Groups	2.466	13	0.19	1.848	0.065
	Within Groups	4.517	44	0.103		
	Total	6.983	57			
Deworming cost (Minimum)	Between Groups	4864.713	13	374.209	2.755	0.006
	Within Groups	5976.667	44	135.833		
	Total	10841.38	57			
Deworming cost (Maximum)	Between Groups	10715.4	13	824.262	3.965	0.000
	Within Groups	9146.667	44	207.879		
	Total	19862.07	57			

Table 54. Block wise means for total herd strength (no.) and total number of cattle and buffaloes (no.)

Particulars	Total herd size (no.)	Total cattle (no.)	Total buffaloes (no.)
Overall mean (μ)	**29.79±0.80 (70)**	**12.95±1.00 (59)**	**19.72±1.17 (67)**
Blocks			
Shamli	28.00±1.05 (5)	8.67±0.88 (3)	22.80±2.78 (5)
Oon	28.80±1.02 (5)	10.25±2.95 (4)	20.60±2.27 (5)
Thana Bhawan	24.80±0.74 (5)	13.80±0.80 (5)	11.00±1.14 (5)
Morna	26.20±2.35 (5)	17.40±4.64 (5)	11.00±1.78 (4)
Jaansath	29.40±4.97 (5)	5.50±1.04 (4)	25.00±6.06 (5)
Charthawal	26.00±1.14 (5)	14.00±0.95 (5)	12.00±2.00 (5)
Purkaji	37.20±4.68 (5)	22.00±16.00 (2)	28.40±7.12 (5)
Khatauli	32.00±1.87 (5)	7.00±2.05 (5)	25.00±3.70 (5)
Sahapur	27.60±0.93 (5)	17.00±7.37 (3)	21.75±5.27 (4)
Baghra	29.00±1.92 (5)	13.50±2.26 (4)	18.20±2.82 (5)
Muzaffarnagar Sadar	39.20±5.55 (5)	18.50±7.01 (4)	30.50±5.81 (4)
Kairana	29.60±1.63 (5)	9.80±1.36 (5)	19.80±1.32 (5)
Kandhla	30.00±1.84 (5)	11.20±1.74 (5)	18.80±0.97 (5)
Budhana	29.20±1.39 (5)	17.20±2.13 (5)	12.00±3.10 (5)

Table 55. Block wise analysis of variance (ANOVA) for total herd size (no.), total cattle (no.) and total buffaloes (no).

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total herd size	Between Groups	1053.38	13	81.03	2.200	0.020
	Within Groups	2060.40	56	36.79		
	Total	3113.78	69			
Total cattle	Between Groups	1084.03	13	83.38	1.600	0.120
	Within Groups	2344.81	45	52.10		
	Total	3428.84	58			
Total buffaloes	Between Groups	2484.26	13	191.09	2.840	0.000
	Within Groups	3565.35	53	67.27		
	Total	6049.61	66			

It has been observed that out of five dairy farms surveyed in each block in each blocks some were having only cattle, some reared buffaloes only and few of these dairies were having both cattle and buffalo populations. Hence, in some cases (blocks), the total number of observations are not a simple sum of number of observations expressed by cattle and buffalo groups.

The overall means for herd strength of cattle, buffalo and total herd were 12.95±1.00, 19.72±1.17 and 29.79±0.80 heads, respectively (Table 54). The total number of buffaloes in these private dairy farms varied from 11.00 (Morna and Thana Bhawan) to 30.50±5.81 heads (Muzaffarnagar Sadar). At the same time, total herds strength varied form 24.80±0.74 (Thana Bhawan) to 39.20±5.55 heads (Muzaffarnagar Sadar, Table 54).

4.3.1 Age group wise herd strengths

4.3.1.1 Cattle

The cattle were generally apparently HF/Jersey crosses with Sahiwal/ other native breeds which were usually termed by these dairymen as *American cows*. Dairy farmers preferred crossbred cattle due to their excellent milk production potential. The block effect was highly significant ($P \leq 0.01$) on the number of male calves below 1 year of age (Table 57). The overall means for number of total cows, milch cows, dry cows, heifers (>1 year), male and female calves (<1 year) were 7.61±0.55, 6.66±0.51, 1.05, 1.00, 2.63±0.22 and 3.09±1.29 heads, respectively (Table 56). The range for number of male calves below 1 year of age varied from 1.00 (Shamli) to 9.00 (Purkaji). Rests of the figures are presented in Table 56.

4.3.1.2 Buffaloes

The breeds of buffaloes maintained were apparently Murrah/graded Murrah, though few non-descript buffaloes were also there. It has been observed that the block effect was significant ($P \leq 0.05$) on male calves below 1 year of age, however, its highly significant effects ($P \leq 0.01$) were observed on total and milch buffaloes and female calves below 1 year of age (Table 59).

The overall means for total buffaloes, milch buffaloes, dry buffaloes, heifers (>1 year), male and female calves (below 1 year of age) were 11.55±0.66,

Table 56. Block wise means for different categories of cattle i.e. total, milch and dry cows, heifers >1 Y, male calves < 1 Y and female calves < 1 Y

Particulars	Herd strength (no. heads)					
	Total cows	Milch cows	Dry cows	Heifers (>1 year)	Male calves (< 1year)	Female calves (< 1 year)
Overall mean (μ)	**7.61±0.55 (59)**	**6.66±0.51 (59)**	**1.05±0.00 (40)**	**1.00±0.00 (14)**	**2.63±0.22 (54)**	**3.09±0.29 (56)**
Blocks						
Shamli	5.00±0.57 (3)	4.67±0.33 (3)	1.00 (1)	-	1.00±0.00 (2)	3.00±0.00 (3)
Oon	5.75±1.65 (4)	5.50±1.71(4)	1.00 (1)	-	2.50±0.65 (4)	2.67±0.67 (3)
Thana Bhawan	8.00±0.45 (5)	7.20±0.37 (5)	1.00±0.00 (3)	1.00 (1)	2.80±0.20 (5)	3.00±0.32 (5)
Morna	10.00±2.49 (5)	9.40±2.58 (5)	1.00±0.00 (3)	-	3.80±1.16 (5)	3.60±1.12 (5)
Jaansath	3.50±0.65 (4)	3.00±0.41 (4)	1.00±0.00 (2)	-	1.25±0.25 (4)	1.00±0.00 (3)
Charthawal	8.20±0.58 (5)	7.00±0.45 (5)	1.00±0.00 (3)	1.00±0.00 (3)	3.40±0.40 (5)	2.40±0.51 (5)
Purkaji	12.00±8.00 (2)	10.50±7.50 (2)	1.50±0.50 (2)	-	9.00 (1)	5.50±3.50 (2)
Khatauli	4.20±1.28 (5)	3.60±1.17 (5)	1.00±0.00 (3)	-	1.67±0.33 (3)	2.25±0.95 (4)
Sahapur	10.00±4.16 (3)	8.67±3.93 (3)	1.00±0.00 (3)	1.00 (1)	2.50±0.50 (2)	5.33±2.33 (3)
Baghra	8.25±1.44 (4)	7.50±1.04 (4)	1.00±0.00 (2)	1.00 (1)	2.50±0.50 (4)	2.75±0.48 (4)
Muzaffarnagar Sadar	11.25±3.68 (4)	9.50±3.57 (4)	1.00±0.00 (4)	1.00±0.00 (3)	3.00±1.41 (4)	4.25±1.93 (4)
Kairana	6.00±0.71 (5)	4.80±0.66 (5)	1.00±0.00 (4)	1.00±0.00 (2)	2.00±0.32 (5)	1.80±0.37 (5)
Kandhla	6.60±1.08 (5)	5.60±1. 08 (5)	1.00±0. 00 (4)	1.00 (1)	2.60±0.40 (5)	2.00±0.55 (5)
Budhana	10.00±1.23 (5)	8.40±1.03 (5)	1.20±0.20 (5)	1.00±0.00 (2)	2.20±0.20 (5)	5.00±0.95 (5)

Table 57. Block wise analysis of variance (ANOVA) for different categories of cattle i.e. total, milch and dry cows, male calves < 1 Y and female calves < 1 Y

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total cows	Between groups	347.98	13	26.76	1.740	0.080
	Within groups	690.05	45	15.33		
	Total	1038.03	58			
Milch cows	Between groups	271.98	13	20.92	1.490	0.150
	Within groups	629.23	45	13.98		
	Total	901.22	58			
Dry cows	Between groups	0.60	13	0.046	0.920	0.540
	Within groups	1.30	26	0.05		
	Total	1.90	39			
Male calves	Between groups	69.87	13	5.37	3.040	0.000
(< 1 Y)	Within groups	70.71	40	1.76		
	Total	140.59	53			
Female calves	Between groups	85.27	13	6.559	1.550	0.130
(< 1 Y)	Within groups	177.28	42	4.221		
	Total	262.55	55			

10.33±0.59, 1.33±0.11, 1.03±0.03, 3.92±0.24 and 4.42±0.33 heads. The range for total buffaloes, milch buffaloes, male and female calves (below 1 year of age) varied from 6.75±0.85 (Morna) to 17.50±3.23 (Muzaffarnagar Sadar), 5.80±1.46 (Budhana) to 15.50±2.84 (Muzaffarnagar Sadar), 2.00±0.71 (Morna) to 6.00±1.45 (Purkaji) and 2.00±0.32 (Thana Bhawan) to 7.50±2.18 heads (Muzaffarnagar Sadar, Table 58).

4.3.2 Performance of livestock

4.3.2.1 Lactation length, dry period and conception rates

Lactation lengths

The farmers were enquired regarding minimum and maximum lactation length and dry periods expressed by cattle and buffaloes. Most of the farmers are keeping animals upto the point of good returns and beyond that there animals are replaced by either an advance pregnant/milch animal. Because of regular replacement of animals from the herd, the values expressed were more ideal values leading to a calving intervals of around one year which is probably because of the fact that observations were based on two individuals.

It has been observed that minimum and maximum lactation lengths of cattle and buffaloes varied in highly significant manner ($P \leq 0.01$) between different blocks (Table 61). The overall means for minimum and maximum lactation lengths in cattle and buffaloes were 291.69±0.70 & 297.12±0.65 and 267.24±0.56 & 272.39±0.56 days, respectively (Table 60). Minimum lactation length for cattle was 282.50±1.44 days (Jaansath) whereas maximum lactation length was 305.00 days (Purkaji). However, the respective values for buffaloes were 261.00±1.00 (Thana Bhawan) and 280.00 days (Sahapur, Table 60).

Dry periods

Blocks expressed highly significant effects ($P \leq 0.01$) on minimum and maximum dry periods of cattle and buffaloes (Table 61). The overall means for minimum and maximum dry periods in cattle and buffaloes were 65.25±0.35 & 72.20±0.46 and 89.85±0.11 & 94.85±0.11 days, respectively (Table 60). The range for minimum and maximum dry periods in cattle were 60.00 (Purkaji) to 70.00±5.00 days (Shamli) and 65.00 (Purkaji) to 78.33±3.33 days (Shamli), whereas the respective range values for buffaloes were 88.00±1.23 (Purkaji) to 90 days (in all of the rest blocks) and 93 (Purkaji) to 95 days (in all of the rest blocks, Table 60).

Table 58. Block wise means for different categories of buffaloes i.e. total, milch and dry buffaloes, heifers (>1 Y), male calves (< 1 Y) and female calves (< 1 Y)

Particulars	Herd strength (no. heads)					
	Total buffaloes	Milch buffaloes	Dry buffaloes	Heifers (>1 year)	Male calves (< 1year)	Female calves (< 1 year)
Overall mean (μ)	**11.55±0.66 (67)**	**10.33±0.59 (67)**	**1.33±0.11 (39)**	**1.03±0.03 (29)**	**3.92±0.24 (65)**	**4.42±0.33 (66)**
Blocks						
Shamli	13.00±1.55 (5)	12.40±1.36 (5)	1.00 (1)	1.00±0.00 (2)	3.20±1.07 (5)	6.60±0.25 (5)
Con	12.00±1.30 (5)	11.00±1.30 (5)	1.00±0.00 (3)	1.00±0.00 (2)	4.80±0.37 (5)	3.80±0.66 (5)
Thana Bhawan	6.80±0.80 (5)	6.20±0.58 (5)	1.00±0.00 (2)	1.00 (1)	2.20±0.20 (5)	2.00±0.32 (5)
Morna	6.75±0.85 (4)	6.00±0.91 (4)	1.00 (1)	1.00±0.00 (2)	2.00±0.71 (4)	2.25±0.25 (4)
Jaansath	15.20±3.72 (5)	13.40±2.69 (5)	2.50±1.50 (2)	1.33±0.33 (3)	4.60±0.87 (5)	5.20±1.50 (5)
Charthawal	7.00±1.18 (5)	6.40±1.03 (5)	2.00 (1)	1.00 (1)	3.00±0.45 (5)	2.50±0.29 (4)
Purkaji	16.60±3.76 (5)	14.80±3.60 (5)	1.60±0.40 (5)	1.00 (1)	6.00±1.45 (5)	5.80±2.20 (5)
Khatauli	14.00±1.92 (5)	12.60±2.16 (5)	1.75±0.25 (4)	-	4.60±0.75 (5)	6.40±1.17 (5)
Sahapur	12.75±2.93 (4)	11.50±2.84 (4)	1.00±0.00 (2)	1.00±0.00 (3)	4.67±1.20 (3)	5.50±1.26 (4)
Baghra	11.20±1.77 (5)	10.20±1.59 (5)	1.00 (1)	1.00±0.00 (4)	3.60±0.68 (5)	3.40±0.81 (5)
Muzaffarnagar Sadar	17.50±3.23 (4)	15.50±2.84 (4)	1.25±0.25 (4)	1.00±0.00 (3)	5.50±0.87 (4)	7.50±2.18 (4)
Kairana	11.20±0.80 (5)	9.60±0.68 (5)	1.00±0.00 (4)	1.00±0.00 (4)	3.80±0.20 (5)	4.80±0.80 (5)
Kandhla	11.20±0.58 (5)	9.60±0.51 (5)	1.00±0.00 (5)	1.00±0.00 (3)	4.00±0.32 (5)	3.60±0.25 (5)
Budhana	7.00±1.70 (5)	5.80±1.46 (5)	1.50±0.29 (4)	-	3.00±1.08 (4)	2.60±0.40 (5)

Table 59. Block wise analysis of variance (ANOVA) for different categories of buffaloes i.e. total, milch and dry buffaloes, heifers (>1 Y), male calves (< 1 Y) and female calves (< 1 Y)

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total buffaloes	Between Groups	796.86	13	61.29	2.860	0.000
	Within Groups	1133.70	53	21.39		
	Total	1930.56	66			
Milch buffaloes	Between Groups	654.37	13	50.33	2.930	0.000
	Within Groups	908.40	53	17.14		
	Total	1562.77	66			
Dry buffaloes	Between Groups	6.46	13	0.49	1.210	0.320
	Within Groups	10.20	25	0.40		
	Total	16.66	38			
Heifers (> 1 year)	Between Groups	0.29	11	0.02	0.690	0.720
	Within Groups	0.66	17	0.039		
	Total	0.96	28			
Male calves	Between Groups	82.14	13	6.31	2.170	0.020
(< 1 year)	Within Groups	148.46	51	2.91		
	Total	230.61	64			
Female calves	Between Groups	189.17	13	14.55	2.610	0.000
(<1 year)	Within Groups	288.95	52	5.55		
	Total	478.12	65			

Table 60. Block wise lactation length, dry period and conception rates in cattle and buffaloes

Particulars	Lactation length (d)				Dry period (d)				Conception rate (%)	
	Cattle		Buffalo		Cattle		Buffalo		Cattle	Buffalo
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum		
Overall mean (µ)	291.69±0.70 (59)	297.12±0.65 (59)	267.24±0.56 (67)	272.39±0.56 (67)	65.25±0.35 (59)	72.20±0.46 (59)	89.85±0.11 (67)	94.85±0.11 (67)	55.76±1.06 (59)	50.60±0.46 (67)
Blocks										
Shamli	283.33±1.67 (3)	290.00±0.00 (3)	266.00±1.00 (5)	271.00±1.00 (5)	70.00±5.00 (3)	78.33±3.33 (3)	90.00±0.00 (5)	95.00±0.00 (5)	56.67±1.67 (3)	51.00±1.00 (5)
Oon	285.00±0.00 (4)	291.25±1.25 (4)	265.00±0.00 (5)	271.00±1.00 (5)	65.00±0.00 (4)	75.00±0.00 (4)	90.00±0.00 (5)	95.00±0.00 (5)	56.25±2.39 (4)	52.00±3.39 (5)
Thana Bhawan	289.00±1.87 (5)	294.00±1.87 (5)	261.00±1.00 (5)	266.00±1.00 (5)	66.00±1.00 (5)	75.00±0.00 (5)	90.00±0.00 (5)	95.00±0.00 (5)	57.00±2.00 (5)	49.00±1.87 (5)
Morna	292.00±1.23 (5)	297.00±1.23 (5)	265.00±2.04 (4)	271.25±2.39 (4)	68.00±1.23 (5)	72.00±2.00 (5)	90.00±0.00 (4)	95.00±0.00 (4)	57.00±1.23 (5)	48.75±1.25 (4)
Jaansath	282.50±1.44 (4)	290.00±0.00 (4)	264.00±1.00 (5)	269.00±1.00 (5)	65.00±0.00 (4)	73.75±1.25 (4)	90.00±0.00 (5)	95.00±0.00 (5)	57.50±2.50 (4)	52.00±2.00 (5)
Charthawal	295.00±0.00 (5)	300.00±0.00 (5)	270.00±1.58 (5)	277.00±1.23 (5)	64.00±1.00 (5)	70.00±0.00 (5)	90.00±0.00 (5)	95.00±0.00 (5)	45.00±11.29 (5)	52.00±1.23 (5)
Purkaji	300.00±0.00 (2)	305.00±0.00 (2)	272.00±2.00 (5)	275.00±2.24 (5)	60.00±0.00 (2)	65.00±0.00 (2)	88.00±1.23 (5)	93.00±1.23 (5)	55.00±5.00 (2)	51.00±1.87 (5)
Khatauli	297.00±1.23 (5)	303.00±2.00 (5)	263.00±3.00 (5)	268.00±3.00 (5)	64.00±1.00 (5)	69.00±1.00 (5)	90.00±0.00 (5)	95.00±0.00 (5)	58.00±1.23 (5)	52.00±1.23 (5)
Sahapur	295.00±0.00 (3)	300.00±0.00 (3)	275.00±0.00 (4)	280.00±0.00 (4)	65.00±0.00 (3)	70.00±0.00 (3)	90.00±0.00 (4)	95.00±0.00 (4)	56.67±3.33 (3)	51.25±2.39 (4)

Table 60. Contd...

Particulars	Lactation length (d)				Dry period (d)				Conception rate (%)	
	Cattle		Buffalo		Cattle		Buffalo		Cattle	Buffalo
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum		
Baghra	285.00±0.00	290.00±0.00	265.00±0.00	270.00±0.00	65.00±0.00	75.00±0.00	90.00±0.00	95.00±0.00	56.25±1.25	49.00±1.00
	(4)	(4)	(5)	(5)	(4)	(4)	(5)	(5)	(4)	(5)
Muzaffarnagar	295.00±0.00	300.00±0.00	270.00±0.00	275.00±0.00	65.00±0.00	75.00±0.00	90.00±0.00	95.00±0.00	56.25±2.39	51.25±2.39
Sadar	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)
Kairana	294.00±1.00	299.00±1.00	267.00±1.23	272.00±1.23	65.00±0.00	72.00±1.23	90.00±0.00	95.00±0.00	56.00±1.00	49.00±1.00
	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Kandhla	295.00±0.00	300.00±0.00	270.00±0.00	275.00±0.00	65.00±0.00	70.00±0.00	90.00±0.00	95.00±0.00	56.00±1.87	49.00±1.87
	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Budhana	295.00±0.00	300.00±0.00	270.00±0.00	275.00±0.00	65.00±0.00	70.00±0.00	90.00±0.00	95.00±0.00	58.00±1.23	51.00±1.00
	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)

Table 61. Block wise analysis of variance (ANOVA) for lactation length, dry period and conception rates in cattle and buffaloes

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Lactation length in cattle (minimum)	Between Groups	1488.84	13	114.52	26.880	0.000
	Within Groups	191.66	45	4.25		
	Total	1680.50	58			
Lactation length in cattle (maximum)	Between Groups	1241.41	13	95.49	19.640	0.000
	Within Groups	218.75	45	4.86		
	Total	1460.16	58			
Lactation length in buffaloes (minimum)	Between Groups	914.17	13	70.32	8.280	0.000
	Within Groups	450.00	53	8.49		
	Total	1364.17	66			
Lactation length in buffaloes (maximum)	Between Groups	879.16	13	67.62	7.330	0.000
	Within Groups	488.75	53	9.22		
	Total	1367.91	66			
Dry period in cattle (minimum)	Between Groups	181.18	13	13.93	2.610	0.000
	Within Groups	240.00	45	5.33		
	Total	421.18	58			
Dry period in cattle (maximum)	Between Groups	498.14	13	38.31	8.000	0.000
	Within Groups	215.41	45	4.78		
	Total	713.55	58			
Dry period buffalo minimum	Between Groups	18.50	13	1.42	2.510	0.000
	Within Groups	30.00	53	0.56		
	Total	48.50	66			
Dry period in buffaloes (maximum)	Between Groups	18.50	13	1.42	2.510	0.000
	Within Groups	30.00	53	0.56		
	Total	48.50	66			
Conception rate in cattle	Between Groups	666.09	13	51.23	0.720	0.720
	Within Groups	3174.58	45	70.54		
	Total	3840.67	58			
Conception rate in buffaloes	Between Groups	109.86	13	8.45	0.540	0.880
	Within Groups	816.25	53	15.40		
	Total	926.11	66			

Conception rates

The block effect was non-significant on conception rates in cattle and buffaloes (Table 61). It has been observed that overall conception rate was 55.76±1.06 and 50.60±0.46 %, respectively, in cattle and buffaloes. The ranges for conception rates in cattle and buffaloes varied from 45.00±11.29 (Charthawal) to 58.00±1.23 % (Budhana and khatauli) and 48.75±1.25 (Morna) and 52.00±3.39 (Oon), respectively (Table 60).

The considerable values of conception rates in the equired her may be due to use natural mating in the herd, though technically AI is recommended which usually expressed low values of CR% as compared to natural service.

Mortality in cattle and buffaloes

It has been observed that mortality of animals differed in different age groups for surveyed private dairy farms. Regarding young cattle (<1 year) majority (64.29%) of the dairy farms had mortality in the range of 10-15 % while these figures for adult cattle, young buffaloes (<1 year) and adult buffaloes were 1-2% (65.71%), 10-15% (72.86%) and 1-2% (82.86%), respectively (Table 62). It indicated that in young cattle and buffaloes the mortality% was 10-15 as was stated by majority of the respondents (64.29% of cattle reares and 72.86% of buffalo reares, Table 62).

4.3.3 Cost of cattle and buffalo purchase, per day minimum and maximum milk yields of cattle and buffaloes and total per day milk production of cattle, buffalo and grand total

The block effect was highly significant ($P \leq 0.01$) on cost of cattle and buffalo purchase, per day minimum and maximum milk yield of buffaloes and total milk production of buffalo per day (Table 64). The overall means for cost of purchase, per day minimum and maximum milk yields, total milk production per day in cattle and buffaloes were Rs. 35186.44±341.44 & Rs. 51791.04±378.97, 11.00±0.15 & 8.27±0.06 kg/d, 12.17±0.14 & 9.42±0.07 kg/d, 82.22±6.92 and 92.90±5.19 kg/d, respectively. The overall means for total milk production (per day including that of cattle and buffaloes both) was 158.21±4.40 kg (Table 63).

The block wise ranges for cost of cattle and buffalo purchase varied from Rs. 30000.00 (Purkaji) to Rs. 38750.00±1250.00 (Baghra) and Rs. 48000.00±1224.74 (Khatauli) to Rs. 55000.00 (Baghra, Oon and Thana Bhawan).

Table 62. Mortality in young and adult cattle and buffaloes

Age groups	Mortality range	Blocks														Total	% of Total
		Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan		
Young cattle	8-10	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1.43
(< 1 year)	10	0	0	0	0	0	1	1	0	1	0	0	0	0	2	5	7.14
	10-15	3	4	3	3	4	4	1	5	1	3	2	5	4	3	45	64.29
	10-20	0	0	0	1	0	0	0	0	0	1	2	0	1	0	5	7.14
	15-20	0	0	2	1	0	0	0	0	0	0	0	0	0	0	3	4.29
	No idea	2	1	0	0	1	0	3	0	2	1	1	0	0	0	11	15.71
Adult cattle	1-2	0	4	4	5	0	5	2	5	3	2	2	5	4	5	46	65.71
	2-3	3	0	1	0	4	0	0	0	0	2	2	0	1	0	13	18.57
	No idea	2	1	0	0	1	0	3	0	2	1	1	0	0	0	11	15.71
Young	10	0	0	0	0	0	1	1	0	1	0	0	0	0	2	5	7.14
buffaloes	10-15	5	5	2	2	4	4	4	5	3	3	2	5	4	3	51	72.86
(< 1 year)	10-20	0	0	0	0	1	0	0	0	0	2	2	0	1	0	6	8.57
	15-20	0	0	3	2	0	0	0	0	0	0	0	0	0	0	5	7.14
	No idea	0	0	0	1	0	0	0	0	1	0	1	0	0	0	3	4.29
Adult buffaloes	1-2	3	5	5	4	3	5	5	5	4	2	3	5	4	5	58	82.86
	2-3	2	0	0	0	2	0	0	0	0	3	1	0	1	0	9	12.86
	No idea	0	0	0	1	0	0	0	0	1	0	1	0	0	0	3	4.29

Table 63. Block wise costs of cattle and buffalo purchase (Rs.), per day minimum and maximum milk yields of cattle and buffaloes and total per day milk production of cattle, buffaloes and grand total

Particular	Cost of Purchase (Rs.)		Per day milk yield (kg)				Total per day milk production (kg)		
			Minimum		Maximum				
	Cattle	Buffalo	Cattle	Buffalo	Cattle	Buffalo	Cattle	Buffalo	Total
Overall mean (μ)	35186.44±341.44	51791.04±378.97	11.00±0.15	8.27±0.06	12.17±0.14	9.42±0.07	82.22±6.92	92.90±5.19	158.21±4.40
	(59)	(67)	(59)	(67)	(59)	(67)	(59)	(67)	(70)
Blocks									
Baghra	38750.00±1250.00	55000.00±0.00	11.25±1.25	8.20±0.20	12.50±1.19	9.20±0.20	97.25±17.13	94.00±14.78	171.80±16.23
	(4)	(5)	(4)	(5)	(4)	(5)	(4)	(5)	(5)
Budhana	34000.00±1000.00	50000.00±0.00	10.80±0.20	8.60±0.24	12.00±0.00	10.00±0.00	100.80±12.35	54.40±14.88	155.20±7.96
	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Charthawal	36000.00±1000.00	51000.00±1000.00	11.00±0.32	9.00±0.00	12.20±0.20	10.00±0.00	87.60±5.23	62.80±10.48	150.40±6.85
	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Jaansath	35000.00±0.00	53000.00±1224.74	11.00±0.00	8.40±0.24	12.00±0.00	9.60±0.24	35.75±4.91	119.20±15.40	147.80±9.53
	(4)	(5)	(4)	(5)	(4)	(5)	(4)	(5)	(5)
Kandhla	36000.00±1000.00	51000.00±1000.00	11.00±0.00	8.40±0.24	12.00±0.00	9.40±0.24	67.20±12.92	91.80±3.64	159.00±10.78
	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Kairana	34000.00±1000.00	51000.00±1000.00	10.80±0.20	8.00±0.00	12.00±0.00	9.00±0.00	57.60±7.96	86.40±6.10	144.00±8.64
	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Khatauli	32000.00±1224.74	48000.00±1224.74	10.80±1.20	7.80±0.20	12.00±1.10	9.20±0.37	44.00±12.71	103.60±15.60	147.60±6.71
	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)
Morna	36000.00±1000.00	51250.00±1250.00	12.00±0.63	8.50±0.29	13.20±0.80	9.75±0.25	124.20±40.44	59.00±9.88	171.40±28.07
	(5)	(4)	(5)	(4)	(5)	(4)	(5)	(4)	(5)

Table 63. Contd...

Particular	Cost of Purchase (Rs.)		Per day milk yield (kg)				Total per day milk production (kg)		
			Minimum		Maximum				
	Cattle	Buffalo	Cattle	Buffalo	Cattle	Buffalo	Cattle	Buffalo	Total
Muzaffarnagar	37500.00±1443.38	52500.00±1443.38	11.00±0.41	7.75±0.25	12.25±0.63	8.75±0.25	122.75±53.21	135.00±21.45	206.20±29.06
Sadar	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(4)	(5)
Oon	35250.00±250.00	55000.00±0.00	11.25±0.25	8.00±0.00	12.25±0.25	9.20±0.20	66.00±20.49	89.40±13.31	142.20±9.30
	(4)	(5)	(4)	(5)	(4)	(5)	(4)	(5)	(5)
Purkaji	30000.00±0.00	49000.00±1870.83	10.50±0.50	8.20±0.20	12.00±0.00	9.20±0.20	126.00±90.00	140.20±36.90	190.60±28.11
	(2)	(5)	(2)	(5)	(2)	(5)	(2)	(5)	(5)
Sahapur	36666.67±1666.67	51250.00±1250.00	10.33±0.33	8.25±0.25	12.00±0.00	9.50±0.29	104.00±47.16	106.50±28.65	147.60±10.05
	(3)	(4)	(3)	(4)	(3)	(4)	(3)	(4)	(5)
Shamli	35000.00±0.00	52000.00±1224.74	11.00±0.00	8.20±0.20	12.00±0.00	9.20±0.20	56.00±4.00	102.60±13.90	136.20±6.70
	(3)	(5)	(3)	(5)	(3)	(5)	(3)	(5)	(5)
Thana Bhawan	35000.00±0.00	55000.00±1581.14	10.80±0.20	8.40±0.24	11.80±0.20	9.80±0.20	85.00±4.88	60.00±4.47	145.00±3.58
	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)	(5)

Table 64. Block wise analysis of variance (ANOVA) for costs of cattle and buffalo purchase (Rs.), per day minimum and maximum milk yields of cattle and buffaloes and total per day milk production of cattle, buffaloes and grand total

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Cost of cattle purchase	Between Groups	207800000.00	13	15980000.00	3.760	0.000
	Within Groups	191200000.00	45	4248148.15		
	Total	398900000.00	58			
Cost of buffalo purchase	Between Groups	302600000.00	13	23270000.00	3.710	0.000
	Within Groups	332500000.00	53	6273584.91		
	Total	635100000.00	66			
Per day minimum milk yield of cattle	Between Groups	8.13	13	0.63	0.440	0.950
	Within Groups	63.87	45	1.42		
	Total	72.00	58			
Per day minimum milk yield of buffalo	Between Groups	6.66	13	0.51	2.590	0.010
	Within Groups	10.50	53	0.20		
	Total	17.16	66			
Per day maximum milk yield of cattle	Between Groups	7.41	13	0.57	0.420	0.950
	Within Groups	60.90	45	1.35		
	Total	68.31	58			
Per day maximum milk yield of buffalo	Between Groups	8.60	13	0.66	3.000	0.000
	Within Groups	11.70	53	0.22		
	Total	20.30	66			
Total milk production of cattle/day	Between Groups	46667.09	13	3589.78	1.380	0.210
	Within Groups	117091.05	45	2602.02		
	Total	163758.14	58			

Table 64. Contd...

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total milk production of buffalo/day	Between Groups	45752.07	13	3519.39	2.550	0.010
	Within Groups	73200.20	53	1381.14		
	Total	118952.27	66			
Total milk production/day	Between Groups	26160.99	13	2012.38	1.670	0.090
	Within Groups	67360.80	56	1202.87		
	Total	93521.79	69			

The range for per day minimum and maximum milk yield in buffaloes varied from 7.75±0.25 (Muzaffarnagar Sadar) to 9.00 kg/d (Charthawal) and 8.75±0.25 (Muzaffarnagar Sadar) to 10.00 kg (Budhana and Charthawal). The range for total per day milk production of buffalo varied from 54.40±14.88 (Budhana) to 140.20±36.90 Kg (Purkaji, Table 63).

Kundu and Basu (1991) investigated on small and large herds to determine the effect of various management factors on herd average milk production and found that herd size was significantly related to milk production. Dixit and Laharia (1996) in their study on farmers constraints in buffalo husbandry in Haryana revealed that herd size had positive and significant relationship with the total constraints score for both the less developed and developed villages. Kumar *et al.* (1998) have done a study on herd size productivity relationship and returns of sale in milk production. It was concluded that yield per milch animal can be increased substantially and significantly with the increase in the herd size. Reddy *et al.* (2000) also reported that milk production is in positive relation with increase in herd size. Mundhwa and Padheriab (1998) observed that 63.56 per cent of dairy women were possessed medium herd size (4 to 10 animals), followed by large herd size i.e. above 10 animals (29.33 %) and small herd size i.e. 1 to 3 animals (7.11 %). Sharma *et al.* (1999) investigated on labour input of selected herds in Rajasthan found that the labour input decreased significantly with increase in herd size, with herd sizes of 23, 23-42, 43-68 and above 68 SAU, the labour required was 2.71, 2.55, 2.09 and 1.83 man hours/SAU/day. Keshava and Mandape (2001) analysed the potentials and problems of dairy farming in North Bihar and found that herd size was largest (3.82 cattle equivalents) on small farms and lowest (2.18 cattle equivalents) on medium-large farms Gour (2002) revealed that two fifth (40.76 %) of the dairy farmers had low level herd size, followed by 32.50 with high and 26.74 with medium herd size. Shah *et al.* (2002) in their study in *Uttaranchal* State observed that 55% of the sample households were from marginal land holding category with land holding up to 2.50 acres. Dairying

was observed to be an important secondary enterprise among 47.50% of sample households and the herd size maintained in half of the selected households was medium sized (5-6 dairy animals).

Kumar (2004) based on a study on optimal farm plans in Haryana suggested that increase in number of milch animals in the rain fed dairy farming systems could further increase farm income. So, in previous studies on relationship in milk productivity and herd size both positive and negative association has been reported. This difference could be attributed mainly to differences in management practices and their efficient use in different farms. However, most of the studies concluded that cost of milk production per litre of milk was lesser in large farms. According to Baruah *et al.* (1996), in Assam, the cost of production per litre of milk was observed to be Rs. 8.47, 8.23, 8.28, 8.38 and 8.08 in <4, 4-6, 7-9, 10-12 and > 10 animal unit sizes, respectively. The large farms in India and Pakistan produce milk at a cost of US $9–12/100 kg ECM, which have an advantage of 48% lower costs than large size farms in Brazil and New Zealand. The average size farms with 1–2 milk animals in India and Pakistan are not competitive in the longer run as compared to average size farms in Brazil and New Zealand due to higher opportunity cost of family labour (Mahmood *et al.*, 2004). Gangil and Dabas (2005) found that farmers possessing large herd have more knowledge in animal husbandry than the farmers possessing smaller herd. Savitha *et al.* (2005) conducted a study on the role of rural women in dairy enterprise in Dharwad and found that herd size was positively and significantly associated with the time spending pattern of the respondents. As the herd size increased, the amount of time spent on washing the animals, milking and various activities of dairy enterprise also increased. Reviews on herd size indicated that, the smaller farms had large herd size and vice versa. The herd size showed positive and significant relationship with adoption of dairy Innovations. Reddy *et al.* (2000) also reported that milk production is in positive relation with increase in herd size. Shah (2005) reported that the average family size was 5-6 persons among the dairy keepers in Maharashtra. Further, the operational land holding

increased with the increase in herd size thus revealing positive relationship between herd size and land holding. Kumar *et al.* (2006) conducted a micro level study in Andaman and Nicobar Islands. The study revealed that for all the farm size categories, the total investment on local cow and crossbred cow was Rs. 9034.45 and 22304.13, respectively. Of which, 77.36 and 75.89 percent was on milch animals, 20.69 and 22.49 percent on dairy buildings and 1.95 and 1.61 percent on dairy equipments and machineries, respectively. It was also reported that there is a positive relationship between investment on milch animals and size of the farm. While there is a negative relationship between investment on dairy buildings and size of the farm in crossbred cows. Tauer and Mishra (2006) reported that the higher cost of production on many smaller farms in United States is caused by inefficiency rather than failure in adoption of technologies. Ranaweera (2007) in his study on small holder dairy farmers in Sri Lanka found that majority reaction among farmers was to increase the herd size. However, due to the shortage of grazing land (3/9) and difficulty in obtaining good animals (5/9) farmers are not in favour of it.

4.4 INDICATIVE ECONOMIC AND VIABILITY OF PRIVATE DAIRY FARMS

4.4.1 Fixed costs incurred

It has been observed that the block had highly significant effects ($P \leq 0.01$) on total cost of land, cost of cattle and transportation cost of animal from Haryana and Budhana (Table 66).

The overall mean for total cost of land, cost of cows, cost of buffaloes and transportation cost of animal from Haryana and Budhana were Rs. 29.87±1.60 lakhs, Rs. 35186.44±341.44, Rs. 51791.04±378.97, Rs. 691.43±18.73 and Rs. 383.08±10.64, respectively. The ranges for total cost of land, cost of cattle, cost of buffaloes and transportation cost of animals from Haryana and Budhana varied between Rs. 17.40±1.12 lakhs (Jaansath) and Rs. 61.20±7.31 lakhs (Muzaffarnagar Sadar), Rs. 30000.00 (Purkaji) to Rs. 38750.00±1250.00 (Baghra),

Table 65. Block wise means for various fixed costs incurred by private dairy farms

	Total cost of land (lakhs)	Cost of shed (lakhs)	Cost of purchase of cows (Rs.)	Cost of purchase of buffaloes (Rs.)	Fixed cost of machines (Rs.)	Fixe cost of utensils (Rs.)	Transportation cost of livestock (per animal) for Haryana (Rs.)	Transportation cost of livestock (per animal) from Budhana (Rs.)
Overall mean (μ)	29.87±1.60 (70)	2.97±0.09 (70)	35186.44±341.44 (59)	51791.04±378.97 (67)	101178.57±14069.92 (70)	5764.29±185.59 (70)	691.43±18.73 (70)	383.08±10.65 (65)
Blocks								
Shamli	25.00±1.58 (5)	3.40±0.25 (5)	35000.00±0.00 (3)	52000.00±1224.75 (5)	137500.00±66351.34 (5)	5500.00±387.30 (5)	500.00±0.00 (5)	300.00±0.00 (5)
Oon	23.40±1.99 (5)	3.10±0.25 (5)	35250.00±250.00 (4)	55000.00±0.00 (5)	216000.00±47497.37 (5)	5400.00±400.00 (5)	460.00±40.00 (5)	400.00±0.00 (5)
Thana Bhawan	20.00±2.59 (5)	2.70±0.37 (5)	35000.00±0.00 (5)	55000.00±1581.14 (5)	84000.00±54000.00 (5)	5000.00±0.00 (5)	460.00±24.50 (5)	220.00±20.00 (5)
Morna	22.00±2.19 (5)	2.80±0.37 (5)	36000.00±1000.00 (3)	51250.00±1250.00 (4)	172000.00±58685.60 (5)	5000.00±0.00 (5)	980.00±20.00 (5)	520.00±20.00 (5)
Jaansath	17.40±1.12 (5)	2.80±0.37 (5)	35000.00±0.00 (4)	53000.00±1224.75 (5)	33000.00±2000.00 (5)	4800.00±489.90 (5)	780.00±37.42 (5)	460.00±24.50 (5)
Charthawal	18.60±1.40 (5)	2.80±0.37 (5)	36000.00±1000.00 (3)	51000.00±1000.00 (5)	78000.00±55533.77 (5)	5000.00±0.00 (5)	640.00±24.50 (5)	380.00±20.00 (5)
Purkaji	23.20±4.50 (5)	3.20±0.37 (5)	30000.00±0.00 (2)	49000.00±1870.83 (5)	93000.00±64257.30 (5)	4800.00±200.00 (5)	720.00±37.42 (5)	460.00±24.50 (5)
Khatauli	31.00±5.10 (5)	2.80±0.20 (5)	32000.00±1224.75 (5)	48000.00±1224.75 (5)	90000.00±52630.79 (5)	6000.00±1183.22 (5)	720.00±80.00 (5)	400.00±0.00 (5)

Table 65. Contd....

	Total cost of land (lakhs)	Cost of shed (lakhs)	Cost of purchase of cows (Rs.)	Cost of purchase of buffaloes (Rs.)	Fixed cost of machines (Rs.)	Fixe cost of utensils (Rs.)	Transportation cost of livestock (per animal) for Haryana (Rs.)	Transportation cost of livestock (per animal) from Budhana (Rs.)
Sahapur	34.40±5.56 (5)	3.60±0.51 (5)	36666.67±1666.67 (3)	51250.00±1250.00 (4)	146000.00±73525.51 (5)	8000.00±1224.75 (5)	680.00±20.00 (5)	300.00±0.00 (5)
Baghra	37.60±3.49 (5)	3.20±0.20 (5)	38750.00±1250.00 (4)	55000.00±0.00 (5)	152000.00±71091.49 (5)	5800.00±374.17 (5)	740.00±24.50 (5)	400.00±0.00 (5)
Muzaffarnagar Sadar	61.20±7.31 (5)	3.20±0.37 (5)	37500.00±1443.38 (4)	52500.00±1443.38 (4)	40000.00±0.00 (5)	6800.00±489.90 (5)	900.00±0.00 (5)	440.00±24.50 (5)
Kairana	36.00±2.92 (5)	2.40±0.19 (5)	34000.00±1000.00 (5)	51000.00±1000.00 (5)	40000.00±0.00 (5)	5600.00±244.95 (5)	700.00±0.00 (5)	400.00±0.00 (5)
Kandhla	39.00±3.32 (5)	2.80±0.37 (5)	36000.00±1000.00 (5)	51000.00±1000.00 (5)	102000.00±62000.00 (5)	6000.00±0.00 (5)	700.00±0.00 (5)	300.00±0.00 (5)
Budhana	29.40±1.97 (5)	2.80±0.37 (5)	34000.00±1000.00 (5)	50000.00±0.00 (5)	33000.00±4358.90 (5)	7000.00±1224.75 (5)	700.00±0.00 (5)	- (5)

Table 66. Block wise analysis of variance (ANOVA) for various fixed costs incurred by private dairy farms

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total cost of land	Between Groups	8681.04	13	667.77	9.986	0.000
	Within Groups	3744.80	56	66.87		
	Total	12425.84	69			
Cost of shed	Between Groups	6.64	13	0.51	0.886	0.572
	Within Groups	32.30	56	0.58		
	Total	38.94	69			
Cost of purchase of cows	Between Groups	207782485.88	13	15983268.14	3.762	0.000
	Within Groups	191166666.67	45	4248148.15		
	Total	398949152.54	58			
Cost of purchase of buffaloes	Between Groups	302574626.87	13	23274971.30	3.710	0.000
	Within Groups	332500000.00	53	6273584.91		
	Total	635074626.87	66			
Fixed cost of machines	Between Groups	209589017857.14	13	16122232142.86	1.209	0.297
	Within Groups	746570000000.00	56	13331607142.86		
	Total	956159017857.14	69			
Fixed cost of utensils	Between Groups	57760714.29	13	4443131.87	2.291	0.016
	Within Groups	108600000.00	56	1939285.71		
	Total	166360714.29	69			
Transportation cost of livestock	Between Groups	1426857.14	13	109758.24	22.935	0.000
(per animal) from Haryana	Within Groups	268000.00	56	4785.71		
	Total	1694857.14	69			
Transportation cost of livestock	Between Groups	411384.62	12	34282.05	29.711	0.000
(per animal) from Budhana	Within Groups	60000.00	52	1153.85		
	Total	471384.62	64			

Rs. 48000.00±1224.74 (Khatauli) to Rs. 55000.00 (Baghra, Oon and Thana Bhawan), Rs. 460.00±24.50 (Thana Bhawan) to Rs. 980.00±20.00 (Morna) and Rs. 220.00±20.00 (Thana Bhawan) to Rs. 520.00±20.00 (Morna, Table 65).

The block expressed significant effect ($P \leq 0.05$) on total fixed cost of utensils too (Table 66). The overall mean total fixed cost of utensils was Rs. 5764.29±185.59. The range for total fixed cost of utensils varied between Rs. 4800±200 (Purkaji) and Rs. 8000±1224.75 (Sahapur, Table 65).

At the same time, the cost of shed and fixed cost of machines expressed non-significant effects of blocks (Table 66). The overall means for cost of shed and fixed cost of machines were Rs. 2.97±0.09 lakhs and Rs.101178.57±14069.92, respectively. The range for cost of shed and fixed cost of machines varied from Rs. 2.40±0.19 lakhs (Kairana) and Rs. 3.40±0.25 lakhs (Shamli) and Rs. 33000±2000 (Jaansath) to Rs. 216000±47497.37 (Oon, Fig. 16-19 and Table 65).

4.4.2 Monthly recurring expenditures

It has been observed that the block expressed highly significant effects ($P \leq 0.01$) on total salary of unskilled workers/m, total expenditure on green fodder/ m, total expenditure on concentrate/m, total monthly expenditure on ave. 5 veterinary visits, total expenditure on AI of 8% breedable females/m, total expenditure on one deworming (done on quarterly basis), total monthly expenditure on chaffing and total monthly expenditure on water and electricity (Table 68). The respective overall means were Rs. 7775.71±233.51, Rs. 7984.34±222.39, Rs. 52975.47±1480.32, Rs. 625.00±10.80, Rs. 150.26±5.37, Rs. 2583.64±165.38, Rs. 5293.94±128.69 and Rs.785.71±27.11 (Table 67). The respective ranges for these traits varied from Rs. 6400.00±509.90 (Jaansath) to Rs. 11800.00±1319.09 (Muzaffarnagar Sadar), Rs. 6201.60±354.52 (Thana Bhawan) to Rs. 11248.00±384.53 (Muzaffarnagar Sadar), Rs. 43943.20±2916.30 (Thana Bhawan) to Rs. 75969.60±7046.70 (Muzaffarnagar Sadar), Rs. 540.00±24.50 (Oon and Charthawal) to Rs. 750.00±79.06 (Purkaji and Muzaffarnagar Sadar), Rs. 108.96±6.44 (Thana Bhawan) to Rs. 220.80±29.90

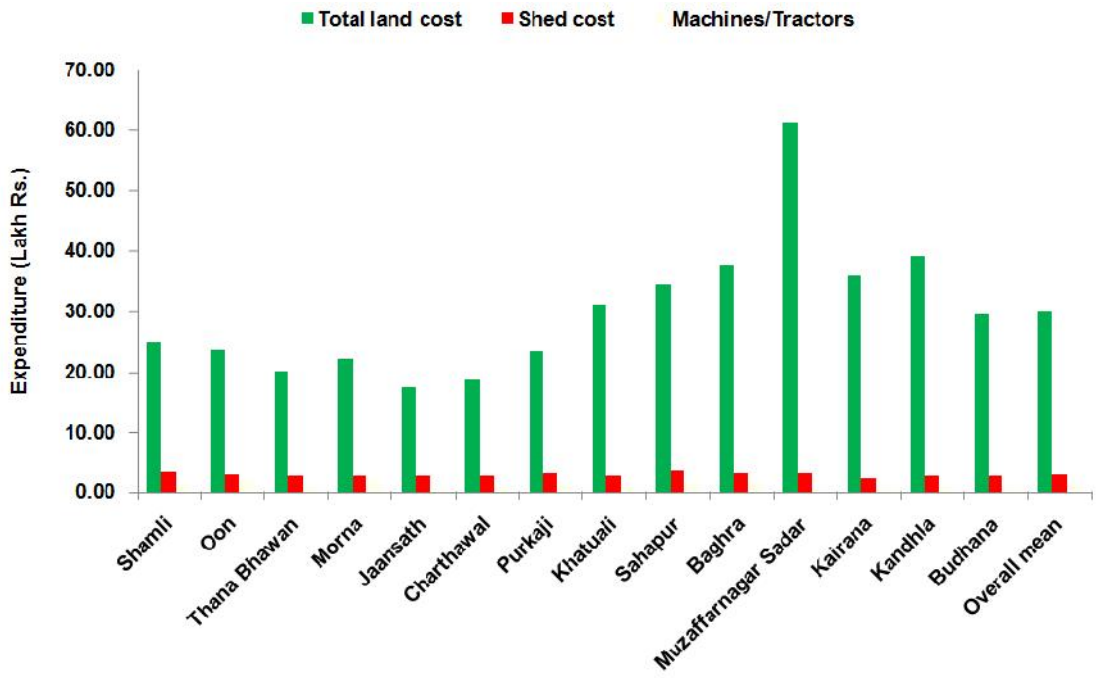

Fig. 16 : Fixed costs (Rs.) on land piece, shed and machines/tractors etc

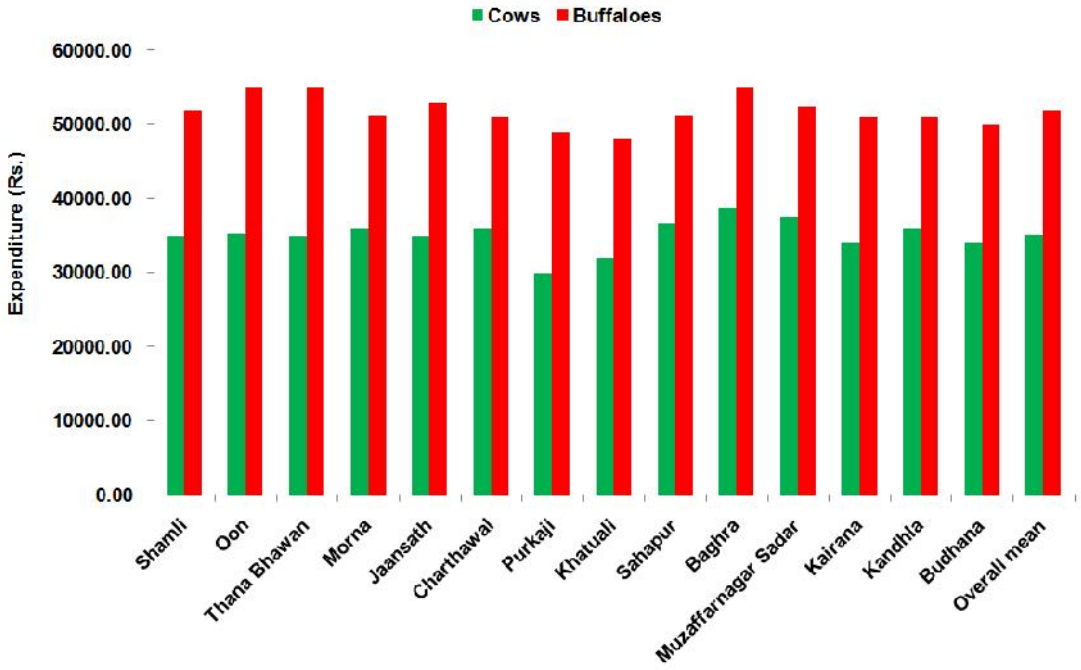

Fig. 17 : Expenditure on purchase of cattle and buffaloes (Rs.)

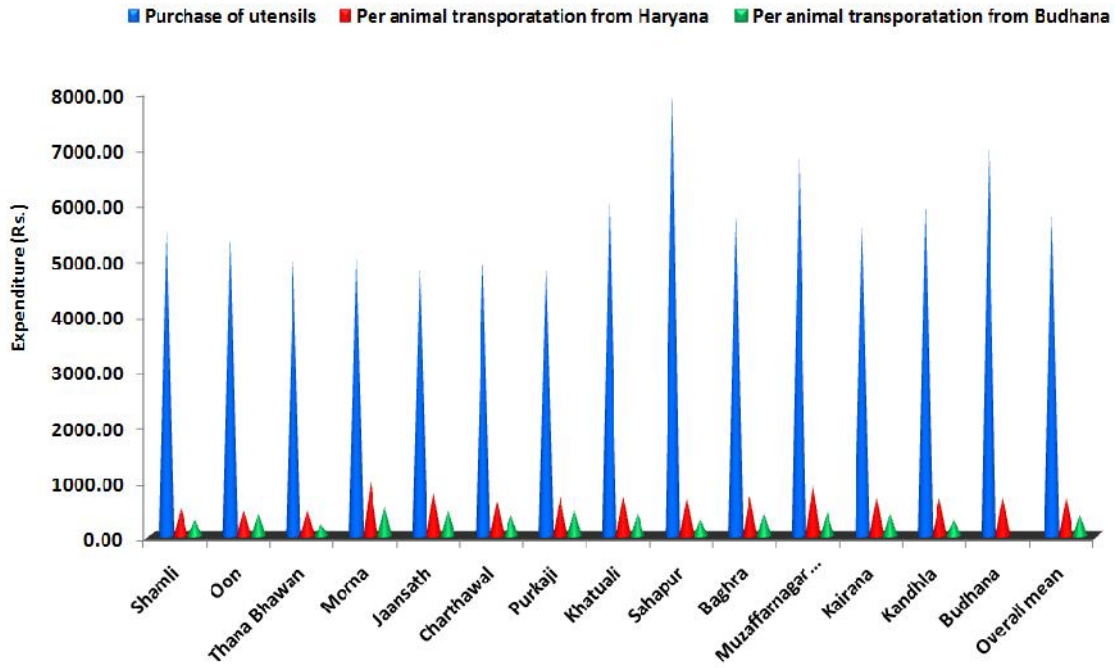

Fig. 18 : Expenditure on purchase of utensils along with one time per animal transportation cost from Haryana/Budhana (Rs.)

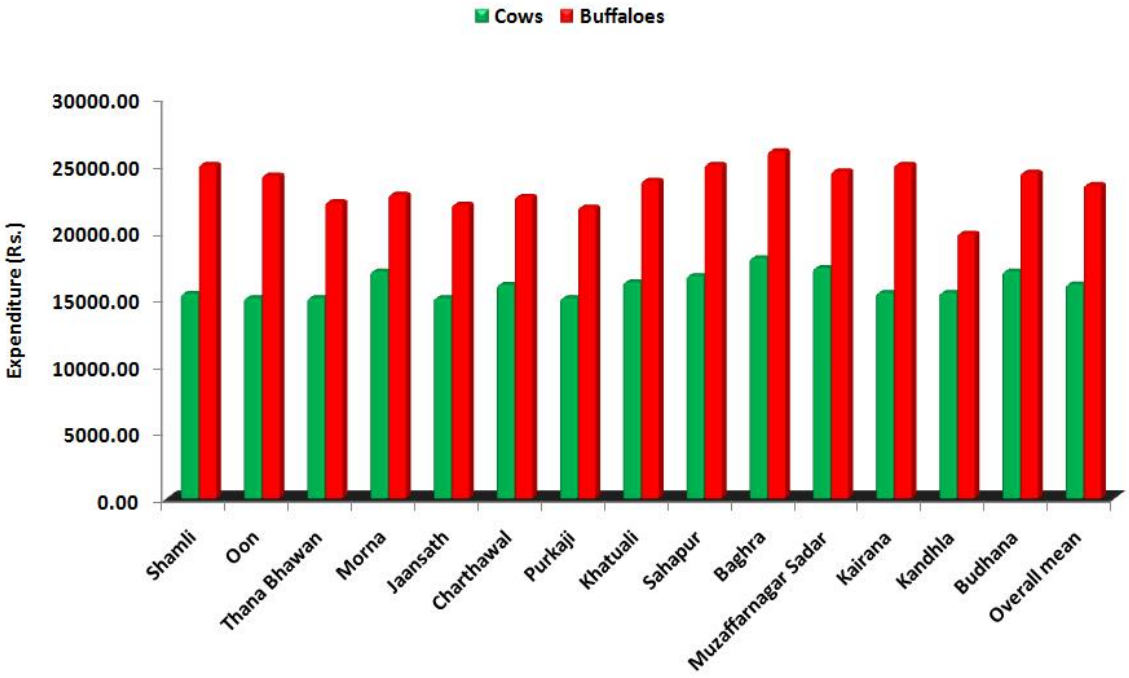

Fig. 19 : One time expected disposal costs of culled cows and buffaloes (Rs.)

(Muzaffarnagar Sadar), Rs. 810.00±810.00 (Purkaji) to Rs. 4325.00±718.93 (Muzaffarnagar Sadar), Rs. 4195.20±498.60 (Khatauli) to Rs. 6840.00±416.27 (Muzaffarnagar Sadar) and Rs. 490.00±33.17 (Morna) and Rs. 1400.00±161.25 (Muzaffarnagar Sadar, Table 67 and Fig. 20-23).

At the same time, block expressed non-significant effect on total monthly expenditure on dry fodder (Table 68). The overall mean for total monthly expenditure on dry fodder was Rs. 30932.00±729.88. The range for total monthly expenditure on dry fodder extended between Rs. 25536.00±2469.71 (Charthawal) to Rs. 38000.00±4162.69 (Muzaffarnagar Sadar, Table 67 and Fig. 22).

4.4.3 Monthly receipts of private dairy farms

4.4.3.1 Sale of milk

It has been observed that the block had highly significant effect ($P \leq 0.01$, Table 70) on total monthly income (Rs.) through sale of milk. The overall mean for total monthly income (Rs.) through sale of milk was Rs. 143231.77±4260.46. The range for total monthly income (Rs.) through sale of milk varied from Rs. 115106.56±3296.99 (Thana Bhawan) to Rs. 210489.60±25974 (Muzaffarnagar Sadar, Fig. 24 and Table 69).

4.4.3.2 Sale of manure and gunny bags

At the same time, block expressed highly significant effects ($P \leq 0.01$, Table 70) on total monthly income (Rs.) through sale of manure and gunny bags. The overall means for these traits were Rs. 1575.00±45.13 and Rs. 665.71±21.04. The range for these traits varied from Rs. 1180±91.65 (Charthawal) to Rs. 1960.00±40.00 (Shamli) and Rs. 460.00±50.99 (Sahapur) to Rs. 900.00±63.25 (Shamli, Fig. 25-26 and Table 69).

Economic viability of private dairy farms

Total monthly receipts

It has been observed that blocks had highly significant effect ($P \leq 0.01$) on total monthly receipts (Table 72). The overall mean for total monthly receipts

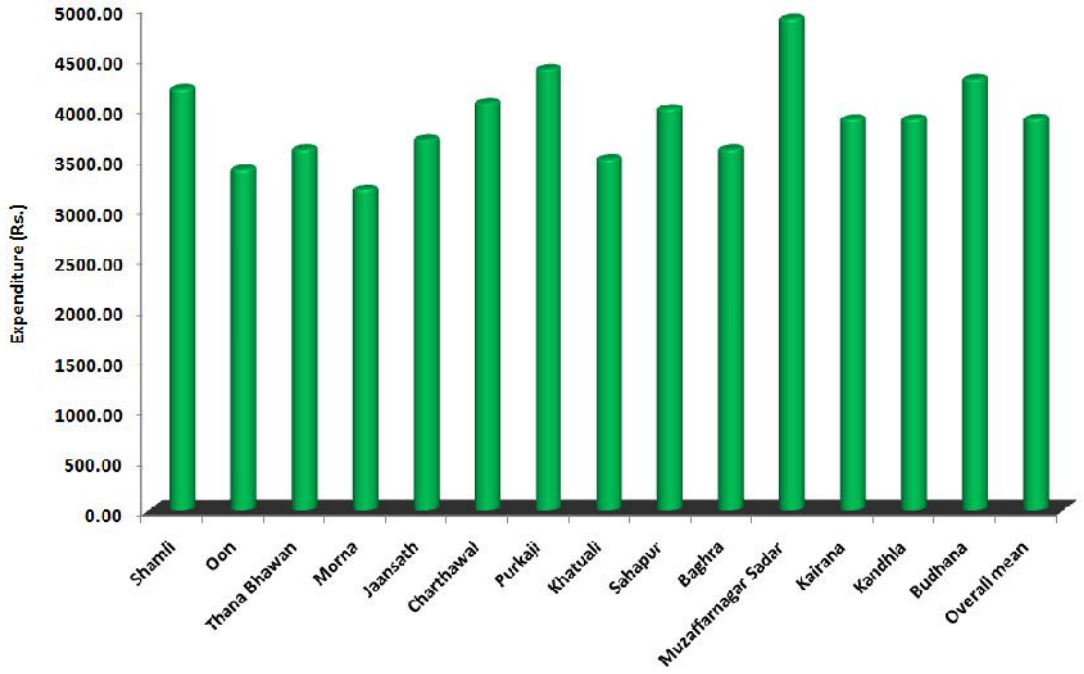

Fig. 20 : Monthly salary of unskilled manpower (Rs./m)

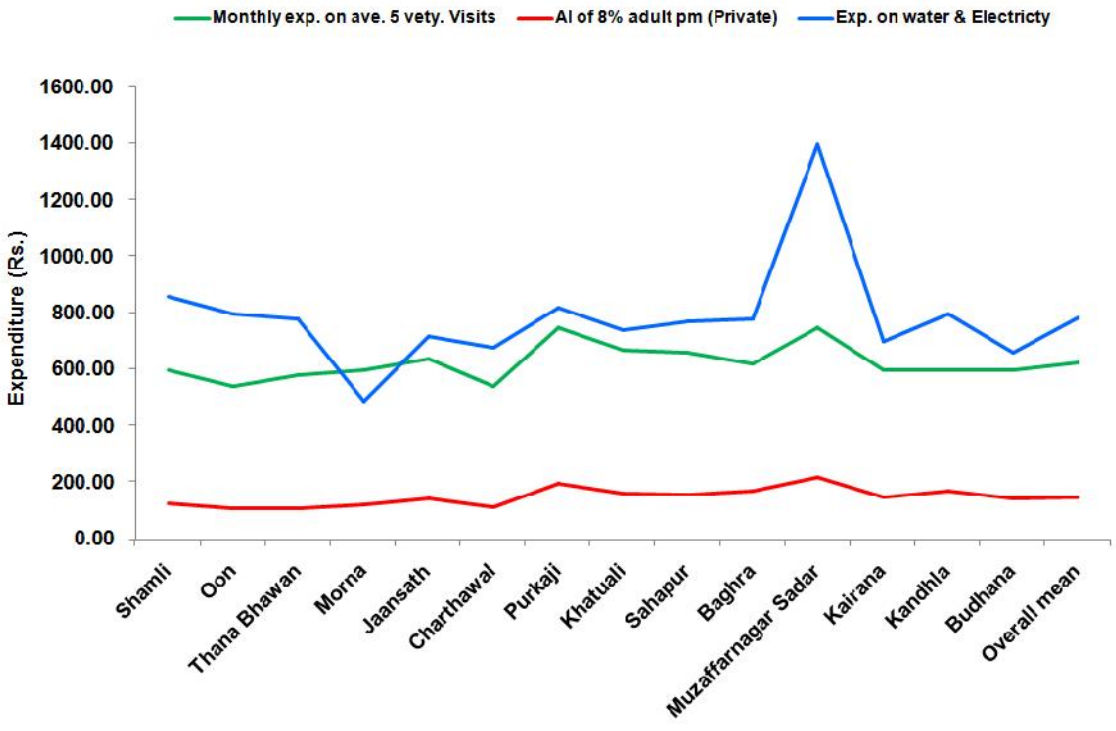

Fig. 21 : Monthly expenditure (Rs.) on vety. care, AI and water and electricity

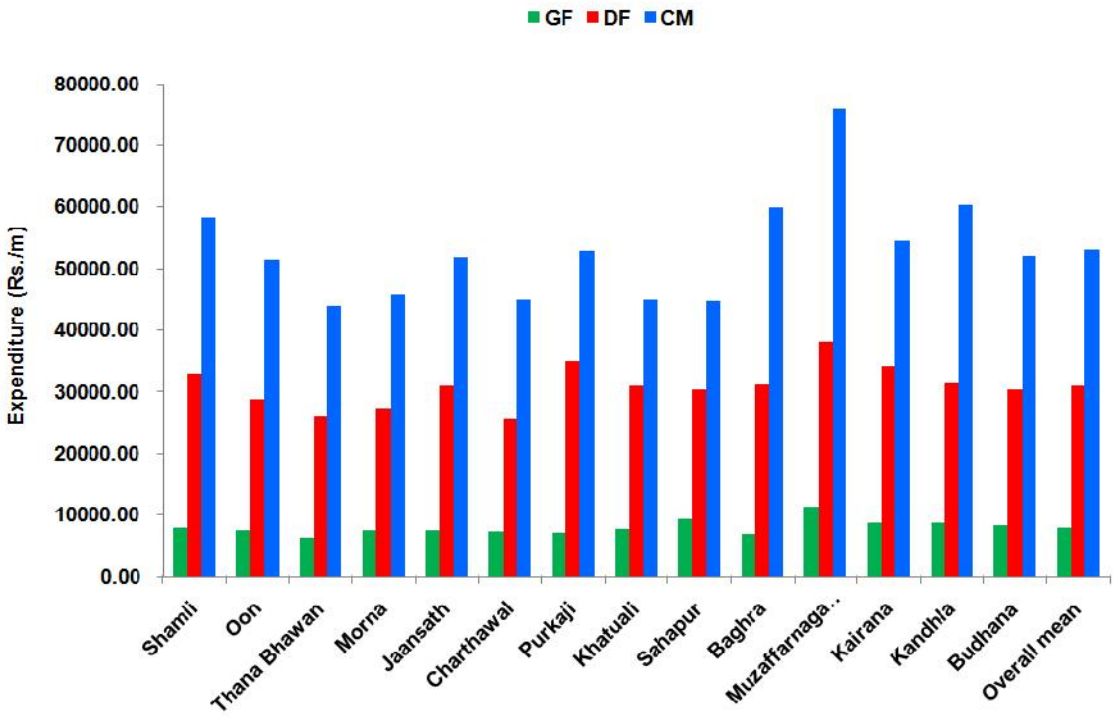

Fig. 22 : Monthly expenditure (Rs.) on green and dry fodder along with conc. mix.

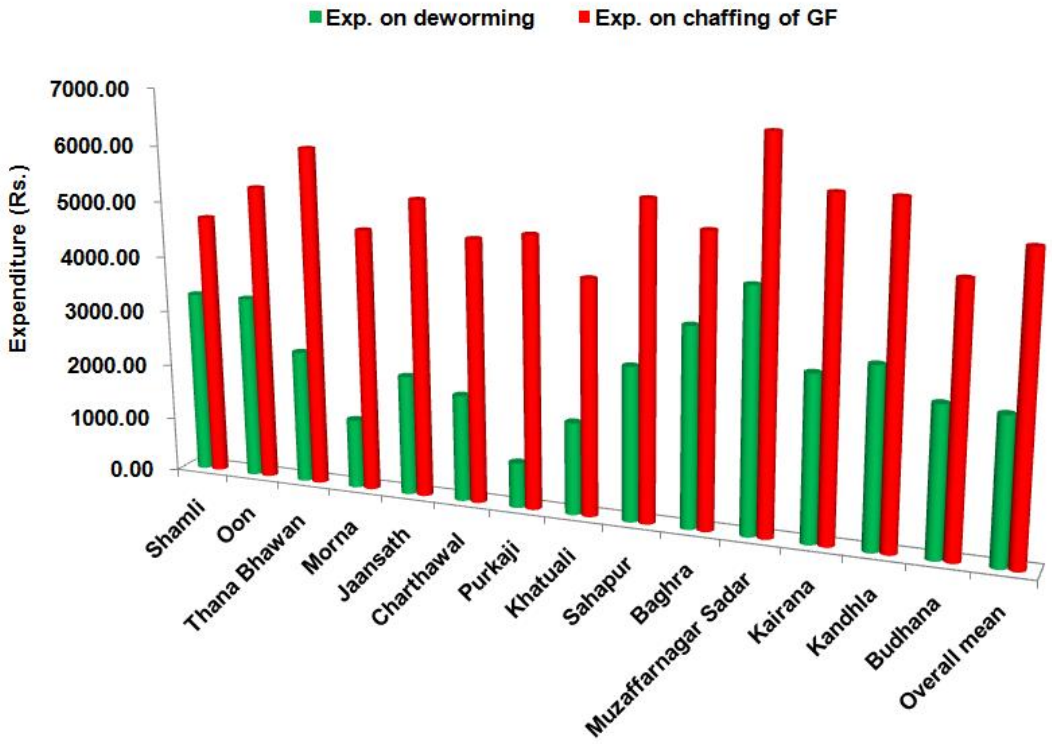

Fig. 23 : Monthly expenditure (Rs.) on deworming and chaffing of green fodder

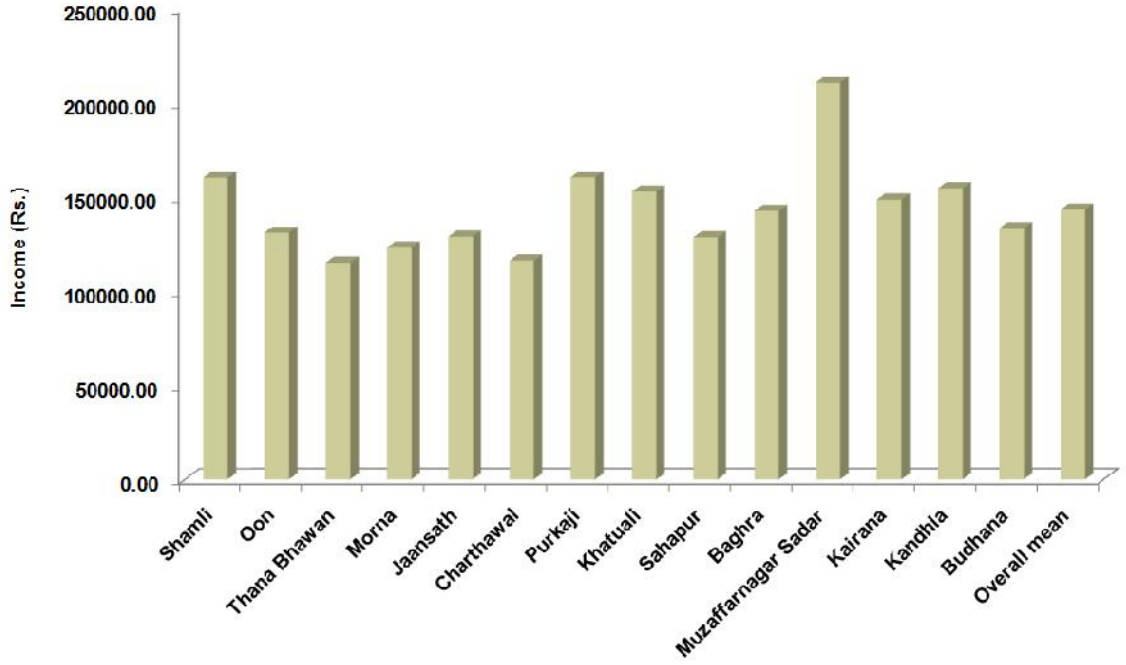

Fig. 24 : Block wise monthly income through sale of milk (Rs./m)

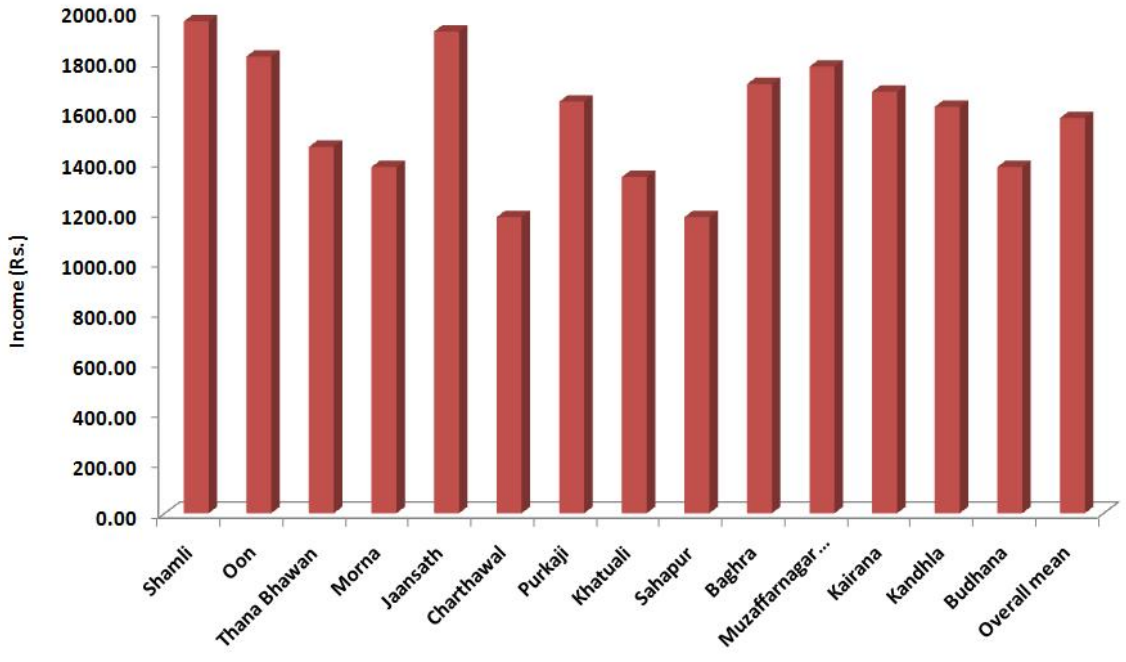

Fig. 25 : Block wise monthly income through sale of manure (Rs./m)

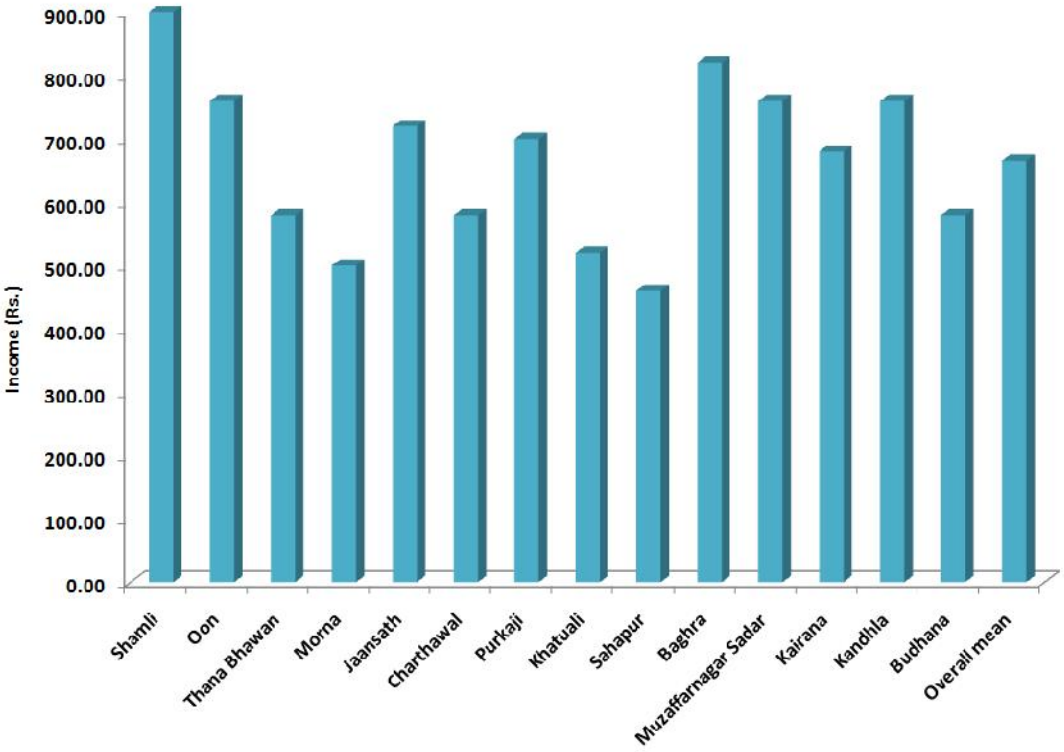

Fig. 26 : Block wise monthly income through sale of gunny bags (Rs./m)

Table 67. Block wise means for monthly recurring expenditures of private dairy farms

Particulars	Total salary on unskilled workers (Rs./m)	Total expenditure on green fodder (Rs./m)	Total expenditure on dry fodder (Rs./m)	Total expenditure on concentrate (Rs./m)	Total expenditure on Veterinary visits (Rs./m for 5 ave. visits)	Total expenditure on AI (Rs./m for 8% breedable/m)	Total expenditure on deworming (Rs./m)	Total expenditure on chaffing (Rs./m)	Total expenditure on water &electricity (Rs./m)
Overall mean (μ)	7775.71±233.51 (70)	7984.34±222.39 (70)	30932.00±729.88 (70)	52975.47±1480.32 (70)	625.00±10.80 (70)	150.26±5.37 (70)	2583.64±165.38 (70)	5293.94±128.69 (70)	785.71±27.11 (70)
Blocks									
Shamli	8400.00±244.95 (5)	7873.60±330.93 (5)	32832.00±2181.61 (5)	58337.60±2941.27 (5)	600.00±0.00 (5)	127.84±5.00 (5)	3281.00±173.42 (5)	4712.00±372.32 (5)	860.00±40.00 (5)
Oon	6800.00±374.17 (5)	7417.60±454.48 (5)	28728.00±1368.00 (5)	51467.20±3565.23 (5)	540.00±24.50 (5)	109.92±1.33 (5)	3288.00±163.78 (5)	5320.00±0.00 (5)	800.00±31.62 (5)
Thana Bhawan	6500.00±894.43 (5)	6201.60±354.52 (5)	25992.00±2559.29 (5)	43943.20±2916.30 (5)	580.00±20.00 (5)	108.96±6.44 (5)	2394.00±96.16 (5)	6080.00±480.67 (5)	780.00±48.99 (5)
Morna	6400.00±244.95 (5)	7539.20±1063.57 (5)	27360.00±3746.42 (5)	45782.40±6957.28 (5)	600.00±0.00 (5)	123.20±8.98 (5)	1248.00±822.33 (5)	4712.00±284.37 (5)	490.00±33.17 (5)
Jaansath	5600.00±509.90 (5)	7569.60±952.16 (5)	31008.00±3648.00 (5)	51908.00±5745.12 (5)	640.00±48.48 (5)	144.00±36.22 (5)	2156.00±546.25 (5)	5320.00±0.00 (5)	720.00±37.42 (5)
Charthawal	7360.00±964.16 (5)	7296.00±608.00 (5)	25536.00±2469.71 (5)	44870.40±1743.96 (5)	540.00±24.50 (5)	114.40±6.14 (5)	1916.00±482.69 (5)	4712.00±152.00 (5)	680.00±20.00 (5)
Purkaji	8800.00±489.90 (5)	7052.80±1028.22 (5)	34960.00±3040.00 (5)	52911.20±5511.25 (5)	750.00±79.06 (5)	199.04±23.26 (5)	810.00±810.00 (5)	4864.00±568.73 (5)	820.00±66.33 (5)

Table 67. Contd...

Particulars	Total salary on unskilled workers (Rs./m)	Total expenditure on green fodder (Rs./m)	Total expenditure on dry fodder (Rs./m)	Total expenditure on concentrate (Rs./m)	Total expenditure on Veterinary visits (Rs./m for 5 ave. visits)	Total expenditure on AI (Rs./m for 8% breedable/m)	Total expenditure on deworming (Rs./m)	Total expenditure on chaffing (Rs./m)	Total expenditure on water & electricity (Rs./m)
Khatauli	7000.00±447.21 (5)	7660.80±530.04 (5)	31008.00±608.00 (5)	45025.44±4178.12 (5)	670.00±51.48 (5)	162.88±9.39 (5)	1653.00±692.77 (5)	4195.20±498.60 (5)	740.00±60.00 (5)
Sahapur	8000.00±632.46 (5)	9302.40±1060.08 (5)	30400.00±0.00 (5)	44748.80±998.58 (5)	660.00±36.74 (5)	155.52±1.92 (5)	2753.00±227.86 (5)	5624.00±515.46 (5)	770.00±37.42 (5)
Baghra	7200.00±374.17 (5)	6900.80±695.89 (5)	31160.00±1830.32 (5)	59857.60±5856.52 (5)	620.00±20.00 (5)	170.88±8.80 (5)	3553.00±211.72 (5)	5168.00±504.13 (5)	780.00±20.00 (5)
Muzaffarnagar Sadar	11800.00±1319.09 (5)	11248.00±384.53 (5)	38000.00±4162.69 (5)	75969.60±7046.70 (5)	750.00±0.00 (5)	220.80±29.90 (5)	4325.00±718.93 (5)	6840.00±416.27 (5)	1400.00±161.25 (5)
Kairana	7800.00±200.00 (5)	8633.60±677.04 (5)	34200.00±2474.38 (5)	54416.00±2112.75 (5)	600.00±0.00 (5)	149.12±12.05 (5)	2949.00±274.82 (5)	5928.00±608.00 (5)	700.00±44.72 (5)
Kandhla	8600.00±871.78 (5)	8694.40±446.79 (5)	31464.00±2736.00 (5)	60344.00±4754.47 (5)	600.00±0.00 (5)	170.88±10.69 (5)	3192.00±265.75 (5)	5928.00±372.32 (5)	800.00±54.77 (5)
Budhana	8600.00±244.95 (5)	8390.40±589.48 (5)	30400.00±0.00 (5)	52075.20±2490.95 (5)	600.00±0.00 (5)	146.24±5.76 (5)	2653.00±669.28 (5)	4712.00±284.37 (5)	660.00±24.50 (5)

Table 68. Block wise analysis of variance (ANOVA) for various monthly recurring expenditures of private dairy farms

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total salary on unskilled workers	Between Groups	13276714.29	13	1021285.71	4.817	0.000
	Within Groups	11872000.00	56	212000.00		
	Total	25148714.29	69			
Total expenditure on green fodder	Between Groups	99907306.97	13	7685177.46	3.097	0.002
	Within Groups	138975180.80	56	2481699.66		
	Total	238882487.77	69			
Total expenditure on dry fodder	Between Groups	762605280.00	13	58661944.62	1.815	0.063
	Within Groups	1810429440.00	56	32329097.14		
	Total	2573034720.00	69			
Total expenditure on concentrate	Between Groups	4976704538.22	13	382823426.02	3.823	0.000
	Within Groups	5607487926.27	56	100133712.97		
	Total	10584192464.49	69			
Total expenditure on Veterinary visits	Between Groups	271750.00	13	20903.85	4.009	0.000
	Within Groups	292000.00	56	5214.29		
	Total	563750.00	69			
Total expenditure on AI	Between Groups	71515.87	13	5501.22	4.537	0.000
	Within Groups	67902.98	56	1212.55		
	Total	139418.84	69			
Total expenditure on deworming	Between Groups	59759586.07	13	4596891.24	3.558	0.000
	Within Groups	72349510.00	56	1291955.54		
	Total	132109096.07	69			

Table 68. Contd...

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total expenditure on chaffing	Between Groups	33425546.97	13	2571195.92	3.093	0.002
	Within Groups	46559180.80	56	831413.94		
	Total	79984727.77	69			
Total expenditure on water & electricity		Between Groups	2564714.29	13	197285.71	11.205 0.000
	Within Groups	986000.00	56	17607.14		
	Total	3550714.29	69			

Table 69. Sale prices of milk, manure and gunny bags obtained by surveyed private dairy farmers

Particulars	Monthly income (Rs.) through sale		
	Milk	Manure	Gunny bags
Overall mean (μ)	**143231.77±4260.46(70)**	**1575.00±45.13(70)**	**665.71±21.04(70)**
Blocks			
Shamli	160171.52±8191.40(5)	1960.00±40.00(5)	900.00±63.25(5)
Oon	130944.96±7114.04(5)	1820.00±91.65(5)	760.00±24.505)
Thana Bhawan	115106.56±3296.99(5)	1460.00±67.82(5)	580.00±48.99(5)
Morna	123101.76±20826.07(5)	1380.00±174.36(5)	500.00±77.46(5)
Jaansath	128798.72±6467.03(5)	1920.00±165.53(5)	720.00±37.42(5)
Charthawal	116200.96±6735.98(5)	1180.00±91.65(5)	580.00±37.42(5)
Purkaji	160323.52±22492.22(5)	1640.00±273.13(5)	700.00±104.88(5)
Khatauli	152705.28±14057.74(5)	1340.00±188.68(5)	520.00±48.99(5)
Sahapur	128458.24±7637.47(5)	1180.00±91.65(5)	460.00±50.99(5)
Baghra	142527.36±10006.66(5)	1710.00±146.97(5)	820.00±80.00(5)
Muzaffarnagar Sadar	210489.60±25974.35(5)	1780.00±188.15(5)	760.00±67.82(5)
Kairana	148510.08±7370.04(5)	1680.00±73.49(5)	680.00±48.99(5)
Kandhla	154584.00±8898.17(5)	1620.00±96.95(5)	760.00±74.83(5)
Budhana	133322.24±8709.70(5)	1380.00±73.49(5)	580.00±20.00(5)

Table 70. Block wise analysis of variance (ANOVA) for monthly income (Rs.) through sale of milk, manure and gunny bags

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Monthly income through sale of milk	Between Groups	39761600235.96	13	3058584633.54	3.575	0.000
	Within Groups	47910094229.50	56	85553396.96		
	Total	87671694465.46	69			
Monthly income through sale of manure	Between Groups	4306750.00	13	331288.46	3.354	0.001
	Within Groups	5532000.00	56	98785.71		
	Total	9838750.00	69			
Monthly income through sale of gunny bags	Between Groups	1113714.29	13	85670.33	4.685	0.000
	Within Groups	1024000.00	56	18285.71		
	Total	2137714.29	69			

Table 71. Block wise means for total monthly receipts, total monthly recurring expenditure and monthly net economic gain (Rs.)

Particulars	Monthly amount (Rs)		
	Total receipts	Total recurring expenditure	Net economic gain
Overall mean (μ)	145472.49±4298.80 (70)	109106.09±2494.28 (70)	36366.39±2447.71 (70)
Blocks			
Shamli	163031.52±8163.02 (5)	117024.04±3820.32 (5)	46007.48±5147.22 (5)
Oon	133524.96±7197.43 (5)	104470.72±5037.71 (5)	29054.24±3188.99 (5)
Thana Bhawan	117146.56±3338.41 (5)	92579.76±4979.19 (5)	24566.80±3224.76 (5)
Morna	124981.76±21070.52 (5)	94254.80±11956.48 (5)	30726.96±9163.57 (5)
Jaansath	131438.72±6630.73 (5)	105065.60±9426.08 (5)	26373.12±7243.32 (5)
Charthawal	117960.96±6803.27 (5)	93024.80±3902.36 (5)	24936.16±4965.13 (5)
Purkaji	162663.52±22844.43 (5) (5)	111167.04±8560.85 (5) (5)	51496.48±15289.06 (5) (5)
Khatauli	154565.28±14140.04 (5)	98115.32±4200.92 (5)	56449.96±13487.84 (5)
Sahapur	130098.24±7578.29 (5)	102413.72±778.99 (5)	27684.52±7066.38 (5)
Baghra	145057.36±10139.30 (5)	115410.28±8104.78 (5)	29647.08±3216.70 (5)
Muzaffarnagar Sadar	213029.60±26187.92 (5)	150553.40±13515.01 (5)	62476.20±14138.49 (5)
Kairana	150870.08±7430.47 (5)	115375.72±4849.48 (5)	35494.36±2995.26 (5)
Kandhla	156964.00±9053.26 (5)	119793.28±9094.83 (5)	37170.72±1344.04 (5)
Budhana	135282.24±8734.77 (5)	108236.84±3304.56 (5)	27045.40±5866.65 (5)

Table 72. Block wise analysis of variance (ANOVA) for total monthly receipts, total monthly recurring expenditure and monthly net economic gain (Rs.)

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total monthly receipts	Between Groups	40354328211.10	13	3104179093.16	3.555	0.000
	Within Groups	48902436261.50	56	873257790.38		
	Total	89256764472.61	69			
Total monthly recurring expenditure	Between Groups	14672644963.88	13	1128664997.22	4.110	0.000
	Within Groups	15376836042.42	56	274586357.90		
	Total	30049481006.30	69			
Monthly net economic gain	Between Groups	10353855344.31	13	796450411.10	2.400	0.010
	Within Groups	18584051121.49	56	331858055.74		
	Total	28937906465.79	69			

Table 73. Technical support class wise means for total monthly receipts, total monthly recurring expenditure and monthly net economic gain (Rs.)

Particulars	Monthly amount (Rs)		
	Total receipts	Total recurring expenditure	Net economic gain
Overall mean (μ)	145472.49±4298.80 (70)	109106.09±2494.28 (70)	36366.39±2447.71 (70)
Technical Support			
Not available	139565.87±6664.15 (24)	101956.94±2406.66 (24)	37608.93±5227.02 (24)
Veterinary Officer (VO)	148554.20±5537.22 (46)	112836.09±3474.24 (46)	35718.11±2581.98 (46)

Table 74. Technical support class wise analysis of variance (ANOVA) for total monthly receipts, total monthly recurring expenditure and monthly net economic gain (Rs.)

Traits	Sources of variation	Sum of Squares	df	Mean Square	F	Sig.
Total monthly receipts	Between Groups	1274000000.00	1	1274000000.00	0.985	0.325
	Within Groups	87980000000.00	68	1294000000.00		
	Total	89260000000.00	69			
Total monthly recurring expenditure	Between Groups	1867000000.00	1	1867000000.00	4.504	0.037
	Within Groups	28180000000.00	68	414500000.00		
	Total	30050000000.00	69			
Monthly net economic gain	Between Groups	56390000.00	1	56390000.00	0.133	0.717
	Within Groups	28880000000.00	68	424700000.00		
	Total	28940000000.00	69			

was Rs.145472.49±4298.80 and it ranged between Rs. 117146.56±3338.41 (Thana Bhawan) and Rs. 213029.60±26187.92 (Muzaffarnagar Sadar, Fig. 27 and Table 71).

Total monthly recurring expenditure

At the same time, block expressed highly significant effect (P≤0.01) on total monthly recurring expenditure, too (Table 72). The overall mean for total monthly recurring expenditure was Rs. 109106.09±2494.28 and it ranged between Rs.92579.76±4979.19 (Thana Bhawan) to Rs. 150553.40±13515.01 (Muzaffarnagar Sadar, Fig. 27 and Table 71).

Monthly net economic gain

Block also expressed highly significant effect (P≤0.01) on monthly net economic gain (Table 72). The overall mean for monthly net economic gain was Rs. 36366.39±2447.71 and it ranged between Rs. 24566.80±3224.76 (Thana Bhawan) and Rs. 62476.20±14138.49 (Muzaffarnagar Sadar, Fig. 27 and Table 71).

Acharya and Pawar (1980) found that the average daily milk production per day and total milk production per lactation of crossbred cow was higher as compared to buffaloes and local cows. It was reported that an average crossbred cow gave a profit of Rs.1538 per lactation and 59 paisa per litre of milk produced against Rs. 400 and 29 paisa per litre of milk of a buffalo. Deoghare and Bhattacharya (1994) reported that the net and the overall income per buffalo per year and input-output ratio were highest on large size farms. Chandra and Agarwal (2000) observed that keeping milch buffaloes was more economical with large farmers than milch cows with medium farmers in Uttar Pradesh. The net cost per litre of milk from crossbred cow was Rs. 6.83 and that of buffalo was Rs. 7.58. Singh *et al.* (2001) did a study on economics of milk production in different herd size groups of buffaloes in Etah district of Uttar Pradesh. The study revealed that the net income derived from different herd size of buffaloes was much higher among members than non-members of Brooke Bond Lipton India Ltd. Similarly, Verma and Sharma (2006) during a study in Rajasthan reported that the

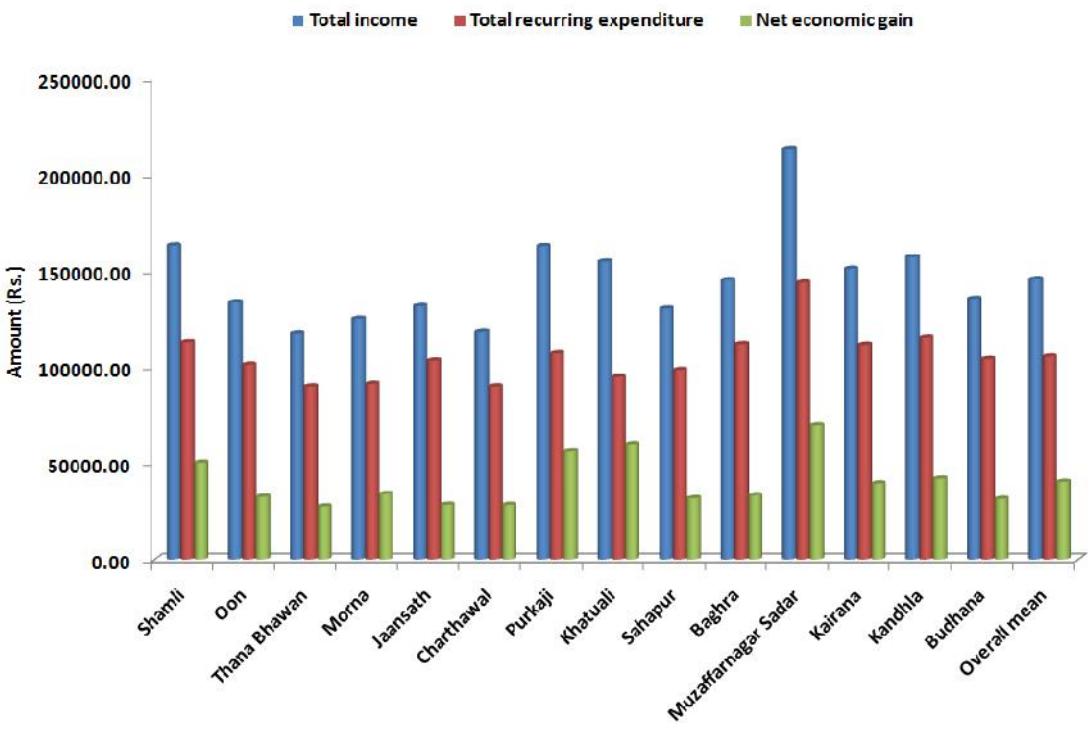

Fig. 27 : Total monthly income, expenditure and net economic gain (Rs.)

contribution of dairying to total income was 30.57 and 23.73 percent, respectively, in member and non-member groups of co-operative society. Chand *et al.* (2002) did an economic analysis of commercial dairy herd in arid region of Rajasthan. The study revealed that the feed cost alone accounted for more than 70 per cent per animal per day. The overall net cost per animal per day was Rs. 53, 51 and 50, respectively, on small, medium and large herds. The net return per milch animal in a day was Rs. 18, 13 and 12, respectively, on small, medium and large herds. The break-even level of output estimated was 30, 37, 38 per cent of the total output on small, medium and large herds, respectively. Sharma *et al.* (2002) carried out a study in Himachal Pradesh on dairying as an income generative activity. They found out that the cost of milk production was Rs. 10.43 and 9.59 in Kangra and Panchrukhi block, respectively. Net profit per litre of milk production was Rs. 0.57 and 1.41 for the respective blocks. Input output ratio for dairying was found to be 1: 2.98 in the study area. Kumar and Pandian (2003) in Tamil Nadu calculated the cost of milk per litre for crossbred cows, indigenous cows and buffaloes as Rs. 9.71, 11.96 and 11.44, respectively. Moreover, it was revealed that total cost of dairying decreased with increase in farm size. The major constituents of variable cost, the feed cost accounted for Rs. 61.22 and labour cost was 34.36 percent of total cost. Further, veterinary expenses and miscellaneous expenses were 0.39 and 0.21 percent, respectively.

Misra and Pal (2003) concluded that 25% of the total earnings comes from dairying as a subsidiary activity of crop livestock integration in rural West Bengal. Chinnappa (2005) in a study done in Karnataka reported that the contribution from dairy farming to the rural smallholder household income was 16.79 and 18% in irrigated and un-irrigated areas, respectively. Desai (2005) in his study on economic analysis of milk production and disposal pattern of milk in rural area of Bidar district (Karnataka) and observed that feed cost was the major cost followed by labour cost in all the species. The study also revealed that the net return per day was highest (Rs.3.72) from the local cow followed by buffalo while in crossbred cow it was negative. The economic feasibility of the perennial-

cow dairy farm was very sensitive to the milk production maintained by the perennial herd and market prices for milk and perennial replacement animals (Rotz *et al.,* 2005). Bardhan et al. (2005) in their study on economics of milk production from crossbred cattle in Udham Singh Nagar district of Uttarakhand reported that average annual cost of maintenance of crossbred cattle was Rs. 21863 with no significant differences among different categories of farmers. Feed and fodder costs constituted major part of total costs for all categories of farmers (59.71 per cent). Labour charges constituted about 20.82 per cent of total costs. Veterinary expenditures constituted 3.80 per cent of total maintenance cost. Per litre cost of milk production was found out to be Rs. 9.78, but it showed declining trend with increase in size of landholdings. For landless labourers it was Rs.10 and for large farmers it was Rs.9.22. The average annual returns including returns from dung were found out to be Rs. 20054 which means that these could not cover the cost of maintenance for all categories of farmers. Bhardwaj *et al.* (2006) conducted a study in four adopted villages of Central Institute of Research on Buffaloes, Hissar (Haryana). Feed cost was found to be a major component accounting as high as 71-76 per cent of the total maintenance cost of milch buffaloes. The net maintenance cost per day per buffalo for small, medium and large farms was worked out to be Rs.57, Rs. 63.80, and Rs.64.30, respectively. The corresponding figures for net gross returns per day per buffalo were Rs. 65.80, Rs. 71.02 and Rs. 73.16 and net profit per day per buffalo were Rs. 11.50, Rs.7.22 and Rs. 8.86, respectively. Shergill (2006) in his study on the commercial dairy farms of Punjab comes out with an interesting fact that commercial dairy farming in rural Punjab is not a profitable economic activity in strict business sense. The overall picture showed that the price of milk received does not cover even the cost of milk production. The cost of per litre milk production worked out to be Rs. 11.13 and the price received by farmers was Rs. 9.98. On every litre of milk sold, the commercial dairy farmer suffered a loss of Rs.1.15. The farmers suffered loss even when the cost of family labour is not taken into consideration. Across herd size categories the picture remains largely the same, the situation of

commercial dairy farms is so grim that when the fixed costs and wages to family labour are completely ignored and only operational expenses are considered, the middle herd size group (4-6 milch animals) fails to cover even the operational expenses. Whereas small herds (1-3 milch animals) and big herds (7 or more milch animals) were able to generate some cash surplus from the sale of milk. In our study on comparatively larger herd sized dairy farms, net income from enterprise is fairly handsome to consider it as viable option for dairy farmers of Muzaffarnagar district.

4.4.4 Technical support and net economic gain

It has been observed that technical support to dairy farmers had no significant effect on monthly receipts and net monthly economic gain. Whereas, technical support had significant effect ($P \leq 0.05$) on monthly recurring expenditure of these dairy farms and it was found that technically supported dairy farms had higher (Rs.112836.09±3474.24) monthly recurring expenditure when compared to non technically supported dairy farms (Rs. 101956.94±2406.66, Table 73). It may be because of the fact that technical advice leads to adoption of scientific concepts and management practices which actually have some cost when implemented.

The non-significant effect of technical support an net economic gain may be due to the fact that the technical advices did not lead to the expected level of output because of which both the groups yielded statistically same results though numeral values were different.

4.4.5 Main constraints faced by these dairy farmers

Most of the surveyed dairy farmers indicated towards following constraints which are enlisted below depending upon their priority:

- Short stay of labour
- Poor milk pricing
- High costs of wheat straw and concentrate ingredients
- Problem of poor conception in cattle and buffaloes
- Extreme hot and cold weather which has adverse effects on milk production
- Non- continuous electricity supply

Table 75. Different types of major constraints experienced by surveyed private dairy farmers

Number of constraints	Blocks														Total	% of Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan		
One																
Short stay of labour	3	1	0	0	3	2	1	2	2	2	3	1	1	2	23	32.86
Low sale price of milk	1	0	1	0	0	3	2	2	0	2	1	2	2	1	17	24.29
Abrupt electricity supply	0	0	4	4	1	0	1	1	1	0	1	0	2	1	16	22.86
Problem of teat blindness (mastitis)	0	4	0	0	0	0	0	0	0	1	0	1	0	1	7	10.00
High cost of wheat straw	0	0	0	0	0	0	1	0	2	0	0	0	0	0	3	4.29
Non-availability of vety. Doctor during night hours	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2	2.86
Shortage of green fodder	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1.43
Low milk production during hot-humid summer season	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1.43
Low sale price of milk	1	3	2	1	3	1	0	2	1	1	3	2	0	0	20	28.57
Short stay of labour	1	1	2	2	0	2	4	0	1	0	2	1	3	1	20	28.57
Two																
Abrupt electricity supply	1	0	0	2	2	1	1	0	2	2	0	1	2	4	18	25.71
High cost of wheat straw	0	0	0	0	0	1	0	2	0	1	0	0	0	0	4	5.71
Low milk production during hot-humid summer season	0	0	0	0	0	0	0	0	0	1	0	1	0	0	2	2.86
Problem of teat blindness (mastitis)	1	0	0	0	0	0	0	0	1	0	0	0	0	0	2	2.86
Shortage of green fodder	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1.43

Table 75. Contd..

Number of constraints	Blocks														Total	% of Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan		
Non-availability of vety. Doctor during night hours	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1.43
Problem of foot rot during rainy season	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1.43
Problem of surra	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.43
Abrupt electricity supply	2	1	0	1	1	1	2	2	3	5	4	3	3	0	28	40.00
Three																
Low sale price of milk	0	2	2	3	2	0	1	1	1	0	1	0	0	3	16	22.86
Short stay of labour	0	1	2	1	1	1	0	0	1	0	0	1	0	1	9	12.86
High cost of wheat straw	0	0	1	0	1	3	1	1	0	0	0	0	1	0	8	11.43
Problem of teat blindness (mastitis)	0	0	0	0	0	0	0	1	0	0	0	1	0	1	3	4.29
Non-availability of vety. Doctor during night hours	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2.86
Low milk production during hot-humid summer season	0	0	0	0	0	0	1	0	0	0	0	0	1	0	2	2.86
Continuously increasing feed rates	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1.43
Problem of foot rot during rainy season	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.43

Table 75. Contd..

Number of constraints	Blocks														Total	% of Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan		
Abrupt electricity supply	0	1	2	0	1	2	0	0	3	1	4	3	0	0	17	24.29
High cost of wheat straw	1	0	1	2	2	0	0	1	0	0	0	1	1	2	11	15.71
Four																
No constraint	0	2	0	1	2	2	1	1	0	0	0	0	0	0	9	12.86
Low sale price of milk	3	0	0	0	0	1	1	0	0	1	0	1	1	1	9	12.86
Short stay of labour	0	2	1	0	0	0	1	2	1	1	0	0	0	0	8	11.43
Problem of teat blindness (mastitis)	0	0	0	2	0	0	1	1	1	1	1	0	0	1	8	11.43
Low milk production during hot-humid summer season	0	0	0	0	0	0	1	0	0	1	0	0	2	0	4	5.71
Non-availability of vety. Doctor during night hours	0	0	1	0	0	0	0	0	0	0	0	0	0	1	2	2.86
Decreased milk prodution during chilling cold weather	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1.43
Problem with urban government bodies due to dung and dairy waste	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.43
Five																
No constraint	2	4	3	5	3	5	5	4	3	2	1	0	0	2	39	55.71
High cost of wheat straw	1	0	1	0	0	0	0	1	1	2	1	1	1	1	10	14.29

Table 75. Contd..

Number of constraints	Blocks														Total	% of Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan		
Short stay of labour	0	0	0	0	0	0	0	0	0	0	0	2	1	1	4	5.71
Low milk production during hot-humid summer season	0	0	0	0	0	0	0	0	0	0	1	1	0	1	3	4.29
Problem of teat blindness (mastitis)	2	0	0	0	0	0	0	0	0	0	0	0	1	0	3	4.29
Abrupt electricity supply	0	0	1	0	1	0	0	0	0	1	0	1	1	0	5	7.14
Non-availability of vety. Doctor during night hours	0	0	0	0	1	0	0	0	0	0	1	0	0	0	2	2.86
Low sale price of milk	0	0	0	0	0	0	0	0	1	0	0	0	1	0	2	2.86
Continuously increasing feed rates	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1.43
Problem with urban government bodies due to dung and dairy waste	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1.43
Six																
No constraint	4	5	5	5	5	5	5	5	4	5	3	1	2	5	59	84.29
High cost of wheat straw	0	0	0	0	0	0	0	0	0	0	1	2	0	0	3	4.29
Abrupt electricity supply	0	0	0	0	0	0	0	0	0	0	0	2	2	0	4	5.71
Problem with urban government bodies due to dung and dairy waste	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1.43

Table 75. Contd..

Number of constraints	Blocks														Total	% of Total
	Baghra	Budhana	Charthawal	Jaansath	Kandhla	Kairana	Khatauli	Morna	Muzaffarnagar Sadar	Oon	Purkaji	Sahapur	Shamli	Thana Bhawan		
Low sale price of milk	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1.43
Low milk production during hot-humid summer season	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1.43
Problem of foot rot during rainy season	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1.43

Dairy farmers reported a maximum of six constraints faced by them in day to day management as enlisted above.

It was observed that short stay of labour was biggest problem for majority (32.86%) of dairy farmers in one constraint group, followed by low sale price of milk (24.29%), poor or abrupt supply of electricity (22.86%). In two constraints group, the top constraint was low sale price of milk (28.57%) followed by short stay of labour (28.57%) and poor or abrupt supply of electricity (25.71%). At the same time, in three constraints group, the major problem was poor or abrupt supply of electricity (40.00%), low sale price of milk (22.86%), short stay of labour (12.86%) and high cost of wheat straw (11.43%). The four constraints group reported major issue related to abrupt supply of electricity (24.29%), rising costs of wheat straw (15.71%), low sale price of milk (12.86%) and problem of teat blindness (mastitis) and short stay of labour (11.43%). Similarly, in five constraints group, majority of dairy owners have not reported any constraint (55.71%), though rising cost of wheat straw (14.29%), poor or abrupt supply of electricity (7.14%), low milk production during hot-humid summer season, problem of teat blindness (mastitis, 4.29%), non-availability of veterinary doctor during night hours and low sale price of milk (2.86%) still appeared in smaller proportions. The six constraint group stated in majority having no constraint (84.29%), though poor or abrupt supply of electricity (5.71%) still reported by few private dairy farmers (Table 7).

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Summary and Conclusions

5 Summary & Conclusions

Muzaffarnagar district of Uttar Pradesh lies between latitude 29° 11' N and 29° 43' N and longitude 77° 04' E and 78° 07' E. Muzaffarnagar possesses 5 tehsils and 14 blocks. The present survey work was conducted on five dairy farms from each block, keeping at least 15 adult animals (cattle or buffaloes or both). In this way, a total 70 private dairy farms were surveyed. Data regarding introductory part, socio-economic profile of dairy farmer, management practices followed, herd structure and indicative economic performance were collected.

Socio-economic profile of dairy farmers of all the 70 private dairy farms surveyed. Regarding religion it was found that 77.14% of the dairy farms were owned by Hindus followed by 20% Muslims and 2.86% by Sikhs. Among Hindus, maximum dairy farmers belonged to the caste Jats (74.07%) followed by Tyagis (11.11%), Pals (5.55%), Gujars (3.70%) and one each by Jains, Kashyaps and Rajputs (1.85%). Among Muslims, the majority of the surveyed private dairy farms were owned by Shias (78.57%) followed by Sunnis (21.43%). All the private dairy farms belonging to religion Sikh were Jatt Sikhs.

Regarding age structure of dairy owners, the profession of dairy farming was most popular among people aged 40 years (22.86%) followed by people aged 38 years (14.29%) and aged 42 years (12.86%) i.e. about 60% of the total private dairy farmers belonged to the age group of 40.00±2.00 years. The maximum number of dairy farmers were Intermediate (39.00%) followed by High School (31.00%), Graduation or above (14.00%), Illiterate (11.43%) and educated up to Middle standard (4.00%). The experience span extended from

7 years (10%) to 18 years. Most of the dairy farmers were having good (5-10 year) and very good (>10 years) experience in practical dairy farming. No one of the surveyed dairy farmers was found to possess an experience of < 5 years (Fair). A total of 32 farmers (45.71%) were having good as well as 38 farmers (54.28%) were having very good experience in dairy farming. It has been observed that 32.85% of these dairy farmers were having comparatively lower financial status (fair) as compared to rest of the 67.14% dairy farmers. The average numbers of motorcycles available with these private dairy farmers were 1.39±0.06. A total of 29.00% dairy farms were having tractors and trailers for transportation of materials like feeds and fodder and garbage etc. It has also been observed that 34.00% of dairy farms were not having a private car while rests of the dairy owners were having different brands of cars for their personal use. The distance of market from all the surveyed dairy farms varied insignificantly among the blocks with an overall mean of 3.37±0.20 Km. Block effect was highly significant ($P \leq 0.01$) on distance from railway station with an overall mean of 19.01±1.47 Km.

It has been accepted by all the private dairy farmers that their spouses extend all help and cooperation to them in various activities of dairy farm management. The number of total children along with number of sons and daughters varied in significantly among the fourteen blocks of Muzaffarnagar district. The overall mean for total children along with number of sons and daughters were 4.07±0.14, 2.28±0.09 and 1.88±0.10 no, respectively.

Information collected were also analyzed regarding management practices utilized by these private dairy farms. The effect of block was highly significant ($P \leq 0.01$) on cost of electric supply per month with an overall mean of Rs. 762.86±19.77. The dairy farms were using submersible pumps along with hand pumps for fulfilling the daily water requirement. In case of electric failure, generators were used by few of these dairy farmers to fulfill the requirements of electricity as well as water.

It has been observed that all the dairy farms were having paved brick floors in livestock sheds. Cement brick walls were used as the fencing style to retain the cattle and buffaloes within the shed. The private dairies were maintaining a store for keeping various utensils and items as per their requirements. The effect of block was significant ($P \leq 0.05$) on the area of store with an overall mean of 171.91±5.77 ft^2. The effect of blocks on wheat straw store area was non-significant with an overall mean of 260.01±8.30 ft^2. No private dairy farm has constructed milk keeping store separately. The dairy farms were having electrical/ diesel engine driven chuff-cutters with an average capacity of 90.71±0.38 q/h. The per hour chaff cutter capacity expressed highly significant effect of blocks ($P \leq 0.01$). No private dairy farm has constructed the silo pits.

Milking machines were not available. All the private dairy farmers were practicing hand milking and were having milking pails and cans as per their requirements. Usually for milking purpose, narrow bottomed metal buckets made up of steel or iron were used for milking of animals. Feed grinders and mixtures were not available in any of these dairy farms to grind and mix concentrate ingredients procured, rather these were mixed manually. Almost all the dairy farms were not having biogas plant, except one, located in dairy farm of block Purkaji.

The orientation of longer axis of shed has no bearing on cost of animal shed whether in E-W or N-S directions. The longer axis of the surveyed private dairy farms was mainly in N-S direction (61%), whereas 39% of these dairy farms were having their longer axis of shed in E-W direction. The shed type which included (partially) RCC – (partially) tin shed (64.00%), (partially) RCC – (partially) thatched (27.00%), complete RCC (6.00%) and 1.5% each were made up of RCC – thatched – tin shed and thatched – tin shed. The effect of shed type on cost of shed was highly significant ($P \leq 0.01$) with an overall mean of Rs. 2.97±0.09 lakhs which varied from 4.25±0.25 lakhs (RCC) to 2.00 lakhs each in case of TH - RCC and TS. The availability of floor space was adequate in 67.00% and inadequate in 33.00% of the total private dairy farms. The shed ventilation in 93.00% of the total surveyed private dairy farms was adequate whereas 7.00%

could be classified as inadequate with respect to shed ventilation. Natural lighting was facilitated in 81.00% of these dairy farms whereas rest of the 19.00% was having inadequate natural lighting. The drain and cleaning arrangements made by these private dairy farms were inadequate to the tune of 54.00% whereas 46.00% were having adequate arrangements.

All of these private dairy farms in different blocks were having an average plot size of 600 yards^2 followed by 17.14% with plot size of 800 yard^2 and 14.28% having 700 yard^2. At the same time, 12.86% of the dairy owners were having a plot size of 500 yard^2 and 11.43% were having 1000 yard^2. Very small and very large plot sizes were owned by 1.500 – 3.00% of the dairy owners. The means for total plot size, dairy plot size, plot use for household purposes, total plot cost were 687.86±21.40 yards^2, 565.00±24.28 yards^2, 232.43±17.35 yards^2 and Rs. 29.87±1.60 lakhs, respectively.

No women workers were employed on these dairy farms and all the workers were unskilled men which were engaged as per the requirements of a farm. The educational level of private dairy farmer had non-significant effect on number of unskilled manpower engaged and their monthly salary. The overall means for these traits were 1.99±0.04 no. and Rs. 3904.29±72.16 per month. The financial status of dairy farmer significantly affected ($P \leq 0.05$) the number of unskilled manpower engaged with an overall mean of 1.99±0.04 persons and it varied from 1.87±0.07 (fair financial status) to 2.04±0.04 persons (good financial status).

The type of green fodder commonly purchased by these private dairy farms were Barseem, oats and sugarcane tops and the type of green fodder expressed its highly significant effect ($P \leq 0.01$) on cost per quintal. The overall means for minimum and maximum per day chaffing expenses for green fodder, per quintal cost of green fodder and total green fodder purchased per day were Rs. 144.00±4.43, Rs. 204.29±4.41, Rs. 113.43±1.82 and Rs. 2.32±0.06 q, respectively. Among different blocks, per quintal cost of dry fodder was varying at highly significant level ($P \leq 0.01$). The mean for total per day consumption of

dry fodder was 2.16±0.05 q/d). The overall means for per quintal costs for WB, MOC, BGC and BGCH were Rs. 1290.36±7.50, Rs. 1469.68±10.50, Rs. 1982.31±12.29 and Rs. 1627.50±12.29, respectively. The overall means for per day consumption of these concentrate ingredients were 0.47±0.01, 0.34±0.01, 0.29±0.01 and 0.24±0.02 q/d. The overall means for total concentrate consumed/ d was 1.15±0.03 q/d. Block affect was highly significant (P=0.01) on total cost of concentrate/d with an overall mean of Rs. 1742.61±48.69 and block also expressed highly significant effect (P≤0.01) on per quintal cost of concentrate with an overall mean of Rs. 1518.45±10.52. Different concentrate compositions used were CC1 (wheat bran) CC2 (Mustard oil cake), CC3 (Black gram *chunni*) and CC4 (Black gram chilka) and these expressed highly significant effect (P≤0.01) on total concentrate consumed/d, total cost of concentrate/d and per quintal cost of concentrate/d and the overall means for these traits were 1.15±0.03 q/d, Rs. 1742.61±48.69 and Rs. 1518.45±10.52, respectively.

These private dairy farms were using fresh clean water for wash of udders before milking. At the same time they were ensuring cleaning of utensils (milking buckets, cans, etc.) before milking. The dairy farmers were ensuring the hand wash of milkers before milking in fresh clean water. As for as the use for oxytocin was concerned (for letting down of milk), most of the dairy farmers denied its use. Milking was performed through hands only and no milk machines were available. The overall means for per litre sale price of cow and buffalo milk along with total daily milk sale were Rs. 27.03±0.42 and Rs. 32.01±0.55 per liter and Rs. 4713.91±136.23 per day, respectively. It indicated that milkmen were purchasing the milk at the cheapest rate whereas the open market sale to clients was at the best possible rates. It has also been observed that periodicity of payment of milk sale i.e. daily and monthly had expressed its highly significant effects (P≤0.01) on per litre sale price of cow and buffalo milk as well as total daily milk sale. The overall means for these traits were Rs. 27.03±0.42, Rs. 32.01±0.55 and Rs. 4713.91±136.23. It indicated that the agencies doing the daily payment are paying cheaper rates of milk as compared to agencies paying at monthly

intervals. That block had highly significant effects (P≤0.01) on per liter sale price of cow and buffalo milk and total daily milk sale.

It has been observed that barring few of these private dairy farmers, most of the dairy farmers preferred artificial insemination (A.I.) either through government Veterinary Hospitals/A.I. Centres or through Private Veterinary Doctors/Inseminators, based on unavailability of breeding bulls either with the dairy farmer itself or in the vicinity. Some of these dairy farmers preferred natural service, through the number was very small. The natural service was, though costly (Rs. 120-200/natural service), was accepted by very few dairy farmers depending upon critical conditions or in case of absence of A.I. facilities. Most of the cattle and buffalo rears accepted the availability of A.I. services either at their door-step or at A.I. Centre through government/private sources. It has also been observed that the block effect was highly significant (P≤0.01) on expenditure per A.I. through private doctors or inseminator. The overall means for distance of A.I. Center, expenditure per A.I. through government and private Veterinary Doctor/Inseminator were 3.78±0.21 Km., Rs. 39.86±0.14 and Rs. 106.36±1.64, respectively.

Block expressed non-significant effect on expected price of culled cows. The overall mean for expected price of culled cows was Rs. 16033.33±267.83. Disposal age group had non-significant effect on expected disposal price for cattle. The overall mean for expected disposal price of cattle was Rs. 16033.33±267. Block had highly significant effect (P≤0.01) on expected minimum disposal price for culled buffaloes. The overall mean for expected minimum disposal price for culled buffaloes was Rs. 20358.21±187.47. Conversely, block had non-significant effect on expected maximum disposal price for culled buffaloes with its overall mean being Rs. 23480.60±390.46.

The cattle and buffaloes maintained by all the dairy farmers were uninsured as was informed by these dairy farmers.

All the dairy farmers were using mini trucks for transporting small numbers of animals either from Haryana or nearby Budhana. Blocks expressed highly

significant effect (P≤0.01) on transportation cost of cattle and buffaloes from Haryana as well as from Budhana. The overall mean transportation costs per animal from Haryana and Budhana were Rs. 691.43±18.73 and Rs. 383.08±10.64, respectively.

The most reliable source of veterinary aid was block hospital where there were qualified veterinarians and who were available at a point of need. All the dairy farmers indicated towards the vaccination of animals for HS and FMD through a government source arranged by local veterinary hospitals. It has been observed that block expressed highly significant effects (P≤0.01) on cost per veterinary visit and minimum and maximum cost for deworming. The overall means for distance of veterinary aid, cost per veterinary visit, deworming stage, minimum and maximum deworming costs were 3.82±0.21 Km., Rs. 125.00±2.16, 2.98±0.051 months, Rs. 93.10±1.81 and Rs. 117.58±2.45, respectively.

From information collected on herd structure, it was observed that block effect was significant (P=0.05) on total herd size; however it was highly significant (P≤0.01) on total number of buffaloes. The overall means for herd strength of cattle buffalo and total were 12.95±1.00, 19.72±1.17 and 29.79±0.80 heads, respectively. Block effect was highly significant (P≤0.01) on the number of male calves below 1 year of age. The overall means for number of total cows, milch cows, dry cows, heifers (>1 year), male and female calves (<1 year) were 7.61±0.55, 6.66±0.51, 1.05, 1.00, 2.63±0.22 and 3.09±1.29 heads, respectively. Block effect was significant (P≤0.05) on male calves below 1 year of age, however, its highly significant effects (P≤0.01) were observed on total and milch buffaloes and female calves below 1 year of age. The overall means for total buffaloes, milch buffaloes, dry buffaloes, heifers (>1 year), male and female calves (below 1 year of age) were 11.55±0.66, 10.35±0.59, 1.33±0.11, 1.03±0.03, 3.92±0.24 and 4.42±0.33 heads.

Minimum and maximum lactation length of cattle and buffaloes varied in highly significantly manner (P≤0.01) between different blocks. Lactation lengths

in cattle and buffaloes were 291.69±0.70, 297.12±0.65, and 267.24±0.56 and 272.39±0.56 days, respectively. Minimum lactation length for cattle was 282.50±1.44 days (Jaansath) whereas maximum lactation length was 305.00±0.00 days (Purkaji). The breeds of buffaloes maintained were apparently Murrah/graded Murrah, though few non-descript buffaloes were also there. The cattle were generally apparently HF/Jersey crosses with Sahiwal/other native breeds which were usually termed by these dairymen as *American cows*. Dairy farmers preferred crossbred cattle due to their excellent milk production potential.

Blocks expressed highly significant effects ($P \leq 0.01$) on minimum and maximum dry periods of cattle and buffaloes. The overall means for minimum and maximum dry periods in cattle and buffaloes were 65.25±0.35, 72.20±0.46, 89.85±0.11 and 94.85±0.11 days, respectively.

The block effect was non-significant on conception rates in cattle and buffaloes. It has been observed that overall conception rate was 55.76±1.06 and 50.60±0.46%, respectively, in cattle and buffaloes. It has been observed that mortality of animals differed in different age groups for surveyed private dairy farms. Regarding young cattle (<1 year) majority (64.29%) of the dairy farms had mortality in the range of 10-15 % while these figures for adult cattle, young buffaloes (<1 year) and adult buffaloes were 1-2% (65.71%), 10-15% (72.86%) and 1-2% (82.86%) respectively.

Regarding economic aspects of study, it was observed that block effect was highly significant ($P \leq 0.01$) on cost of cattle and buffalo purchase, per day minimum and maximum milk yield of buffaloes and total milk production of buffalo per day. The overall means for cost of purchase, per day minimum and maximum milk yields, total milk production per day in cattle and buffaloes were Rs. 35186.44±341.44 and Rs. 51791.04±378.97, 11.00±0.15 and 8.28±0.06 kg, 12.17±0.14 and 9.42±0.07 kg/d, 82.22±6.92 and 92.90±5.19 kg/d, respectively. The overall means for total milk production (per day including that of cattle and buffaloes both) was 158.21±4.40 kg.

Block had highly significant effect (P≤0.01) on total cost of land, cost of cattle and transportation cost of animal from Haryana and Budhana. The overall mean for total cost of land, cost of cattle, cost of buffaloes and transportation cost of animal from Haryana and Budhana were Rs. 29.87±1.60 lakhs, Rs. 35186.44±341.44, Rs. 51791.04±378.97, Rs. 691.43±18.73 and Rs. 383.08±10.64, respectively. The block expressed significant effect (P≤0.05) on total fixed cost of utensils too. The overall mean total fixed cost of utensils was Rs. 5764.29±185.59. At the same time, the cost of shed and fixed cost of machines expressed non-significant effects of blocks. The overall means for cost of shed and fixed cost of machines were Rs. 2.97±0.09 lakhs and Rs.101178.57±14069.92, respectively.

The block expressed highly significant effects (P≤0.01) on total salary of unskilled workers/m, total expenditure on green fodder/m, total expenditure on concentrate/m, total monthly expenditure on ave. 5 veterinary visits, total expenditure on AI of 8% breedable females/m, total expenditure on one deworming (done on quarterly basis), total monthly expenditure on chaffing and total monthly expenditure on water and electricity. The respective overall means were Rs. 7775.71±233.51, Rs. 7984.34±222.39, Rs. 52975.47±1480.32, Rs. 625.00±10.80, Rs. 150.26±5.37, Rs. 2583.64±165.38, Rs. 293.94±128.69 and Rs.785.71±27.11.

At the same time, block expressed non-significant effect on total monthly expenditure on dry fodder. The overall mean for total monthly expenditure on dry fodder was Rs. 30932.00±729.88.

Block had highly significant effect (P≤0.01) on total monthly income (Rs.) through sale of milk. The overall mean for total monthly income (Rs.) through sale of milk was Rs. 143231.77±4260.46. At the same time, block expressed highly significant effects (P≤0.01) on total monthly income (Rs.) through sale of manure and gunny bags. The overall means for these traits were Rs. 1575.00±45.13 and Rs. 665.71±21.04. Block expressed non-significant effects

on expected price of culled cows and buffaloes which were usually culled after a productive life span ranging from 6-10 years. The overall means for expected price of culled cows and buffaloes were Rs. 16033.33±267.83 and Rs. 23480.60±390.46.

Blocks had highly significant effect ($P \leq 0.01$) on total monthly receipts. The overall mean for total monthly receipts was Rs.145472.49±4298.80. At the same time, block expressed highly significant effect ($P \leq 0.01$) on total monthly recurring expenditure, too. The overall mean for total monthly recurring expenditure was Rs. 109106.09±2494.28. Block also expressed highly significant effect ($P \leq 0.01$) on monthly net economic gain. The overall mean for monthly net economic gain was Rs. 36366.39±2447.71.

Technical support to dairy farmers had no significant effect on total income and net profit of their dairy farms. Whereas, technical support had significant effect ($P<0.05$) on total expenditure of these dairy farms and it was found that technically supported dairy farmers had higher (Rs.112836.09±3474.24) total expenditure when compared to non technically supported (Rs. 101956.94±2406.66) dairy farmers.

Most of the surveyed dairy farmers indicated towards following constraints which are enlisted below depending upon their priority:

- Short stay of labour
- Poor milk pricing
- High costs of wheat straw and concentrate ingredients
- Problem of poor conception in cattle and buffaloes
- Extreme hot and cold weather which has adverse impact on milk production
- Non- continuous electricity supply

Dairy farmers reported number of constraints for their farms and maximum six constraints were enlisted by them. It was observed that short stay of labour

was biggest problem for majority (32.86%) of dairy farmers in one constraint group, followed by low sale price of milk (24.29%), poor or abrupt supply of electricity (22.86%), high cost of wheat straw (11.43%) and problem of teat blindness (mastitis) (11.43%), low milk production during hot-humid summer season, (4.29%), non-availability of veterinary doctor during night hours (2.86%). The six constraint group stated in majority having no constraint (84.29%), still reported by few private dairy farmers.

CONCLUSION

The private dairy farms of Muzaffarnagar district possess following characteristics :

- A 70 dairy farms are managed in individual capacity by people with fair and good socio-economic status. Majority of the dairy farm owners (77%) were Hindus followed by Muslims and Sikhs. Jats were the main community (among Hindus) engaged on dairy farming. Majority of the dairy owners (around 60%) were aged around 40 years and were literate.
- These dairy farms (average plot size 600 yards) were having good infrastructural facilities (paved brick floors, goodsheds cement brick wall, fencing, stores, Chaff cutter etc.). The longer axis of shed was in N-S direction and was mainly made up of RCC-tinshed with an average cost of 2.97 lakhs. The sheds were adequate w.r. to floor space, shed ventilation, and natural lighting. The average manpower engaged was 1-2. The feeds and fodders were purchased from open market and the milk was sale to cooperatives / milk man/open market. Hand milking was usually practiced.
- The average herd size was medium (29 heads) with 13 cattle and/or 20 buffaloes. It consisted of 7 milch cows and/or 10 milch buffaloes, respectively. Rest of the population belonged to dry, heifers (>1 year) and male and female calves (<1 year) group. The Thana Bhawan possessed minimum her strength (25) whereas as Muzaffarnagar Sadar possessed maximum herd strength (39).
- Dairying is an economically viable activity in 70 dairy farms conveyed an 14 14 blocks of Muzaffarnagar districts with Rs. 36366 as average monthly net economic gain. Thana Bhawan was having minimum values having for expenditure output and net economic gain, whereas Muzaffarnagar Sadar expressed highest values for these parameters.

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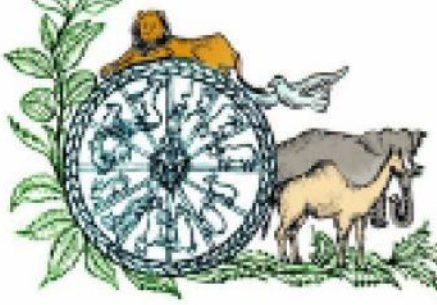
Mini Abstract



Mini Abstract

Present study was conducted in Muzaffarnagar district of Uttar Pradesh to assess status of private dairy farms. Five dairy farms, holding at least 15 adult animals (cattle or buffaloes or both), from each block (14 blocks) were selected randomly for collection of data and in this way total 70 private dairy farms were surveyed. Data regarding socio-economic profile of dairy farmers, management practices followed, herd structure and indicative economic performance were collected. Of all the 70 private dairy farms surveyed, 77.14% (54) were owned by Hindus and rest by Muslims and Sikhs. Among Hindus, maximum dairy farmers belonged to the caste Jats (74.07%) and rest to other communities. Around 60% of the total private dairy farmers (42 out of 70) belonged to the age group of 40.00±2.00 years. Maximum number of dairy farmers were Intermediate (27, 39.00%) followed by High School (22, 31.00%), Graduation or above (10, 14.00%), Illiterate (8, 11.43%) and educated up to Middle standard (3, 4.00%) indicating that majority of the dairy farmers are literate. Most of the dairy farmers were having good (5-10 year) and very good (>10 years) experience in practical dairy farming. The dairying profession was well supported by the spouses of these dairy owners with an average no. of 4 children. The Infrastructural facilities available at the private dairy farms of Muzaffarnagar district were generally paved brick floors, cement brick wall fencing, a store for keeping various utensils and items with an area of average 171.91±5.77 ft^2, a wheat straw store (260.01±8.30 ft^2), no milk store, electrically/diesel driven chaff-cutters with no provision Silo pits. Hand milking was usually practiced. Milking cans and pails were purchased as per the requirements. Orientation of longer axis of livestock shed in majority of farms were in N-S; type of livestock shed/construction material was mainly (partially) RCC – (partially) tin shed (45, 64.00%). The overall mean of shed cost was Rs. 2.97±0.09 lakhs. In majority of farms facilities were adequate i.e. floor space (67.00%, 47), shed ventilation (93.00%, 65) and natural lighting (81.00%, 57). The drain and cleaning arrangements were inadequate to the tune of 54.00% (38). On an average 1-2 unskilled male manpower were mainly available on these private dairy farms. Average plot size of 600 $yards^2$ was the space availability with private dairy farms. Purchased green and dry fodder along with conc. mixtures were the main sources of feeding. Milk was mainly sold to cooperative societies, milkmen and open market. Most of the dairy farmers denied use of oxytocin. Regarding breeding facilities, AI was done by Govt/private veterinary doctors, who were assisting in health care also. The animals maintained in all the dairy farms were uninsured. All the dairy farmers were using mini trucks for transporting few numbers of animals either from Haryana or nearby Budhana. Total average herd size of these private dairy farms was 29 animals consisting of 13 cattle (for cattle rearers) and 20 buffaloes (by buffalo rearers) or both. The block Thana Bhawan was having minimum expenditure, minimum output and minimum economic gain and Muzaffarnagar Sadar was having highest figures for these three parameters. At the same time the herd strength of Thana Bhawan was also minimum (25 heads) and that of Muzaffarnagar Sadar was maximum (39 heads) indicating that for maximization of economic gains a herd size of around 39-40 should be maintained under prevailing conditions. As average monthly net economic gain in the surveyed farms of the district was Rs. 36366.39±2447.71, it is clearly visible that dairying is economically viable enterprise in the district.

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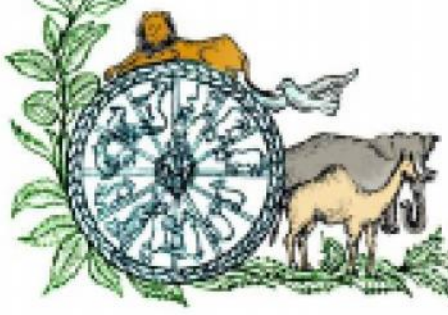

लघु सारांश

प्रस्तुत अध्ययन उत्तर प्रदेश के मुजफ्फरनगर जिले के निजी डेयरी फार्मो की स्थिति के आंकलन हेतु संचालित किया गया। जिले के प्रत्येक ब्लाक (कुल 14 ब्लाक) से पांच डेयरी फार्म, प्रत्येक कम से कम 15 व्यस्क पशुओं (गायें या भैसें या दोनों) को पाले हुये, यादृच्छिक रूप से सूचना एकत्र करने हेतु चुने गये। इस प्रकार कुल 70 निजी डेयरी फार्मो का सर्वेक्षण किया गया। डेयरी कृषकों की सामाजिक व आर्थिक स्थिति, प्रबंधन गतिविधियां, डेयरी पशु समूह की संरचना तथा सांकेतिक आर्थिक अवस्था से सम्बंधित सूचना एकत्र की गई। कुल सर्वेक्षित 70 निजी डेयरी फार्मो में से 77.14 प्रतिशत (54) हिन्दुओं तथा बाकी मुस्लिम व सिक्खों द्वारा संचालित पाये गये। हिन्दुओं में सर्वाधिक डेयरी कृषक जाट जाति (74.07 प्रतिशत) से सम्बंधित व बाकी अन्य समुदायों से थे। लगभग 60 प्रतिशत निजी डेयरी कृषक (70 में से 42), 40.00±2.00 वर्ष की आयु समूह के थे। सर्वाधिक संख्या में डेयरी कृषक उच्चतर माध्यामिक (27, 39.00 प्रतिशत), इसके बाद माध्यमिक (22, 31.00 प्रतिशत), स्नातक या अधिक (10, 14. 00 प्रतिशत) व निरक्षर (8, 11.43) पाये गये जो दर्शाते है कि अधिकतर डेयरी कृषक साक्षर थे। अधिकतर निजी डेयरी कृषकों को व्यावहारिक डेयरी व्यवसाय के बारे में अच्छा (5–10 वर्ष) व बहुत अच्छा (>10 वर्ष) अनुभव पाया गया। इन डेयरी कृषकों को डेयरी व्यवसाय में इनकी पत्नियों व औसतन 4 बच्चों के परिवार द्वारा सहयोग प्राप्त होता था। मुजफ्फरनगर जिले के निजी डेयरी फार्मों में उपलब्ध आधारभूत सुविधायें इस प्रकार है। साधारणतः ईटों का पक्का फर्श, ईट व सीमेंट की दीवार, विभिन्न यंत्रों व साधनों को रखने हेतु औसत 171.91±5.77 फीट^2 का संग्रह कक्ष, गेहूँ के भूसे हेतु संग्रह कक्ष (260.01±8.30 फीट^2), दुग्ध संग्रह कक्ष की अनुपलब्धता, बिजली या डीजल से चलने वाली चारा कटाई की मशीन व सीलों की अनुपलब्धता आदि। दुग्ध दोहन सामान्यता हाथों द्वारा किया जाता था। दूध की टंकी व बर्तन आवश्यकतानुसार खरीदे जाते थे। अधिकतर डेयरी फार्मो की लम्बाई का अभिविन्यास उत्तर दक्षिण दिशा में था व अधिकतर डेयरी फार्मों में शेड के प्रकार/निर्माण सामग्री के रूप में मुख्य रूप से (आंशिक) आर.सी.सी. (आंशिक), टीन शेड (45, 64.00 प्रतिशत) का उपयोग किया गया। औसतन शेड की कीमत 2.97±0.09 लाख रूपये पायी गयी। अधिकतर फार्मो में सुविधाये पर्याप्त पायी गयी। जैसे कि पशु फर्श/जगह (67.00 प्रतिशत, 47), शेड में वायु प्रवाह (93.00 प्रतिशत, 65) तथा प्राकृतिक रोशनी (81.00 प्रतिशत, 57)। जबकि सफाई व प्रवाह प्रबंधन अधिकतर अपर्याप्त (54.00 प्रतिशत, 38) पाये गये। इन निजी डेयरी फार्मो में औसतन 1–2 अकुशल पुरूष श्रमशक्ति उपलब्ध थे। इन निजी डेयरी कृषकों के पास औसत 600 गज^2 भूखंड पाये गये।खाद्य के मुख्य स्रोत के रूप में खरीदा हुआ हरा व सूखा चारा तथा सांद्रित मिश्रण का उपयोग किया जाता था। दूध मुख्यतः दुग्ध सहकारी समितियों, दूध वालों व खुले बाजार में बेचा जाता था। अधिकतर डेयरी कृषकों ने ऑक्सीटोसिन के उपयोग से इंकार किया। प्रजनन हेतु सरकारी/निजी पशुचिकित्सकों द्वारा कृत्रिम गर्भाधान कराया जाता था तथा वे स्वास्थय देखभाल में भी मदद करते थे। सभी डेयरी फार्मो में पशुओं का बीमा नहीं किया गया था। सभी डेयरी कृषक पशुओं को हरियाणा या बुधाना से लाने हेतु मिनी ट्रकों का प्रयोग करते थे। इन डेयरी फार्मो में औसत पशुओं की संख्या 29 पायी गयी। जिसमें 13 गाय (गायों के फार्मो में) और 20 भैसें (भैसों के फार्म में) या दोनो थे। थानाभवन ब्लाक में न्यूनतम व्यय, न्यूनतम उत्पादन व न्यूनतम आर्थिक लाभ पाया गया जबकि ये तीनों मुजफ्फरनगर सदर में सर्वाधिक पाये गये। थानाभवन में फार्मो में पशुओं की संख्या न्यूनतम (25 पशु) थी जबकि मुजफ्फरनगर सदर में ये सर्वाधिक (39 पशु) पाये गये जो इंगित करता है कि अधिकतम आर्थिक लाभ हेतु फार्म में इन परिस्थितियों में पशुओं की संख्या लगभग 39–40 होनी चाहिये। जिले में इन फार्मो की मासिक शुद्ध आय 36, 366.39±2447.71 रूपये पायी गयी, जो यह इंगित करता है कि जिले में दुग्ध उत्पादन का व्यवसाय आर्थिक रूप से जीवंत व्यवयाय है।

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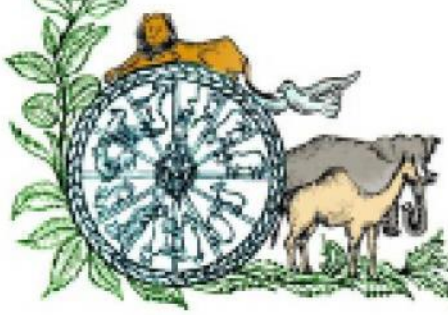

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